A Computer-Based DSS for Funds Management
in a Large State University Environment

by

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(ABSTRACT)

The comprehensive computerized decision support system developed in this research employs two techniques, computer modeling and goal programming, to assist top university financial officers in assessing the current status of funds sources and uses. The purpose of the DSS is to aid in reaching decisions concerning proposed projects, and to allocate funds from sources to uses on an aggregate basis according to a rational set of prescribed procedures.

The computer model provides fast and easy access to the database and it permits the administrator to update the database as new information is received. Goal programming is used for modeling the allocation process since it provides a framework for the inclusion of multiple goals that may be conflicting and incommensurable. The goal programming model allocates funds from sources to uses based on a priority structure associated with the goals.

The DSS, which runs interactively, performs a number of tasks that include: selection of model parameters, formulating goals and priority structure, and solving the GP model. It also provides on-line access to the database so that it may be updated as necessary. In addition, the DSS generates reports regarding funds allocation and goal achievements to allow analysis of the model results. The decision support system also provides a framework for experimentation with various goal and priority structures, thus facilitating what-if analyses. The user can also perform a sensitivity analysis by observing the effect of assigning different relative importance to a goal or set of goals.
To my mother, father, the rest of the family, and all my friends.
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<td>109</td>
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</tbody>
</table>
1.0 INTRODUCTION

Senior university administrators spend a great amount of time and effort dealing with problems that involve allocation of scarce resources. In general, the funds allocation process is one in which there are a number of projects, or uses, that require certain amounts of funds over time, and correspondingly, there are several sources that provide funds over time which may be used for the uses. Thus, the allocation process includes not only the selection of which projects to fund from limited fund sources, but also the matching up of the schedules of cash outflows to uses with cash inflows from sources. The problem faced by administration is twofold: (1) how to establish an information system that will provide up-to-date information about sources and uses of funds, and (2) how to allocate funds from the sources to the uses.

At present, most university administrations do not have computerized databases that maintain information on sources and uses of funds over time, and on the planned funds allocations. Thus, the administrators don't have a quick and easy way to access all the data which is needed for review when an allocation decision arises. As a result, administrators are in urgent need of a computerized database to store the relevant information.

In addition, the task of allocating funds is becoming increasingly difficult and often results in conflicts as to how the scarce funds should be allocated among the various competing uses. The
scarcity of these funds results not only from reduced sources of funds, but also from increasing re-
quests for funds. The past few years have witnessed a trend of decreasing federal, state, and local
funding support to state universities. This has placed an increasing pressure on these universities
to generate their own funds. As a result, university administrations are searching for alternative
sources, such as research centers, hoping to generate new funds from these sources. The costs in-
curred in the development of these alternative sources have placed an additional burden on the al-
ready diminished cash inflow situation, and have made the allocation problem even more critical.

Another way university administrations are tackling this problem is by placing more importance
on judicious use of available funds by recognizing the need to make more efficient and effective
funds allocation decisions. In order to achieve this objective, university administrations are turning
away from traditional, and often inefficient, methods of making fund allocations and looking toward
more scientific, or analytical, ways to make these allocations. They are searching for techniques
that can be appropriately used to model the allocation process. The allocation procedure should
be able to incorporate all the factors that influence the decision making and recognize the fact that
administrations have multiple and competing goals and objectives. These procedures should also
be able to provide a sensitivity analysis so that the effect of changes in the values of the various
variables that affect the allocations can be measured and evaluated.

University administrations also need tools that will facilitate the allocation process. Very often,
techniques are available that may be used to model a certain allocation problem; however, they are
either very complicated and cumbersome to use, or the user has to be an expert in computer pro-
gramming to be able to use them. Thus, for all practical purpose, those analytical tools are rendered
useless. What is needed is some supporting computer system that will facilitate the dialog between
the user and the model. It should be able to access a database to select the model parameters. It
should be flexible enough to let the user build the model based on his/her beliefs about which fac-
tors should be included in the model. It should also be able to generate reports that would help in
the analysis of the model results.

INTRODUCTION
1.1 STATEMENT OF THE PROBLEM AND NEEDS

The basic idea behind this research evolved from the difficulties the Vice President for Finance at a major state university faces in trying to decide how to fund various projects. The problem is as follows: at present the Vice President does not have readily available complete and timely information about how funds from various sources are being channeled to various uses. Consequently, when a new project turns up, he cannot readily determine which sources could be used to fund this project, or if sufficient funds will be available to support the proposed project. Presently, in such a situation, the Director of Financial Planning and Budgeting provides this information by looking at the projected availability of and requirements for funds over time. Then, keeping in mind the goals and objectives of the university, the budget director intuitively arrives at a proposed allocation structure. The whole process is very tedious and time consuming since the university's goals and constraints are competitive and often conflicting. These goals and requirements include: meeting restrictions placed on use of state funds, using multiple sources to fund projects, and depleting non-interest bearing funds prior to those bearing interest. The task is further complicated by the fact that, at present, the administration is facing a trend of increasing requests for funds and a reduction in the number of sources of funds.

What the Vice President would like is a computerized system that would allow him to access information, via an on-line terminal, concerning the up-to-date status of all funds available to the university. The system should provide a projection over time of all funding requirements or needs, a projection over time of all fund sources, and a projection over time of currently proposed allocations of available funds to specified needs. Thus, the system would also provide up-to-date information concerning available (unallocated) funds by source and by time period available. This would allow the Vice President to match up the schedule of available funds with the projected needs to determine if sufficient funds would be available at the times needed.
Since the system involves numerous possible sources and numerous possible uses, both over a quarterly planning horizon of several periods, the possible allocation of funds from various sources to various uses over several time periods becomes a quite complex set of decisions. Thus, the Vice President would also like for the computerized system to include a model to assist in making the allocations of funds from sources to uses, based on a set of goals, guidelines, and constraints prescribed by the Vice President and other senior university administrators (and by legal restrictions concerning use of various sources of state funds). The model should be able to include all the factors that are involved in the decision-making concerning funds allocations and measure the effects of any changes in these factors. It should be able to incorporate the diversity and multiplicity of the university's goals and objectives and legal restrictions concerning funds use. The model should be flexible enough to let the user decide which goals, and at what priority, are to be included.

Such a system should be able to provide the user access to the database for the purpose of selecting model parameters for the model. It should also be 'user-friendly' so that the user does not have to be an expert in mathematical modeling and computer programming to be able to model the funds allocation process.

Such a system should also provide the administrator with a means to analyze systematically the allocation process and make policies and decisions, and provide a framework for testing and evaluating alternative policies, and performing 'what-if' analyses. In summary, the proposed computerized system would be able to provide on-line information on what funds are available and needed over a certain planning horizon and how these funds are being channeled to the various uses according to predefined goals. As a result of implementing this system, the Vice President would immediately know which sources had unused funds and, thus, might be available to fund an upcoming project. The system would also indicate when funds are simply not available for a proposed project and/or when the timing of funds is a problem requiring a rescheduling of the project cash outlays.


1.2 PURPOSE OF THE RESEARCH

The objective of this research is to employ two techniques - computer modeling and goal programming - to yield a decision support system to assist the top university financial officer in assessing the current and projected status of funds sources and uses in order to reach decisions concerning proposed projects, and to allocate funds from sources to proposed uses on an aggregate basis according to a rational set of prescribed procedures.

The specific purpose of this research is to construct a computer model including an imbedded goal programming model to accomplish the above-stated objectives. While goal programming is used to model the funds allocation process, the computer modeling facilitates the human-model interaction process by providing easy access to the data base and the model.

The decision support system provides on-line information regarding the availability and requirements of sources and uses, respectively. It also provides information on how these funds are being channeled to various uses over time. The administrator can use this information to determine whether actual funds allocation is taking place as planned. The user can also determine which sources have unused funds and may be used to fund an upcoming project. Therefore, the decision support system could also be used in conjunction with financial control as well as planning and decision modeling.

The computer model provides fast and easy access to the database. It permits the user to view the sources and uses that are presently included in the database. Using the computer model, the administrator can update the database as new information is received. For instance, it may be used to create a new source, delete a source, or to modify information pertaining to an existing source.

Goal programming is the selected technique for modeling the allocation process since it provides a framework for the inclusion of multiple goals that may be conflicting and incommensurable. For
instance, the objective of using multiple sources to support a particular use may conflict with a desire to deplete a particular source to avoid reduction in availability of funds from that source in the future. The goal programming model allocates funds from sources to uses based on a priority structure for these goals. The priority structure represents the relative importance that the administration places on these goals and objectives.

The decision support system provides the dialog between the user and the goal programming model. The DSS, which runs interactively, performs a number of tasks that include: selection of model parameters, formulating goals and priority structure, and solving the GP model. It also provides on-line access to the database so that it may be updated when necessary. In addition, it generates reports regarding funds allocation and goal achievements to provide analysis of the model results. The decision support system also provides a framework for experimentation with various goal and priority structures, thus facilitating what-if analyses. The user can also perform a sensitivity analysis by observing the effect of giving different relative importance to a goal, or set of goals.

1.3 METHODOLOGY OVERVIEW

As stated earlier, the basis for the decision support system is the application of two techniques - computer modeling and goal programming. Goal programming is used to model the funds allocation process, while the computer modeling facilitates the human-model interaction process by providing easy access to the database and model. The following sections discuss the appropriateness and the usefulness of these two techniques in the research.
1.3.1 Computer Modeling of the Funds Sources and Uses Over Time

Access to the database is provided through computer modeling. Information concerning all the relevant detail about cash flows over time, by source and by project, is provided by the computer model via interactive menu-driven screens. It permits the user to modify or update the database, thus providing the capability to change parameter values of the goal programming model. Through the use of computer modeling, the user can select sources and uses that he would like to include in the model and modify their relevant funds. This is very useful when there is some uncertainty as to source or uses of funds and a what-if analysis is desired to evaluate various possible scenarios. In such instances, the user might like to study the impact of these changes should those changes eventually materialize.

1.3.2 Modeling the Fund Allocation Process via Goal Programming

The fund allocation process, like most resource allocation processes, usually involves competitive and often conflicting goals. The university administration would like to allocate funds based on a number of goals and objectives that take into consideration factors such as: restrictions placed on lawful use of state funds, uncertainty about the availability of funds from some sources, and interest rates. Because of the scarcity of the available funds, and because of the competitive and conflicting nature of the university's goals, it is not generally possible to meet or satisfy all the goals. Consequently, it is not always possible to arrive at an allocation structure that would satisfy each and every goal of the university. The administration must decide which goals are more important and must attain them at the expense of those that are not as important. Consequently, the administration has to prioritize these goals on the basis of their relative importance and must often settle for a funds allocation structure that may not seem to be optimal, but rather satisfies most, or all
of the goals. That is, the administration has to settle for a satisficing solution instead of an optimal solution.

Goal programming is most appropriate for modeling a funds allocation process because of its ability to apply sensitivity analysis. The user specifies the priority structure based on the relative importance attached to the goals included in the model. The user can simulate varying conditions by simply modifying the parameters, goals, or the priority structure, thus facilitating testing and comparison of various allocation structures. The user may also observe the impact that a particular goal has on the allocation structure by including or deleting it from the model and evaluating the resulting solution. An objective of the computer model is to facilitate the user interaction with the goal programming model in as 'user-friendly' a manner as possible.

1.3.3 The Overall Decision Support System

The decision support system was developed with the objective of providing information about the various sources and uses of funds in the university while possessing the following features: (1) computer-based, (2) user-friendly, (3) on-line to the user, and (4) up-to-date information. Included was the objective of making the goal programming technique readily and easily accessible to the decision maker. It uses computer hardware and software to provide a dialog between the user and the model so that the user does not have to be an expert in computer programming or mathematical programming to be able to model the funds allocation process.

The DSS handles a number of tasks that include data handling and storage, formulating and solving a GP model, generating reports, and what-if analyses. Through the use of menus and panels, the user defines model parameters, goals, and the priority structure for the GP model. The DSS then automatically formulates the GP model and solves it using a commercial mathematical programming software package. The resulting allocation structure is then displayed in the form of reports,
along with goal achievement reports. Control is then passed back to the user who can continue testing and evaluating different goals and priority structures in search of an acceptable solution.

A word about the distinction between a model and a DSS is in order. While a model (e.g., a GP model) is employed to represent a problem or a process to obtain a solution, a decision support system places a greater emphasis on developing a system that allows involvement of the decision-maker in the decision making process. The objective of a decision support system is to make it easy for a decision-maker to interact with, and make use of, powerful computerized systems for information management and problem analysis. A DSS integrates database, decision models, and the computer to provide a mechanism for the decision maker to interact with the data and models in a convenient and supportive manner. Thus, a model is just one of the components of a decision support system.

1.4 REVIEW OF RELATED LITERATURE

A number of research papers have been presented and published relating to the use of decision support systems and goal programming for a wide variety of problems in academic institutions. However, very few studies have dealt with the specific area of sources and uses cash-flow models. The following sections will cover related literature on: (1) use of decision support systems in academic institutions, and (1) goal programming applications in academic institutions.

1.4.1 Use of Decision Support Systems in Academic Institutions

The concept of decision support systems began in the late 60's. However, their use in real applications was very limited until the 1980's. Since then, applications to a variety of problems have
included: portfolio management, merger and acquisition analysis, design of police force beats, redesign of school districts, market planning, corporate planning, manpower planning, state government policy analysis, R&D management, product planning, media planning, and budgeting [16]. The reported use of decision support systems in academic institutions, however, has been rather limited.

One of the best examples of a computer-based decision support system applied in an academic institution was done by Greenwood [7]. Greenwood developed a decision support system to enhance the planning, policy-setting, and decision-making processes associated with establishing university tuition and fee charges. The comprehensive computerized system integrates data, model, and reports into an on-line interactive user-friendly tuition and fee analysis package. The DSS embeds a goal programming model that is used to determine the tuition charges per credit hour for different student categories. The multi-year goal programming model considers: state-level tuition requirements, tuition as percentage of total cost, revenue requirements, and tuition charges at peer institutions.

Franz, Lee, and Van Horn developed a proposed approach for academic resource planning referred to as a decision support system [5]. The DSS was based on a single-period goal programming model of an academic department. The model is used to establish the departments personnel requirements and corresponding budget, based on a set of rank-ordered goals, and to investigate the impact of policy changes on staffing and budget requirements. The model's goal formulations consider: faculty distribution by rank, support staff, credit-hour demand, level of salary increases, advising activities, contractual commitments, and budget levels.
1.4.2 Goal Programming Applications in Academic Institutions

Goal programming has been applied to a wide variety of allocation problems. However, most of the research work relating to application of goal programming models in academic institutions has dealt with faculty/staff planning and student enrollments. One of the first such models was developed by Lee and Clayton, and deals with determining personnel requirements for a single academic unit over a single time period [22]. Schroeder extended the model to multiple academic units and time periods, and considered goals on: faculty/staff ratio, faculty/courses loads, faculty/graduate assistant ratio, and faculty ranks [33]. Walters, Mangold, and Haran used weights, instead of preemptive priorities in their GP model which took into consideration career constraints, teaching loads, tenure constraints, and budget constraints [38].

Greenwood used a goal programming model for determining the tuition and fees structure over multiple years [7]. The system establishes a tuition charge per credit hour for a number of student categories. These categories are based on academic level (undergraduate vs graduate), residency (resident vs non-resident), and location (on-campus vs off-campus). The model used goals that considered: state-level tuition requirements, tuition as percentage of total cost, revenue requirements, and tuition charges at peer institutions.

Lee and Moore developed a goal programming model for admissions planning [23]. It determines the number of students that should be admitted by various categories based on state residence policies, admissions standards, student mix, and residence hall capacity. A model for student recruiting activities was developed by Kendall and Luebbe, and determines the kind of recruiting activities that should be performed to reach the enrollment goals [19].

A mixed-integer goal programming model for capital budgeting was developed by Keown, Taylor, and Pinkerton [20]. The model is used to select projects based on a set of goals that consider, among others: capital budgets, operating expenses, building construction, and equipment purchases.
1.5 **SCOPE AND LIMITATIONS**

The purpose of this research is to develop a decision support system that provides an on-line data storage and retrieval capability to provide immediate access to information relating to sources and uses of funds and to the allocation structure. An additional purpose is to develop and include a scientific procedure (model) to accomplish the allocation of funds.

1.5.1 **Scope**

A database is developed to store information relating to the availability of funds and the specified requirements for funds, by categories of sources and uses, respectively. It also provides on-line access to the funds allocation structures which can be presented in various formats including summarized reports, and detailed reports by sources and uses categories.

A goal programming model is developed to aid the administration in allocating resources. It incorporates all factors that affect the allocation process. It will be capable of measuring the effect of changes in the values of these variables. The parameters for the GP model are selected from the database which is to be provided by the university budget office. The goals and priority structure for the model are formulated by the user, i.e., the Vice President in conjunction with the Provost and the President. Goal achievement reports are generated that specify which goals were achieved, and states the deviations, absolute and percentages, from the target value for goals that could not be achieved.

The decision support system provides the capability to test different goals and priority structures and observe their effect on the allocation structure. It is capable of providing a framework to test and evaluate alternatives and perform what-if analysis.
Even though this research work was tested and implemented at Virginia Polytechnic Institute and State University, it is not limited to this institution, or just an academic institution only. Since the funds allocation process is encountered in almost all kinds of organizations, a decision support system like this could find very widespread use.

1.5.2 Limitations

The are a number of obvious limitations. First, even though the decision support system is general enough to be implemented in different types of organizations, the maximum problem size, in terms of number of sources and uses and planning horizon, that it can handle would be constrained by the computing resources available at those organizations. This particular DSS was developed on the Virginia Polytechnic Institute and State University's IBM 3090 computer system and can handle sixteen sources, sixteen uses, and a planning horizon of four years. It also requires that availability of and requirements for funds be given by the quarter of each year. It can not handle situations where the time unit is, say, a year or a month unless those funds could be broken down or aggregated by the quarter for each year.

This research does not address the decision making process. The goal programming model developed to model the allocation process is intended to be used only as an aid to the decision maker and is not a decision making system. It is the user who must decide which goals are to be included in the model and at what priority. The role of the decision support system is essentially to facilitate the process of goal formulation, analysis of the results, and the what-if analysis.

Another limitation of this research is that it is not capable of estimating requirements or availability of funds in the future. All such data has to be gathered by the administration and entered into the database. It also does not help determine ways in which more funds could be generated.
1.6 *PLAN OF PRESENTATION*

Chapter 2, entitled The Sources and Uses of Funds System, defines the key features of the sources and uses cash flow system and the allocation of funds. It explains how the sources and uses categories are developed. It also introduces the concepts of deficits and the eligibility matrix.

Chapter 3, entitled The DSS Architecture, describes the DSS in terms of its three subsystems - data, dialog and model. It explains the various data files that comprise the overall database. It describes in detail the interaction that takes place between the user and the funds allocation model. It also explains how these subsystems are integrated to form the overall decision support system.

Chapter 4, entitled The Goal Programming Funds Allocation Model, presents the goal programming model of the funds allocation process. The decision variables are defined, and all the constraints included in the formulation of the GP model are described. The various types of goals that may be formulated are also described along with a discussion of the priority structure. Also included is a description of the solution methodology for the GP model, and the procedures used to validate the model and the program.

Chapter 5, entitled Summary and Conclusions, evaluates the research in terms of its components and suggests ways in which this decision support system can be integrated with other existing systems to develop a comprehensive financial control package.
2.0 THE SOURCES AND USES OF FUNDS SYSTEM

The sources and uses of funds system consists of funds defined in terms of sources from which to obtain funds and uses to which the funds can be put. The problem is one of keeping track of (1) all the possible sources of funds along with the projected schedule of dollar amounts that will be available over time out into the future, (2) all the identified uses or needs for funds along with the projected schedule of dollar amounts over time, (3) the proposed allocation of funds by category of source to each category of use for each time period, and (4) the excess available funds by source for each time period and the unmet funding needs by use by time period.

Such an information system allows university management to address the question of how to finance additional proposed projects, and of the potential need to look for additional funds sources for the case in which some projects are not fully funded (deficits exist).

An implicit problem in the sources and uses of funds system previously described is the problem of allocating funds from sources to uses. The allocation problem becomes quite complex when considering several sources, several uses, and several time periods. The allocation decisions must
be made while considering the various goals and objectives of the university as well as the state
imposed restrictions on the use of various categories of funds sources.

In this chapter, the cash flow system is described in detail in terms of the sources and uses and the
format in which their relevant data is assumed available or needed. Also explained are some other
features of the cash flow system including the concepts of the eligibility matrix and deficits.

2.1 SOURCES

What is referred to as a source is actually a category of sources. In practice, any cash flow system
at a university consists of a very large number of sources of funds. To include each such source
individually in the model would make the model very complicated and cumbersome. Besides, a
computer model for such a system will primarily be used by a top financial officer and he would
not want to be burdened with details on all these sources, many of which provide relatively very
small amounts of funds. Consequently, to keep the number of sources down to a manageable size,
these many sources are classified into broad categories and then aggregated. Eventually, there re-
main only a limited number of sources, or source categories.

Funds from these sources are assumed available by the quarter for each fiscal year. Figure 1 shows
the typical format for a two year planning horizon. For the first year of the planning horizon (i.e.,
1986-87), for each source, there are entries corresponding to the total funds available during the
entire planning horizon, the balance forward, funds available by each quarter, and total funds for
the year. The balance forward represents any unused funds from previous years that are available
for use and, therefore, have been brought forward. Entries for each of the subsequent years (i.e.,
1987-88) include: cumulative funds up through the previous year, funds by each quarter, total funds
for the year, and cumulative up through the current year. For example, the source 'Aux Prin Re-
## FUNDS AVAILABILITY BY SOURCE - 1986-87

<table>
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<th>FWD</th>
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<td>152</td>
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<tr>
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## FUNDS AVAILABILITY BY SOURCE - 1987-88

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<tr>
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<th>3RD QT</th>
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</table>

Figure 1. Funds Availability by Source
serve' has available funds of $69,551 during 1986-87, $69,551 during 1987-88, and a total of $139,102 for the planning horizon.

2.2 USES (NEEDS)

Similar to categories of sources, individual uses are also aggregated into broad categories to reduce their number to a manageable size. In each case, the desired categories of sources and uses of funds were developed in consultation with the Vice President of Finance. The fund requirements for the uses are also specified by quarter for each fiscal year, as shown in Figure 2. Entries for the first year (i.e., 1986-87) include: total funds needed for the planning horizon, funds needed each quarter, and total for the year. For each subsequent year (i.e., 1987-88), the entries include cumulative funds up through the previous year, funds by each quarter, total for the year, and cumulative total up through the year. For example, 'Stu Fin Aid' needs $281 during 1986-87, $295 during 1987-88, and $576 over the planning horizon. Note that, unlike sources, there is no 'balance forward' for the uses. This results from the fact that the cash flow system does not permit funding needs of uses to be carried over to other periods, even in the case of insufficient availability of funds. In such an event either additional funding is arranged for, or the funding requirements of uses must be reduced, or the timing of funding needs must be rescheduled by administration.

2.3 ALLOCATIONS

Since the sources and uses of funds system involves a number of sources and uses categories, the task of allocating funds becomes very complex and time consuming. To assist the user in making
### FUNDS REQUIREMENT BY USE - 1986-87

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### FUNDS REQUIREMENT BY USE - 1987-88

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<td>300</td>
<td>200</td>
<td>800</td>
<td>1600</td>
</tr>
<tr>
<td>EQP ENHANCEMENT</td>
<td>33</td>
<td>0</td>
<td>0</td>
<td>33</td>
<td>0</td>
<td>33</td>
<td>66</td>
</tr>
<tr>
<td>STU FIN AID</td>
<td>281</td>
<td>99</td>
<td>79</td>
<td>38</td>
<td>79</td>
<td>295</td>
<td>576</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>1114</strong></td>
<td><strong>199</strong></td>
<td><strong>279</strong></td>
<td><strong>371</strong></td>
<td><strong>279</strong></td>
<td><strong>1128</strong></td>
<td><strong>2242</strong></td>
</tr>
</tbody>
</table>

Figure 2. Funds Requirements by Use
the allocations, a goal programming model is embedded within the decision support system to model the funds allocation process, subject to the goals and objectives of the university. These goals include: meeting restrictions placed on use of state funds, using multiple sources to fund projects, and depleting non-interest bearing funds prior to those bearing interest. The GP model allocates funds from sources to uses based on a priority structure for these goals. The priority structure represents the relative importance that the administration places on these goals and objectives.

Once the task of allocating funds from sources to uses has been accomplished using a goal programming model, the proposed allocations are stored in the database and provide on-line information to the Vice President. This information consists of: (1) allocations of funds from a specified source category to various use categories, and (2) allocations of funds from various source categories to a specified use category.

2.3.1 Allocations of Each Source to Various Uses

Allocation of funds from a specified source to various uses are given in the format shown in Figure 3. The information provided for the first year (i.e., 1986-87) includes, by each quarter, the balance carried forward, quarterly additions, allocations made to various uses, total amount of allocations made, and the ending balance. The same information is also available for the year on an aggregate basis. In addition, the total allocations made to various uses over the entire planning horizon are shown. For each subsequent year in the planning horizon, the entries correspond to, by each quarter, balance forward, quarterly additions, usage by various uses, total amount allocated, and the ending balance. This information is also aggregated and accumulated up through the year. For example, out of the $69551 available from 'Aux Prin Reserve' during 1986-87, a total of $505 was allocated to various uses, while in 1987-88 an additional $69551 was available out of which
### AUX PRIN RESERVE EXPENDITURES BY USE - 1986-87

<table>
<thead>
<tr>
<th></th>
<th>1ST QT</th>
<th>2ND QT</th>
<th>3RD QT</th>
<th>4TH QT</th>
<th>YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>BALANCE FORWARD</td>
<td>0</td>
<td>69501</td>
<td>69301</td>
<td>69208</td>
<td>0</td>
</tr>
<tr>
<td>QTRLY ADDITIONS</td>
<td>69551</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>69551</td>
</tr>
<tr>
<td>TOTAL FUNDS AVAILABLE</td>
<td>69551</td>
<td>69501</td>
<td>69301</td>
<td>69208</td>
<td>69551</td>
</tr>
<tr>
<td>GEN OPERATIONS</td>
<td>1022</td>
<td>50</td>
<td>200</td>
<td>60</td>
<td>472</td>
</tr>
<tr>
<td>EQP ENHANCEMENT</td>
<td>33</td>
<td>0</td>
<td>0</td>
<td>33</td>
<td>33</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1055</td>
<td>50</td>
<td>200</td>
<td>93</td>
<td>162</td>
</tr>
<tr>
<td>ENDING BALANCE</td>
<td>69501</td>
<td>69301</td>
<td>69208</td>
<td>69046</td>
<td>69046</td>
</tr>
</tbody>
</table>

### AUX PRIN RESERVE EXPENDITURES BY USE - 1987-88

<table>
<thead>
<tr>
<th></th>
<th>1ST QT</th>
<th>2ND QT</th>
<th>3RD QT</th>
<th>4TH QT</th>
<th>CUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>BALANCE FORWARD</td>
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<td>138527</td>
<td>138327</td>
<td>138247</td>
<td>69046</td>
</tr>
<tr>
<td>QTRLY ADDITIONS</td>
<td>69551</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>69551</td>
</tr>
<tr>
<td>TOTAL FUNDS AVAILABLE</td>
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<td>138527</td>
<td>138327</td>
<td>138247</td>
<td>138597</td>
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<tr>
<td>GEN OPERATIONS</td>
<td>472</td>
<td>70</td>
<td>200</td>
<td>80</td>
<td>200</td>
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<td>EQP ENHANCEMENT</td>
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<td>0</td>
<td>0</td>
<td>33</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>505</td>
<td>70</td>
<td>200</td>
<td>80</td>
<td>200</td>
</tr>
<tr>
<td>ENDING BALANCE</td>
<td>138527</td>
<td>138327</td>
<td>138247</td>
<td>138047</td>
<td>138047</td>
</tr>
</tbody>
</table>

Figure 3. Source Expenditures
$550 was allocated. Thus, it is possible that all of the available funds from a source may not be allocated to the stipulated uses, resulting in a surplus of funds for the indicated source of funds.

2.3.2 Allocations to Each Use from Various Sources

Allocation of funds to a specified use from various sources is shown in Figure 4. In this example, the use category is 'Stu Fin Aid'. The information provided for the first year (i.e., 1986-87) shows which sources are providing funds by each quarter, and for the year as a whole. The total funds allocated from the sources over the entire planning horizon are also provided. For each subsequent year in the planning horizon, the entries correspond to the amount allocated from various sources by each quarter, and for the year. In addition, the total amount of funds provided by each source up through the previous year and up through the current year are also shown. For example, 'Stu Fin Aid' received $138 and $176 from 'Aux Interest Income' during 1986-87 and 1987-88, respectively, for a total of $314 for the entire planning horizon.

Note the presence of 'Deficit' in the list of sources providing funds to 'Stu Fin Aid'. This indicates that funds available from the sources eligible to fund this use were insufficient to satisfy all needs of 'Stu Fin Aid'. This point will be discussed in more detail in the following section.

2.4 DEFICITS

As mentioned earlier, a key feature of the cash flow system is that it does not allow funding needs to be carried over to future periods and, thus, every attempt must be made to meet those needs in the period required. There exists, however, the possibility that funds available from the sources may be insufficient to meet the needs of all the uses in some time periods. Therefore, to counter
### EXPENDITURES BY SOURCE - 1986-87

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>TOTAL</th>
<th>1ST QT</th>
<th>2ND QT</th>
<th>3RD QT</th>
<th>4TH QT</th>
<th>YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUX INTEREST INCOME</td>
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<td>0</td>
<td>0</td>
<td>75</td>
<td>63</td>
<td>138</td>
</tr>
<tr>
<td>O/H FUNDS 20%</td>
<td>119</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>DEFICIT</td>
<td>143</td>
<td>55</td>
<td>88</td>
<td>0</td>
<td>0</td>
<td>143</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>576</strong></td>
<td><strong>55</strong></td>
<td><strong>88</strong></td>
<td><strong>75</strong></td>
<td><strong>63</strong></td>
<td><strong>281</strong></td>
</tr>
</tbody>
</table>

### EXPENDITURES BY SOURCE - 1987-88

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>CUM</th>
<th>1ST QT</th>
<th>2ND QT</th>
<th>3RD QT</th>
<th>4TH QT</th>
<th>YEAR</th>
<th>TOT</th>
<th>2YR</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUX INTEREST INCOME</td>
<td>138</td>
<td>61</td>
<td>79</td>
<td>36</td>
<td>0</td>
<td>176</td>
<td>314</td>
<td></td>
</tr>
<tr>
<td>O/H FUNDS 20%</td>
<td>0</td>
<td>38</td>
<td>0</td>
<td>2</td>
<td>79</td>
<td>119</td>
<td>119</td>
<td></td>
</tr>
<tr>
<td>DEFICIT</td>
<td>143</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>143</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>281</strong></td>
<td><strong>99</strong></td>
<td><strong>79</strong></td>
<td><strong>38</strong></td>
<td><strong>79</strong></td>
<td><strong>295</strong></td>
<td><strong>576</strong></td>
<td></td>
</tr>
</tbody>
</table>

Figure 4. Expenditure Sources
that possibility, it is assumed that there is another source called 'Deficit' with unlimited availability of funds and that funds from this source will be utilized in case funds from the stipulated sources are insufficient to fund all the requirements. Figures 4 and 5 illustrate situations involving deficits. Figure 5 represents a situation in which the aggregate sources and uses cash flow system had a deficit of $179 during 1986-87, though no deficits existed in 1987-88.

If an allocation solution results in an allocation structure that involves deficits, it implies that available funds are insufficient to meet the needs of the uses. There are three possible ways an administrator can handle such a situation: (1) arrange for additional funds to meet the requirements, (2) reduce the funding requirements of uses in an attempt to avoid deficits, or (3) revise the schedule of cash requirements to be within the schedule of funds availability.

2.5 ELIGIBILITY MATRIX

Another important feature of the cash flow system is the 'eligibility matrix' which indicates the eligibility of a particular use to be funded from a particular source. The reason behind the existence of this matrix is that very often restrictions are placed on a source as to which uses may receive funds from the source. This is especially true of federal and state funds. The eligibility matrix is specified in the format shown in Figure 6. A value of 'Y' in the matrix for the element corresponding to a particular source and use combination implies that the use may receive funds from the source. An 'N', however, prohibits that use from receiving any funds from the source. For example, 'Bonds' cannot fund 'Gen Operations' or 'Professorships'; they may, however, provide funds to 'Renovations'.

There is another instance where it might be useful to place restrictions on uses that may receive funds from a source. For instance, the administration may want to avoid using a particular source
### SOURCE EXPENDITURES THROUGH TIME - 1986-87

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>AVAIL</th>
<th>USED</th>
<th>1ST QT</th>
<th>2ND QT</th>
<th>3RD QT</th>
<th>4TH QT</th>
<th>YEAR</th>
</tr>
</thead>
<tbody>
<tr>
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<td>50</td>
<td>200</td>
<td>93</td>
<td>162</td>
<td>505</td>
</tr>
<tr>
<td>AUX INTEREST INCOME</td>
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<td>704</td>
<td>0</td>
<td>0</td>
<td>215</td>
<td>63</td>
<td>278</td>
</tr>
<tr>
<td>O/H FUNDS 20%</td>
<td>304</td>
<td>304</td>
<td>14</td>
<td>0</td>
<td>100</td>
<td>38</td>
<td>152</td>
</tr>
<tr>
<td>DEFICIT</td>
<td>179</td>
<td>179</td>
<td>91</td>
<td>88</td>
<td>0</td>
<td>0</td>
<td>179</td>
</tr>
<tr>
<td>TOTAL</td>
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<td>2242</td>
<td>155</td>
<td>288</td>
<td>408</td>
<td>263</td>
<td>1114</td>
</tr>
</tbody>
</table>

### SOURCE EXPENDITURES THROUGH TIME - 1987-88

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>CUM</th>
<th>1ST QT</th>
<th>2ND QT</th>
<th>3RD QT</th>
<th>4TH QT</th>
<th>YEAR</th>
<th>TOT 2YR</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUX PRIN RESERVE</td>
<td>505</td>
<td>70</td>
<td>200</td>
<td>80</td>
<td>200</td>
<td>550</td>
<td>1055</td>
</tr>
<tr>
<td>AUX INTEREST INCOME</td>
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<td>79</td>
<td>256</td>
<td>0</td>
<td>426</td>
<td>704</td>
</tr>
<tr>
<td>O/H FUNDS 20%</td>
<td>152</td>
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<td>0</td>
<td>35</td>
<td>79</td>
<td>152</td>
<td>304</td>
</tr>
<tr>
<td>DEFICIT</td>
<td>179</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>179</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1114</td>
<td>199</td>
<td>279</td>
<td>371</td>
<td>279</td>
<td>1128</td>
<td>2242</td>
</tr>
</tbody>
</table>

Figure 5. Funds Use Through Time
## ELIGIBILITY MATRIX

<table>
<thead>
<tr>
<th>Source</th>
<th>Gen Operations</th>
<th>Professorships</th>
<th>.......</th>
<th>Renovations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bonds</td>
<td>N</td>
<td>N</td>
<td>.......</td>
<td>Y</td>
</tr>
<tr>
<td>Local Funds</td>
<td>Y</td>
<td>Y</td>
<td>.......</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>.......</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>.......</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>.......</td>
<td></td>
</tr>
<tr>
<td>Borrowing</td>
<td>N</td>
<td>N</td>
<td>.......</td>
<td>Y</td>
</tr>
</tbody>
</table>

**Figure 6. The Eligibility Matrix**
so that interest may be earned on those funds. In such a situation, the user can make all uses ineligible to receive funds from that source by placing a 'N' in the eligibility matrix for all source-use combinations involving that source. As a result, when a goal programming model is formulated and solved, the resulting funds allocation structure will have no allocations from that source.

The eligibility matrix may also be used to give structure to the funds allocation process. For every 'N' in the eligibility matrix, all decision variables involving the corresponding source and use are forced to take a value of zero. This reduces the dimensionality of the allocation process and, therefore, reduces its complexity for the solution procedure used.

2.6 SUMMARY

This chapter has presented the sources and uses of funds system in terms of the sources that provide funds and the uses to which these funds can be channeled. The sources and uses were described as categories, instead of individual sources and uses. Sources and uses were categorized in order to reduce the large number of sources and uses involved in the system to a manageable size and to reduce the complexity of the system. The concepts of 'deficits' and the 'eligibility matrix' were also introduced.

The cash flow system provides multi-period information concerning: (1) possible sources along with dollar amount of funds available, (2) possible uses with dollar amounts of needed funds, (3) proposed allocation of funds from sources to uses, (4) excess available funds by source and time period, and (5) deficits in funding needs for some use categories. This information allows the Vice President to match up the schedule of available funds with the projected needs to determine if sufficient funds will be available to meet the needs during each of the time periods in the planning horizon.
3.0 THE DSS ARCHITECTURE

The decision support system performs a number of tasks including facilitating interaction with the data-base subsystem, the model subsystem, and the DSS user/decision maker. For example, the interaction associated with the allocation of funds solution procedure includes selecting the goals, setting the target values, specifying the priority structure, solving the GP model and analyzing the results. In addition, the DSS also performs the following functions: processing data, facilitating what-if analysis and generating reports.

For purposes of presentation of the above-mentioned tasks, the decision support system is divided into three categories: database, GP model, and computer modeling. This chapter will discuss the overall DSS architecture, and each of its three categories.
3.1 THE OVERALL DECISION SUPPORT SYSTEM

This section presents an overview of the system. This overview includes: (1) an outline of the various steps involved in a typical session, (2) important features/characteristics of the system, and (3) computer systems and programming languages used in the development of this DSS.

3.1.1 Steps in a Typical Session

A typical session starts with the user being provided access to the database which stores information relating to the sources and uses of funds system. The user is provided on-line access to information concerning the up-to-date status of the system, including the following information: (1) projection over time of all available funds by source, (2) projection over time of all funding requirements or needs, (3) projection over time of currently proposed allocations, and (4) projection over time of available (unallocated) funds by source. This information allows the user to match up the schedule of available funds with the projected needs to determine if sufficient funds would be available at the times needed. It also allows the user to reach new decisions concerning proposed new projects. The user also has an opportunity to modify or update the database. The possible changes include: adding a new source/use, deleting an existing source/use, or modifying funding availability, funding requirements, the eligibility matrix, or the planning horizon (time periods considered).

After the database has been updated, if required, the user can resolve for a new allocation solution of the cash flow system using a goal programming model. The modeling process starts with the user viewing results of the existing GP model from a previous session. This existing model, or the base model, is the GP model that has so far given the best results to the funds allocation problem being considered. The results of this model serve as a base from which to start looking for ways to improve the system in search of a better solution. Next, the problem framework needs to be
defined in terms of the planning horizon, and sources and uses that are to be included in the goal programming model. The problem framework need not be the same as that existing in the database. That is, the user decides which sources and uses to include in the goal programming model, and what the planning horizon should be. The funding availability or requirements and the eligibility matrix may also be changed for the sources and uses selected to be included in the model.

When the variables relating to the problem framework have been defined, the user may begin working on the GP model. There are two choices at this stage: either use the existing GP model, in which case all the goals in that model are automatically loaded, or formulate a new GP model, in which case the user must provide all goals that are to be included. It may be noted that since the user decides which sources and uses to include in the GP model, the base GP model is automatically modified when changes to the temporary database are made. For instance, if a particular source exists in the base model, but is excluded from the current problem framework, then all goals and rigid allocations concerning that source are deleted from the base model. Regardless of whether the existing model is used or a new model created, goals may be added, modified, or deleted at the user's discretion. Formulation of a goal requires specification of the target value, deviation type, priority and weight.

After all goals have been formulated, the GP model is ready to be solved. The DSS automatically executes the GP model by generating the model code in an appropriate format and invoking the solution algorithm. The model results are then displayed in the form of reports which summarize funding availability and requirements over time and how these funds are to be allocated. The reports also describe in detail how funds from a particular source are to be channeled to various uses, and which sources are funding a particular use. The user also has an opportunity to view goal achievement reports that describe which goals were achieved. These reports include the deviations, both absolute and percentage, from the target value for goals that could not be achieved. The control is then returned to the user who, if not satisfied with the allocation structure, can test and evaluate alternative goals and priority structures in the search for a more acceptable funds allocations structure.
3.1.2 Design Philosophy

For any decision support system to be an effective and valuable tool as an aid to decision-making, it must possess certain key features or characteristics [18]. This DSS was designed and developed to possess the following features:

INTERACTIVE: to provide on-line information and access to the sources and uses of funds model and immediate feedback on the goal programming model results to facilitate evaluation of the solution results by the user as well as an opportunity to perform what-if and sensitivity analyses.

COMPREHENSIVE: to integrate the three subsystems of the DSS: database, model, and computer modeling.

USER-FRIENDLY: to facilitate the interaction between the user, database, and the model so that it is not necessary for the user to be an expert in computer programming or goal programming to be able to use the system effectively.

MENU-DRIVEN: to keep the user informed of all possible options at different stages of a session and facilitate back and forth movement from one hierarchical level of the system to another.

FLEXIBLE: to let the user decide the problem framework, and goals and rigid allocations that are to be included in the goal programming model, and facilitate experimentation with various different goal and priority structures.

The need to incorporate these features and characteristics in the decision support system strongly influenced the design and development of this system, including: structuring of the system, selection of programming languages, design of the database, and the mechanism for solving the goal programming model.
Figure 7 illustrates the overall architecture of the DSS. The DSS has been divided into three components, or subsystems: (1) Database, (2) GP model, and (3) Computer modeling. Note the bilateral flow of information from one subsystem to another. The computer modeling provides the user information from the database, and allows the user to update the database. The database stores information relating to the sources and uses of funds system including the funding availability by sources, funding needs of uses, and the GP model allocation results. It also provides the interaction between the user and the allocation model. The model takes the parameter values from the database and, in return, updates the database after the model has been formulated and solved. The use of these subsystems was very effective in the development of this DSS. Each of these subsystems was developed separately before they were integrated to form the overall system. Developing each system separately greatly facilitated the testing and validation of the DSS. Also, modifications to the system translated into modifying one or more of these subsystems, and each of these subsystem could then be modified and validated before being reintegrated into the overall system.

3.1.3 The Computer System and Programming Languages

The DSS was developed and implemented on the Virginia Polytechnic Institute and State University’s IBM 3090 computer system, which uses the VM/SP (Virtual Machine/System Product) operating system. It is run in an interactive mode in the CMS (Conversational Monitoring System) environment on an IBM 3270, or emulator terminal.

All programs and data are kept in files which are stored on minidisks. Each file is identified by a filename, a filetype, and a filemode. The filemode identifies the minidisk on which the file is stored; the file type determines the type of contents (DATA, EXEC, FORTRAN, PANEL) of the file; and filename gives a specific indication of their contents (for data files) or their purpose (for program files). The DSS uses the following programming languages and systems: EXEC 2, FORTRAN,
Figure 7. The DSS Architecture
LINDO, and DMS (Display Management System). Each language or system will be described in the following discussion.

### 3.1.3.1 EXEC 2

All control programs are written in EXEC 2. The justification for selecting EXEC 2 is that it can be used both as a programming language and as a command language. Also, it is one of the few languages that can provide access to DMS (Display Management System) that is used to prepare panels for presenting menus and performing input/output operations in the DSS. Aside from being used to write programs, EXEC 2 has been used as a command language to perform a variety of functions including: (1) read and write files, (2) invoke the DMS, (3) invoke the LINDO program, and (4) execute CP and CMS commands.

### 3.1.3.2 FORTRAN

FORTRAN programs are used to perform computations, create data files, generate the GP model code in MPS format, and write reports. The programs, which run interactively, are executed from EXEC 2 control programs. Most of their input/output operations are performed on data files, which are specified using the FILEDEF commands. FORTRAN programs have been used quite frequently and extensively in the DSS due to the fact that EXEC 2 has very limited computational capabilities and cannot read or write files in a formatted mode.

### 3.1.3.3 LINDO

The goal programming model is solved using LINDO [29,30,31], a commercial linear programming package. LINDO, an interactive package, provides the software for the simplex solution algorithm
and the USER subroutine is used to solve the goal programming model as a sequence of linear programming models using LINDO. There are two files that serve as the input to LINDO. FILE FT25F001 contains the mathematical constraints and a dummy objective function in the MPS format, and FILE FT75F001 contains the achievement function in terms of deviation variables at various priority levels. Both these files are generated by FORTRAN programs after the goals and rigid allocations have been formulated by the user.

3.1.3.4 DMS

The menu-driven decision support system utilizes the IBM Display Management System (DMS) [10] to prepare panels which can be used for presenting menus as well as for performing data input/output operations.

Before a screen can be used, it has to be designed as a panel using the DMS. The designing phase essentially consists of defining all the titles and the data fields. These titles may be highlighted, if needed. The options for data fields include whether they are to be numeric or alphanumeric, protected or unprotected, and highlighted. Once a screen has been designed, it is stored in the form of a file with a file name and a filetype of PANEL.

When a screen needs to be shown, the particular panel is selected and data fields, if any, are given names and values, and the panel is then displayed. These panels can be printed immediately, using the PRINT SCREEN key on the terminal keyboard. This invoking of the DMS environment is possible from only a limited number of programming languages that include: EXEC, EXEC 2, COBOL, PL/I, and the Assembly language.
3.1.4 The System Flow-Chart

The system flowchart for the DSS is given in Figure 8. The flowchart details various tasks that are performed by the system. The modular form of the system implies that each function of the DSS can be explained and developed independent of the others. Note that a number of options are provided to the user at various stages of the DSS. Using the menus provided, the user can go back and forth to various levels, skipping options that he/she does not wish to use.

3.2 THE DATABASE SUBSYSTEM

As previously stated, the database subsystem represents one of the three major components of the DSS. The database subsystem stores and processes all information relating to the sources and uses of funds. This information base also includes the parameter values that are used in formulating the GP model. It is comprised of two kinds of data: those that define the problem framework and those that define the goals for the GP model used to model the cash flow system. All data is stored on a minidisk in the form of files. In the following sections, these data files will be discussed.

3.2.1 Data Files Relating to Sources and Uses

There are seven such data files, each with a file type of PERM, that serve as the permanent data base. When a DSS session is initiated, copies of each of these files are made with the same file name but with a file type of DATA, and these form the temporary database. All temporary changes that are made are incorporated into these files so as not to change the permanent data base, unless the
Figure 8(a). Flow-Chart of the DSS Structure
Figure 8(b). View Results of Existing Model
Figure 8(c). Make Temporary Changes to Model Data
Figure 8(d). Make Permanent Changes to Model Data
Figure 8(e). Run a Model
user so authorizes. The data contained in these files is used to provide on-line information about the cash flow system and to define parameters of the GP model.

3.2.1.1 INIT

This file consists of a single record that contains the following pieces of information, in a free format, relating to the problem framework:

- Number of Sources
- Number of Uses
- Planning Horizon in Years
- Starting Year

The primary purpose of this file is to determine the structure of other data files since the number of records per source or use depends on the planning horizon. This file allows the computer programs to know which record corresponds to which source or use and for which fiscal year.

3.2.1.2 YEAR

This file stores the fiscal years that comprise the planning horizon. For example, if the planning horizon is three years and the initial year is 1986-87, this file would have three records with the following entries:

1986-87
1987-88
1988-89
3.2.1.3 **SOURCEN**

This file stores the names of all sources that will provide funds. Each name is written on a separate record and can contain a maximum of twenty characters. Because a printed line on the terminal can contain only eighty characters, in some of the reports that are displayed on the terminal these names are truncated to the right to fit all relevant data on one line. All printed reports, however, contain the full twenty characters of a source name.

3.2.1.4 **USEN**

This file stores the names of all uses that require funds. Each name is written on a separate record and can contain a maximum of twenty characters. As in the case of sources, these names are sometimes truncated in reports that are displayed on the terminal.

3.2.1.5 **SOURCED**

This file stores data pertaining to the availability of funds for each source included in the sources and uses of funds system. For each source, there is one record for the initial balance, and one record for each year in the planning horizon that contains data for the four quarters of that year.

3.2.1.6 **USED**

This file stores data pertaining to requirements (needs) for funds for each use included in the database. For each use, there is one record for each year in the planning horizon that contains data for the four quarters of that year.
3.2.1.7 CONST

This file contains the eligibility matrix which determines the eligibility of a source to fund a use. The rows and columns correspond to sources and uses, respectively; a '1' for a particular source-use combination indicates the source may fund the use, while a '0' prohibits any such funding. The user decides whether a source may fund a use or not by entering a 'Y' or an 'N'. These 'Y's and 'N's are then automatically transformed into '1's and '0's, respectively, by the program.

3.2.2 Data Files Relating to the GP Model

These files contain information relating to rigid constraints and goals included in the existing or the base GP model. When a user asks for the existing model to be loaded, the rigid constraints and goals of the existing GP model are loaded from these files. There are four such files explained in the sections that follow.

3.2.2.1 RIGID

These constraints, which must always be satisfied, are used to allocate a specified amount of funds from a source to a use during a period. For example, one such rigid allocation might be to allocate $500 from 'Private Funds' to 'Professorships' during the third period. The file RIGID keeps one record for each such constraint that exists in the existing GP model. Each record contains:

- Source number
- Use number
- Period number
- Amount allocated
This file contains information concerning type I goals: allocate within a specified target dollar amount from a source to a use during a particular period. The user must specify the deviation type of the goal, that is, whether the amount to be allocated is to be at most, at least, or exactly equal to the target value, by using the symbols \( \leq \), \( \geq \), and \( = \), respectively. For example, one such goal might be to allocate exactly $800 from 'Private Funds' to 'Professorships' during the fifth period at a priority of 3 and a weight of 1. Each record of this file contains the following data for such a goal:

- Source number
- Use number
- Period number
- Target amount
- Deviation type
- Priority
- Weight

Type II goals are used to allocate a percentage of available funds from a source to a use during a specified year. The user must specify whether the percentage amount to be allocated is to be at most, at least, or exactly equal to the target value. For example, one such goal might be to allocate 20% of 'Private Funds' to 'Professorships' during the first year (i.e., 1986-87) of the planning horizon at a priority of 4 and a weight of 1. Each record of this file contains the following information for such a goal:
- Source number
- Use number
- Year
- Target percentage
- Deviation type
- Priority
- Weight

3.2.2.4 **GOAL3**

Type III goals are used to allocate a percentage of total funds needed for a project from a specific source during a specified year. The user must specify whether the percentage amount to be allocated is to be at most, at least, or exactly equal to the target value. For example, one such goal might be to fund 50% of the cost of 'Student Aid' from 'Overhead' funds during the second year (i.e., 1987-88) of the planning horizon at a priority of 2 and a weight of 1. Each record of this file contains the following information.

- Source number
- Use number
- Year
- Target percentage
- Deviation type
- Priority
- Weight
3.2.2.5 *ALLOCATN*

This file contains the allocation results of the goal programming model. There are as many records as the number of decision variables, with each record containing the value for one decision variable. For example, if the GP model contained ten sources, ten uses, and a planning horizon of two years (i.e., eight quarterly periods), the ALLOCATN file would have 10*10*8 = 800 records.

3.3 *THE DIALOG SUBSYSTEM*

The dialog subsystem is probably the most important of the three subsystems as it provides the interaction between the user on the one hand and data and models on the other. It allows the Vice President to access information, via an on-line terminal, concerning the up-to-date status of all funds available to the university. The system provides a projection over time of all funding requirements or needs, and a projection over time of currently proposed allocations of available funds to specified needs. Thus, the system also provides up-to-date information concerning available (unallocated) funds by source and by time period available. This allows the Vice President to match up the schedule of available funds with the projected needs to determine if sufficient funds would be available at the times needed. It also allows the user to model the funds allocation process by formulating a goal programming model, solving it, analyzing the results, and performing a what-if analysis without having an expertise in goal programming or computer programming languages.

The decision support system uses menus to provide various options to the user. The user selects the option using program function, or PF, keys. After each selection, additional menus may be provided to pinpoint the specific option available to the user.
At the time a session is initiated, the user is presented with six major options at the highest level, as shown in Figure 9. The following sections will discuss these major high level options, and any further lower level options provided within each of these.

### 3.3.1 View Results of Existing Model

This option provides information about the sources and uses of funds system in the form of reports. These reports also include results of the GP model used to model the allocation process. These reports, which include summaries as well as detailed reports, are explained below.

- **Funds Availability by Sources:** Describes, for each year in the planning horizon, the dollar amount of funds available from each source by quarter.
- **Funding Requirements by Uses:** Describes, for each year in the planning horizon, the dollar amount of funds needed for each use by quarter.
- **Source Expenditures:** Describes in detail how funds from a particular source are being channeled to various uses over time, as determined by the allocation model. A different report is generated for each source category.
- **Expenditure Sources:** Describes in detail how a particular use is being funded from various sources over time, as determined by the allocation model. A different report is generated for each use category.
- **Funds Use Through Time:** Describes how much funds are available from each source and how much of these have been allocated to various uses by quarter, as determined by the allocation model.
FUND SOURCES AND USES MODEL

PF1  VIEW RESULTS OF EXISTING MODEL
PF2  MAKE TEMPORARY CHANGES (WHAT-IF ANALYSES) TO DATA
PF3  RELOAD ORIGINAL (PERMANENT) DATA
PF4  MAKE TEMPORARY CHANGES TO DATA PERMANENT
PF5  MAKE PERMANENT CHANGES TO DATA
PF6  RUN A MODEL
PF10 QUIT

Figure 9. The Main Menu
3.3.2 Make Temporary Changes to Model Data

This option is used to change the length of the planning horizon, the number of sources or uses along with the available or needed funds, and the constraint matrix for data stored on the temporary database. All of these changes are temporary in nature and do not affect the permanent database. When a terminal session is initiated, the permanent database is copied to the temporary database, which in turn is used to provide parameters for the GP model of the cash flow system. The primary purpose in providing this temporary database is to ensure that the user is not restricted to using the problem framework of the permanent database. Thus, for modeling the cash flow system, the user need not use all sources and uses residing on the database. The user can decide which elements to include by appropriately modifying the temporary database to define the problem framework for the decision problem at hand. This prevents the permanent database from being needlessly and unintentionally changed while allowing flexibility in decision analysis.

As mentioned previously, this option is used to make changes relating to the planning horizon and the sources and uses. The planning horizon is specified in terms of the number of years in the planning horizon, and the starting year. The default values are the same as stored for the permanent database. The user has the option of changing either or both the planning horizon and the starting year. The DSS will automatically modify the temporary database to reflect these new values by deleting data that corresponds to fiscal years not included in the planning horizon and by asking the user to provide data for those years that are in the planning horizon but for which data is not available in the permanent database.

Changes to sources include: (1) deleting a source, (2) modifying a source, (3) creating a new source, and (4) sorting (rearranging the order of) the sources. When a source is deleted, all data relating to that source is purged from the temporary database. In addition, all rigid allocations and goals involving the source are also purged from the existing GP model. A source may be modified in terms of its initial balance, the funding available over each period of the planning horizon, and the list of
uses that are eligible to receive funds from the source. Just as in the case of deleting a source, when a source is modified, all rigid allocations and goals involving the source are purged from the existing GP model. When a new source is created, the user has to input the initial balance, the funding available over each period of the planning horizon, and the list of uses eligible to receive funds from the new source. Sorting the sources essentially means specifying the order in which these sources will appear in various reports.

When a source is deleted, the sources listed below that source are moved up one notch. A newly created source is added at the bottom of the existing list of sources. Modifying a source does not change its position in the list. The user has the option to change the order in which the sources are listed by sorting them on a number of criteria that include: alphabetically, decreasing amount of funds, increasing amount of funds, and user-specified. All of these criteria are self-explanatory except the user-specified criteria, in which a list of all sources is displayed and the user can specify the order in which these should be sorted by placing a rank-order number after each source.

Possible changes to uses are exactly the same as those for sources; that is, they may be deleted, modified, or created. It may be noted, however, that uses do not involve any initial balance. They may also be sorted using criteria similar to those for the sources.

3.3.3 Reload Original (Permanent) Data

If, while making temporary changes to data, the user realizes that some unintentional changes have been made, or simply wishes to start all over again, this option can be used to erase all temporary data changes that have been made thus far. When this option is used, the current temporary database is erased and a new one is copied from the permanent database. No further user interaction is required when this option is selected.
3.3.4 Make Temporary Changes to Data Permanent

If a user has been experimenting with temporary changes to the data, feels satisfied with these changes and would like to make the same changes to the permanent data base, then the "Make Temporary Changes to Data Permanent" option may be used. In selecting this option, the user has no further interaction with the DSS. Using this option after some temporary changes have been made would have the same effect as making permanent changes to begin with. This could provide more flexibility, since the user can experiment with various temporary changes before deciding to implement those changes permanently.

3.3.5 Make Permanent changes to Model Data

This option works the same way as the option "Make Temporary Changes" to Data, except that changes made using this option are permanent and are incorporated into the permanent database.

Because the use of this option can have a tremendous impact on the contents of the permanent database, extreme caution must be taken when using this option. In fact, it is highly recommended that instead of using this option, the user use a combination of two options: "Make Temporary Changes to Data", followed by "Make Temporary Changes to Data Permanent". This will achieve the same results and provide a margin for changing one's mind about what changes to make permanent.
3.4 **THE MODEL SUBSYSTEM**

All user interaction relating to GP model formulation is achieved using the option: "Run a Model". When this option is used, the user is informed of the variables that define the problem, including number of sources, number of uses, planning horizon, and the starting year. These variables cannot be changed by the user at this point. They can only be changed using the option "Make Temporary Changes to Data". It is assumed that the user has already exercised that option to define the values of these variables before moving on to this part of the program.

Next, the user must decide whether the existing GP model is to be used or a new model is to be formulated. In the former case, goals and rigid allocations of the existing model are automatically loaded, while in the latter case there are no default goals or rigid allocations and the user must formulate all such allocations and goals that are to be included in the model. In either case, the user has the option to create, delete, or modify goals and allocations.

After the user has made a choice as to whether the existing model is to be loaded or a new one is to be created, there are a number of options. These include: (1) view results of existing model, (2) select/modify rigid allocations, (3) select/modify goals, (4) view current goals and allocations, and (4) run model. These options are discussed in greater detail in the following sections.

### 3.4.1 View Results of Existing Model

This option provides information relating to the solution results previously obtained from the GP model (if any). This includes the sources and uses included in the model, and the resulting fund allocations in the form of reports. These reports, which include summaries as well as detailed reports, are explained below.
Funds Availability by Sources: Describes, for each year in the planning horizon, the dollar amount of funds available from each source by quarter.

Funding Requirements by Uses: Describes, for each year in the planning horizon, the dollar amount of funds needed for each use by quarter.

Source Expenditures: Describes in detail how funds from a particular source are being channeled to various uses over time, as determined by the allocation model. A different report is generated for each source category.

Expenditure Sources: Describes in detail how a particular use is being funded from various sources over time, as determined by the allocation model. A different report is generated for each use category.

Funds Use Through Time: Describes how much funds are available from each source and how much of these have been allocated to various uses by quarter, as determined by the allocation model.

3.4.2 Select/Modify Rigid Allocations

As was previously explained, rigid constraints are used to allocate a specified dollar amount from a source to a use during a quarter. When this option is used, a screen containing a list of all sources and uses is displayed. The user selects the particular source and use categories for which the specified allocation is to be made by entering their respective numbers. Once these numbers are entered, a screen displays the funds available from the source and the funds needed for the use, by quarter for each year of the planning horizon. Any existing allocations are also displayed. The user can enter the appropriate allocation amount for each quarter of the planning horizon, or modify an existing value. A test is made (by the program) after each such allocation to ensure that the entered amount in not greater than either what is needed or what is available.
Figure 10 illustrates how this allocation process takes place. For the year 1986-87, the source ‘Aux Prin Reserve’ has $69551 available during the first quarter and none during the second quarter. The funding needs for ‘Gen Operations’ during the two quarters are $100 and $200 respectively. When the user makes an allocation of $100 from ‘Aux Prin Reserve’ to ‘Gen Operations’ out of the $69551 available from ‘Aux Prin Reserve’ during the first quarter, only $100 is used, and the remaining amount of $69451 is carried forward to the next quarter. The funds available from this source for the second quarter now become $69451 instead of the initial amount of zero funds available during that quarter. This process continues on as allocations are made in subsequent time periods.

3.4.3 Select/Modify Goals

There are three types of goals that may be included in the GP model: (1) allocate specified dollar target amount from a source to a use, (2) allocate percentage of a source to a use, and (3) allocate percentage of a use from a source. The following sections discuss the formulation of these three types of goals within the Run a Model option of the program.

3.4.3.1 Allocate Specified Dollar Target Amount From a Source to a Use

To formulate this goal, the source-use combination needs to be selected using a procedure similar to that for the rigid constraints. The user fills in the target dollar amount, the deviation type of the goal, and the goal priority and weight for each quarter. The deviation type of the goal specifies whether the amount to be allocated is to be at most, at least, or exactly equal to the target value. In case this goal had already been formulated, the relevant values would appear in the data fields and the user has the option to modify those values, or delete this goal altogether by putting a Y in the ‘delete?’ field. Also provided at the bottom of the screen are fields relating to goal achievement.
**GOAL PROGRAMMING MODEL**

**SOURCE NAME: AUX PRIN RESERVE**

**USE NAME**: GEN OPERATIONS

**YEAR**: 1986-87

<table>
<thead>
<tr>
<th></th>
<th>QTR1</th>
<th>QTR2</th>
<th>QTR3</th>
<th>QTR4</th>
</tr>
</thead>
<tbody>
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<td>AVAILABLE FROM SOURCE:</td>
<td>69551</td>
<td>69451</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>REQUIRED FOR USE</td>
<td>100</td>
<td>200</td>
<td>300</td>
<td>200</td>
</tr>
<tr>
<td>AMOUNT ALLOCATED</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 10. Select/Modify Rigid Allocations**
If a goal for this combination had been included in the last GP model that was solved, these fields would contain the relevant goal achievement values. These values provide some feedback as to the achievement of that goal so that the user may suitably change the priority or weight for this goal in case the goal attainment was vastly off the target. Note that four such goals, one per quarter, are possible for each year in the planning horizon for each source-use combination.

A typical goal formulation process for this type of goal for the source 'O/H Funds 20%' and the use 'Stu Fin Aid' is shown in Figure 11. The screen displays the amount of funds available from the source and the amount needed by the use for each quarter of the year 1986-87. For each quarter, there are four fields for data entry, including data on the target value, deviation type, priority, and the weight for the goal formulated. These are followed by fields that detail the goal achievement results. Note that a goal to allocate exactly $30 from 'O/H Funds 20%' to 'Stu Fin Aid' at a priority of 3 and a weight of 1 had been included in the previous model. As the goal achievement fields indicate, this goal could not be achieved as no funds were allocated from the source to the use during that quarter, thus, resulting in an absolute deviation of $30 and a percentage deviation of 100% from the goal target value. As can be seen, the user has formulated a new goal for the first quarter to allocate at least $25 from the source to the use at a priority of 3 and a weight of 1. In addition, the existing goal for the second quarter has been modified so as to allocate exactly $35 at a priority of 1 and a weight of 1.

3.4.3.2 Allocate Percentage of a Source to a Use

Since this is an aggregate goal, i.e., for a year instead of for each quarter, only one goal per year is possible for every source-use combination. The user needs to input the target percentage, deviation type, priority, and the weight. As in the previous case, if the goal already exists relevant values would fill these fields and could be changed if needed, or the goal could be altogether dropped by using the 'delete?' option. Also, if a goal had been included in the last GP model that was solved, goal achievement data would be provided in the relevant fields.
GOAL PROGRAMMING MODEL

GOAL: ALLOCATE SPECIFIED AMOUNT FROM SOURCE TO USE

SOURCE : O/H FUNDS 20%
USE : STU FIN AID
YEAR : 1986-87

<table>
<thead>
<tr>
<th>QTR 1</th>
<th>QTR 2</th>
<th>QTR 3</th>
<th>QTR 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVAILABLE FROM SOURCE</td>
<td>38</td>
<td>38</td>
<td>38</td>
</tr>
<tr>
<td>REQUIRED FOR USE</td>
<td>55</td>
<td>88</td>
<td>75</td>
</tr>
<tr>
<td>ALLOCATION TARGET</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>DEVIATIONAL TYPE (&lt;,=,&gt;)</td>
<td>=</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRIORITY</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WEIGHT</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>DELETE ?</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>AMOUNT TARGETED</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMOUNT ACHIEVED</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ABSOLUTE DEVIATION</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PERCENTAGE DEVIATION</td>
<td>100.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

GOAL PROGRAMMING MODEL

GOAL: ALLOCATE SPECIFIED AMOUNT FROM SOURCE TO USE

SOURCE : O/H FUNDS 20%
USE : STU FIN AID
YEAR : 1986-87

<table>
<thead>
<tr>
<th>QTR 1</th>
<th>QTR 2</th>
<th>QTR 3</th>
<th>QTR 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVAILABLE FROM SOURCE</td>
<td>38</td>
<td>38</td>
<td>38</td>
</tr>
<tr>
<td>REQUIRED FOR USE</td>
<td>55</td>
<td>88</td>
<td>75</td>
</tr>
<tr>
<td>ALLOCATION TARGET</td>
<td>25</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>DEVIATIONAL TYPE (&lt;,=,&gt;)</td>
<td>&gt;</td>
<td>=</td>
<td></td>
</tr>
<tr>
<td>PRIORITY</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>WEIGHT</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>DELETE ?</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>AMOUNT TARGETED</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMOUNT ACHIEVED</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ABSOLUTE DEVIATION</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PERCENTAGE DEVIATION</td>
<td>100.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 11. Select/Modify Goal Type I - Allocate Specified Amount From a Source to a Use
Figure 12 illustrates the goal formulation process for this type of goal. The screen provides funds availability and requirements for the current year (i.e., 1987-88), cumulative up through this year, and total over the entire planning horizon. The screen does not contain any goal, implying that the previous GP model did not include this goal and consequently the goal achievement fields at the bottom of the screen are left blank. In this case, the user has formulated a goal to allocate at most 10% of funds available from the source 'O/H Funds 20%' to the use 'EQP Enhancement' at a priority of 5 and a weight of 1 for the year 1987-88.

### 3.4.3.3 Allocate Percentage of a Use from a Source

The formulation for this type of goal involves exactly the same procedure as in the previous goal type. It may be noted, however, that the percentage now applies to funds needed (use) instead of funds available (source).

A typical goal formulation for this type of goal is shown in Figure 13. As may be seen, a goal to allocate exactly 50% of the needed funds for 'Gen Operations' from 'O/H Funds 20%' at a priority of 4 and a weight of 1 during 1986-87 had been included in the previous model, and as the goal achievement fields indicate, the goal fell short by $248 or 62%. In this case, the user has modified the goal to allocate exactly 25% of the needed funds at a priority of 3 and a weight of 1.

### 3.4.4 View Existing Goals

This option permits the user to view, in the form of reports, all rigid constraints and goal formulations that have been included in the model. The basic objective is to provide the user with an idea of the total number of goals of each type that have been included, and the priorities of these goals. There are six such reports including: (1) Rigid Allocations (sorted by source), (2) Rigid Allocations (sorted by use), (3) Goal Type I (sorted by priority), (4) Goal Type II (sorted by priority), (5) Goal
GOAL PROGRAMMING MODEL

GOAL: ALLOCATE PERCENTAGE OF A SOURCE TO A USE

SOURCE : O/H FUNDS 20%
USE : EQP ENHANCEMENT
YEAR : 1987-88

<table>
<thead>
<tr>
<th>FUNDS AVAILABLE</th>
<th>FUNDS REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>THIS YEAR</td>
<td></td>
</tr>
<tr>
<td>152</td>
<td>33</td>
</tr>
<tr>
<td>CUMMULATIVE</td>
<td></td>
</tr>
<tr>
<td>304</td>
<td>66</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
</tr>
<tr>
<td>304</td>
<td>66</td>
</tr>
</tbody>
</table>

PERCENTAGE TO BE ALLOCATED : 10.0
DEVIATIONAL TYPE (<,=,>) : <
PRIORITY : 5
WEIGHT : 1
DELETE ? N

PERCENTAGE $ AMOUNT

TARGET :
ACHIEVED :
ABSOLUTE DEVIATION :
PERCENTAGE DEVIATION :

Figure 12. Select/Modify Goal Type II - Allocate Percentage of a Source to a Use in a Year
GOAL PROGRAMMING MODEL

GOAL: ALLOCATE PERCENTAGE OF A USE FROM A SOURCE

SOURCE : O/H FUNDS 20%
USE : GEN OPERATIONS
YEAR : 1986-87

<table>
<thead>
<tr>
<th>FUNDS AVAILABLE</th>
<th>FUNDS REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>THIS YEAR</td>
<td>152</td>
</tr>
<tr>
<td>CUMMULATIVE</td>
<td>152</td>
</tr>
<tr>
<td>TOTAL</td>
<td>304</td>
</tr>
</tbody>
</table>

PERCENTAGE TO BE ALLOCATED : 50.00
DEVIATIONAL TYPE (<,=,>) : =
PRIORITY : 4
WEIGHT : 1

<table>
<thead>
<tr>
<th>PERCENTAGE</th>
<th>$ AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>TARGET</td>
<td>50.0</td>
</tr>
<tr>
<td>ACHIEVED</td>
<td>19.0</td>
</tr>
<tr>
<td>-</td>
<td></td>
</tr>
<tr>
<td>ABSOLUTE DEVIATION</td>
<td>31.0</td>
</tr>
<tr>
<td>PERCENTAGE DEVIATION</td>
<td>62.0</td>
</tr>
</tbody>
</table>

GOAL PROGRAMMING MODEL

GOAL: ALLOCATE PERCENTAGE OF A USE FROM A SOURCE

SOURCE : O/H FUNDS 20%
USE : GEN OPERATIONS
YEAR : 1986-87

<table>
<thead>
<tr>
<th>FUNDS AVAILABLE</th>
<th>FUNDS REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>THIS YEAR</td>
<td>152</td>
</tr>
<tr>
<td>CUMMULATIVE</td>
<td>152</td>
</tr>
<tr>
<td>TOTAL</td>
<td>304</td>
</tr>
</tbody>
</table>

PERCENTAGE TO BE ALLOCATED : 25.00
DEVIATIONAL TYPE (<,=,>) : =
PRIORITY : 3
WEIGHT : 1

<table>
<thead>
<tr>
<th>PERCENTAGE</th>
<th>$ AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>TARGET</td>
<td>50.0</td>
</tr>
<tr>
<td>ACHIEVED</td>
<td>19.0</td>
</tr>
<tr>
<td>ABSOLUTE DEVIATION</td>
<td>31.0</td>
</tr>
<tr>
<td>PERCENTAGE DEVIATION</td>
<td>62.0</td>
</tr>
</tbody>
</table>

Figure 13. Select/Modify Goal Type III - Allocate Percentage of a Use From a Source in a Year
Type III (sorted by priority), and (6) All Goals (sorted by priority). These reports are illustrated in Figure 14.

3.4.5 Run Model

When all constraints and goals have been formulated, the GP model is ready to be solved. The DSS automatically uses a series of FORTRAN programs and SYSTEM UTILITIES to create two files: FILE FT25F001 which stores the GP model constraints in the MPS format, and FILE FT75F001 which contains the objective function of the model. These two files form the input to LINDOGP which solves the GP model as a series of linear programming models by utilizing the USER subroutine to invoke LINDO for each priority level in the GP objective function.

After the GP model has been solved, control is automatically passed to the option: “View Results of the GP Model”, where the results are displayed in the form of reports as previously described. The user can analyze these reports to evaluate the fund allocations that have been made by the GP model. If the user wishes to skip viewing the results, the PF10 option (to quit) may be selected.

Next, control is automatically passed to the option: “View Goal Achievement Reports”, where the results in terms of goal achievement reports are provided. These reports, one for each type of goal, describe which goals were attained, and state the deviations, in absolute values and percentage values, for goals that could not be attained. Figure 15 provides an example of the goal achievement reports. After the goal achievement reports have been viewed, the user is provided an opportunity to store the current GP model as the permanent, or base model, for future DSS sessions.

Control is then transferred to the user who can further modify the existing goals and/or model parameters in order to search for a better solution if the current solution is not acceptable. The user may also delete the current model and restart with the base model, or with a totally new model.
### VIEW GP MODEL'S GOALS/RIGID ALLOCATIONS

#### RIGID ALLOCATIONS (BY USE)

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>USE</th>
<th>YR/QTR</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUX PRIN RESERVE</td>
<td>GEN OPERATIONS</td>
<td>1/1</td>
<td>50</td>
</tr>
<tr>
<td>AUX PRIN RESERVE</td>
<td>GEN OPERATIONS</td>
<td>1/3</td>
<td>60</td>
</tr>
<tr>
<td>AUX PRIN RESERVE</td>
<td>GEN OPERATIONS</td>
<td>2/1</td>
<td>70</td>
</tr>
<tr>
<td>AUX PRIN RESERVE</td>
<td>GEN OPERATIONS</td>
<td>2/3</td>
<td>80</td>
</tr>
</tbody>
</table>

Figure 14 (a). View Rigid Allocations (Sorted by Source)
VIEW GP MODEL'S GOALS/RIGID ALLOCATIONS

RIGID ALLOCATIONS (BY SOURCE)

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>USE</th>
<th>YR/QTR</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUX PRIN RESERVE</td>
<td>GEN OPERATIONS</td>
<td>1/1</td>
<td>50</td>
</tr>
<tr>
<td>AUX PRIN RESERVE</td>
<td>GEN OPERATIONS</td>
<td>1/3</td>
<td>60</td>
</tr>
<tr>
<td>AUX PRIN RESERVE</td>
<td>GEN OPERATIONS</td>
<td>2/1</td>
<td>70</td>
</tr>
<tr>
<td>AUX PRIN RESERVE</td>
<td>GEN OPERATIONS</td>
<td>2/3</td>
<td>80</td>
</tr>
</tbody>
</table>

Figure 14 (b). View Rigid Allocations (Sorted by Use)
VIEW GP MODEL'S GOALS/RIGID ALLOCATIONS

GOAL 1 : SPECIFIC ALLOCATION

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>USE</th>
<th>YR/QTR</th>
<th>AMOUNT</th>
<th>TYPE</th>
<th>PR</th>
<th>WT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. O/H FUNDS 20%</td>
<td>GEN OPERATIONS</td>
<td>1/3</td>
<td>100</td>
<td>=</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>2. O/H FUNDS 20%</td>
<td>GEN OPERATIONS</td>
<td>1/1</td>
<td>100</td>
<td>=</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3. O/H FUNDS 20%</td>
<td>GEN OPERATIONS</td>
<td>1/2</td>
<td>100</td>
<td>=</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>4. O/H FUNDS 20%</td>
<td>GEN OPERATIONS</td>
<td>1/4</td>
<td>100</td>
<td>=</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

Figure 14 (c). View Goal Type I - Allocate Specified Amount From a Source to a Use
**VIEW GP MODEL'S GOALS/RIGID ALLOCATIONS**

**GOAL 2 : ALLOCATE PERCENTAGE OF SOURCE TO USE**

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>USE</th>
<th>YEAR</th>
<th>PERCENT</th>
<th>TYPE</th>
<th>PR</th>
<th>WT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. O/H FUNDS 20%</td>
<td>EQP ENHANCEMENT</td>
<td>1</td>
<td>50.00</td>
<td>=</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>2. O/H FUNDS 20%</td>
<td>EQP ENHANCEMENT</td>
<td>2</td>
<td>100.00</td>
<td>=</td>
<td>6</td>
<td>2</td>
</tr>
</tbody>
</table>

Figure 14 (d). View Goal Type II - Allocate Percentage of a Source to a Use in a Year
VIEW GP MODEL'S GOALS/RIGID ALLOCATIONS

GOAL 3: ALLOCATE PERCENTAGE OF USE FROM SOURCE

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>USE</th>
<th>YEAR</th>
<th>PERCENT</th>
<th>TYPE</th>
<th>PR</th>
<th>WT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 0/H FUNDS 20%</td>
<td>STU FIN AID</td>
<td>1</td>
<td>50.00</td>
<td>=</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>2. 0/H FUNDS 20%</td>
<td>STU FIN AID</td>
<td>2</td>
<td>100.00</td>
<td>=</td>
<td>7</td>
<td>2</td>
</tr>
</tbody>
</table>

Figure 14 (e). View Goal Type III - Allocate Percentage of a Use From a Source in a Year
## View GP Model's Goals/Rigid Allocations

### All Goals: By Priority

<table>
<thead>
<tr>
<th>GT</th>
<th>Source</th>
<th>Use</th>
<th>Yr/Qtr</th>
<th>Target</th>
<th>Type</th>
<th>PR</th>
<th>WT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>1 O/H Funds 20%</td>
<td>GEN OPERATIONS</td>
<td>1/3</td>
<td>100</td>
<td>=</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>1 O/H Funds 20%</td>
<td>GEN OPERATIONS</td>
<td>1/1</td>
<td>100</td>
<td>=</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3.</td>
<td>1 O/H Funds 20%</td>
<td>GEN OPERATIONS</td>
<td>1/2</td>
<td>100</td>
<td>=</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>4.</td>
<td>1 O/H Funds 20%</td>
<td>GEN OPERATIONS</td>
<td>1/4</td>
<td>100</td>
<td>=</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>5.</td>
<td>2 O/H Funds 20%</td>
<td>EQP ENHANCEMENT</td>
<td>1</td>
<td>50.00</td>
<td>=</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>6.</td>
<td>2 O/H Funds 20%</td>
<td>EQP ENHANCEMENT</td>
<td>2</td>
<td>100.00</td>
<td>=</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>7.</td>
<td>3 O/H Funds 20%</td>
<td>STU FIN AID</td>
<td>1</td>
<td>50.00</td>
<td>=</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>8.</td>
<td>3 O/H Funds 20%</td>
<td>STU FIN AID</td>
<td>2</td>
<td>100.00</td>
<td>=</td>
<td>7</td>
<td>2</td>
</tr>
</tbody>
</table>

Figure 14 (f). View All Goals
<table>
<thead>
<tr>
<th>SOURCE</th>
<th>USE</th>
<th>YR/QT</th>
<th>TY</th>
<th>PR</th>
<th>WT</th>
<th>TARGET</th>
<th>ACHVED</th>
<th>ABS-DEV</th>
<th>%-DEV</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. O/H FUNDS 20%</td>
<td>GEN OPERATIONS</td>
<td>1/3</td>
<td>1</td>
<td>3</td>
<td>100</td>
<td>100</td>
<td>0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>2. O/H FUNDS 20%</td>
<td>GEN OPERATIONS</td>
<td>1/1</td>
<td>2</td>
<td>1</td>
<td>100</td>
<td>14</td>
<td>86</td>
<td>86.0</td>
<td></td>
</tr>
<tr>
<td>3. O/H FUNDS 20%</td>
<td>GEN OPERATIONS</td>
<td>1/2</td>
<td>3</td>
<td>2</td>
<td>100</td>
<td>0</td>
<td>100</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>4. O/H FUNDS 20%</td>
<td>GEN OPERATIONS</td>
<td>1/4</td>
<td>4</td>
<td>4</td>
<td>100</td>
<td>38</td>
<td>62</td>
<td>62.0</td>
<td></td>
</tr>
</tbody>
</table>

Figure 15 (a). Achievements of Goal Type I - Allocate Specified Amount From a Source to a Use
GOAL ACHIEVEMENTS

GOAL 2: ALLOCATE PERCENTAGE OF SOURCE TO USE

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>USE</th>
<th>YR</th>
<th>TY</th>
<th>PR</th>
<th>WT</th>
<th>DOLLAR/PRCNT</th>
<th>DOLLAR/PRCNT</th>
<th>DOLLAR/PRCNT</th>
<th>ABS DEVTN</th>
<th>PRCNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. O/H FUNDS EQP ENHAN 1 = 6 1</td>
<td>76/50.0</td>
<td>0/0.0</td>
<td>76/50.0</td>
<td>100.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. O/H FUNDS EQP ENHAN 2 = 6 2</td>
<td>152/100.0</td>
<td>33/21.7</td>
<td>119/78.3</td>
<td>78.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 15 (b). Achievements of Goal Type II - Allocate Percentage of a Source to a Use in a Year
### GOAL ACHIEVEMENTS

**GOAL 3: ALLOCATE PERCENTAGE OF USE FROM SOURCE**

<table>
<thead>
<tr>
<th>SOURCE USE</th>
<th>YR TY PR WT</th>
<th>DOLLAR/PRCNT TARGET</th>
<th>DOLLAR/PRCNT ACHIEVED</th>
<th>ABS DEVTN</th>
<th>PRCNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. O/H FUNDS STU FIN A 1 = 7 1</td>
<td>140/ 50.0</td>
<td>0/ 0.0</td>
<td>140/ 50.0</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>2. O/H FUNDS STU FIN A 2 = 7 2</td>
<td>295/100.0</td>
<td>119/ 40.3</td>
<td>176/ 59.7</td>
<td>59.7</td>
<td></td>
</tr>
</tbody>
</table>

Figure 15 (c). Achievements of Goal Type III - Allocate Percentage of a Use From a Source in a Year
<table>
<thead>
<tr>
<th>GT</th>
<th>Source</th>
<th>Use</th>
<th>Y/Q</th>
<th>TY</th>
<th>PR</th>
<th>WT</th>
<th>Target</th>
<th>Achieved</th>
<th>Abs Devtn</th>
<th>Prcnt</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>1</td>
<td>O/H</td>
<td>Fun</td>
<td>Gen</td>
<td>Ope</td>
<td>1/3</td>
<td>1       3</td>
<td>100</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>2.</td>
<td>1</td>
<td>O/H</td>
<td>Fun</td>
<td>Gen</td>
<td>Ope</td>
<td>1/1</td>
<td>2       1</td>
<td>100</td>
<td>14</td>
<td>86</td>
</tr>
<tr>
<td>3.</td>
<td>1</td>
<td>O/H</td>
<td>Fun</td>
<td>Gen</td>
<td>Ope</td>
<td>1/2</td>
<td>3       2</td>
<td>100</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>4.</td>
<td>1</td>
<td>O/H</td>
<td>Fun</td>
<td>Gen</td>
<td>Ope</td>
<td>1/4</td>
<td>4       4</td>
<td>100</td>
<td>38</td>
<td>62</td>
</tr>
<tr>
<td>5.</td>
<td>2</td>
<td>O/H</td>
<td>Fun</td>
<td>Eqp</td>
<td>Enh</td>
<td>1</td>
<td>6       1</td>
<td>76/ 50.0</td>
<td>0/ 0.0</td>
<td>76/ 50.0</td>
</tr>
<tr>
<td>6.</td>
<td>2</td>
<td>O/H</td>
<td>Fun</td>
<td>Eqp</td>
<td>Enh</td>
<td>2</td>
<td>6       2</td>
<td>152/100.0</td>
<td>33/ 21.7</td>
<td>119/ 78.3</td>
</tr>
<tr>
<td>7.</td>
<td>3</td>
<td>O/H</td>
<td>Fun</td>
<td>Stu</td>
<td>Fin</td>
<td>1</td>
<td>7       1</td>
<td>140/ 50.0</td>
<td>0/ 0.0</td>
<td>140/ 50.0</td>
</tr>
<tr>
<td>8.</td>
<td>3</td>
<td>O/H</td>
<td>Fun</td>
<td>Stu</td>
<td>Fin</td>
<td>2</td>
<td>7       2</td>
<td>295/100.0</td>
<td>119/ 40.3</td>
<td>176/ 59.7</td>
</tr>
</tbody>
</table>

Figure 15 (d). Achievements of All Goals
3.5 TESTING AND VALIDATING THE DSS

It was quite apparent from the beginning that testing and validation would be a very demanding task for such a large and complicated system. To facilitate the validation and testing, the basic approach taken was to build the decision support system in modular form. That is, the overall system was broken down into a number of small, manageable components. Each of these components, which usually consisted of EXEC 2 and FORTRAN programs, was tested independently and then integrated into the overall decision support system after proving to be working correctly.

The use of components greatly facilitated not only the validation, but also the development of the DSS. The system had to be modified frequently as a result of either improvements or problems that could not be foreseen earlier on. Using the modular form meant that modifying the system translated into modifying one or more components, which was a relatively easy task because these components could be removed and tested independently and then again reintegrated into the overall system.

The EXEC 2 programs were tested by inserting the command 'TRACE ALL' at the beginning of each EXEC 2 program. The 'TRACE ALL' option traces all executable statements in the program and displays the trace on the terminal. The trace includes: (1) the order in which the executable statements were executed, and (2) the exact operation that these executable statements performed. Whenever it was felt necessary to get a hard copy of the trace, the 'CP SPOOL CON START *' command was used to spool a copy of input/output operations at the terminal to the virtual reader and then have it printed.

The FORTRAN programs were tested by using write statements to: (1) trace the execution path, and (2) print the values that the variables took during the execution.
To ensure that all parts of the programs were validated, the above mentioned testing was performed a number of times using different inputs to the programs. In the case of EXEC 2 control programs, that meant selecting each and every option provided at different stages of the programs. In the case of FORTRAN programs, which usually involved input/output operations using files, the contents of the input files were given different values and the resulting output files were printed and manually checked to ensure that they contained the correct values.

The goal programming model validation consisted of two parts: (1) testing the FORTRAN programs that generate the MPS code and the achievement function files, and (2) testing the GP solution algorithm. The first part was validated by testing the FORTRAN programs on a number of 'textbook' problems and manually checking the resulting MPS code and objective function files. Once these files were found to be correct, they were then used to validate the GP solution algorithm by invoking the LINDO package and issuing the USER command. The results were then checked to ensure that the solution algorithm worked properly.

3.6 SUMMARY

This chapter has presented the decision support system that was developed for the sources and uses of funds system. The system provides up-to-date on-line information on: (1) funds availability by source for each time period, (2) funds requirements by use for each time period, (3) the proposed allocations from sources to uses by time periods, and (4) the available (unallocated) funds by source and by time period.

The highly integrated system was described in terms of its three subsystems: database, model, and dialog. The database stores all information relating to the sources and uses of funds system; a goal
programming model is used to allocate funds from the sources to the uses; and the dialog subsystem provides the interaction between the user and the database, and between the user and the model.
4.0 THE GOAL PROGRAMMING FUNDS ALLOCATION MODEL

A key component of the decision support system is the goal programming model used to perform the allocation of funds from sources to uses. This chapter discusses the goal programming technique used to model the cash flow system. The decision variables are defined and the basic components of the general goal programming model formulation are presented. The chapter also discusses the algorithm used to solve the GP model.
4.1 MODELING THE SOURCES AND USES

CASH-FLOW SYSTEM AS A GOAL

PROGRAMMING MODEL

As previously indicated, the funds allocations are made after the availabilities of and requirements for funds, by sources and uses respectively, have been determined. These allocations are made based on a set of objectives and goals of the university administration, as well as restrictions or constraints on the allowable use of state funds. Some examples of model constraints and goals are: meeting the state restrictions regarding the use of state funds, depleting non-interest bearing funds prior to those bearing interest, and utilizing several funding sources in order to find sufficient money to complete a project. The process is shown in Figure 16.

Because of restrictions imposed on the rather limited variety of the available funds, and because of the high diversity of the university's objectives, the goals are often conflicting and competitive. Consequently, it is not generally possible to meet or satisfy all goals. As a result, the administration must prioritize its goals and must settle for a 'satisficing', or acceptable solution.

Goal programming is used to allocate funds from the sources to the uses. GP is a management science technique that attempts to attain a satisfactory level of achievement for several objectives. Within the GP model, some goals may be achieved only at the expense of other goals. Although it may not be possible to achieve every goal, goal programming attempts to maximize the levels of goal attainment possible yielding the best possible combination of goal achievements. This necessitates the establishment of a priority system for the goals such that lower-ranked goals are considered only after higher-ranked goals have been satisfied or cannot be further improved (See Ignizio [11], [12], and [14], and Lee [21]).
Figure 16. Using a GP Model to Allocate Funds
In practice, any cash flow system at a university level consists of a very large number of sources and uses of funds. To include each source and use individually in the model would make the goal programming model very complicated and cumbersome. Besides, a computer model for such a system will primarily be used by a top financial officer and he would not like to be burdened with details on all of these sources and uses, many of which involve relatively very small amounts of funds. Consequently, to keep the number of sources and uses down to a manageable size, these many sources are classified into broad categories and then aggregated. Eventually, there remains only a limited number of source and use categories and, thus, the resulting goal programming model is relatively easier to manage.

4.2 DECISION VARIABLES

The decision variables are defined as the amount allocated from a source to a use during a period (i.e. a quarter). In mathematical terms, the decision variables are given by:

\[ X_{ijk} = \text{amount allocated from source } i \text{ to use } j \text{ in period } k. \]  

For example, \( X_{237} \) is the amount allocated from source number 2 to use number 3 during the seventh period (i.e. third quarter of second year).
4.3 **SYSTEM CONSTRAINTS**

System constraints are those restrictions that must be included when defining the problem, and must always be satisfied. The GP model used in the decision support system has such constraints involving three aspects of the cash-flow model:

1. Fund use eligibility
2. Fund requirements for uses
3. Fund availability by sources

These constraints are discussed in the next few sections.

### 4.3.1 Fund Use Eligibility

The concept of the eligibility matrix was presented in chapter 2. The eligibility matrix determines the eligibility of a source to fund a use. To enforce that eligibility criteria, for each source-use combination that does not meet the eligibility criteria a constraint is needed that will set the allocation amount for that source-use combination in each period to zero.

\[ X_{ijk} = 0, \quad \text{for all } k \]  

where (i,j) is a source-use combination for which the corresponding eligibility matrix element is an 'N'. These constraints do not require any user input, and are automatically formulated and included in the GP model.

There are two possible reasons why a particular use may not be allowed to receive funds from a particular source. First, it could be that legal restrictions are placed on a source which permit the source to fund only a select few uses, as in the case of some federal and state funds. Second, it could
be a tool used by the administration to structure the allocation process. For instance, all or most of the uses could be made ineligible to be funded from a certain source if it is desired to avoid using funds from that source. Or, it could be used to reduce the problem size since for every ‘N’ in the eligibility matrix, all decision variables involving the corresponding source and use are forced to take a value of zero. This reduces the dimensionality of the allocation process and, therefore, reduces its complexity.

4.3.2 Fund Requirements of Uses (Demand)

These constraints ensure that, for each period, fund requirements for all uses are met.

\[ \sum_{i} X_{ijk} \geq U_{jk}, \quad \text{for all } j, k \]  

where, \( U_{jk} \) is the amount needed by use \( j \) in period \( k \),

and, \( \sum_{i} X_{ijk} \) is the total amount allocated to use \( j \) from all sources in period \( k \).

For each use (i.e., project), there will be one such constraint for every period of the planning horizon. These constraints do not require any user input and are automatically formulated and included in the GP model. Note that since all of the requirements for funds have to be satisfied, the possibility may arise that the available funds may not be sufficient to meet all of the requirements. In such an event, funds will be allocated by the model from a source identified as ‘Deficit’.

There are a number of ways to tackle deficits. On one hand, deficits could be perceived to be funds that currently don’t exist and will have to be arranged for. On the other hand, deficits could be used to imply that the needs of all uses cannot be satisfied and, therefore, the funding needs of some uses must be curtailed by an amount sufficient to erase the deficits. It may be noted, however, that these deficits could also arise because of the way the goals and their priorities have been formulated.
In such instances, it may be possible to erase the deficits by altering the goals and/or priority structure, or by rescheduling the periods of funding needs to correspond to the schedule of when funds are available.

4.3.3 Fund Availability of Sources (Supply)

The total amount of funds that may be allocated from a source during any period must not be greater than the amount available in that period plus any unused or unallocated funds carried over from previous periods.

\[
\sum_{t=1}^{k} \sum_{j} X_{ijt} \leq \sum_{t=1}^{k} S_{it}, \text{ for all } i, k
\]

where, \( \sum_{t=1}^{k} S_{it} \) is the total amount available from source \( i \) up to and including period \( k \), and, \( \sum_{t=1}^{k} \sum_{j} X_{ijt} \) is the total amount allocated from source \( i \) to all uses up to and including period \( k \).

For each source, there will be one such constraint for every period of the planning horizon. These constraints are automatically formulated and included in the GP model and do not require any user input. Note that since the constraint involves a less-than inequality sign, it is possible that the goal programming model solution may result in a surplus of funds for some sources, i.e., funds that are not allocated to uses. The existence of surplus funds for a source could be because: (1) overall funds availability was greater than overall funds needs, or (2) the source was eligible to fund only a limited number of uses, and could not be used to fund other uses.
4.4 RIGID ALLOCATIONS

These are constraints that may be employed by the user to make an allocation of some specific amount from a certain source to a certain use during a certain period. These are not goals and, like the previously described system constraints, they must be satisfied for any solution to the GP model. To ensure that the resulting solution to the GP model does not become infeasible due to such constraints, tests are made at the time of making these allocations to ensure that such allocations are indeed feasible. The tests ensure that the entered amount does not exceed either what is available from the source, or what is needed by the use.

These constraints may mathematically be written as:

\[ X_{ijk} = b \]  

where \( b \) is the dollar amount that must be allocated from source \( i \) to use \( j \) during period \( k \). For example, one such rigid allocation might be to allocate \$500 from 'Private Funds' to 'Professorships' during the third period.

Rigid allocations can be used to give structure to the allocation process. These allocations serve to set the corresponding decision variables at the specified values, and thus reduce the number of 'free' variables. Rigid allocations reduce the complexity of the GP model by reducing the dimensionality of the problem.
4.5 GOALS FORMULATION

The goals in the goal programming model are formulated as follows:

\[ f(X_{ijk}) + d^- - d^+ = b \]  

where \( f(X_{ijk}) \) is a function of the decision variables and defines the goal. The target level of the goal is given by \( b \). The negative and positive deviation variables for the goal are shown by \( d^- \) and \( d^+ \), and represent the under-achievement and over-achievement, respectively, of the solution value from the desired target value of \( b \). A goal may be underachieved, overachieved, or exactly achieved depending on whether \( d^+ \), or \( d^- \), or both \( d^+ \) and \( d^- \), respectively, take a value of zero in the solution of the goal programming model.

In the goal programming model developed for the funds allocation process, there are three kinds or 'types' of goals that may be formulated by the user. These are:

1 - allocate specified dollar target amount from a source to a use during a period.
2 - allocate specified percentage of the available funds of a source to a use, during a year.
3 - allocate specified percentage of needed funds for a use from a source, during a given year.

The following sections will discuss these three general types of goals.

4.5.1 Allocate Specified Dollar Target Amount in a Period

Sometimes it is desired that all or some specified amount of the needed funds of a use be allocated from a certain source during some given period of the planning horizon. This goal may be formulated as:
\[ X_{ijk} + d^- - d^+ = b \]  \[ \text{[7]} \]

\( X_{ijk} \), the amount allocated from source i to use j in period k, is to be set to a target value b. For example, $4,000 of 'General Funds' must be used for 'Renovations' in the fifth period (first quarter of second year, i.e., 1987-88). Depending on whether the user wants the amount \( X_{ijk} \) to be at most, at least, or exactly equal to b, \( d^+ \), \( d^- \), or both \( d^+ \) and \( d^- \), respectively, will need to be minimized in the GP objective function.

4.5.2 Allocate Specified Percentage from Source to Use in a Year

This goal sets the amount allocated from a source to a use during a year close to some specified percentage, \( p \), of the total funds available from the source in that year.

This goal may be formulated as:

\[
\sum_{t=4(n-1)+1}^{t=4(n-1)+4} X_{ijt} + d^- - d^+ = (\frac{p}{100}) \times \sum_{t=4(n-1)+1}^{t=4(n-1)+4} S_{it}
\]  \[ \text{[8]} \]

\( \sum_{t=4(n-1)+1}^{t=4(n-1)+4} X_{ijt} \), the total amount allocated from source i to use j in year n, is to be set to a target value which is equal to a percentage, \( p \), of the total funds available from source i in year n, i.e., \( \sum_{t=4(n-1)+1}^{t=4(n-1)+4} S_{it} \). For instance, one such goal might be to allocate 20% of 'Private Funds' to 'Professorships' during the first year (i.e., 1986-87) of the planning horizon. Note that when \( n \), the year, takes the value 1 in the equation, the summation is performed over the periods 4(1-1) + 1 to 4(1-1) + 4, i.e., periods 1 through 4. Similarly, when n takes the value 2, the summation covers the periods 4(2-1) + 1 to 4(2-1) + 4, that is, periods 5 through 8.
4.5.3 Allocate Specified Percentage of Use from Source in a Year

This goal sets the amount allocated from a source to a use during a year close to some specified percentage, $p$, of the total funds needed by the use in that year. This goal may be formulated as:

$$\sum_{t=4(n-1)+4}^{t=4(n-1)+4} X_{ijt} + d^- - d^+ = \left(\frac{p}{100}\right) \times \sum_{t=4(n-1)+4}^{t=4(n-1)+4} U_{jt}$$

The total amount allocated from source $i$ to use $j$ in year $n$, is to be set to a target value which is equal to a percentage, $p$, of the total funds needed by use $j$ in the year $n$, i.e.,

$$\sum_{t=4(n-1)+4}^{t=4(n-1)+4} U_{jt}$$

For instance, one such goal might be to fund 50% of the cost of 'Student Aid' from 'Overhead' funds during the second year (i.e., 1987-88) of the planning horizon.

4.6 THE PRIORITY STRUCTURE AND ACHIEVEMENT FUNCTION

The priority structure and the achievement function are determined by the relative importance placed on the goals of the university. The achievement function dictates the order in which the solution algorithm will attempt to attain the specified goals.
4.6.1 The Priority Structure

The priority structure for the goals is determined by the administration and depends on the objectives of the institution. It is established at the time goals are formulated in the GP model. Along with the target value and the deviational type, the user is required to assign a priority and weight to each goal. The priority determines the relative importance of the goals; the lower ranked goals are satisfied only after the higher-ranked goals are satisfied, or cannot be further improved. Goals at the same priority level have equal importance.

Weights, which are usually assigned to goals at the same priority level, are equivalent to coefficients in the objective function of the linear programming problem. Numerically, weights assigned to deviation variables in a GP model can be translated into coefficients for decision variables. The impact of these weights is, therefore, similar to that of coefficients in the objective function of linear programming. However, it is very difficult to predict the impact of the weights on the solution because the decision variables are not included in the objective function, as they are in linear programming. Therefore, the assignment of numerical weights should be done very judiciously. In fact, it is generally recommended that the use of numerical weights should be avoided by using different priority levels, instead of weights at the same priority level, to establish the relative importance of goals.

Figure 17 illustrates the use of different priorities and weights to establish the relative importance of goals included in the goal programming model. The first three goals are assigned to different priority levels to establish their relative importance. The next two goals are assigned to the same priority level 6, but are given different weights (1 and 3) to establish their relative importance.
### PRIORITY STRUCTURE

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<th>SOURCE</th>
<th>USE</th>
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<td>=</td>
<td>6</td>
<td>3</td>
</tr>
</tbody>
</table>

Figure 17. An Example of Priority Structure
4.6.2 The Achievement Function

Once the goals have been prioritized and weighted, if necessary, the appropriate deviation variable, or variables, of the goals are sorted by decreasing order of priority. As a result, each priority level of the objective function consists of a number of deviation variables corresponding to goals at that priority level. The resulting achievement function has the form:

\[ A = \{ p_1(d^-,d^+), p_2(d^-,d^+), \ldots, p_n(d^-,d^+) \} \]  \hspace{1cm} [10]

where \( n \) is the total number of different priority levels that have been used in the goals formulation and \( p_i(d^-,d^+) \) is a function of deviation variables corresponding to goals at \( i \)th priority level. When the GP model is solved, the solution algorithm starts by attempting to minimize \( p_1(d^-,d^+) \). Then, the solution algorithm successively tries to minimize the remaining functions, by decreasing order of priority, while ensuring that the higher ranked functions are not allowed to deteriorate.

4.7 GP SOLUTION METHODOLOGY

Once the goals have been specified, they are translated into mathematical constraints and the achievement function is generated. Along with the system constraints and the rigid allocations, these constitute the GP model.

The GP model is solved using LINOGP [8], which uses the sequential linear programming approach whereby the GP model is solved as a series of linear programming models. At each step, a different priority level serves as the objective function, starting with the highest priority level and ending with the lowest priority level. LINOGP is an extension of LINDO, the commercial LP
solution code and makes use of the USER (FORTRAN) subroutine to solve the GP model as a series of LP models which are each solved using LINDO.

LINDO contains a dummy subroutine called USER which is executed when the command USER is typed after LINDO has been invoked. The user may replace this dummy subroutine with his own USER subroutine to perform a variety of operations which include special purpose input/output procedures and incorporating LINDO within a larger computer system.

The way a goal programming problem is solved using LINDO is as follows: input from the GP model is fed to LINDO in the same form as a LP model, with the exception that the objective function consists of only one term, MIN DUMMY. DUMMY, as the name suggests, is a dummy variable and is used simply because the model must contain at least one term in the objective function. The priority structure of the GP achievement function is stored in a file and a USER subroutine is created in such a way that it will provide the logic to solve the GP model as a sequential LP model. When the GP model is to be solved, the command USER is issued by the user and the subroutine will solve the GP model by invoking the LINDO package and solving the model for each priority level in the objective function. Thus, solving a GP model requires two separate inputs: (1) the mathematical constraints along with the dummy objective function, and (2) the objective function.

LINDO has commands for taking input from files in two possible formats: TAKE, where the model code is written onto a file instead of inputting from the terminal, and MPS, where the model code is stored in a special format. When a problem is being 'generated' the TAKE option becomes very difficult to use and creates a variety of problems including spacing between terms of a mathematical constraint. The MPS format, on the other hand, is much easier to generate and is very widely used and accepted by most commercial LP packages. The MPS format for storing an LP model and the file for storing the objective function are described in the following sections.

THE GOAL PROGRAMMING FUNDS ALLOCATION MODEL
4.7.1 MPS Format

The mathematical constraints of the goal programming model are written in the MPS (Mathematical Programming System) format. This format consists of four components, including:

ROWS: lists the row number and a symbol depicting the equality or inequality sign for each row. The symbol can take the following values: 'L' for a ≤ constraint, 'E' for a = constraint, 'G' for a ≥ constraint, and 'N' for the row corresponding to the objective function.

RHS: lists the row number and the right hand side value for each constraint. No entry is needed for the row corresponding to the objective function, which does not involve a right hand side.

COLUMNS: lists each term in terms of the variable and its coefficient, along with the row number in which it appears for each constraint in the model. For instance, suppose the third constraint in the model is: 2X + 4Y = 3. The COLUMNS section will contain two records to depict this constraint: one will contain the entries 'X', '3', and '2', while the second will contain 'Y', '3', and '4', corresponding to the variable name, row number, and the coefficient of the variable, respectively. Thus, for each constraint, the COLUMNS section contains one record for each term in that constraint.

BOUNDS: describes upper bounds, if any, on the decision variables. The BOUNDS section provides an alternate way of describing simple upper bound constraints of the form X ≤ 5. The reason for allowing this option is that most LP codes, including LINDO, have specialized procedures for efficiently handling such constraints during the solution computations. This section can also be used to indicate variables 'free', or unconstrained in sign.

All the constraints of the goal programming model are described using these components of the MPS format. These sections are then consolidated into one file whose file number should be between 1 and 50, excepting 5 and 6. For the GP model formulated by the DSS, this file is given a
number of 25. This file then serves as one of the inputs to LINDO. The MPS format code for a sample goal programming model is shown in Figure 18. The model involves three sources, three uses, and a planning horizon of two years. It includes four rigid allocations, and nine goals.

4.7.2 Objective Function

The objective function, in terms of all of the different priority levels, is stored in a special format in a file. The file starts with a scale as its first record which serves a purpose only during the debugging process when the user can use it to determine if the entries have been made in the correct format. The next two records contain the number of priority levels and the number of variables in each priority level, by decreasing order of priority. Then for each priority level, starting with the highest priority level and moving down to the lowest priority level, the file lists all variables that are included at that priority, followed by their coefficients.

When the command USER is issued, the USER subroutine uses this file to read all of the relevant information, including the number of priority levels, the number of variables in each priority level, and the variables along with their coefficients that are included at each priority level. The USER subroutine then invokes LINDO for each priority level to solve the GP model as a sequential LP model.

This file, which is supposed to have a file number between 51 and 99, is given a number of 75 for the GP model formulated by the DSS. The USER subroutine used in the decision support system can handle objective functions that involve up to twenty different priority levels, with each priority level containing at most forty terms at that priority. The objective function file for the goal programming model used to illustrate the MPS format code is shown in Figure 19. As may be observed, the nine goals included in the model are assigned to a total of seven different priority levels.
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Figure 18. The MPS Format for an Example GP Model
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**ENDATA**

Figure 18 (cont'd).
Figure 19. Achievement Function File for an Example GP Model
A complete printout of this example goal programming model is shown in Figure 20. As may be noted, the GP model consists of (1) an objective function, (2) system constraints, (3) rigid allocations, (4) goals constraints, and (5) variables with upper bound constraints.

4.8 SUMMARY

A generalized goal programming model was developed as a model component of the DSS to facilitate the allocation of funds from the sources to the uses while considering the goals and objectives of the university. In this chapter, the decision variables were defined and the various components of the general goal programming model were presented. These components include: (1) system constraints, (2) rigid allocations, and (3) goals constraints. The solution methodology involves invoking LINDO, a commercial linear programming package, and using the USER subroutine to solve the goal programming model as a series of linear programming problems.

Access to the goal programming model is provided by the decision support system. The DSS uses menus and screens to provide the dialog between the user and the model and facilitates the process of defining, solving, and evaluating the solution of the GP model. This process includes: defining the problem framework, calculating model parameters, formulating goals, establishing the priority structure, solving the model, and providing the solution in the form of reports.
SANDU GP MODEL

MIN  DUMMY + D030101M + D030101P + 2 D030102M + 2 D030102P
     + 3 D030103M + 3 D030103P + 4 D030104M + 4 D030104P + E030201M
     + E030201P + 2 E030202M + 2 E030202P + F030301M + F030301P
     + 2 F030302M + 2 F030302P + GM + GP

SUBJECT TO

2)  X010101 + X020101 + X030101 + X040101 = 100
3)  X010102 + X020102 + X030102 + X040102 = 200
4)  X010103 + X020103 + X030103 + X040103 = 300
5)  X010104 + X020104 + X030104 + X040104 = 200
6)  X010105 + X020105 + X030105 + X040105 = 100
7)  X010106 + X020106 + X030106 + X040106 = 200
8)  X010107 + X020107 + X030107 + X040107 = 300
9)  X010108 + X020108 + X030108 + X040108 = 200
10) X010201 + X020201 + X030201 + X040201 = 0
11) X010202 + X020202 + X030202 + X040202 = 0
12) X010203 + X020203 + X030203 + X040203 = 33
13) X010204 + X020204 + X030204 + X040204 = 0
14) X010205 + X020205 + X030205 + X040205 = 0
15) X010206 + X020206 + X030206 + X040206 = 0
16) X010207 + X020207 + X030207 + X040207 = 33
17) X010208 + X020208 + X030208 + X040208 = 0
18) X010301 + X020301 + X030301 + X040301 = 55
19) X010302 + X020302 + X030302 + X040302 = 88
20) X010303 + X020303 + X030303 + X040303 = 75
21) X010304 + X020304 + X030304 + X040304 = 63
22) X010305 + X020305 + X030305 + X040305 = 99
23) X010306 + X020306 + X030306 + X040306 = 79
24) X010307 + X020307 + X030307 + X040307 = 38
25) X010308 + X020308 + X030308 + X040308 = 79
26) X010101 + X010101 + X010301 <= 69551
27) X010101 + X010102 + X010201 + X010202 + X010301
    + X010302 <= 69551
28) X010101 + X010102 + X010103 + X010201 + X010202
    + X010203 + X010301 + X010302 + X010303 <= 69551
29) X010101 + X010102 + X010103 + X010104 + X010201
    + X010202 + X010203 + X010204 + X010301 + X010302
    + X010303 + X010304 <= 69551

Figure 20. Listing of an Example GP Model
30) \(X010101 + X010102 + X010103 + X010104 + X010105\)
+ \(X010201 + X010202 + X010203 + X010204 + X010205\)
+ \(X010301 + X010302 + X010303 + X010304 + X010305\)
\(\leq 139102\)

31) \(X010101 + X010102 + X010103 + X010104 + X010105\)
+ \(X010106 + X010201 + X010202 + X010203 + X010204\)
+ \(X010301 + X010302 + X010303 + X010304\)
\(\leq 139102\)

32) \(X010101 + X010102 + X010103 + X010104 + X010105\)
+ \(X010106 + X010107 + X010201 + X010202 + X010203\)
+ \(X010204 + X010205 + X010206 + X010207 + X010301\)
+ \(X010302 + X010303 + X010304 + X010305 + X010306\)
\(\leq 139102\)

33) \(X010101 + X010102 + X010103 + X010104 + X010105\)
+ \(X010106 + X010107 + X010108 + X010201 + X010202\)
+ \(X010203 + X010204 + X010205 + X010206 + X010207\)
+ \(X010208 + X010301 + X010302 + X010303 + X010304\)
+ \(X010305 + X010306 + X010307 + X010308\)
\(\leq 139102\)

34) \(X020101 + X020201 + X020301\)
\(\leq 0\)

35) \(X020101 + X020102 + X020201 + X020202 + X020301\)
+ \(X020302\)
\(\leq 0\)

36) \(X020101 + X020102 + X020103 + X020201 + X020202\)
+ \(X020203 + X020301 + X020302 + X020303\)
\(\leq 9000\)

37) \(X020101 + X020102 + X020103 + X020104 + X020201\)
+ \(X020202 + X020203 + X020204 + X020301 + X020302\)
+ \(X020303 + X020304\)
\(\leq 9000\)

38) \(X020101 + X020102 + X020103 + X020104 + X020105\)
+ \(X020201 + X020202 + X020203 + X020204 + X020205\)
+ \(X020301 + X020302 + X020303 + X020304 + X020305\)
\(\leq 9000\)

39) \(X020101 + X020102 + X020103 + X020104 + X020105\)
+ \(X020106 + X020201 + X020202 + X020203 + X020204\)
+ \(X020205 + X020206 + X020301 + X020302 + X020303\)
+ \(X020304 + X020305 + X020306\)
\(\leq 9000\)

40) \(X020101 + X020102 + X020103 + X020104 + X020105\)
+ \(X020106 + X020107 + X020201 + X020202 + X020203\)
+ \(X020204 + X020205 + X020206 + X020207 + X020301\)
+ \(X020302 + X020303 + X020304 + X020305 + X020306\)
\(\leq 18000\)

41) \(X020101 + X020102 + X020103 + X020104 + X020105\)
+ \(X020106 + X020107 + X020108 + X020201 + X020202\)
+ \(X020203 + X020204 + X020205 + X020206 + X020207\)
+ \(X020208 + X020301 + X020302 + X020303 + X020304\)
+ \(X020305 + X020306 + X020307 + X020308\)
\(\leq 18000\)

42) \(X030101 + X030201 + X030301\)
\(\leq 38\)

43) \(X030101 + X030102 + X030201 + X030202 + X030301\)
+ \(X030302\)
\(\leq 76\)

Figure 20 (cont'd).
44) \[ X_{030101} + X_{030102} + X_{030103} + X_{030201} + X_{030202} + X_{030203} + X_{030301} + X_{030302} + X_{030303} \leq 114 \]
45) \[ X_{030101} + X_{030102} + X_{030103} + X_{030104} + X_{030201} + X_{030202} + X_{030203} + X_{030301} + X_{030302} \leq 152 \]
46) \[ X_{030101} + X_{030102} + X_{030103} + X_{030104} + X_{030105} + X_{030201} + X_{030202} + X_{030203} + X_{030301} + X_{030302} + X_{030303} + X_{030304} + X_{030305} \leq 190 \]
47) \[ X_{030101} + X_{030102} + X_{030103} + X_{030104} + X_{030105} + X_{030106} + X_{030201} + X_{030202} + X_{030203} + X_{030204} + X_{030205} + X_{030206} + X_{030301} + X_{030302} + X_{030303} + X_{030304} + X_{030305} + X_{030306} \leq 228 \]
48) \[ X_{030101} + X_{030102} + X_{030103} + X_{030104} + X_{030105} + X_{030106} + X_{030107} + X_{030201} + X_{030202} + X_{030203} + X_{030204} + X_{030205} + X_{030206} + X_{030207} + X_{030208} + X_{030301} + X_{030302} + X_{030303} + X_{030304} + X_{030305} + X_{030306} + X_{030307} \leq 266 \]
49) \[ X_{030101} + X_{030102} + X_{030103} + X_{030104} + X_{030105} + X_{030106} + X_{030107} + X_{030108} + X_{030201} + X_{030202} + X_{030203} + X_{030204} + X_{030205} + X_{030206} + X_{030207} + X_{030208} + X_{030301} + X_{030302} + X_{030303} + X_{030304} + X_{030305} + X_{030306} + X_{030307} + X_{030308} \leq 304 \]
50) \[ X_{010101} = 50 \]
51) \[ X_{010103} = 60 \]
52) \[ X_{010105} = 70 \]
53) \[ X_{010107} = 80 \]
54) \[ D_{030101M} - D_{030101P} + X_{030101} = 100 \]
55) \[ D_{030102M} - D_{030102P} + X_{030102} = 100 \]
56) \[ D_{030103M} - D_{030103P} + X_{030103} = 100 \]
57) \[ D_{030104M} - D_{030104P} + X_{030104} = 100 \]
58) \[ E_{030201M} - E_{030201P} + X_{030201} + X_{030202} + X_{030203} + X_{030204} = 76 \]
59) \[ E_{030202M} - E_{030202P} + X_{030205} + X_{030206} + X_{030207} + X_{030208} = 152 \]
60) \[ F_{030301M} - F_{030301P} + X_{030301} + X_{030302} + X_{030303} + X_{030304} = 141 \]
61) \[ F_{030302M} - F_{030302P} + X_{030305} + X_{030306} + X_{030307} + X_{030308} = 295 \]
62) \[ G - M + X_{040101} + X_{040102} + X_{040103} + X_{040104} + X_{040105} + X_{040106} + X_{040107} + X_{040108} + X_{040201} + X_{040202} + X_{040203} + X_{040204} + X_{040205} + X_{040206} + X_{040207} + X_{040208} + X_{040301} + X_{040302} + X_{040303} + X_{040304} + X_{040305} + X_{040306} + X_{040307} + X_{040308} = 0 \]

END

Figure 20 (cont'd).
SUB X010301  0.00
SUB X010302  0.00
SUB X010303  0.00
SUB X010304  0.00
SUB X010305  0.00
SUB X010306  0.00
SUB X010307  0.00
SUB X010308  0.00

Figure 20 (cont'd).
5.0 SUMMARY AND CONCLUSIONS

The purpose of this research was to make use of the latest computer and software technology in conjunction with the most recent theoretical and conceptual developments concerning interface of the decision-maker with computer databases and mathematical models to aid senior university management in the planning and control of university funds. The following sections will summarize this research work, discuss conclusions, and recommend further possible research and development work.

5.1 OVERVIEW

The specific objective of this research was to use two techniques - computer modeling and multi-objective mathematical programming - to yield a decision support system to assist top university financial officers in assessing the current and projected status of funds sources and uses, in order to reach new decisions concerning funding of proposed projects and to allocate funds from sources to proposed uses on an aggregate basis according to a rational set of prescribed procedures.
The computerized system allows the Vice President to access information, via an on-line terminal, concerning the up-to-date status of all funds available to the university. The system provides a projection over time of all funding requirements or needs, and a projection over time of currently proposed allocations of available funds to specified needs. Thus, the system also provides up-to-date information concerning available (unallocated) funds by source and by time period available. This allows the Vice President to match up the schedule of available funds with the projected needs to determine if sufficient funds would be available at the times needed.

Since the system involves numerous possible sources and numerous possible uses, both over a quarterly planning horizon of several periods, the possible allocation of funds from various sources to various uses over several time periods becomes a quite complex set of decisions. Thus, the computerized system embeds a goal programming model within the computer model to make the allocations of funds from sources to uses, based on a set of goals, guidelines, and constraints prescribed by the Vice President (and by legal restrictions concerning the use of various sources of state funds). The model includes all the factors that are involved in the decision-making concerning funds allocations and can measure the effects of any changes in these factors. It incorporates the diversity and multiplicity of the university's goals and objectives and legal restrictions concerning funds use. The model is flexible enough to let the user decide which goals, and at what priority, are to be included.

The DSS provides the user access to the database for the purpose of selecting model parameters for the model. It is designed and developed to be 'user-friendly' so that the user does not have to be an expert in goal programming and computer programming to be able to model the funds allocation process.

Such a system provides the administrator with a means to analyze systematically the allocation process and to make policies and decisions, and provides a framework for testing and evaluating alternative policies and performing 'what-if' analyses. In summary, the computerized system provides on-line information on how funds are available and needed over a certain planning horizon.
and how these funds are being channeled to the various uses according to predefined goals. As a result, the Vice President can immediately know which sources have unused funds and which therefore might be available to fund an upcoming project. It also indicates when funds are simply not available for a proposed project, or when the timing of funds is a problem requiring a rescheduling of the project cash outlays.

5.2 CONCLUSIONS

This research demonstrates how computer database technology, management science mathematical modeling techniques, and the latest concepts concerning computer/user interfacing can be combined to provide senior university administrators with on-line up-to-date information and decision analysis concerning the funds cash flow system. The procedures employed for user interface with the database and model are the most sophisticated currently available. Also, the allocation procedure represents state-of-the-art with regard to multi-objective decision analysis. More specific conclusions on this research can be drawn in the context of the two techniques used to develop this decision support system - computer modeling and goal programming - and the overall decision support system itself.

5.2.1 Computer Modeling

A key purpose of the research was to develop a computerized data base for the cash flow system with easy access by the user. The decision support system provides on-line information concerning the sources and uses and their respective funds via interactive terminal using screens with menu commands. It also stores information on the planned and actual funds allocations from the sources to the uses which is readily available to the user.
This information is provided to the user in the form of reports, both on the terminal and printed copies. There are five such reports:

Funds Availability by Sources: Describes, for each year in the planning horizon, the dollar amount of funds available from each source by quarter.

Funding Requirements by Uses: Describes, for each year in the planning horizon, the dollar amount of funds needed for each use by quarter.

Source Expenditures: Describes in detail how funds from a particular source are being channeled to various uses over time, as determined by the allocation model. A different report is generated for each source category.

Expenditure Sources: Describes in detail how a particular use is being funded from various sources over time, as determined by the allocation model. A different report is generated for each use category.

Funds Use Through Time: Describes how much funds are available from each source and how much of these have been allocated to various uses by quarter, as determined by the allocation model.

The main objective of establishing the database was to provide the administrator with immediate on-line information on the cash flow system. The user can appropriately update the database when new sources or uses are identified. It assists the administrator in various ways. For instance, it acts as a financial control system where the user can determine whether the actual allocations are taking place as planned. It also helps determine which sources have unused funds and may be used to fund an upcoming project.
5.2.2 Use of Goal Programming to Model Funds Allocation Process

One purpose of this research was to model the sources and uses cash flow system using a technique that would be amenable to solution. The technique of goal programming was selected because of its ability to consider multiple and incommensurable goals. As noted earlier, fairly extensive research efforts have been conducted to model university resource allocation problems using this technique; however, no research work has dealt with the specific area of cash flow systems. This research has adequately demonstrated the feasibility of using goal programming to model the allocation procedure in a sources and uses cash flow process.

Goal programming provides a scientific and systematic way to allocate funds from the sources to the uses over several time periods, subject to the goals and priorities of the university administration. It also provides a great deal of flexibility. The user decides the parameter values of the model, and determines which goals are to be included in the model and at what priority and weight.

Goal programming is an appropriate tool for modeling the sources and uses cash flow system because of its ability to handle multiple and conflicting goals. It provides a way for the administration to seek and find a compromise among its various competitive and often conflicting goals, some of which include: meeting restrictions placed on use of state funds, using multiple sources to fund projects, and depleting non-interest bearing funds prior to those bearing interest.

This research has also demonstrated the flexibility that goal programming offers. The user decides which goals are to be included in the model. In addition, goal programming provides the user a means for sensitivity analysis. The user can study the effect of changes in the values of different variables by simply modifying the goals and/or priority structure and analyzing the resulting funds allocation structure.
5.2.3 The Decision Support System

The decision support system was developed with the objective of making the database and the goal programming technique readily and easily accessible to the decision maker. It uses computer hardware and software to facilitate the user-model interaction by providing access to the database and model using menu commands and data entry via full screen editing techniques.

The DSS handles a number of tasks that include data handling and storage, formulating and solving the GP model, generating reports, and what-if analyses. Through the use of menus and panels, the user defines model parameters, goals, and the priority structure for the GP model. The DSS then automatically formulates the GP model and solves it using a commercial mathematical programming software package.

The DSS was developed so as to possess a number of features and characteristics; but most importantly, it had to be user-friendly and interactive. The system is user-friendly in the sense that it provides the user easy access to the database and facilitates the user-model interaction. The user does not have to be an expert in computer programming or goal programming to be able to use it.

The need for the decision support system to be interactive arose from the desire to provide: (1) on-line information on the cash flow system, and (2) immediate feedback on model results when modeling the cash flow system using goal programming. As has been mentioned on numerous previous occasions, one of the purposes of the system was to provide a framework for testing of alternative allocation policies. Immediate feedback, through reports, permits the user to test different goals and priority structures in the search for an acceptable allocation structure.

The decision support system was developed using the following programming languages and computer systems: EXEC 2, FORTRAN, LINDO, and DMS. The decision to use these computer languages and systems was not made at the beginning of the research, but instead took place over
a considerable period of time as it became apparent that a single computer programming language would not be sufficient to develop such a complex system.

Initially, consideration was given to developing the decision support system on a personal computer. It soon became apparent, however, that a personal computer would not be able to satisfy the tremendous core memory requirements for such a large computer package and database system. In addition, it was felt that to solve a goal programming model of the size needed to model the allocation process would require a large execution time, possibly as much as ten to fifteen minutes. This would have negated a key characteristic of the DSS, that it be interactive and capable of providing immediate feedback. After some deliberation, it was decided to develop the decision support system on the Virginia Polytechnic Institute's IBM 3090 mainframe computer system.

Having decided to build the DSS on the mainframe, the next step was to look for a suitable programming language. Keeping in mind the user-friendliness that such a system would demand, it was decided that the Display Management System (DMS) should be used to prepare panels or screens that could be used to display menus to perform input/output operations. Research on DMS revealed that it could be accessed from only a limited number of programming languages. These programming languages are: EXEC, EXEC 2, COBOL, PL/I, and Assembly Language. Out of these only EXEC and EXEC 2 were considered because the other three either required tremendous programming effort or lacked capability as a command language. In the end, EXEC 2 was selected because its a newer and extended version of EXEC. EXEC 2 possesses great capability as a command language and has the flexibility to be used as a programming language as well. Additionally, it offers considerable debugging facilities.

As the programming work began, it was soon discovered that EXEC 2 offers little by way of computational capabilities. It also does not possess any capability to write a record in a formatted mode. Consequently, the need for an additional programming language was felt. FORTRAN was the obvious choice because of its simplicity and quick execution time.

SUMMARY AND CONCLUSIONS
A computer code for solving the goal programming model was also needed. LINDO was selected not only because it can be used in an interactive mode, but also because it offers the USER subroutine that can be utilized to solve a goal programming model as a sequence of linear programming problems. In addition, LINDO can accept a problem code in the MPS format which is relatively easy to generate using FORTRAN programs, as is the case for this system.

The use of Display Management System (DMS) to prepare panels, or screens, for providing menus and for performing input/output operations was very well received. It went a long way toward making this decision support system user-friendly. The use of panels not only gives the system a 'professional look', but also offers a number of advantages that are explained in the following paragraphs.

One of the advantages of using DMS was evident when displaying menus. Instead of asking the user to select an option by writing the option number and hitting the return key, the user need only use the corresponding PF key. In effect, instead of having to perform two operations - typing the option number and hitting the return key - the user has to use only one key. This may not seem like a great advantage, but when using a very large computer system where a large number of options have to be specified during a typical session, this turns out to be a very significant advantage. Also, most of the top administrators use systems such as PROFS very frequently, and so are familiar with using PF keys.

Another advantage of using DMS is that output can be easily displayed on the terminal in a formatted mode, which is a relatively difficult task using, say, EXEC 2 or FORTRAN. In addition, specific titles and data fields may be highlighted, and this capability can be exploited to focus the user's attention on some important piece of instruction or information.

There is a significant advantage during data input operations as well. It is possible to specify certain data fields to take only numeric values. Consequently, when an entry is to be made in such a data field, the screen will not accept any non-numeric characters in that field. If, by mistake, the user
hits a character key while typing a number, the terminal will not accept that character and, instead, sounds a signal to alert the user to this effect.

The use of signals is not limited to this instance alone. The system makes use of signals to alert the user when an invalid selection is made, or when an inappropriate data entry is made. For instance, the user may select a PF key that does not correspond to any option, or, while making a rigid allocation, may try to allocate more funds than are needed or available. In such instances, the signal is sounded and an highlighted error message explaining the error is displayed at the bottom left corner of the screen.

In all, the use of DMS to create panels for menus and for performing input/output operations made a significant contribution towards providing the interaction between user and database, and between user and model. It went a long way towards making this a really user-friendly system.

5.3 RECOMMENDATIONS

Even though this decision support system is at present going to be used by the top officials of the university, its use should not be limited to strategic planning for the overall university financial system. It could be used at the college level or even the department level. Various research centers in the university could also find this system very useful.

In addition, the administration might consider selling this DSS to other state universities. To a large extent, the cash flow system at other state universities would have features very similar to those at the Virginia Polytechnic Institute and State University. One possible stumbling block might be the requirement that the funding be given by the quarter of each year, which may not be the case at some other institutions which may have a time unit of, say, a month or a half-year. However, as
noted in an earlier section, this could be overcome by breaking down or aggregating the funding requirements so that the resulting time unit is a quarter of a year.

It is highly advisable that this system be used for multi-year planning horizons. This may involve dealing with data that are only estimates, but such use would help detect any potential problems, such as funding shortages in the future. Early detection of such problems would give the administration sufficient time to develop a strategy to tackle those problems.

Additional experimentation should be done with the system by considering further different possible scenarios. This could provide further insight into how the allocation process is affected by changes in the objectives and priorities of the administration, and by changes in other variables that affect the allocation process.

As far as further development and research work is concerned, several ideas immediately come to mind. First, some additional types of goals may be included in the goal programming model. These additional goals could include: (1) exhaust all funds from a particular use, (2) funds from a particular source should go to a specified number of uses, and (3) funding for a use should come from a specified number of sources.

Another possible extension to the system would be to build in a forecasting model. The forecasting model, which could be a time series or a regression model, could be used to forecast the funding availability and requirements in the future years. The goal programming model could then be used on these predictions to evaluate possible allocation structures and to identify possible problem areas.

Further research should also be conducted into the possibility of extending the computer model to include performing a funds allocation for a particular source-use categories combination. That is, further develop this model so that after a funds allocation structure has been developed for certain categories of sources and uses, the same analysis can be performed at a more detailed level for
specific source and use categories by breaking down those categories into their respective components.

The administration should also consider integrating this system with other existing information/decision support systems like the tuition and fee model and the budget model, to develop a comprehensive financial information and control package. Also, any forthcoming financial systems should be developed with the intent of eventual integration into the overall system.

5.4 SUMMARY

In summary, this research demonstrates how computer hardware and software technology can be combined with management science techniques to develop a powerful tool to aid the university administration in managing a sources and uses of funds system and making sound and effective funds allocation decisions. The research also follows the premise that the purpose of a decision support system is not to replace a decision-maker by making decisions for him, but rather to increase the decision-maker’s involvement in the decision-making process by providing him access to database and decision models, and by facilitating the interaction between database, model, and the user.
BIBLIOGRAPHY


**BIBLIOGRAPHY**


Appendix A. LISTING OF EXEC 2 PROGRAMS
A.I  ACHVMNT

**********************************************************************
* * OPTION - DISPLAY GOAL ACHIEVEMENT REPORTS
* * THIS EXEC COMPUTES GOAL ACHIEVEMENTS AND DISPLAYS THEM.
**********************************************************************

&TRACE OFF

FILEDEF * CLEAR

FILEDEF FT01F001 DISK GOAL1 DATA X
FILEDEF FT02F001 DISK GOAL2 DATA X
FILEDEF FT03F001 DISK GOAL3 DATA X
FILEDEF FT04F001 DISK RIGID DATA X
FILEDEF FT11F001 DISK G1 DATA X
FILEDEF FT12F001 DISK G2 DATA X
FILEDEF FT13F001 DISK G3 DATA X
FILEDEF FT14F001 DISK RIG DATA X
FILEDEF FT17F001 DISK G8 DATA X
FILEDEF FT18F001 DISK NG DATA X
FILEDEF FT19F001 DISK NR DATA X
PREGLACH

COPYFILE NG DATA X (LRECL 80 RECFM F
COPYFILE NR DATA X (LRECL 80 RECFM F

EXECIO 1 DISKR NR DATA X 1 (FINIS
&READ VAR &NRC

ERASE RIGID DATA X
COPY RIG DATA X RIGID DATA X
ERASE RIG DATA X
COPYFILE RIGID DATA X (LRECL 100 RECFM F

EXECIO 1 DISKR NG DATA X 1 (FINIS
&READ VAR &CT1 &CT2 &CT3 &CT0

SET CMSTYPE HT
&IF &CT1 = 0 &SKIP 3
COPYFILE G1 DATA X (LRECL 80 RECFM F
&STACK 21 22 8 9
SORT G1 DATA X G11 DATA X

&IF &CT2 = 0 &SKIP 3
COPYFILE G2 DATA X (LRECL 80 RECFM F
&STACK 21 22 8 9
SORT G2 DATA X G21 DATA X

&IF &CT3 = 0 &SKIP 3
COPYFILE G3 DATA X (LRECL 80 RECFM F
&STACK 21 22 8 9
SORT G3 DATA X G31 DATA X

&IF &CT0 = 0 &SKIP 3
COPYFILE G0 DATA X (LRECL 80 RECFM F
&STACK 21 22 29 30 8 9
SORT G0 DATA X G01 DATA X

SET CMSTYPE RT

FILEDEF FT01F001 DISK INIT DATA X
FILEDEF FT02F001 DISK SOURCED DATA X

Appendix A. LISTING OF EXEC 2 PROGRAMS 128
FILEDEF FT03FOO DISK USED DATA X
FILEDEF FT04FOO DISK ALLOCATN DATA X
FILEDEF FT17FOO DISK G11 DATA X
FILEDEF FT18FOO DISK G21 DATA X
FILEDEF FT19FOO DISK G31 DATA X
FILEDEF FT11FOO DISK G12 DATA X (LRECL 100 BLKSIZE 100 RECFM F
FILEDEF FT12FOO DISK G22 DATA X (LRECL 100 BLKSIZE 100 RECFM F
FILEDEF FT13FOO DISK G32 DATA X (LRECL 100 BLKSIZE 100 RECFM F
FILEDEF FT14FOO DISK G02
FILEDEF FT0IFOO DISK INIT DATA X
FILEDEF FT02FOO DISK SOURCEN DATA X
FILEDEF FT03FOO DISK USEN DATA X
FILEDEF FT04FOO DISK NG DATA X
FILEDEF FT11FOO DISK G12 DATA X (LRECL 100 BLKSIZE 100 RECFM F
FILEDEF FT12FOO DISK G22 DATA X (LRECL 100 BLKSIZE 100 RECFM F
FILEDEF FT13FOO DISK G32 DATA X (LRECL 100 BLKSIZE 100 RECFM F
FILEDEF FT14FOO DISK G02
FILEDEF FT37FOO DISK FILE FT31FOO DATA X (LRECL 120 BLKSIZE 120 RECFM F
FILEDEF FT32FOO DISK FILE FT32FOO DATA X (LRECL 120 BLKSIZE 120 RECFM F
FILEDEF FT33FOO DISK FILE FT33FOO DATA X (LRECL 120 BLKSIZE 120 RECFM F
FILEDEF FT37FOO DISK FILE FT37FOO DATA X (LRECL 120 BLKSIZE 120 RECFM F
GAREPTS
ENDIF &CT1 = 0 &SKIP 1
COPYFILE G13 DATA X (LRECL 80 RECFM F
ENDIF &CT2 = 0 &SKIP 1
COPYFILE G23 DATA X (LRECL 80 RECFM F
ENDIF &CT3 = 0 &SKIP 1
COPYFILE G33 DATA X (LRECL 80 RECFM F
ENDIF &CT0 = 0 &SKIP 1
COPYFILE G03 DATA X (LRECL 80 RECFM F
ERASE G0 DATA X
ERASE G1 DATA X
ERASE G2 DATA X
ERASE G3 DATA X
ERASE G01 DATA X
ERASE G11 DATA X
ERASE G21 DATA X
ERASE G31 DATA X
ERASE G02 DATA X
ERASE GOAL1 DATA X
ERASE GOAL2 DATA X
ERASE GOAL3 DATA X
COPYFILE G12 DATA X GOAL1 DATA X
COPYFILE G22 DATA X GOAL2 DATA X
COPYFILE G32 DATA X GOAL3 DATA X
ERASE G12 DATA X
ERASE G22 DATA X
ERASE G32 DATA X
SET CMSTYPE HT
&STACK 26 27 1 2
SORT G03 DATA X G43 DATA X
ERASE G03 DATA X
SET CMSTYPE RT
FILEDEF FT01F001 DISK G43 DATA X
FILEDEF FT02FOO DISK G03 DATA X
ORDGARPT

Appendix A. LISTING OF EXEC 2 PROGRAMS
ERASE G43 DATA X
COPYFILE G03 DATA X (LRECL 80 RECFM F)

* DISPLAY MENU FOR GOAL ACHIEVEMENT REPORTS

EUDEXEC2
&PRESUME &SUBCOMMAND DISPLAY
&COMMAND EXECIO 1 DISKR NG DATA X 1 (FINIS
&READ VAR &C2 &C3 &C4 &C0

-MAIN

USE PANEL10
MAP DATA 1 ECODE (LOAD UNLOAD PREVIEW
-ERRDIS
DISPLAY
&IF &RSTATUS = PF1 &GOTO -OPN1
&IF &RSTATUS = PF2 &GOTO -OPN2
&IF &RSTATUS = PF3 &GOTO -OPN3
&IF &RSTATUS = PF4 &GOTO -OPN4
&IF &RSTATUS = PF5 &GOTO -OPN5
&IF &RSTATUS = PF10 &GOTO -QUIT
&ECODE = &STRING OF UNDEFINED PF KEY!
SIGNAL
&GOTO -ERRDIS

-OPN1

&CALL -OPT1
&GOTO -MAIN

-OPN2

&CALL -OPT2
&GOTO -MAIN

-OPN3

&CALL -OPT3
&GOTO -MAIN

-OPN4

&CALL -OPT4
&GOTO -MAIN

Appendix A. LISTING OF EXEC 2 PROGRAMS 130
* OPTION 5 - PRINT ALL GOAL ACHIEVEMENT REPORTS

-OPNS
&CALL -OPT5

USE PANEL10
MAP DATA 1 ECODE (LOAD UNLOAD PREVIEW
&ECODE = &STRING OF REPORTS SENT TO PRINTER
SIGNAL
&GOTO -ERRDIS

-OPT1
&IF &C2 = 0 &SKIP 1
&COMMAND EXECIO &C2 DISKR G13 DATA X 1 (FINIS

&N = 0
&LOOP 3 &C2
&N = &N + 1
&NAME = &CONCAT OF X3 &N
&READ STRING &NAME

USE PANEL101
MAP DATA 1 Y1 2 Y2 3 Y3 4 Y4 5 Y5 (LOAD UNLOAD PREVIEW
MAP DATA 6 Y6 7 Y7 8 Y8 9 Y9 10 Y10 (LOAD UNLOAD PREVIEW
MAP DATA 11 Y11 12 Y12 13 Y13 14 Y14 15 Y15 (LOAD UNLOAD PREVIEW
MAP DATA 16 Y16 17 Y17 18 Y18 19 ECODE (LOAD UNLOAD PREVIEW

&SL = 0
-CONT3
&LN = &SL
&N = 0
&LOOP -RS3 18
&N = &N + 1
&NAME1 = &CONCAT OF Y &N
&NAME1 = &BLANK
&IF &LN EQ &C2 &GOTO -RS3
&LN = &LN + 1
&NAME2 = &CONCAT OF X3 &LN
&NAME2 = &NAME2
-RS3

-ED3
DISPLAY
&ECODE = &BLANK
&IF &RSTATUS = PF7 &SKIP 6
&IF &RSTATUS = PF8 &SKIP 5
&IF &RSTATUS = PF10 &RETURN
&ECODE = &STRING OF IMPROPER PFKEY!
-GERR3
SIGNAL
&GOTO -ED3

&IF &RSTATUS = PF8 &SKIP 5
&IF &SL NE 0 &SKIP 2
&ECODE = &STRING OF NO PREVIOUS GOALS!
&GOTO -GERR3
&SL = &SL - 18
&GOTO -CONT3
&IF &LN NE &C2 &SKIP 2
&ECODE = &STRING OF NO MORE GOALS!
&GOTO -GERR3
&SL = &SL + 18
&GOTO -CONT3
&IF &C3 = 0 &SKIP 1
&COMMAND EXECIO &C3 DISKR G23 DATA X 1 (FINIS

&N = 0
&LOOP 3 &C3
&N = &N + 1
&NAME = &CONCAT OF X4 &N
&READ STRING &&NAME

USE PANEL102
MAP DATA 1 Y1 2 Y2 3 Y3 4 Y4 5 Y5 (LOAD UNLOAD PREVIEW
MAP DATA 6 Y6 7 Y7 8 Y8 9 Y9 10 Y10 (LOAD UNLOAD PREVIEW
MAP DATA 11 Y11 12 Y12 13 Y13 14 Y14 15 Y15 (LOAD UNLOAD PREVIEW
MAP DATA 16 Y16 17 Y17 18 Y18 19 Y19 (LOAD UNLOAD PREVIEW

&SL = 0

-CONT4
&LN = &SL
&N = 0
&LOOP -RS4 18
&N = &N + 1
&NAME1 = &CONCAT OF Y &N
&&NAME1 = &BLANK
&IF &LN EQ &C3 &GOTO -RS4
&LN = &LN + 1
&NAME2 = &CONCAT OF X4 &LN
&&NAME1 = &&NAME2
-RS4

-DISP4

-ED4
DISPLAY
&ECODE = &BLANK
&IF &RSTATUS = PF7 &SKIP 6
&IF &RSTATUS = PF8 &SKIP 5
&IF &RSTATUS = PF10 &RETURN
&ECODE = &STRING OF IMPROPER PFKEY!
-GERR4
SIGNAL
&GOTO -ED4

&IF &RSTATUS = PF8 &SKIP 5
&IF &SL NE 0 &SKIP 2
&ECODE = &STRING OF NO PREVIOUS GOALS!
&GOTO -GERR4
&SL = &SL - 18
&GOTO -CONT4
&IF &LN NE &C3 &SKIP 2
&ECODE = &STRING OF NO MORE GOALS!
&GOTO -GERR4
&SL = &SL + 18
&GOTO -CONT4

-OPT3

&IF &C4 = 0 &SKIP 1
&COMMAND EXECIO &C4 DISKR G33 DATA X 1 (FINIS

&N = 0
&LOOP 3 &C4
&N = &N + 1
&NAME = &CONCAT OF X5 &N
&READ STRING &&NAME

USE PANEL103
MAP DATA 1 Y1 2 Y2 3 Y3 4 Y4 5 Y5 (LOAD UNLOAD PREVIEW

Appendix A. LISTING OF EXEC 2 PROGRAMS
&SL = 0
-CONT5
&LN = &SL
&N = 0
&LOOP -RS5 18
&N = &N + 1
&NAME1 = &CONCAT OF Y &N
&NAME1 = &BLANK
&IF &LN EQ &C4 &GOTO -RS5
&LN = &LN + 1
&NAME2 = &CONCAT OF X5 &LN
&NAME1 = &NAME2
-RS5
-EDS5
DISPLAY
&ECODE = &BLANK
&IF &RSTATUS = PF7 &SKIP 6
&IF &RSTATUS = PF8 &SKIP 5
&IF &RSTATUS = PF10 &RETURN
&ECODE = &STRING OF IMPROPER PFKEY!
-GERR5
SIGNAL
&GOTO -EDS5
-IF &RSTATUS = PF8 &SKIP 5
&IF &SL NE 0 &SKIP 2
&ECODE = &STRING OF NO PREVIOUS GOALS!
&GOTO -GERR5
&SL = &SL - 18
&GOTO -CONT5
&IF &LN NE &C4 &SKIP 2
&ECODE = &STRING OF NO MORE GOALS!
&GOTO -GERR5
&SL = &SL + 18
&GOTO -CONT5
-OPT4
&IF &C0 = 0 &SKIP 1
&COMMAND EXECC0 &C0 DISKR G03 DATA X 1 (FINIS)
&N = 0
&LOOP 3 &C0
&N = &N + 1
&NAME = &CONCAT OF X5 &N
&READ STRING &NAME

USE PANEL104
MAP DATA 1 Y1 2 Y2 3 Y3 4 Y4 5 Y5 (LOAD UNLOAD PREVIEW
MAP DATA 6 Y6 7 Y7 8 Y8 9 Y9 10 Y10 (LOAD UNLOAD PREVIEW
MAP DATA 11 Y11 12 Y12 13 Y13 14 Y14 15 Y15 (LOAD UNLOAD PREVIEW
MAP DATA 16 Y16 17 Y17 18 Y18 19 ECODE (LOAD UNLOAD PREVIEW

&SL = 0
-CONT6
&LN = &SL
&N = 0
&LOOP -RS6 18
&N = &N + 1
&NAME1 = &CONCAT OF Y &N
&NAME1 = &BLANK
&IF &LN EQ &C0 &GOTO -RS6

Appendix A. LISTING OF EXEC 2 PROGRAMS
&LN = &LN + 1
&NAME2 = &CONCAT OF X5 &LN
&&NAME1 = &&NAME2
-RS6

-ED6
DISPLAY
&ECODE = &BLANK
&IF &RSTATUS = PF7 &SKIP 6
&IF &RSTATUS = PF8 &SKIP 5
&IF &RSTATUS = PF10 &RETURN
&ECODE = &STRING OF IMPROPER PFKEY!
-GERR6
SIGNAL
&GOTO -ED6

&IF &RSTATUS = PF8 &SKIP 5
&IF &SL NE 0 &SKIP 2
&ECODE = &STRING OF NO PREVIOUS GOALS!
&GOTO -GERR6
&SL = &SL - 18
&GOTO -CONT6
&IF &LN NE &co &SKIP 2
&ECODE = &STRING OF NO MORE GOALS!
&GOTO -GERR6
&SL = &SL + 18
&GOTO -CONT6

-OPTS
&PRESUME &COMMAND

&IF &CT1 = 0 &SKIP 1
COPYFILE FILE FT31F001 X (LRECL 120 RECFM F
&IF &CT2 = 0 &SKIP 1
COPYFILE FILE FT32F001 X (LRECL 120 RECFM F
&IF &CT3 = 0 &SKIP 1
COPYFILE FILE FT33F001 X (LRECL 120 RECFM F
COPYFILE FILE FT37F001 X (LRECL 120 RECFM F

SET CMSTYPE HT
&STACK 56 57 1 2
SORT FILE FT37F001 X TEMP FT37F001 X
SET CMSTYPE RT
ERASE FILE FT37F001 X
COPY TEMP FT37F001 X FILE FT37F001 X
ERASE TEMP FT37F001 X
FILEDEF FT01F001 DISK NG DATA X
FILEDEF FT31F001 DISK FILE FT31F001 X (LRECL 120 BLKSIZE 120 RECFM F
FILEDEF FT32F001 DISK FILE FT32F001 X (LRECL 120 BLKSIZE 120 RECFM F
FILEDEF FT33F001 DISK FILE FT33F001 X (LRECL 120 BLKSIZE 120 RECFM F
FILEDEF FT37F001 DISK FILE FT37F001 X (LRECL 120 BLKSIZE 120 RECFM F
FILEDEF FT11F001 DISK FILE FT11F001 X (LRECL 132 BLKSIZE 132 RECFM F
PRNTGARP
PRINT GLACHMNT LISTING X
ERASE GLACHMNT LISTING X
EUDEEXEC2
&PRESUME &SUBCOMMAND DISPLAY
&RETURN

-QUIT
&PRESUME &COMMAND
ERASE RI1 DATA X
ERASE R21  DATA X
ERASE G03  DATA X
ERASE G13  DATA X
ERASE G23  DATA X
ERASE G33  DATA X
ERASE NG   DATA X
ERASE NR   DATA X

ERASE FILE FT31F001 X
ERASE FILE FT32F001 X
ERASE FILE FT33F001 X
ERASE FILE FT37F001 X

&EXIT
A.2 NEWMODEL

CREATE A DUMMY DATABASE

&TRACE OFF
EUDEXEC2 &PRESUME &SUBCOMMAND DISPLAY

USE NEWMODL
MAP DATA 1 ECODE (LOAD UNLOAD PREVIEW
-ERRQUIT
DISPLAY
&IF &RSTATUS = PF1 &GOTO -NEW
&IF &RSTATUS = PF10 &GOTO -QUIT
&ECODE = &STRING OF UNDEFINED PF KEY
SIGNAL
&GOTO -ERRQUIT
-NEW

&PRESUME &COMMAND
ERASE SOURCED PERM A
ERASE SOURCEN PERM A
ERASE USED PERM A
ERASE USEN PERM A
ERASE YEAR PERM A
ERASE INIT PERM A
ERASE CONST PERM A
ERASE ALLOCATN PERM A
ERASE RIGID PERM A
ERASE GOAL1 PERM A
ERASE GOAL2 PERM A
ERASE GOAL3 PERM A
ERASE GOALS PERM A
COPY SOURCED DUMMY Z SOURCED PERM A
COPY SOURCEN DUMMY Z SOURCEN PERM A
COPY USED DUMMY Z USED PERM A
COPY USEN DUMMY Z USEN PERM A
COPY YEAR DUMMY Z YEAR PERM A
COPY INIT DUMMY Z INIT PERM A
COPY CONST DUMMY Z CONST PERM A
COPY ALLOCATN DUMMY Z ALLOCATN PERM A
COPY GOALS DUMMY Z GOALS PERM A
COPY GOAL1 DUMMY Z GOAL1 PERM A
COPY GOAL2 DUMMY Z GOAL2 PERM A
COPY GOAL3 DUMMY Z GOAL3 PERM A
COPY RIGID DUMMY Z RIGID PERM A

&EXIT
-QUIT
&PRESUME &COMMAND
&EXIT
A.3 PERMCHNG

**********************************************************************
*
* OPTION 2 - MAKE TEMPORARY CHANGES TO DATA
*
**********************************************************************

&TRACE OFF

ERASE SOURCED TEMP X
ERASE SOURCEN TEMP X
ERASE USED TEMP X
ERASE USEN TEMP X
ERASE YEAR TEMP X
ERASE INIT TEMP X
ERASE CONST TEMP X
ERASE GOALS TEMP X
ERASE GOAL1 TEMP X
ERASE GOAL2 TEMP X
ERASE GOAL3 TEMP X
ERASE RIGID TEMP X
COPY SOURCED DATA X SOURCED TEMP X
COPY SOURCEN DATA X SOURCEN TEMP X
COPY USED DATA X USED TEMP X
COPY USEN DATA X USEN TEMP X
COPY YEAR DATA X YEAR TEMP X
COPY INIT DATA X INIT TEMP X
COPY CONST DATA X CONST TEMP X
COPY GOALS DATA X GOALS TEMP X
COPY GOAL1 DATA X GOAL1 TEMP X
COPY GOAL2 DATA X GOAL2 TEMP X
COPY GOAL3 DATA X GOAL3 TEMP X
COPY RIGID DATA X RIGID TEMP X
ERASE SOURCED DATA X
ERASE SOURCEN DATA X
ERASE USED DATA X
ERASE USEN DATA X
ERASE YEAR DATA X
ERASE INIT DATA X
ERASE CONST DATA X
ERASE GOALS DATA X
ERASE GOAL1 DATA X
ERASE GOAL2 DATA X
ERASE GOAL3 DATA X
ERASE RIGID DATA X
COPY SOURCED PERM A SOURCED DATA X
COPY SOURCEN PERM A SOURCEN DATA X
COPY USED PERM A USED DATA X
COPY USEN PERM A USEN DATA X
COPY YEAR PERM A YEAR DATA X
COPY INIT PERM A INIT DATA X
COPY CONST PERM A CONST DATA X
COPY GOALS PERM A GOALS DATA X
COPY GOAL1 PERM A GOAL1 DATA X
COPY GOAL2 PERM A GOAL2 DATA X
COPY GOAL3 PERM A GOAL3 DATA X
COPY RIGID PERM A RIGID DATA X

**********************************************************************
*
* DECIDE ON PLANNING HORIZON
*
**********************************************************************

EXEC PERMHRZN
EUDEXEC2
&PRESUME &SUBCOMMAND DISPLAY

**********************************************************************
* DISPLAY MAIN MENU
**********************************************************************

-MAIN

USE PERMMAIN
-ERRORMAIN

DISPLAY
MAP DATA I ECODE (LOAD UNLOAD PREVIEW
&IF &RSTATUS = PF1 &GOTO -OPTION1
&IF &RSTATUS = PF2 &GOTO -OPTION2
&IF &RSTATUS = PF10 &GOTO -SAVECHNG
&ECODE = &STRING OF UNDEFINED PF KEY!
SIGNAL
&GOTO -ERRORMAIN

**********************************************************************
* OPTION1 - MAKE CHANGES TO SOURCES
**********************************************************************

-OPTION1

**********************************************************************
* DISPLAY SOURCE CHANGE MENU
**********************************************************************

-SRCEMENU

USE PSRCOPTN
MAP DATA I ECODE (LOAD UNLOAD PREVIEW
-ERRSRCEOPN
DISPLAY
&IF &RSTATUS = PF1 &GOTO -SRCEOPT1
&IF &RSTATUS = PF2 &GOTO -SRCEOPT2
&IF &RSTATUS = PF3 &GOTO -SRCEOPT3
&IF &RSTATUS = PF4 &GOTO -SRCEOPT4
&IF &RSTATUS = PF10 &GOTO -MAIN
&ECODE = &STRING OF UNDEFINED PF KEY!
SIGNAL
&GOTO -ERRSRCEOPN

**********************************************************************
* MODIFY X SOURCE
* SELECT SOURCE
**********************************************************************

-SRCEOPT1

USE PMTSRCEM
MAP DATA 1 SN1 2 SN2 3 SN3 4 SN4 5 SN5 (LOAD UNLOAD PREVIEW
MAP DATA 6 SN6 7 SN7 8 SN8 9 SN9 10 SN10 (LOAD UNLOAD PREVIEW
MAP DATA 11 SN11 12 SN12 13 SN13 14 SN14 15 SN15 (LOAD UNLOAD PREVIEW
MAP DATA 16 SN16 17 ECODE (LOAD UNLOAD PREVIEW

&COMMAND EXECIO 1 DISKR INIT DATA X 1 (FINIS
&READ VAR &NS &NU &NY &STYR &STYRNO

&COMMAND EXECIO &NU DISKR USEN DATA X 1 (FINIS
&N = 0

Appendix A. LISTING OF EXEC 2 PROGRAMS 138
&LOOP 3 &NU
&N = &N + 1
&NAME = &CONCAT OF U &N
&READ STRING &NAME

&COMMAND EXECIO &NS DISKR SOURCEN DATA X 1 (FINIS
&N = 0
&LOOP 6 &NS
&N = &N + 1
&NAME = &CONCAT OF S &N
&READ STRING &NAME
&NAME1 = &CONCAT OF SN &N
&NAME1 = &CONCAT OF &BLANK &N . &BLANK &NAME
&IF &N LT 10 &NAME1 = &CONCAT OF &BLANK &NAME1

&N = &N + 1
&IF &N GT 16 &SKIP 3
&TEMP = &CONCAT OF SN &N
SET &TEMP (PRO
&SKIP -4

&SN = 0

-ERRSRCOPT1
DISPLAY

&IF &RSTATUS = PF10 &GOTO -SRCEMENU
&IF &RCURSOR = SN1 &SN = 1
&IF &RCURSOR = SN2 &SN = 2
&IF &RCURSOR = SN3 &SN = 3
&IF &RCURSOR = SN4 &SN = 4
&IF &RCURSOR = SN5 &SN = 5
&IF &RCURSOR = SN6 &SN = 6
&IF &RCURSOR = SN7 &SN = 7
&IF &RCURSOR = SN8 &SN = 8
&IF &RCURSOR = SN9 &SN = 9
&IF &RCURSOR = SN10 &SN = 10
&IF &RCURSOR = SN11 &SN = 11
&IF &RCURSOR = SN12 &SN = 12
&IF &RCURSOR = SN13 &SN = 13
&IF &RCURSOR = SN14 &SN = 14
&IF &RCURSOR = SN15 &SN = 15
&IF &RCURSOR = SN16 &SN = 16
&IF &RSTATUS EQ ENTER &GOTO -MODSOU
&ECODE = &STRING OF UNDEFINED PF KEY!
SIGNA
&GOTO -ERRSRCOPT1

-MODSOU

&STACK &NS &NU &SN &NY
&COMMAND EXECIO 1 DISKW SRCE DATA X 1 F 80 (FINIS

&PRESUME &COMMAND

FILEDEF FT01F001 DISK SRCE DATA X
FILEDEF FT02F001 DISK SOURCED DATA X
FILEDEF FT03F001 DISK CONST DATA X
FILEDEF FT07F001 DISK RETSRC DATA X
FILEDEF FT08F001 DISK RETCONT DATA X
RETSRC
COPYFILE RETSRC DATA X (LRECL 80 RECFM F
COPYFILE RETCONT DATA X (LRECL 80 RECFM F

EUDEXEC2
&PRESUME &SUBCOMMAND DISPLAY

**********************************************************************
*MODIFY INITIAL BALANCE
**********************************************************************
USE PMSRCBAL
MAP DATA 1 SNAME 2 CIBAL 3 IBAL 4 ECODE (LOAD UNLOAD PREVIEW
&NAME = &CONCAT OF $ &SN
&SNAME = &NAME
&COMMAND EXECIO 1 DISKR RETSRC DATA X 1 (FINIS
&READ VAR &CIBAL

DISPLAY

&IF .&IBAL NE .&BLANK &SKIP 3
&IF .&IBAL = .&BLANK &IBAL = &CIBAL

DISPLAY

&STACK &IBAL
&COMMAND EXECIO 1 DISKW MODSRC DATA X 1 F 80 (FINIS

**********************************************************************
* MODIFY QUARTERLY FUNDS
**********************************************************************

USE PMSRCQTR
MAP DATA 1 SNAME 2 YEAR (LOAD UNLOAD PREVIEW
MAP DATA 3 QTROI 4 QTNR1 5 QTRO2 6 QTNR2 (LOAD UNLOAD PREVIEW
MAP DATA 7 QTROI 8 QTNR3 9 QTRO4 10 QTNR4 (LOAD UNLOAD PREVIEW
MAP DATA 11 ECODE (LOAD UNLOAD PREVIEW

&N = 0
&LOOP . &MSRCQTR &NY
&N = &N + 1
&M = &N + 1
&QTNR1 = &BLANK
&QTNR2 = &BLANK
&QTNR3 = &BLANK
&QTNR4 = &BLANK

&NAME = &CONCAT OF $ &SN
&SNAME = &NAME

&COMMAND EXECIO 1 DISKR YEAR DATA X &N (FINIS
&READ VAR &YEAR

&COMMAND EXECIO 1 DISKR RETSRC DATA X &M (FINIS
&READ VAR &QTROI &QTRO2 &QTRO3 &QTRO4

&NB = 0

DISPLAY

&IF .&QTNR1 EQ .&BLANK &NB = 1
&IF .&QTNR2 EQ .&BLANK &NB = 1
&IF .&QTNR3 EQ .&BLANK &NB = 1
&IF .&QTNR4 EQ .&BLANK &NB = 1
&IF .&QTNR1 EQ .&BLANK &QTNR1 = &QTROI
&IF .&QTNR2 EQ .&BLANK &QTNR2 = &QTRO2
&IF .&QTNR3 EQ .&BLANK &QTNR3 = &QTRO3
&IF .&QTNR4 EQ .&BLANK &QTNR4 = &QTRO4

&IF &NB = 0 &SKIP 2

DISPLAY

&STACK &QTNR1 &QTNR2 &QTNR3 &QTNR4
&COMMAND EXECIO 1 DISKW MODSRC DATA X &M F 80 (FINIS

-MSRCQTR

Appendix A. LISTING OF EXEC 2 PROGRAMS 140
USE PSRCLIST
MAP DATA 1 SNAME 2 REPLY 3 ECODE

&NAME = &CONCAT OF S &SN
&SNAME = &NAME
&REPLY = N

DISPLAY

&IF &REPLY = N &GOTO -NMSRCelig
&IF &REPLY = Y &GOTO -MSRCelig
&ECODE = &STRING OF ENTER 'Y' OR 'N'
SIGNAL
&SKIP -6

-MSRCelig

USE PMCKSRC
MAP DATA 1 SNAME

&NAME = &CONCAT OF S &SN
&SNAME = &NAME

&COMMAND EXECIO &NU DISKR RETCONT DATA X 1 (FINIS
&N = 0
&LOOP 6 &NU
&N = &N + 1
&NAME = &CONCAT OF E &N
&READ VAR &NAME
&NAME = &CONCAT OF UN &N
&NAME1 = &CONCAT OF U &N
&NAME = &NAME1

&IF &N GE 16 &SKIP 4
&N = &N + 1
&NAME = &CONCAT OF E &N
SET &NAME (PRO
&SKIP -4

-MSRCLERR

DISPLAY

&N = 0
&LOOP -MSRCCONT &NU
&N = &N + 1
&NAME = &CONCAT OF E &N
&IF &NAME EQ .Y &GOTO -MSRCCONT
&IF &NAME EQ .N &GOTO -MSRCCONT
&ECODE = &STRING OF ENTER 'Y' OR 'N'
SIGNAL
&GOTO -MSRCLERR

-MSRCCONT

&N = 0
&LOOP 3 &NU
&N = &N + 1
&NAME = &CONCAT OF E &N
&STACK &NAME
&COMMAND EXECIO &NU DISKW MODCONT DATA X 1 F 80 (FINIS
&GOTO -MSDONE

-NMSRCelig
&COMMAND COPY RETCONT DATA X MODCONT DATA X

Appendix A. LISTING OF EXEC 2 PROGRAMS

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Appendix A. LISTING OF EXEC 2 PROGRAMS

-MSDONE
&PRESUME &COMMAND
FILEDEF FT01F001 DISK SRCE  DATA X
FILEDEF FT02F001 DISK SOURCED DATA X
FILEDEF FT03F001 DISK CONST  DATA X
FILEDEF FT08F001 DISK MODSRCE DATA X
FILEDEF FT09F001 DISK MODCONT DATA X
FILEDEF FT10F001 DISK NEWSRCE DATA X
FILEDEF FT11F001 DISK NEWCONT DATA X
FILEDEF FT21F001 DISK RIGID  DATA X
FILEDEF FT22F001 DISK GOAL! DATA X
FILEDEF FT23F001 DISK GOAL2 DATA X
FILEDEF FT24F001 DISK GOAL3 DATA X
FILEDEF FT31F001 DISK RIGID  DATA1 X
FILEDEF FT32F001 DISK GOAL1 DATA1 X
FILEDEF FT33F001 DISK GOAL2 DATA1 X
FILEDEF FT34F001 DISK GOAL3 DATA1 X
FILEDEF FT35F001 DISK GOALS DATA1 X
MODSRCE
COPYFILE NEWSRCE DATA X (LRECL 80 RECFM F
COPYFILE NEWCONT DATA X (LRECL 80 RECFM F
ERASE SOURCED DATA X
ERASE CONST  DATA X
COPY NEWSRCE DATA X SOURCED DATA X
COPY NEWCONT DATA X CONST  DATA X
ERASE NEWSRCE DATA X
ERASE NEWCONT DATA X
ERASE SRCE DATA X
ERASE MODSRCE DATA X
ERASE RETSRCE DATA X
ERASE MODCONT DATA X
ERASE RETCONT DATA X
ERASE RIGID DATA X
ERASE GOAL1 DATA X
ERASE GOAL2 DATA X
ERASE GOAL3 DATA X
ERASE GOALS DATA X
COPY RIGID DATA1 X RIGID DATA X (LRECL 100 RECFM F
COPY GOAL1 DATA1 X GOAL1 DATA X (LRECL 100 RECFM F
COPY GOAL2 DATA1 X GOAL2 DATA X (LRECL 100 RECFM F
COPY GOAL3 DATA1 X GOAL3 DATA X (LRECL 100 RECFM F
COPY GOALS DATA1 X GOALS DATA X (LRECL 100 RECFM F
ERASE RIGID DATA1 X
ERASE GOAL1 DATA1 X
ERASE GOAL2 DATA1 X
ERASE GOAL3 DATA1 X
ERASE GOALS DATA1 X
EUDEXEC2
&PRESUME &SUBCOMMAND DISPLAY
&GOTO -SRCEMENU

*******************************************************************************
* DELETE X SOURCE
* SELECT SOURCE
*******************************************************************************

-SRCEOPT2
USE PMTSRCED
MAP DATA  1 SN1  2 SN2  3 SN3  4 SN4  5 SN5  (LOAD UNLOAD PREVIEW
MAP DATA  6 SN6  7 SN7  8 SN8  9 SN9 10 SN10 (LOAD UNLOAD PREVIEW
MAP DATA 11 SN11 12 SN12 13 SN13 14 SN14 15 SN15 (LOAD UNLOAD PREVIEW
MAP DATA 16 SN16 17 ECODE (LOAD UNLOAD PREVIEW
&COMMAND EXECIO 1 DISKR INIT DATA X 1 (FINIS
&READ VAR &NS &NU &NY &STyr &STyrNo

&COMMAND EXECIO &NU DISKR USEN DATA X 1 (FINIS
&N = 0
&LOOP 3 &NU
&N = &N + 1
&NAME = &CONCAT OF U &N
&READ STRING &&NAME

&COMMAND EXECIO &NS DISKR SOURCEN DATA X 1 (FINIS
&N = 0
&LOOP 6 &NS
&N = &N + 1
&NAME = &CONCAT OF S &N
&READ STRING &&NAME
&&NAME1 = &CONCAT OF SN &N
&&NAME1 = &CONCAT OF &BLANK &N . &BLANK &&NAME
&IF &N LT &NS &&NAME1 = &CONCAT OF &BLANK &&NAME1
&N = &N + 1
&IF &N GT 16 &SKIP 3
&TEMP = &CONCAT OF SN &N
SET &TEMP (PRO
&SKIP -4

&SN = 0

-ERRSRCOPT2

DISPLAY

&IF &RSTATUS = PF10 &GOTO -SRCEMENU
&IF &RCURSOR = SN1 &SN = 1
&IF &RCURSOR = SN2 &SN = 2
&IF &RCURSOR = SN3 &SN = 3
&IF &RCURSOR = SN4 &SN = 4
&IF &RCURSOR = SN5 &SN = 5
&IF &RCURSOR = SN6 &SN = 6
&IF &RCURSOR = SN7 &SN = 7
&IF &RCURSOR = SN8 &SN = 8
&IF &RCURSOR = SN9 &SN = 9
&IF &RCURSOR = SN10 &SN = 10
&IF &RCURSOR = SN11 &SN = 11
&IF &RCURSOR = SN12 &SN = 12
&IF &RCURSOR = SN13 &SN = 13
&IF &RCURSOR = SN14 &SN = 14
&IF &RCURSOR = SN15 &SN = 15
&IF &RCURSOR = SN16 &SN = 16
&IF &RSTATUS EQ ENTER &GOTO -DELSOU
&ECODE = &STRING OF UNDEFINED PF KEY!
SIGNAL
&GOTO -ERRSRCOPT2

-DELSOU

USE PSRCDCK
MAP DATA 1 SNAME 2 REPLY 3 ECODE (LOAD UNLOAD PREVIEW
-SRCDCHEK
&&NAME = &CONCAT OF S &SN
&&SNAME = &&NAME
&REPLY = &BLANK
DISPLAY
&IF &REPLY = Y &GOTO -SRCDYES
&IF &REPLY = N &GOTO -SRCEMENU
&ECODE = &STRING OF ENTER 'Y' OR 'N'
SIGNAL
&GOTO -SRCDCHEK

**************************************************************************
*
DELETE X SOURCE

Appendix A. LISTING OF EXEC 2 PROGRAMS 143
UPDATE FILES

-SRCDYES
&LN = &NS - 1
&N = 0
&LOOP 5 &NS
&N = &N + 1
&IF &N = &SN &SKIP 2
&NAME = &CONCAT OF S &N
&STACK &&NAME

&COMMAND ERASE SOURCEN DATA X
&COMMAND EXECIO &LN DISKW SOURCEN DATA X 1 F 80 (FINIS
&STACK &NS &SN &NY
&COMMAND EXECIO 1 DISKW SRCCE DATA X 1 F 80 (FINIS
&PRESUME &COMMAND
FILEDEF FT01F001 DISK SRCCE DATA X
FILEDEF FT02F001 DISK SOURCED DATA X
FILEDEF FT03F001 DISK CONST DATA X
FILEDEF FT07F001 DISK NEWSRCE DATA X
FILEDEF FT08F001 DISK NEWCONT DATA X
FILEDEF FT11F001 DISK RIGID DATA X
FILEDEF FT12F001 DISK GOAL1 DATA X
FILEDEF FT13F001 DISK GOAL2 DATA X
FILEDEF FT14F001 DISK GOAL3 DATA X
FILEDEF FT21F001 DISK RIGID DATA1 X
FILEDEF FT22F001 DISK GOAL1 DATA1 X
FILEDEF FT23F001 DISK GOAL2 DATA1 X
FILEDEF FT24F001 DISK GOAL3 DATA1 X
FILEDEF FT25F001 DISK GOALS DATA1 X
DELSRCE
COPYFILE NEWSRCE DATA X (LRECL 80 RECFM F
COPYFILE NEWSRCE DATA X (LRECL 80 RECFM F
ERASE SOURCED DATA X
ERASE CONST DATA X
COPY NEWSRCE DATA X SOURCED DATA X
COPY NEWCONT DATA X CONST DATA X
ERASE NEWSRCE DATA X
ERASE NEWCONT DATA X
ERASE SRCCE DATA X
ERASE RIGID DATA X
ERASE GOAL1 DATA X
ERASE GOAL2 DATA X
ERASE GOAL3 DATA X
ERASE GOALS DATA X
COPY RIGID DATA1 X RIGID DATA X (LRECL 100 RECFM F
COPY GOAL1 DATA1 X GOAL1 DATA X (LRECL 100 RECFM F
COPY GOAL2 DATA1 X GOAL2 DATA X (LRECL 100 RECFM F
COPY GOAL3 DATA1 X GOAL3 DATA X (LRECL 100 RECFM F
COPY GOALS DATA1 X GOALS DATA X (LRECL 100 RECFM F
ERASE RIGID DATA1 X
ERASE GOAL1 DATA1 X
ERASE GOAL2 DATA1 X
ERASE GOAL3 DATA1 X
ERASE GOALS DATA1 X

&NS = &NS - 1
&STACK &NS &NU &NY &STYR &STYRNO
&COMMAND EXECIO 1 DISKW INIT DATA X 1 (FINIS
EUDEXEC2
&PRESUME &SUBCOMMAND DISPLAY
USE PMTSRCDL
MAP DATA 1 SNAM (LOAD UNLOAD PREVIEW
MAP DATA 2 SN1 3 SN2 4 SN3 5 SN4 6 SN5 (LOAD UNLOAD PREVIEW

Appendix A. LISTING OF EXEC 2 PROGRAMS 144
&NAME = &CONCAT OF S &SN
&SNAM = &NAME

&COMMAND EXECIO &NS DISKR SOURCEN DATA X 1 (FINIS
&N = 0
&LOOP 5 &NS
&N = &N + 1
&NAME = &CONCAT OF SN &N
&READ STRING &NAME
&NAME = &CONCAT OF &BLANK &N . &BLANK &NAME
&IF &N LT 10 &NAME = &CONCAT OF &BLANK &NAME

DISPLAY
&GOTO -SRCEMENU

**************************************************************************
* ADD X NEW SOURCE  
* GET SOURCE NAME
**************************************************************************

-SRCEOPT3
USE PNSRCBAL
MAP DATA 1 SNAM 2 IBAL 3 ECODE  

-NSRCNAMER
DISPLAY
&IF .&SNAM NE .&BLANK &SKIP 3
&ECODE = &STRING OF ENTER SOURCE NAME SIGNAL
&GOTO -NSRCNAMER
&IF .&IBAL NE .&BLANK &SKIP 2
&IF .&IBAL = .&BLANK &IBAL = 0
DISPLAY

&COMMAND EXECIO 1 DISKR INIT DATA X 1 (FINIS
&READ VAR &NS &NU &NY &STYR &STYRNO

&COMMAND EXECIO &NU DISKR USEN DATA X 1 (FINIS
&N = 0
&LOOP 3 &NU
&N = &N + 1
&NAME = &CONCAT OF U &N
&READ STRING &NAME

&COMMAND EXECIO &NS DISKR SOURCEN DATA X 1 (FINIS
&N = 0
&LOOP 3 &NS
&N = &N + 1
&NAME = &CONCAT OF S &N
&READ STRING &NAME

&N = &NS + 1
&STACK &SNAM
&COMMAND EXECIO 1 DISKW SOURCEN DATA X &N F 80 (FINIS
&STACK &IBAL
&COMMAND EXECIO 1 DISKW NSRCE DATA X 1 F 80 (FINIS

**************************************************************************
* READ QUARTERLY FUNDS
**************************************************************************

Appendix A. LISTING OF EXEC 2 PROGRAMS
USE PN1SRQTR
MAP DATA 1 SNAME 2 YEAR (LOAD UNLOAD PREVIEW
MAP DATA 3 QTR1 4 QTR2 5 QTR3 6 QTR4 7 ECODE (LOAD UNLOAD PREVIEW

&N = 0
&LOOP -NSRQTR &NY
&N = &N + 1
&M = &N + 1
&QTR1 = &BLANK
&QTR2 = &BLANK
&QTR3 = &BLANK
&QTR4 = &BLANK
&COMMAND EXECIO 1 DISKR YEAR DATA X &N (FINIS
&READ VAR &YEAR
&SNAME = &SNAM
&NB = 0

DISPLAY

&IF .&QTR1 EQ .&BLANK &NB = 1
&IF .&QTR2 EQ .&BLANK &NB = 1
&IF .&QTR3 EQ .&BLANK &NB = 1
&IF .&QTR4 EQ .&BLANK &NB = 1
&IF .&QTR1 EQ .&BLANK &QTR1 = 0
&IF .&QTR2 EQ .&BLANK &QTR2 = 0
&IF .&QTR3 EQ .&BLANK &QTR3 = 0
&IF .&QTR4 EQ .&BLANK &QTR4 = 0
&IF &NB = 0 &SKIP 2

DISPLAY

&STACK &QTR1 &QTR2 &QTR3 &QTR4
&COMMAND EXECIO 1 DISKR NSRCE DATA X &M F 80 (FINIS

-NSRQTR

USE PNCKSRC
MAP DATA 1 SNAME (LOAD UNLOAD PREVIEW
MAP DATA 2 UN1 3 E1 4 UN2 5 E2 6 UN3 7 E3 (LOAD UNLOAD PREVIEW
MAP DATA 8 UN4 9 E4 10 UN5 11 E5 12 UN6 13 E6 (LOAD UNLOAD PREVIEW
MAP DATA 14 UN7 15 E7 16 UN8 17 E8 18 UN9 19 E9 (LOAD UNLOAD PREVIEW
MAP DATA 20 UN10 21 E10 22 UN11 23 E11 (LOAD UNLOAD PREVIEW
MAP DATA 24 UN12 25 E12 26 UN13 27 E13 (LOAD UNLOAD PREVIEW
MAP DATA 28 UN14 29 E14 30 UN15 31 E15 (LOAD UNLOAD PREVIEW
MAP DATA 32 UN16 33 E16 34 ECODE (LOAD UNLOAD PREVIEW

&SNAME = &SNAM

&N = 0
&LOOP 4 &NU
&N = &N + 1
&NAME = &CONCAT OF UN &N
&NAME1 = &CONCAT OF U &N
&&NAME = &&NAME1

&IF &N GE 16 &SKIP 4
&N = &N + 1
&NAME = &CONCAT OF E &N
SET &NAME (PRO
&SKIP -4

-NSRCLERR

DISPLAY

&N = 0
&LOOP -NSRCONT &NU
&N = &N + 1
&NAME = &CONCAT OF E &N
&IF .&NAME EQ .Y &GOTO -NSRCONT
&IF .&NAME EQ .N &GOTO -NSRCONT

Appendix A. LISTING OF EXEC 2 PROGRAMS 146
ECODE = STRING OF ENTER 'Y' OR 'N'
SIGNAL
GOTO -NSRCLERR

-NSRCCONT

N = 0
LOOP 3 &NU
N = &N + 1
&NAME = &CONCAT OF E &N
&STACK &&NAME
&COMMAND EXECIO &NU DISKW NCONT DATA X 1 F 80 (FINIS

&STACK &NS &NU &NY
&COMMAND EXECIO 1 DISKW SRCE DATA X 1 (FINIS

-NSDONE

&PRESUME &COMMAND

FILEDEF FT01FO01 DISK SRCE DATA X
FILEDEF FT02FO01 DISK SOURCED DATA X
FILEDEF FT03FO01 DISK CONST DATA X
FILEDEF FT08FO01 DISK NSRCE DATA X
FILEDEF FT09FO01 DISK NCONT DATA X
FILEDEF FT10FO01 DISK NEWSRCE DATA X
FILEDEF FT11FO01 DISK NEWCONT DATA X
ADDSRCE
COPYFILE NEWSRCE DATA X (LRECL 80 RECFM F
COPYFILE NEWCONT DATA X (LRECL 80 RECFM F
ERASE SOURCED DATA X
ERASE CONST DATA X
COPY NEWSRCE DATA X SOURCED DATA X
COPY NEWCONT DATA X CONST DATA X
ERASE NEWSRCE DATA X
ERASE NEWCONT DATA X
ERASE SRCE DATA X
ERASE NSRCE DATA X
ERASE NCONT DATA X

NS = &NS + 1
&STACK &NS &NU &NY &STYR &STYRNO
&COMMAND EXECIO 1 DISKW INIT DATA X 1 (FINIS

EUDEXEC2
&PRESUME &SUBCOMMAND DISPLAY

USE PMTSCRCL
MAP DATA 1 SNAM (LOAD UNLOAD PREVIEW
MAP DATA 2 SN1 3 SN2 4 SN3 5 SN4 6 SN5 (LOAD UNLOAD PREVIEW
MAP DATA 7 SN6 8 SN7 9 SN8 10 SN9 11 SN10 (LOAD UNLOAD PREVIEW
MAP DATA 12 SN11 13 SN12 14 SN13 15 SN14 16 SN15 (LOAD UNLOAD PREVIEW
MAP DATA 17 SN16 (LOAD UNLOAD PREVIEW

&SNAM = &SNAM

&COMMAND EXECIO &NS DISKR SOURCEN DATA X 1 (FINIS
N = 0
LOOP 5 &NS
N = &N + 1
&NAME = &CONCAT OF SN &N
&READ STRING &NAME
&IF &N LT 10 &&NAME = &CONCAT OF &BLANK &N &BLANK &&NAME

DISPLAY
GOTO -SRCMENU

Appendix A. LISTING OF EXEC 2 PROGRAMS
* SORT SOURCES

-SRCOPT4

&PRESUME &COMMAND
EXEC PMTSRTSR
EUDEEXEC2
&PRESUME &SUBCOMMAND DISPLAY

&GOTO -SRCMENU

* DISPLAY USE CHANGE MENU

-OPTION2

-USEMENU

USE PUSEOPTN
MAP DATA I ECODE (LOAD UNLOAD PREVIEW
-ERRUSEOPN
DISPLAY
&IF &RSTATUS = PF1 &GOTO -USEOPT1
&IF &RSTATUS = PF2 &GOTO -USEOPT2
&IF &RSTATUS = PF3 &GOTO -USEOPT3
&IF &RSTATUS = PF4 &GOTO -USEOPT4
&IF &RSTATUS = PF10 &GOTO -MAIN
&ECODE = &STRING OF UNDEFINED PF KEY!
SIGNAL
&GOTO -ERRUSEOPN

* MODIFY X USE
* SELECT USE

-USEOPT1

USE PMTUUSEM
MAP DATA 1 UN1 2 UN2 3 UN3 4 UN4 5 UN5 (LOAD UNLOAD PREVIEW
MAP DATA 6 UN6 7 UN7 8 UN8 9 UN9 10 UN10 (LOAD UNLOAD PREVIEW
MAP DATA 11 UN11 12 UN12 13 UN13 14 UN14 15 UN15 (LOAD UNLOAD PREVIEW
MAP DATA 16 UN16 17 ECODE (LOAD UNLOAD PREVIEW

&COMMAND EXECIO 1 DISKR INIT DATA X 1 (FINIS
&READ VAR &NS &NU &NY &STYR &STYRNO

&COMMAND EXECIO &NU DISKR USEN DATA X 1 (FINIS
&N = 0
&LOOP 6 &NU
&N = &N + 1
&NAME = &CONCAT OF U &N
&READ STRING &NAME
&NAME1 = &CONCAT OF UN &N
&NAME1 = &CONCAT OF &BLANK &N . &BLANK &NAME
&IF &N LT 10 &NAME1 = &CONCAT OF &BLANK &NAME1

&COMMAND EXECIO &NS DISKR SOURCEN DATA X 1 (FINIS
&N = 0
&LOOP 3 &NS
&N = &N + 1
&NAME = &CONCAT OF S &N
&READ STRING &NAME

Appendix A. LISTING OF EXEC 2 PROGRAMS 148
&N = &NU
&N = &N + 1
&IF &N GT 16 &SKIP 3
&TEMP = &CONCAT OF UN &N
SET &TEMP (PR
&SKIP -4

&UN = 0

-ERRUSEOPT1

DISPLAY

&IF &RSTATUS = PF10 &GOTO -USEMENU
&IF &RCursor = UN1 &UN = 1
&IF &RCursor = UN2 &UN = 2
&IF &RCursor = UN3 &UN = 3
&IF &RCursor = UN4 &UN = 4
&IF &RCursor = UN5 &UN = 5
&IF &RCursor = UN6 &UN = 6
&IF &RCursor = UN7 &UN = 7
&IF &RCursor = UN8 &UN = 8
&IF &RCursor = UN9 &UN = 9
&IF &RCursor = UN10 &UN = 10
&IF &RCursor = UN11 &UN = 11
&IF &RCursor = UN12 &UN = 12
&IF &RCursor = UN13 &UN = 13
&IF &RCursor = UN14 &UN = 14
&IF &RCursor = UN15 &UN = 15
&IF &RCursor = UN16 &UN = 16
&IF &RSTATUS EQ ENTER &GOTO -MODUSE
&ECODE = &STRING OF UNDEFINED PF KEY!
SIGNAL
&GOTO -ERRUSEOPT1

-MODUSE

&STACK &NS &NU &UN &NY
&COMMAND EXECIO 1 DISKW USE DATA X 1 F 80 (FINIS

&PRESUME &COMMAND

FILEDEF FT01F001 DISK USE DATA X
FILEDEF FT02F001 DISK USED DATA X
FILEDEF FT03F001 DISK CONST DATA X
FILEDEF FT07F001 DISK RETUSE DATA X
FILEDEF FT08F001 DISK RETCONT DATA X
RETUSE
COPYFILE RETUSE DATA X (LRECL 80 RECFM F
COPYFILE RETCONT DATA X (LRECL 80 RECFM F
EUDEXEC2
&PRESUME &SUBCOMMAND DISPLAY

******************************************************************************
MODIFY QUARTERLY FUNDS
******************************************************************************

USE PMUSEQTR
MAP DATA 1 UNAME 2 YEAR (LOAD UNLOAD PREVIEW
MAP DATA 3 QTRO1 4 QTNR1 5 QTRO2 6 QTNR2 (LOAD UNLOAD PREVIEW
MAP DATA 7 QTRO3 8 QTNR3 9 QTRO4 10 QTNR4 (LOAD UNLOAD PREVIEW
MAP DATA 11 ECODE (LOAD UNLOAD PREVIEW

&N = 0
&LOOP -MUSEQTR &NY
&N = &N + 1
&QTNR1 = &BLANK
&QTNR2 = &BLANK

Appendix A. LISTING OF EXEC 2 PROGRAMS 149
&QTRN3 = &BLANK
&QTRN4 = &BLANK

&NAME = &CONCAT OF U &UN
&UNAME = &NAME

&COMMAND EXECIO 1 DISKR YEAR DATA X &N (FINIS
&READ VAR &YEAR

&COMMAND EXECIO 1 DISKR RETUSE DATA X &N (FINIS
&READ VAR &QTRN1 &QTRN2 &QTRN3 &QTRN4

&NB = 0
DISPLAY

&IF &QTRN1 EQ .&BLANK &NB = 1
&IF &QTRN2 EQ .&BLANK &NB = 1
&IF &QTRN3 EQ .&BLANK &NB = 1
&IF &QTRN4 EQ .&BLANK &NB = 1
&IF &QTRN1 EQ .&BLANK &QTRN1 = &QTR01
&IF &QTRN2 EQ .&BLANK &QTRN2 = &QTR02
&IF &QTRN3 EQ .&BLANK &QTRN3 = &QTR03
&IF &QTRN4 EQ .&BLANK &QTRN4 = &QTR04
&IF &NB = 0 &SKIP 2
DISPLAY

&STACK &QTRN1 &QTRN2 &QTRN3 &QTRN4
&COMMAND EXECIO 1 DISKW MODUSE DATA X &N F 80 (FINIS

-MUSEQTR

USE PUSELIST
MAP DATA 1 UNAME 2 REPLY 3 ECODE (LOAD UNLOAD PREVIEW

&NAME = &CONCAT OF U &UN
&UNAME = &NAME
&REPLY = N
DISPLAY

&IF &REPLY = N &GOTO -NMUSEELIG
&IF &REPLY = Y &GOTO -MUSEELIG
&ECODE = &STRING OF ENTER 'Y' OR 'N'
SIGNAL
&SKIP -6

-MUSEELIG

USE PMCKUSE
MAP DATA 1 UNAME (LOAD UNLOAD PREVIEW
MAP DATA 2 SN1 3 E1 4 SN2 5 E2 6 SN3 7 E3 (LOAD UNLOAD PREVIEW
MAP DATA 8 SN4 9 E4 10 SN5 11 E5 12 SN6 13 E6 (LOAD UNLOAD PREVIEW
MAP DATA 14 SN7 15 E7 16 SN8 17 E8 18 SN9 19 E9 (LOAD UNLOAD PREVIEW
MAP DATA 20 SN10 21 E10 22 SN11 23 E11 (LOAD UNLOAD PREVIEW
MAP DATA 24 SN12 25 E12 26 SN13 27 E13 (LOAD UNLOAD PREVIEW
MAP DATA 28 SN14 29 E14 30 SN15 31 E15 (LOAD UNLOAD PREVIEW
MAP DATA 32 SN16 33 E16 34 ECODE (LOAD UNLOAD PREVIEW

&NAME = &CONCAT OF U &UN
&UNAME = &NAME

&COMMAND EXECIO &NS DISKR RETCONT DATA X 1 (FINIS
&N = 0
&LOOP 6 &NS
&N = &N + 1
&NAME = &CONCAT OF E &N
&READ VAR &NAME
&NAME = &CONCAT OF SN &N
&NAME1 = &CONCAT OF S &N
&NAME1 = &NAME1

Appendix A. LISTING OF EXEC 2 PROGRAMS
&IF &N GE 16 &SKIP 4
&N = &N + 1
&NAME = &CONCAT OF E &N
SET &NAME (PRO
&SKIP 4
-MUSELERR
DISPLAY

&N = 0
&LOOP -MUSECONT &NS
&N = &N + 1
&NAME = &CONCAT OF E &N
&IF .&&NAME EQ .Y &GOTO -MUSECONT
&IF .&&NAME EQ .N &GOTO -MUSECONT
&ECODE = &STRING OF ENTER 'Y' OR 'N'
SIGNAL
&GOTO -MUSELERR
-MUSECONT

&N = 0
&LOOP 3 &NS
&N = &N + 1
&NAME = &CONCAT OF E &N
&STACK &&NAME
&COMMAND EXECIO &NS DISKW MODCONT DATA X 1 F 80 (FINIS
&GOTO -MUDONE
-NMUSEELIG
&COMMAND COPY RETCONT DATA X MODCONT DATA X
-MUDONE
&PRESUME &COMMAND
FILEDEF FT01F001 DISK USE DATA X
FILEDEF FT02F001 DISK USED DATA X
FILEDEF FT03F001 DISK CONST DATA X
FILEDEF FT08F001 DISK MODUSE DATA X
FILEDEF FT09F001 DISK MODCONT DATA X
FILEDEF FT10F001 DISK NEWUSE DATA X
FILEDEF FT11F001 DISK NEWCONT DATA X
FILEDEF FT21F001 DISK RIGID DATA X
FILEDEF FT22F001 DISK GOAL1 DATA X
FILEDEF FT23F001 DISK GOAL2 DATA X
FILEDEF FT24F001 DISK GOAL3 DATA X
FILEDEF FT25F001 DISK RIGID DATA X
FILEDEF FT32F001 DISK GOAL1 DATA X
FILEDEF FT33F001 DISK GOAL2 DATA X
FILEDEF FT34F001 DISK GOAL3 DATA X
FILEDEF FT35F001 DISK GOALS DATA X
MODUSE
COPYFILE NEWUSE DATA X (LRECL 80 RECFM F
COPYFILE NEWCONT DATA X (LRECL 80 RECFM F
ERASE USED DATA X
ERASE CONST DATA X
COPY NEWUSE DATA X USED DATA X
COPY NEWCONT DATA X CONST DATA X
ERASE NEWUSE DATA X
ERASE NEWCONT DATA X
ERASE USE DATA X
ERASE MODUSE DATA X
ERASE RETUSE DATA X
ERASE MODCONT DATA X
ERASE RETCONT DATA X
ERASE RIGID DATA X
ERASE GOAL1 DATA X
ERASE GOAL2 DATA X
ERASE GOAL3 DATA X
ERASE GOALS DATA X

Appendix A. LISTING OF EXEC 2 PROGRAMS 151
COPY RIGID DATA1 X RIGID DATA X (LRECL 100 RECFM F
COPY GOAL1 DATA1 X GOAL1 DATA X (LRECL 100 RECFM F
COPY GOAL2 DATA1 X GOAL2 DATA X (LRECL 100 RECFM F
COPY GOAL3 DATA1 X GOAL3 DATA X (LRECL 100 RECFM F
COPY GOALS DATA1 X GOALS DATA X (LRECL 100 RECFM F

ERASE RIGID DATA1 X
ERASE GOAL1 DATA1 X
ERASE GOAL2 DATA1 X
ERASE GOAL3 DATA1 X
ERASE GOALS DATA1 X

EUDEXEC2
&PRESUME &SUBCOMMAND DISPLAY
&GOTO -USEMENU

**********************************************************************
* DELETE X USE
* SELECT USE
**********************************************************************

-USEOPT2
USE PMTUSED
MAP DATA 1 UN1 2 UN2 3 UN3 4 UN4 5 UN5 (LOAD UNLOAD PREVIEW
MAP DATA 6 UN6 7 UN7 8 UN8 9 UN9 10 UN10 (LOAD UNLOAD PREVIEW
MAP DATA 11 UN11 12 UN12 13 UN13 14 UN14 15 UN15 (LOAD UNLOAD PREVIEW
MAP DATA 16 UN16 17 ECODE (LOAD UNLOAD PREVIEW

&COMMAND EXECIO 1 DISKR INIT DATA X 1 (FINIS
&READ VAR &NS &NU &NY &STYR &STYRNO

&COMMAND EXECIO &NU DISKR USEN DATA X 1 (FINIS
&N = 0
&LOOP 6 &NU
&N = &N + 1
&NAME = &CONCAT OF U &N
&READ STRING &NAME
&NAME1 = &CONCAT OF UN &N
&NAME2 = &CONCAT OF &BLANK &N &BLANK &NAME
&IF &N LT 10 &NAME2 = &CONCAT OF &BLANK &NAME
&IF &N LT 10 &NAME2 = &CONCAT OF &BLANK &NAME1

&COMMAND EXECIO &NS DISKR SOURCEN DATA X 1 (FINIS
&N = 0
&LOOP 3 &NS
&N = &N + 1
&NAME = &CONCAT OF S &N
&READ STRING &NAME

&N = &NU
&N = &N + 1
&IF &N GT 16 &SKIP 3
&TEMP = &CONCAT OF UN &N
&SET &TEMP (PRO
&SKIP -4

&UN = 0

-ERRUSEOPT2
DISPLAY

&IF &RSTATUS = PF10 &GOTO -USEMENU
&IF &RCURSOR = UN1 &UN = 1
&IF &RCURSOR = UN2 &UN = 2
&IF &RCURSOR = UN3 &UN = 3
&IF &RCURSOR = UN4 &UN = 4
&IF &RCURSOR = UN5 &UN = 5
&IF &RCURSOR = UN6 &UN = 6

Appendix A. LISTING OF EXEC 2 PROGRAMS 152
&IF &RCURSOR = UN7 &UN = 7
&IF &RCURSOR = UN8 &UN = 8
&IF &RCURSOR = UN9 &UN = 9
&IF &RCURSOR = UN10 &UN = 10
&IF &RCURSOR = UN11 &UN = 11
&IF &RCURSOR = UN12 &UN = 12
&IF &RCURSOR = UN13 &UN = 13
&IF &RCURSOR = UN14 &UN = 14
&IF &RCURSOR = UN15 &UN = 15
&IF &RCURSOR = UN16 &UN = 16
&IF &STATUS EQ ENTER &GOTO -DELUSE
&ECODE = &STRING OF UNDEFINED PF KEY!
SIGNAL
&GOTO -ERRUSEOPT2

-DELUSE

USE PUSEDCK
MAP DATA 1 UNAME 2 REPLY 3 ECODE
(LOAD UNLOAD PREVIEW
-USEDCHKE
&NAME = &CONCAT OF U &UN
&UNAME = &&NAME
&REPLY = &BLANK
DISPLAY
&IF &REPLY = Y &GOTO -USEDYES
&IF &REPLY = N &GOTO -USEMENU
&ECODE = &STRING OF ENTER 'Y' OR 'N'
SIGNAL
&GOTO -USEDCHKE

******************************************************************************
* DELETE X USE
* UPDATE FILES
******************************************************************************

-USEDYES
&LN = &NU - 1
&N = 0
&LOOP 5 &NU
&N = &N + 1
&IF &N = &UN &SKIP 2
&NAME = &CONCAT OF U &N
&STACK &&NAME

&COMMAND ERASE USEN DATA X
&COMMAND EXECCIO &LN DISKW USEN DATA X 1 F 80 (FINIS
&STACK &NS &NU &UN &NY
&COMMAND EXECCIO 1 DISKW USE DATA X 1 F 80 (FINIS
&PREUSE &COMMAND
FILEDEF FT01F001 DISK USE DATA X
FILEDEF FT02F001 DISK USED DATA X
FILEDEF FT03F001 DISK CONST DATA X
FILEDEF FT07F001 DISK NEWUSE DATA X
FILEDEF FT08F001 DISK NEWCONT DATA X
FILEDEF FT11F001 DISK RIGID DATA X
FILEDEF FT12F001 DISK GOAL1 DATA X
FILEDEF FT13F001 DISK GOAL2 DATA X
FILEDEF FT14F001 DISK GOAL3 DATA X
FILEDEF FT21F001 DISK RIGID DATA1 X
FILEDEF FT22F001 DISK GOAL1 DATA1 X
FILEDEF FT23F001 DISK GOAL2 DATA1 X
FILEDEF FT24F001 DISK GOAL3 DATA1 X
FILEDEF FT25F001 DISK GOALS DATA1 X
DELUSE
COPYFILE NEWUSE DATA X (LRECL 80 RECFM F
COPYFILE NEWCONT DATA X (LRECL 80 RECFM F
ERASE USED DATA X
ERASE CONST DATA X

Appendix A. LISTING OF EXEC 2 PROGRAMS 153
COPY NEWUSE DATA X USED DATA X
COPY NEWCONT DATA X CONST DATA X
ERASE NEWUSE DATA X
ERASE NEWCONT DATA X
ERASE USE DATA X

ERASE RIGID DATA X
ERASE GOAL1 DATA X
ERASE GOAL2 DATA X
ERASE GOAL3 DATA X
ERASE GOALS DATA X

COPY RIGID DATA1 X RIGID DATA X (LRECL 100 RECFM F
COPY GOAL1 DATA1 X GOAL1 DATA X (LRECL 100 RECFM F
COPY GOAL2 DATA1 X GOAL2 DATA X (LRECL 100 RECFM F
COPY GOAL3 DATA1 X GOAL3 DATA X (LRECL 100 RECFM F
COPY GOALS DATA1 X GOALS DATA X (LRECL 100 RECFM F

ERASE RIGID DATA1 X
ERASE GOAL1 DATA1 X
ERASE GOAL2 DATA1 X
ERASE GOAL3 DATA1 X
ERASE GOALS DATA1 X

&NU = &NU + 1
&STACK &NS &NY &STYR &STYRNO
&COMMAND EXECIO 1 DISKW INIT DATA X 1 (FINIS

EUDEXEC2
&PRESUME &SUBCOMMAND DISPLAY

USE PMTUSEDL
MAP DATA 1 UNAM (LOAD UNLOAD PREVIEW
MAP DATA 2 UN1 3 UN2 4 UN3 5 UN4 6 UN5 (LOAD UNLOAD PREVIEW
MAP DATA 7 UN6 8 UN7 9 UN8 10 UN9 11 UN10 (LOAD UNLOAD PREVIEW
MAP DATA 12 UN11 13 UN12 14 UN13 15 UN14 16 UN15 (LOAD UNLOAD PREVIEW
MAP DATA 17 UN16 (LOAD UNLOAD PREVIEW

&NAME = &CONCAT OF U &UN
&UNAM = &&NAME

&COMMAND EXECIO &NU DISKR USEN DATA X 1 (FINIS
&N = 0
&LOOP 5 &NU
&N = &N + 1
&NAME = &CONCAT OF UN &N
&READ STRING &&NAME
&&NAME = &CONCAT OF &BLANK &N . &BLANK &&NAME
&IF &N LT 10 &&NAME = &CONCAT OF &BLANK &&NAME

DISPLAY

&GOTO -USEMENU

******************************************************************************
* ADD X NEW USE
* GET USE NAME
******************************************************************************

-USEOPT3

USE PNUSEBAL
MAP DATA 1 UNAM 2 ECODE (LOAD UNLOAD PREVIEW

-NUSENAME
DISPLAY

&IF .&UNAM NE .&BLANK &SKIP 3
&ECODE = &STRING OF ENTER USE NAME

Appendix A. LISTING OF EXEC 2 PROGRAMS 154
SIGNAL
&GOTO -NUSENAME

&COMMAND EXECIO &DISKR INIT DATA X 1 (FINIS
&READ VAR &NS &NU &NY &STYR &STYRN0

&COMMAND EXECIO &DISKR USEN DATA X 1 (FINIS
&N = 0
&LOOP 3 &NU
&N = &N + 1
&NAME = &CONCAT OF U &N
&READ STRING &NAME

&COMMAND EXECIO &NS DISKR SOURCEN DATA X 1 (FINIS
&N = 0
&LOOP 3 &NS
&N = &N + 1
&NAME = &CONCAT OF S &N
&READ STRING &NAME

&N = &NU + 1
&STACK &UNAM
&COMMAND EXECIO 1 DISKW USEN DATA X &N F 80 (FINIS

**********************************************************************
* READ QUARTERLY FUNDS
**********************************************************************

USE PNUSEQTR
MAP DATA 1 UNAME 2 YEAR (LOAD UNLOAD PREVIEW
MAP DATA 3 QTR1 4 QTR2 5 QTR3 6 QTR4 7 ECODE (LOAD UNLOAD PREVIEW

&N = 0
&LOOP -NUSEQTR &NY
&N = &N + 1
&QTR1 = &BLANK
&QTR2 = &BLANK
&QTR3 = &BLANK
&QTR4 = &BLANK
&COMMAND EXECIO 1 DISKR YEAR DATA X &N (FINIS
&READ VAR &YEAR
&UNAME = &UNAM
&NB = 0

DISPLAY
&IF &QTR1 EQ &BLANK &NB = 1
&IF &QTR2 EQ &BLANK &NB = 1
&IF &QTR3 EQ &BLANK &NB = 1
&IF &QTR4 EQ &BLANK &NB = 1
&IF &QTR1 EQ &BLANK &QTR1 = 0
&IF &QTR2 EQ &BLANK &QTR2 = 0
&IF &QTR3 EQ &BLANK &QTR3 = 0
&IF &QTR4 EQ &BLANK &QTR4 = 0
&IF &NB = 0 &SKIP 2

DISPLAY
&STACK &QTR1 &QTR2 &QTR3 &QTR4
&COMMAND EXECIO 1 DISKW NUSE DATA X &N F 80 (FINIS

-NUSEQTR

USE PNCKUSE
MAP DATA 1 UNAME (LOAD UNLOAD PREVIEW
MAP DATA 2 SN1 3 E1 4 SN2 5 E2 6 SN3 7 E3 (LOAD UNLOAD PREVIEW
MAP DATA 8 SN4 9 E4 10 SN5 11 E5 12 SN6 13 E6 (LOAD UNLOAD PREVIEW
MAP DATA 14 SN7 15 E7 16 SN8 17 E8 18 SN9 19 E9 (LOAD UNLOAD PREVIEW
MAP DATA 20 SN10 21 E10 22 SN11 23 E11 (LOAD UNLOAD PREVIEW

Appendix A. LISTING OF EXEC 2 PROGRAMS 155
&UNAME = &UNAM

&N = 0
&LOOP 4 &NS
&N = &N + 1
&NAME = &CONCAT OF SN &N
&NAME1 = &CONCAT OF S &N
&NAME = &NAME1

&IF &N GE 16 &SKIP 4
&N = &N + 1
&NAME = &CONCAT OF E &N
SET &NAME (PRO
&SKIP 4

-NUSELERR

DISPLAY

&N = 0
&LOOP -NUSECONT &NS
&N = &N + 1
&NAME = &CONCAT OF E &N
&IF &NAME EQ .Y &GOTO -NUSECONT
&IF &NAME EQ .N &GOTO -NUSECONT
&ECODE = &STRING OF ENTER 'Y' OR 'N'
SIGNAL
&GOTO -NUSELERR

-NUSECONT

&N = 0
&LOOP 3 &NS
&N = &N + 1
&NAME = &CONCAT OF E &N
&STACK &NAME
&COMMAND EXECIO &NS DISKW NCONT DATA X 1 F 80 (FINIS

&STACK &NS &NU &NY
&COMMAND EXECIO 1 DISKW USE DATA X 1 (FINIS

-NSDONE

&PRESUME &COMMAND

FILEDEF FT01F001 DISK USE DATA X
FILEDEF FT02F001 DISK USED DATA X
FILEDEF FT03F001 DISK CONST DATA X
FILEDEF FT08F001 DISK NUSE DATA X
FILEDEF FT09F001 DISK NCONT DATA X
FILEDEF FT10F001 DISK NEWUSE DATA X
FILEDEF FT11F001 DISK NEWCONT DATA X
ADDUSE
COPYFILE NEWUSE DATA X (LRECL 80 RECFM F
COPYFILE NEWCONT DATA X (LRECL 80 RECFM F
ERASE USED DATA X
ERASE CONST DATA X
COPY NEWUSE DATA X USED DATA X
COPY NEWCONT DATA X CONST DATA X
ERASE NEWUSE DATA X
ERASE NEWCONT DATA X
ERASE USE DATA X
ERASE NUSE DATA X
ERASE NCONT DATA X

&NU = &NU + 1
&STACK &NS &NU &NY &STYR &STYRNO
&COMMAND EXECIO 1 DISKW INIT DATA X 1 (FINIS

Appendix A. LISTING OF EXEC 2 PROGRAMS  156
EUDEXEC2
&PREMUSE &SUBCOMMAND DISPLAY

USE PMTUSENL
MAP DATA 1 UNAME (LOAD UNLOAD PREVIEW
MAP DATA 2 UN1 3 UN2 4 UN3 5 UN4 6 UN5 (LOAD UNLOAD PREVIEW
MAP DATA 7 UN6 8 UN7 9 UN8 10 UN9 11 UN10 (LOAD UNLOAD PREVIEW
MAP DATA 12 UN11 13 UN12 14 UN13 15 UN14 16 UN15 (LOAD UNLOAD PREVIEW
MAP DATA 17 UN16 (LOAD UNLOAD PREVIEW

&UNAME = &UNAM

&COMMAND EXECIO &NU DISKR USEN DATA X 1 (FINIS
&N = 0
&LOOP 5 &NU
&N = &N + 1
&NAME = &CONCAT OF UN &N
&READ STRING &NAME
&NAME = &CONCAT OF &BLANK &N &BLANK &NAME
&IF &N LT 10 &NAME = &CONCAT OF &BLANK &NAME

DISPLAY
&GOTO -USEMENU

**********************************************************************
* SORT SOURCES
**********************************************************************

-USEOPT4

&PREMUSE &COMMAND
EXEC PMTSTRTUS
EUDEXEC2
&PREMUSE &SUBCOMMAND DISPLAY

&GOTO -USEMENU

-SAVECHNG

USE MAKESURE
MAP DATA 1 ECODE (LOAD UNLOAD PREVIEW
-ERRQUIT
DISPLAY
&IF &RSTATUS = PF1 &GOTO -SAVE
&IF &RSTATUS = PF10 &GOTO -DONTSAVE
&ECODE = &STRING OF UNDEFINED PF KEY
SIGNAL
&GOTO -ERRQUIT

-SAVE

&PREMUSE &COMMAND
ERASE SOURCED PERM A
ERASE SOURCEN PERM A
ERASE USED PERM A
ERASE USEN PERM A
ERASE YEAR PERM A
ERASE INIT PERM A
ERASE CONST PERM A
ERASE GOAL1 PERM A
ERASE GOAL2 PERM A
ERASE GOAL3 PERM A
ERASE RIGID PERM A
COPY SOURCED DATA X SOURCED PERM A
COPY SOURCEN DATA X SOURCEN PERM A
COPY USED DATA X USED PERM A
COPY USEN DATA X USEN PERM A
COPY YEAR DATA X YEAR PERM A
COPY INIT DATA X INIT PERM A
COPY CONST DATA X CONST PERM A
COPY GOALS DATA X GOALS PERM A
COPY GOAL1 DATA X GOAL1 PERM A
COPY GOAL2 DATA X GOAL2 PERM A
COPY GOAL3 DATA X GOAL3 PERM A
COPY RIGID DATA X RIGID PERM A

ERASE SOURCED DATA X
ERASE SOURCEN DATA X
ERASE USED DATA X
ERASE USEN DATA X
ERASE YEAR DATA X
ERASE INIT DATA X
ERASE CONST DATA X
ERASE GOALS DATA X
ERASE GOAL1 DATA X
ERASE GOAL2 DATA X
ERASE GOAL3 DATA X
ERASE RIGID DATA X
COPY SOURCED TEMP X SOURCEN DATA X
COPY SOURCEN TEMP X SOURCEN DATA X
COPY USED TEMP X USED DATA X
COPY USEN TEMP X USEN DATA X
COPY YEAR TEMP X YEAR DATA X
COPY INIT TEMP X INIT DATA X
COPY CONST TEMP X CONST DATA X
COPY GOALS TEMP X GOALS DATA X
COPY GOAL1 TEMP X GOAL1 DATA X
COPY GOAL2 TEMP X GOAL2 DATA X
COPY GOAL3 TEMP X GOAL3 DATA X
COPY RIGID TEMP X RIGID DATA X
ERASE SOURCED TEMP X
ERASE SOURCEN TEMP X
ERASE USED TEMP X
ERASE USEN TEMP X
ERASE YEAR TEMP X
ERASE INIT TEMP X
ERASE CONST TEMP X
ERASE GOALS TEMP X
ERASE GOAL1 TEMP X
ERASE GOAL2 TEMP X
ERASE GOAL3 TEMP X
ERASE RIGID TEMP X

&GOTO -END

-DON'TSAVE

&PRESUME &COMMAND
ERASE SOURCED DATA X
ERASE SOURCEN DATA X
ERASE USED DATA X
ERASE USEN DATA X
ERASE YEAR DATA X
ERASE INIT DATA X
ERASE CONST DATA X
ERASE GOALS DATA X
ERASE GOAL1 DATA X
ERASE GOAL2 DATA X
ERASE GOAL3 DATA X
ERASE RIGID DATA X
COPY SOURCED TEMP X SOURCEN DATA X
COPY SOURCEN TEMP X SOURCEN DATA X
COPY USED TEMP X USED DATA X
COPY USEN TEMP X USEN DATA X
COPY YEAR TEMP X YEAR DATA X

Appendix A. LISTING OF EXEC 2 PROGRAMS
COPY INIT TEMP X INIT DATA X
COPY CONST TEMP X CONST DATA X
COPY GOALS TEMP X GOALS DATA X
COPY GOAL1 TEMP X GOAL1 DATA X
COPY GOAL2 TEMP X GOAL2 DATA X
COPY GOAL3 TEMP X GOAL3 DATA X
COPY RIGID TEMP X RIGID DATA X
ERASE SOURCED TEMP X
ERASE SOURCE TEMP X
ERASE USED TEMP X
ERASE USEN TEMP X
ERASE YEAR TEMP X
ERASE INIT TEMP X
ERASE CONST TEMP X
ERASE GOALS TEMP X
ERASE GOAL1 TEMP X
ERASE GOAL2 TEMP X
ERASE GOAL3 TEMP X
ERASE RIGID TEMP X

-END

EUDEXEC2
&PRESUME &SUBCOMMAND DISPLAY

&EXIT
A.4 PERMHRZN

* OPTION - PERMANENTLY CHANGE PLANNING HORIZON
* THIS EXEC PERMITS USER TO CHANGE NUMBER OF YEARS IN PLANNING HORIZON
* AND/OR STARTING YEAR OF THE PLANNING HORIZON

&TRACE OFF

* DISPLAY CURRENT SETTINGS FOR PLANNING HORIZON

EUDEXEC2 &PRESUME &SUBCOMMAND DISPLAY

-TOP

&COMMAND EXECIO 1 DISKR INIT DATA X 1 (FINIS
&READ VARS &NS &NU &NY &STYR &STYRNO

USE PERMPLAN
MAP DATA 1 VOID 2 YEARS 3 STYEAR 4 ECODE (LOAD UNLOAD PREVIEW
&YEARS = &NY
&STYEAR = &STYR

-ERRPLNTIME DISPLAY

* CHECK IF USER HAS CHANGED PLANNING HORIZON

&IF &STYEAR NE &STYR &GOTO -CHSTYR
&IF &YEARS NE &NY &GOTO -CHNOYR
&GOTO -NOCHANGE

* CHANGE IN STARTING YEAR

-CHSTYR

&N = 1

-REFYRCT

&COMMAND EXECIO 1 DISKR REFYEAR DATA Z &N (FINIS
&READ VAR &NRFYR
&IF &NRFYR = &STYEAR &GOTO -CHYRCONT
&N = &N + 1
&IF &N LE 19 &GOTO -REFYRCT
&ECODE = &STRING OF INCORRECT STARTING YEAR!
SIGNAL
&GOTO -ERRPLNTIME
* CHANGE IN NUMBER OF YEARS

-CHNOYR
&N = &STYRNO

-CHYRCNT
&OL = &STYRNO
&OU = &OL + &NY - 1
&TL = &N
&TU = &TL + &YEARS - 1

&X = 0
&IF &TL LT &OL &X = &X + &OL - &TL
&IF &TU GT &OU &X = &X + &TU - &OU
&IF &TL GT &OU &X = &YEARS
&IF &TU LT &OL &X = &YEARS

&IF &X LE 0 &GOTO -CHREFYR

* WARN USER ABOUT NUMBER OF DATA ENTRIES THAT WILL BE NEEDED

USE PCHPLYR
MAP DATA 1 ENTRIES 2 ECODE (LOAD UNLOAD PREVIEW
&ENTRIES = &NS + &NU
&ENTRIES = &MULT OF &ENTRIES 4
&ENTRIES = &MULT OF &ENTRIES &X
&FLAG = 0
&IF &X = &YEARS &FLAG = 1
&IF &TL NE &OL &FLAG = 1
&IF &FLAG = 1 &ENTRIES = &ENTRIES + &NS

-CHKPYERR
DISPLAY
&IF &RSTATUS = PF1 &GOTO -CHREFYR
&IF &RSTATUS = PF10 &GOTO -NOCHANGE
&ECODE = &STRING OF UNDEFINED PF KEY!
SIGNAL
&GOTO -CHKPYERR

* READ ADDITIONAL DATA THAT IS NEEDED FOR NEW PLANNING HORIZON

-CHREFYR
&M = 1
&YN = &N
&COMMAND ERASE YEAR DATA X

-CREFYRCT
&COMMAND EXECIO 1 DISKR REFYEAR DATA Z &YN (FINIS
&READ VAR &YEARREAD
&STACK &YEARREAD
&COMMAND EXECIO 1 DISKW YEAR DATA X &M F 80 (FINIS
&M = &M + 1
&YN = &YN + 1
&IF &M LE &YEARS &GOTO -CREFYRCT

-DATAFILES
&STACK &NS &NU &YEARS &STYEAR &N
&COMMAND EXECIO 1 DISKW INIT DATA X 1 F 80 (FINIS

Appendix A. LISTING OF EXEC 2 PROGRAMS 161
&M = 0
&Y = &NY + 1
&LOOP -SRCPLCH UNTIL &M = &NS
&L = &MULT OF &M &Y
&M = &M + 1
&COMMAND EXECIO 1 DISKR SOURCEN DATA X &M (FINIS
&READ STRING &$NAME
&LINE = &L + 1
&IF &FLAG = 1 &GOTO -NEWSTBAL

USE PSRCBALO
MAP DATA 1 SN 2 IBAL 3 ECODE (LOAD UNLOAD PREVIEW
&COMMAND EXECIO 1 DISKR SOURCED DATA X &LINE (FINIS
&READ VAR &IBAL
&SN = &$NAME
DISPLAY
&IF &RSTATUS = PF10 &GOTO -QUIT
&GOTO -WRBAL

-NEWSTBAL
USE PSRCBALN
MAP DATA 1 SN 2 IBAL 3 ECODE (LOAD UNLOAD PREVIEW
&SN = &$NAME
DISPLAY
&IF &RSTATUS = PF10 &GOTO -QUIT
&IF .&IBAL NE .&BLANK &SKIP 2
&IF .&IBAL = .&BLANK &IBAL = 0
DISPLAY
&IF &RSTATUS = PF10 &GOTO -QUIT

-WRBAL
&STACK &IBAL
&COMMAND EXECIO 1 DISKW SRCE DATA X

&I = -1
&LOOP -SRCEDATA &YEARS
&I = &I + 1
&J = &TL + &I
&IF &I GE &OL &SKIP 2
&CALL -NSRCQTR
&GOTO -SRCEDATA
&IF &J LE &OL &SKIP 2
&CALL -NSRCQTR
&GOTO -SRCEDATA
&CALL -OSRCQTR
-SRCEDATA
&COMMAND FINIS YEAR DATA X

-SRCPLOCH
&COMMAND FINIS SRCE DATA X

&M = 0
&Y = &NY
&LOOP -USEPLCH UNTIL &M = &NU
&L = &MULT OF &M &Y
&LINE = &L
&M = &M + 1
&COMMAND EXECIO 1 DISKR USEN DATA X &M (FINIS
&READ STRING &$NAME

&I = -1
&LOOP -USEDATA &YEARS
&I = &I + 1
&J = &TL + &I
&IF &J GE &OL &SKIP 2
&CALL -NUSEQTR
&GOTO -USEDATA

Appendix A. LISTING OF EXEC 2 PROGRAMS
&IF &J LE &OU &SKIP 2
&CALL -NUSEQTR
&GOTO -USEDATA
&CALL -OUSEQTR
-USEDATA

&COMMAND FINIS YEAR DATA X
-USEPLCH

&COMMAND FINIS USE DATA X
&GOTO -UPDATE

-OSRCQTR
&LINE = &LINE + 1

USE PSRCQTRO
MAP DATA 1 SNAM 2 YEAR
(LOAD UNLOAD PREVIEW
MAP DATA 3 QTR1 4 QTR2 5 QTR3 6 QTR4 7 ECODE
(LOAD UNLOAD PREVIEW

&COMMAND EXECIO 1 DISKR SORCED DATA X &LINE (FINIS
&READ VARS &QTR1 &QTR2 &QTR3 &QTR4
&COMMAND EXECIO 1 DISKR YEAR DATA X
&READ VAR &YEAR
&SNAM = &SNAME
&NB = 0
DISPLAY
&IF &RSTATUS = PF10 &GOTO -QUIT
&STACK &QTR1 &QTR2 &QTR3 &QTR4
&COMMAND EXECIO 1 DISKW SRCE DATA X
&RETURN

-NSRCQTR

USE PSRCQTRN
MAP DATA 1 SNAM 2 YEAR
(LOAD UNLOAD PREVIEW
MAP DATA 3 QTR1 4 QTR2 5 QTR3 6 QTR4 7 ECODE
(LOAD UNLOAD PREVIEW

&QTR1 = &BLANK
&QTR2 = &BLANK
&QTR3 = &BLANK
&QTR4 = &BLANK
&COMMAND EXECIO 1 DISKR YEAR DATA X
&READ VAR &YEAR
&SNAM = &SNAME
&NB = 0
DISPLAY
&IF &RSTATUS = PF10 &GOTO -QUIT
&IF .&QTR1 EQ .&BLANK &NB = 1
&IF .&QTR2 EQ .&BLANK &NB = 1
&IF .&QTR3 EQ .&BLANK &NB = 1
&IF .&QTR4 EQ .&BLANK &NB = 1
&IF .&QTR1 EQ .&BLANK &QTR1 = 0
&IF .&QTR2 EQ .&BLANK &QTR2 = 0
&IF .&QTR3 EQ .&BLANK &QTR3 = 0
&IF .&QTR4 EQ .&BLANK &QTR4 = 0
&IF &NB = 0 &SKIP 1
DISPLAY
&IF &RSTATUS = PF10 &GOTO -QUIT
&STACK &QTR1 &QTR2 &QTR3 &QTR4
&COMMAND EXECIO 1 DISKW SRCE DATA X
&RETURN

-OUSEQTR
&LINE = &LINE + 1

USE PUSEQTR
MAP DATA 1 UNAM 2 YEAR
(LOAD UNLOAD PREVIEW
MAP DATA 3 QTR1 4 QTR2 5 QTR3 6 QTR4 7 ECODE
(LOAD UNLOAD PREVIEW

Appendix A. LISTING OF EXEC 2 PROGRAMS
&COMMAND EXECIO 1 DISKR USED DATA X &LINE (FINIS
&READ VAR &QTR1 &QTR2 &QTR3 &QTR4 &COMMAND EXECIO 1 DISKR YEAR DATA X
&READ VAR &YEAR &UNAM = &UNAME
DISPLAY
&IF &RSTATUS = PF10 &GOTO -QUIT
&STACK &QTR1 &QTR2 &QTR3 &QTR4 &COMMAND EXECIO 1 DISKW USE DATA X

&RETURN
-NUSEQTR

USE PUSEQTRN
MAP DATA 1 UNAM 2 YEAR (LOAD UNLOAD PREVIEW
MAP DATA 3 QTR1 4 QTR2 5 QTR3 6 QTR4 7 ECODE (LOAD UNLOAD PREVIEW

&QTR1 = &BLANK &QTR2 = &BLANK &QTR3 = &BLANK &QTR4 = &BLANK
&COMMAND EXECIO 1 DISKR YEAR DATA X
&READ VAR &YEAR &UNAM = &UNAME &NB = 0
DISPLAY &IF &RSTATUS = PF10 &GOTO -QUIT &IF &QTR1 EQ &BLANK &NB = 1 &IF &QTR2 EQ &BLANK &NB = 1 &IF &QTR3 EQ &BLANK &NB = 1 &IF &QTR4 EQ &BLANK &NB = 1 &IF &QTR1 EQ &BLANK &QTR1 = 0 &IF &QTR2 EQ &BLANK &QTR2 = 0 &IF &QTR3 EQ &BLANK &QTR3 = 0 &IF &QTR4 EQ &BLANK &QTR4 = 0 &IF &NB = 0 &SKIP 1
DISPLAY &IF &RSTATUS = PF10 &GOTO -QUIT &STACK &QTR1 &QTR2 &QTR3 &QTR4 &COMMAND EXECIO 1 DISKW USE DATA X

&RETURN

*****************************************************************************
* UPDATE DATA FILES
*****************************************************************************

-UPDATE

&PRESUME &COMMAND
COPYFILE YEAR DATA X (LRECL 80 RECFM F
COPYFILE SRCE DATA X (LRECL 80 RECFM F
COPYFILE USE DATA X (LRECL 80 RECFM F
ERASE SOURCED DATA X
ERASE USED DATA X

&STACK &NS &NU &YEARS
EXECIO 1 DISKW TMPPLYR DATA X (FINIS
COPYFILE TMPPLYR DATA X (LRECL 80 RECFM F
FILEDEF FT01F001 DISK TMPPLYR DATA X
FILEDEF FT02F001 DISK SRCE DATA X
FILEDEF FT03F001 DISK USE DATA X
FILEDEF FT08F001 DISK SOURCED DATA X
FILEDEF FT09F001 DISK USED DATA X
PLANYEAR
COPYFILE SOURCED DATA X (LRECL 80 RECFM F

Appendix A. LISTING OF EXEC 2 PROGRAMS 164
COPYFILE USED DATA X (LRECL 80 RECFM F)
ERASE TMPPLYR DATA X
ERASE SRCE DATA X
ERASE USE DATA X

ERASE RIGID DATA X
ERASE GOALS DATA X
ERASE GOAL1 DATA X
ERASE GOAL2 DATA X
ERASE GOAL3 DATA X
&STACK
EXECIO DISKW RIGID DATA X 1 F 80 (FINIS
&STACK
EXECIO DISKW GOAL1 DATA X 1 F 80 (FINIS
&STACK
EXECIO DISKW GOAL2 DATA X 1 F 80 (FINIS
&STACK
EXECIO DISKW GOAL3 DATA X 1 F 80 (FINIS
&STACK
EXECIO DISKW GOALS DATA X 1 F 80 (FINIS
&EXIT

**********************************************************************
* DON'T MAKE ANY CHANGES
**********************************************************************

-NOCHANGE
&PRESUME &COMMAND
&EXIT

-QUIT
&PRESUME &COMMAND

ERASE INIT DATA X
ERASE YEAR DATA X
COPY INIT PERM A INIT DATA X
COPY YEAR PERM A YEAR DATA X

ERASE TMPPLYR DATA X
ERASE SRCE DATA X
ERASE USE DATA X

EUDEXEC2
&PRESUME &SUBCOMMAND DISPLAY

&GOTO -TOP
A.5  PMTSRTSR

* SORTING (PERMANENT) OPTIONS FOR SOURCES

&TRACE OFF

EXECIO 1 DISKR INIT DATA X 1 (FINIS
&RREAD VAR &NS &NU &NY

EUDEEXEC2
&PRESUME &SUBCOMMAND DISPLAY

-RANKSRC

USE PRANKSRC
MAP DATA 1 ECODE
-ERANKSRC
DISPLAY
&IF &RSTATUS = PF1 &GOTO -RSRCOPT1
&IF &RSTATUS = PF2 &GOTO -RSRCOPT3
&IF &RSTATUS = PF3 &GOTO -RSRCOPT4
&IF &RSTATUS = PF4 &GOTO -RSRCOPT5
&IF &RSTATUS = PF5 &GOTO -RSRCOPT2
&IF &RSTATUS = PF6 &GOTO -QUIT
&ECODE = &STRING OF UNDEFINED PF KEY!
SIGNAL
&GOTO -ERANKSRC

-RSRCOPT1

&SO = 1
&GOTO -RANKSOURCE

-RSRCOPT2

USE PUSRTSRC
MAP DATA 1 SN1 2 R1 3 SN2 4 R2 5 SN3 6 R3 (LOAD UNLOAD PREVIEW
MAP DATA 7 SN4 8 R4 9 SN5 10 R5 11 SN6 12 R6 (LOAD UNLOAD PREVIEW
MAP DATA 13 SN7 14 R7 15 SN8 16 R8 17 SN9 18 R9 (LOAD UNLOAD PREVIEW
MAP DATA 19 SN10 20 R10 21 SN11 22 R11 23 SN12 24 R12 (LOAD UNLOAD PREVIEW
MAP DATA 25 SN13 26 R13 27 SN14 28 R14 29 SN15 30 R15 (LOAD UNLOAD PREVIEW
MAP DATA 31 SN16 32 R16 33 ECODE (LOAD UNLOAD PREVIEW

&COMMAND EXECIO &NS DISKR SOURCEN DATA X 1 (FINIS
&N = 0
&LOOP 5 &NS
&N = &N + 1
&NAME = &CONCAT OF SN &N
&READ STRING &NAME
&NAME = &CONCAT OF &BLANK &N, &BLANK &NAME
&IF &N LT 10 &NAME = &CONCAT OF &BLANK &NAME
&N = &N + 1
&IF &N GT 16 &SKIP 3
&TEMP = &CONCAT OF R &N
SET &TEMP (PRO
&SKIP 4

-EOPT2SRCE
DISPLAY

&SUM1 = 0
&SUM2 = 0
&N = 0
&LOOP 11 &NS
&N = &N + 1

Appendix A. LISTING OF EXEC 2 PROGRAMS

166
&NAME = &CONCAT OF R &N
&NAME1 = &LEFT OF &NAME 1
&IF &NAME1 = .&BLANK &NAME = &RIGHT OF &NAME 1
&IF &NAME NE .&BLANK &SKIP 3
&ECODE = &STRING OF BLANK ENTRY!
SIGNAL
&GOTO -EOPT2SRCE
&&NAME = &TRIM OF &&NAME
&SUM1 = &SUM1 + &N
&SUM2 = &SUM2 + &&NAME
&IF &SUM1 = &&NAME &STANDARD 3
&ECODE = &STRING OF IMPROPER ORDERING!
SIGNAL
&GOTO -EOPT2SRCE

&N = 0
&LOOP 4 &NS
&N = &N + 1
&NAME = &CONCAT OF R &N
&IF &NAME LT 10 &&NAME = &CONCAT OF &BLANK &&NAME
&STACK &&NAME
&COMMAND EXECIO &NS DISKW SRC1 DATA X 1 (FINIS
&COMMAND COPYFILE SRC1 DATA X (LRECL 80 RECFM F

&N = 0
&LOOP 2 &NS
&N = &N + 1
&STACK &N
&COMMAND EXECIO &NS DISKW SRC2 DATA X 1 (FINIS
&COMMAND COPYFILE SRC2 DATA X (LRECL 80 RECFM F

&COMMAND SET CMSTYPE HT
&STACK 1-50 51
&COMMAND COPYFILE SRC2 DATA X SRC1 DATA X (SPECS NOPROMPT OVLY LRECL 80 RECFM F

&STACK 1 3
&COMMAND SORT SRC1 DATA X SRC DATA X

&STACK 51-52 1
&COMMAND COPYFILE SRC DATA X SRC1 DATA X (SPECS NOPROMPT LRECL 80 RECFM F
&COMMAND SET CMSTYPE RT

&COMMAND ERASE SRC DATA X
&COMMAND ERASE SRC1 DATA X
&COMMAND ERASE SRC2 DATA X

&SO = 2
&GOTO -RANKSOURCE
-RSRCOPT3

&COMMAND COPYFILE SOURCEN DATA X SRC1 DATA X
&N = 0
&LOOP 2 &NS
&N = &N + 1
&STACK &N
&COMMAND EXECIO &NS DISKW SRC2 DATA X 1 (FINIS
&COMMAND COPYFILE SRC2 DATA X (LRECL 80 RECFM F

&COMMAND SET CMSTYPE HT
&STACK 1-50 51
&COMMAND COPYFILE SRC2 DATA X SRC1 DATA X (SPECS NOPROMPT OVLY LRECL 80 RECFM F

&STACK 1 20
&COMMAND SORT SRC1 DATA X SRC DATA X

&STACK 51-52 1
&COMMAND COPYFILE SRC DATA X SRCE DATA X (SPECS NOPROMPT LRECL 80 RECFM F
&COMMAND SET CMSTYPE RT

Appendix A. LISTING OF EXEC 2 PROGRAMS

167
&COMMAND ERASE SRC DATA X
&COMMAND ERASE SRC1 DATA X
&COMMAND ERASE SRC2 DATA X

&SO = 3
&GOTO -RANKSOURCE
-RSRCOPT4
&SO = 4
&GOTO -RANKSOURCE
-RSRCOPT5
&SO = 5
-RANKSOURCE
&PRESUME &COMMAND

&IF &SO = 1 &GOTO -DISPSRC
&IF &SO = 2 &GOTO -RUNSRCSORT
&IF &SO = 3 &GOTO -RUNSRCSORT

&STACK &SO
&STACK &NS &NU &NY
EXECIO 2 DISKW SRC DATA X 1 (FINIS
COPYFILE SRC DATA X (LRECL 80 RECFM F

FILEDEF FT01F001 DISK SRC DATA X
FILEDEF FT02F001 DISK SOURCED DATA X
FILEDEF FT11F001 DISK SRCCE DATA X
SRCAMT
COPYFILE SRCE DATA X (LRECL 80 RECFM F

ERASE SRC DATA X

-RUNSRCSORT

FILEDEF FT01F001 DISK INIT DATA X
FILEDEF FT02F001 DISK SRCCE DATA X
FILEDEF FT03F001 DISK SOURCEN DATA X
FILEDEF FT04F001 DISK SOURCED DATA X
FILEDEF FT08F001 DISK CONST DATA X
FILEDEF FT21F001 DISK RIGID DATA X
FILEDEF FT22F001 DISK GOAL1 DATA X
FILEDEF FT23F001 DISK GOAL2 DATA X
FILEDEF FT24F001 DISK GOAL3 DATA X
FILEDEF FT11F001 DISK SN DATA X
FILEDEF FT12F001 DISK SD DATA X
FILEDEF FT13F001 DISK CONS DATA X
FILEDEF FT31F001 DISK RIGID DATA1 X
FILEDEF FT32F001 DISK GOAL1 DATA1 X
FILEDEF FT33F001 DISK GOAL2 DATA1 X
FILEDEF FT34F001 DISK GOAL3 DATA1 X
SRCSORT

ERASE SRCCE DATA X
ERASE SOURCEN DATA X
ERASE SOURCED DATA X
ERASE CONST DATA X
COPYFILE SN DATA X SOURCEN DATA X (LRECL 80 RECFM F
COPYFILE SD DATA X SOURCED DATA X (LRECL 80 RECFM F
COPYFILE CONS DATA X CONST DATA X (LRECL 80 RECFM F
ERASE SN DATA X
ERASE SD DATA X
ERASE CONS DATA X
ERASE RIGID DATA X
ERASE GOAL1 DATA X
ERASE GOAL2 DATA X

Appendix A. LISTING OF EXEC 2 PROGRAMS
ERASE GOAL3  DATA X
COPYFILE RIGID DATA1 X RIGID DATA X (LRECL 100 RECFM F
COPYFILE GOAL1 DATA1 X GOAL1 DATA X (LRECL 100 RECFM F
COPYFILE GOAL2 DATA1 X GOAL2 DATA X (LRECL 100 RECFM F
COPYFILE GOAL3 DATA1 X GOAL3 DATA X (LRECL 100 RECFM F
ERASE RIGID  DATA1 X
ERASE GOAL1  DATA1 X
ERASE GOAL2  DATA1 X
ERASE GOAL3  DATA1 X

*****************************************************************************
*    DISPLAY LIST OF SORTED SOURCES                                          *
*****************************************************************************

-DISPSRC

EUDEEXEC2
&PRESUME &SUBCOMMAND DISPLAY

USE PSRTDSRC
MAP DATA 1 SCHEME (LOAD UNLOAD PREVIEW
MAP DATA 2 SN1 3 SN2 4 SN3 5 SN4 6 SN5 (LOAD UNLOAD PREVIEW
MAP DATA 7 SN6 8 SN7 9 SN8 10 SN9 11 SN10 (LOAD UNLOAD PREVIEW
MAP DATA 12 SN11 13 SN12 14 SN13 15 SN14 16 SN15 (LOAD UNLOAD PREVIEW
MAP DATA 17 SN16 (LOAD UNLOAD PREVIEW

&IF &SO = 1 &SCHEME = &STRING OF CURRENT ORDERING
&IF &SO = 2 &SCHEME = &STRING OF USER SPECIFIED
&IF &SO = 3 &SCHEME = &STRING OF ALPHABETICAL
&IF &SO = 4 &SCHEME = &STRING OF DECREASING FUNDS
&IF &SO = 5 &SCHEME = &STRING OF INCREASING FUNDS

&COMMAND EXECIO &NS DISKR SOURCEN DATA X 1 (FINIS
&nbsp;N = 0
&LOOP 5 &NS
&nbsp;N = &N + 1
&nbsp;&NAME = &CONCAT OF SN &N
&nbsp;&READ STRING &NAME
&nbsp;&NAME = &CONCAT OF &BLANK &N , &BLANK &NAME
&nbsp;&IF &N LT 10 &NAME = &CONCAT OF &BLANK &NAME

DISPLAY
&GOTO -RANKSRC

-QUIT

&PRESUME &COMMAND

&EXIT

Appendix A. LISTING OF EXEC 2 PROGRAMS 169
A.6 PMTSRTUS

* SORTING (PERMANENT) OPTIONS FOR USES

&TRACE OFF
EXECIO 1 DISKR INIT DATA X 1 (FINIS
&READ VAR &NS &NU &NY
EUDEXEC2
&PRESUME &SUBCOMMAND DISPLAY

-RANKUSE
USE PRANKUSE
MAP DATA 1 ECODE (LOAD UNLOAD PREVIEW
-ERANKUSE DISPLAY
&IF &RSTATUS = PF1 &GOTO -RUSEOPT1
&IF &RSTATUS = PF2 &GOTO -RUSEOPT3
&IF &RSTATUS = PF3 &GOTO -RUSEOPT4
&IF &RSTATUS = PF4 &GOTO -RUSEOPT5
&IF &RSTATUS = PF5 &GOTO -RUSEOPT2
&IF &RSTATUS = PF10 &GOTO -QUIT
&ECODE = &STRING OF UNDEFINED PF KEY!
SIGNAL
&GOTO -ERANKUSE

-RUSEOPT1

&LO = 1
&GOTO -RANKPROJ

-RUSEOPT2

USE PRSRTUSE
MAP DATA 1 UN1 2 R1 3 UN2 4 R2 5 UN3 6 R3 (LOAD UNLOAD PREVIEW
MAP DATA 7 UN4 8 R4 9 UN5 10 R5 11 UN6 12 R6 (LOAD UNLOAD PREVIEW
MAP DATA 13 UN7 14 R7 15 UN8 16 R8 17 UN9 18 R9 (LOAD UNLOAD PREVIEW
MAP DATA 19 UN10 20 R10 21 UN11 22 R11 23 UN12 24 R12 (LOAD UNLOAD PREVIEW
MAP DATA 25 UN13 26 R13 27 UN14 28 R14 29 UN15 30 R15 (LOAD UNLOAD PREVIEW
MAP DATA 31 UN16 32 R16 33 ECODE (LOAD UNLOAD PREVIEW

&COMMAND EXECIO &NU DISKR USEN DATA X 1 (FINIS
&N = 0
&LOOP 5 &NU
&N = &N + 1
&NAME = &CONCAT OF UN &N
&READ STRING &&NAME
&IF &N LT 10 &&NAME = &CONCAT OF &BLANK &N . &BLANK &&NAME
&IF &N LT 10 &&NAME = &CONCAT OF &BLANK &&NAME
&N = &N + 1
&IF &N GT 16 &SKIP 3
&TEMP = &CONCAT OF R &N
SET &TEMP (PRO
&SKIP -4

-EOPT2USE
DISPLAY

&SUM1 = 0
&SUM2 = 0
&N = 0
&LOOP 11 &NU
&N = &N + 1

Appendix A. LISTING OF EXEC 2 PROGRAMS 170
&NAME = &CONCAT OF R &N
&NAME1 = &LEFT OF &&NAME 1
&IF &NAME1 = .&BLANK &NAME = &RIGHT OF &&NAME 1
&IF &NAME NE .&BLANK &SKIP 3
&ECODE = &STRING OF BLANK ENTRY!
SIGNAL
&GOTO -EOPT2USE
&&NAME = &TRIM OF &NAME
&SUM1 = &SUM1 + &N
&SUM2 = &SUM2 + &NAME
&IF &SUM1 = &SUM2 &SKIP 3
&ECODE = &STRING OF IMPROPER ORDERING!
SIGNAL
&GOTO -EOPT2USE

&N = 0
&LOOP 4 &NU
&N = &N + 1
&STACK &N
&COMMAND EXECIO &NU DISKW USE1 DATA X 1 (FINIS
&COMMAND COPYFILE USE1 DATA X (LRECL 80 RECFM F

&N = 0
&LOOP 2 &NU
&N = &N + 1
&STACK &N
&COMMAND EXECIO &NU DISKW USE2 DATA X 1 (FINIS
&COMMAND COPYFILE USE2 DATA X (LRECL 80 RECFM F

&COMMAND SET CMSTYPE HT
&STACK 1-50 51
&COMMAND COPYFILE USE2 DATA X USE1 DATA X (SPECS NOPROMPT OVLY LRECL 80 RECFM F

&STACK 1 3
&COMMAND SORT USE1 DATA X USE DATA X

&STACK 51-52 1
&COMMAND COPYFILE USE DATA X USEE DATA X (SPECS NOPROMPT LRECL 80 RECFM F
&COMMAND SET CMSTYPE RT

&COMMAND ERASE USE DATA X
&COMMAND ERASE USE1 DATA X
&COMMAND ERASE USE2 DATA X
&UO = 2
&GOTO -RANKPROJ
-RUSEOPT3

&COMMAND COPYFILE USEN DATA X USE1 DATA X
&N = 0
&LOOP 2 &NU
&N = &N + 1
&STACK &N
&COMMAND EXECIO &NU DISKW USE2 DATA X 1 (FINIS
&COMMAND COPYFILE USE2 DATA X (LRECL 80 RECFM F

&COMMAND SET CMSTYPE HT
&STACK 1-50 51
&COMMAND COPYFILE USE2 DATA X USE1 DATA X (SPECS NOPROMPT OVLY LRECL 80 RECFM F

&STACK 1 20
&COMMAND SORT USE1 DATA X USE DATA X

&STACK 51-52 1
&COMMAND COPYFILE USE DATA X USEE DATA X (SPECS NOPROMPT LRECL 80 RECFM F
&COMMAND SET CMSTYPE RT
&COMMAND ERASE USE DATA X
&COMMAND ERASE USE1 DATA X
&COMMAND ERASE USE2 DATA X

&UO = 3
&GOTO -RANKPROJ
-RUSEOPT4
&UO = 4
&GOTO -RANKPROJ
-RUSEOPT5
&UO = 5

-RANKPROJ
&PRESUME &COMMAND

&IF &UO = 1 &GOTO -DISPUSE
&IF &UO = 2 &GOTO -RUNUSESORT
&IF &UO = 3 &GOTO -RUNUSESORT

&STACK &UO
&STACK &NS &NU &NY
EXECIO 2 DISKW USE DATA X I (FINIS
COPYFILE USE DATA X (LRECL 80 RECFM F

FILEDEF FT01F001 DISK USE DATA X
FILEDEF FT02F001 DISK USEE DATA X
FILEDEF FT11F001 DISK USEE DATA X
USEAMT
COPYFILE USE DATA X (LRECL 80 RECFM F

ERASE USE DATA X

-RUNUSESORT

FILEDEF FT01F001 DISK INIT DATA X
FILEDEF FT02F001 DISK USEE DATA X
FILEDEF FT03F001 DISK USEN DATA X
FILEDEF FT04F001 DISK USED DATA X
FILEDEF FT08F001 DISK CONST DATA X
FILEDEF FT21F001 DISK RIGID DATA X
FILEDEF FT22F001 DISK GOAL1 DATA X
FILEDEF FT23F001 DISK GOAL2 DATA X
FILEDEF FT24F001 DISK GOAL3 DATA X
FILEDEF FT11F001 DISK UN DATA X
FILEDEF FT12F001 DISK UD DATA X
FILEDEF FT13F001 DISK CONS DATA X
FILEDEF FT31F001 DISK RIGID DATA1 X
FILEDEF FT32F001 DISK GOAL1 DATA1 X
FILEDEF FT33F001 DISK GOAL2 DATA1 X
FILEDEF FT34F001 DISK GOAL3 DATA1 X

USESORT

ERASE USE DATA X
ERASE USEN DATA X
ERASE USED DATA X
ERASE CONST DATA X
COPYFILE UN DATA X USEN DATA X (LRECL 80 RECFM F
COPYFILE UD DATA X USED DATA X (LRECL 80 RECFM F
COPYFILE CONS DATA X CONST DATA X (LRECL 80 RECFM F
ERASE UN DATA X
ERASE UD DATA X
ERASE CONS DATA X
ERASE RIGID DATA X
ERASE GOAL1 DATA X
ERASE GOAL2 DATA X

Appendix A. LISTING OF EXEC 2 PROGRAMS 172
ERASE GOAL3 DATA X
COPYFILE RIGID DATA1 X RIGID DATA X (LRECL 100 RECFM F
COPYFILE GOAL1 DATA1 X GOAL1 DATA X (LRECL 100 RECFM F
COPYFILE GOAL2 DATA1 X GOAL2 DATA X (LRECL 100 RECFM F
COPYFILE GOAL3 DATA1 X GOAL3 DATA X (LRECL 100 RECFM F
ERASE RIGID DATA1 X
ERASE GOAL1 DATA1 X
ERASE GOAL2 DATA1 X
ERASE GOAL3 DATA1 X

* DISPLAY LIST OF SORTED USES

******************************************************************
* DISPLAY LIST OF SORTED USES
******************************************************************

-DISPUSE
EUDEXEC2
&PRESUME &SUBCOMMAND DISPLAY

USE PSRTDUSE
MAP DATA 1 SCHEME  (LOAD UNLOAD PREVIEW
MAP DATA 2 UN1 3 UN2 4 UN3 5 UN4 6 UN5  (LOAD UNLOAD PREVIEW
MAP DATA 7 UN6 8 UN7 9 UN8 10 UN9 11 UN10  (LOAD UNLOAD PREVIEW
MAP DATA 12 UN11 13 UN12 14 UN13 15 UN14 16 UN15  (LOAD UNLOAD PREVIEW
MAP DATA 17 UN16  (LOAD UNLOAD PREVIEW

&IF &UO = 1 &SCHEME = &STRING OF CURRENT ORDERING
&IF &UO = 2 &SCHEME = &STRING OF USER SPECIFIED
&IF &UO = 3 &SCHEME = &STRING OF ALPHABETICAL
&IF &UO = 4 &SCHEME = &STRING OF DECREASING FUNDS
&IF &UO = 5 &SCHEME = &STRING OF INCREASING FUNDS

&COMMAND EXECIO &NU DISKR USEN DATA X 1 (FINIS
&N = 0
&LOOP 5 &NU
&N = &N + 1
&NAME = &CONCAT OF UN &N
&READ STRING &&NAME
&IF &N LT 10 &&NAME = &CONCAT OF &BLANK &N . &BLANK &&NAME
&IF &N LT 10 &&NAME = &CONCAT OF &BLANK &&NAME

DISPLAY
&GOTO -RANKUSE
-QUIT
&PRESUME &COMMAND
&EXIT
A.7 RESULTS

**********************************************************************
* OPTION
*I - VIEW RESULTS OF GP MODEL
* THIS EXEC GENERATES RESULTS OF THE GP MODEL IN THE FORM OF REPORTS
**********************************************************************
&TRACE OFF

FILEDEF * CLEAR

* RUN THE REPORTS FORTRAN PROGRAM

FILEDEF FT01F001 DISK INIT TEMP X
FILEDEF FT02F001 DISK SOURCED TEMP X
FILEDEF FT03F001 DISK USED TEMP X
FILEDEF FT04F001 DISK CONST TEMP X
FILEDEF FT11F001 DISK OPTION1 DATA X
FILEDEF FT12F001 DISK OPTION2 DATA X
FILEDEF FT13F001 DISK OPTION3 DATA X
FILEDEF FT14F001 DISK OPTION4 DATA X
FILEDEF FT18F001 DISK OPTION5 DATA X
FILEDEF FT20F001 DISK ALLOCATN TEMP X
REPORTS
COPY OPTION1 DATA X (LRECL 80 RECFM F)
COPY OPTION2 DATA X (LRECL 80 RECFM F)
COPY OPTION3 DATA X (LRECL 80 RECFM F)
COPY OPTION4 DATA X (LRECL 80 RECFM F)
COPY OPTION5 DATA X (LRECL 80 RECFM F)
-START

**********************************************************************
* SETUP DMS ENVIRONMENT
**********************************************************************
EUDEXEC2
&PRESUME &SUBCOMMAND DISPLAY

* DISPLAY OUTPUT PANEL

-MENU
USE SELOUT
MAP DATA 1 ECODE (LOAD UNLOAD PREVIEW
-ERRMAIN
DISPLAY
&IF &RSTATUS = PF1 &GOTO -OPTION1
&IF &RSTATUS = PF2 &GOTO -OPTION2
&IF &RSTATUS = PF3 &GOTO -OPTION3
&IF &RSTATUS = PF4 &GOTO -OPTION4
&IF &RSTATUS = PF5 &GOTO -OPTION5
&IF &RSTATUS = PF6 &GOTO -OPTION6
&IF &RSTATUS = PF7 &GOTO -OPTION7
&IF &RSTATUS = PF10 &GOTO -END
&ECODE = &STRING OF UNDEFINED PF KEY!
SIGNAL
&GOTO -ERRMAIN

Appendix A. LISTING OF EXEC 2 PROGRAMS 174
-OPTION1

&CALL -OPT1
&GOTO -MENU
-OPT1

* FIRST YEAR

USE FUNSRC1

MAP DATA 1 YEAR (LOAD UNLOAD PREVIEW
MAP DATA 2 SN1 3 SF11 4 SF12 5 SF13 (LOAD UNLOAD PREVIEW
MAP DATA 6 SF14 7 SF15 8 SF16 9 SF17 (LOAD UNLOAD PREVIEW
MAP DATA 10 SN2 11 SF21 12 SF22 13 SF23 (LOAD UNLOAD PREVIEW
MAP DATA 14 SF24 15 SF25 16 SF26 17 SF27 (LOAD UNLOAD PREVIEW
MAP DATA 18 SN3 19 SF31 20 SF32 21 SF33 (LOAD UNLOAD PREVIEW
MAP DATA 22 SF34 23 SF35 24 SF36 25 SF37 (LOAD UNLOAD PREVIEW
MAP DATA 26 SN4 27 SF41 28 SF42 29 SF43 (LOAD UNLOAD PREVIEW
MAP DATA 30 SF44 31 SF45 32 SF46 33 SF47 (LOAD UNLOAD PREVIEW
MAP DATA 34 SN5 35 SF51 36 SF52 37 SF53 (LOAD UNLOAD PREVIEW
MAP DATA 38 SF54 39 SF55 40 SF56 41 SF57 (LOAD UNLOAD PREVIEW
MAP DATA 42 SN6 43 SF61 44 SF62 45 SF63 (LOAD UNLOAD PREVIEW
MAP DATA 46 SF64 47 SF65 48 SF66 49 SF67 (LOAD UNLOAD PREVIEW
MAP DATA 50 SN7 51 SF71 52 SF72 53 SF73 (LOAD UNLOAD PREVIEW
MAP DATA 54 SF74 55 SF75 56 SF76 57 SF77 (LOAD UNLOAD PREVIEW
MAP DATA 58 SN8 59 SF81 60 SF82 61 SF83 (LOAD UNLOAD PREVIEW
MAP DATA 62 SF84 63 SF85 64 SF86 65 SF87 (LOAD UNLOAD PREVIEW
MAP DATA 66 SN9 67 SF91 68 SF92 69 SF93 (LOAD UNLOAD PREVIEW
MAP DATA 70 SF94 71 SF95 72 SF96 73 SF97 (LOAD UNLOAD PREVIEW
MAP DATA 74 SN10 75 SF101 76 SF102 77 SF103 (LOAD UNLOAD PREVIEW
MAP DATA 78 SF104 79 SF105 80 SF106 81 SF107 (LOAD UNLOAD PREVIEW
MAP DATA 82 SN11 83 SF111 84 SF112 85 SF113 (LOAD UNLOAD PREVIEW
MAP DATA 86 SF114 87 SF115 88 SF116 89 SF117 (LOAD UNLOAD PREVIEW
MAP DATA 90 SN12 91 SF121 92 SF122 93 SF123 (LOAD UNLOAD PREVIEW
MAP DATA 94 SF124 95 SF125 96 SF126 97 SF127 (LOAD UNLOAD PREVIEW
MAP DATA 98 SN13 99 SF131 100 SF132 101 SF133 (LOAD UNLOAD PREVIEW
MAP DATA 102 SF134 103 SF135 104 SF136 105 SF137 (LOAD UNLOAD PREVIEW
MAP DATA 106 SN14 107 SF141 108 SF142 109 SF143 (LOAD UNLOAD PREVIEW
MAP DATA 110 SF144 111 SF145 112 SF146 113 SF147 (LOAD UNLOAD PREVIEW
MAP DATA 114 SN15 115 SF151 116 SF152 117 SF153 (LOAD UNLOAD PREVIEW
MAP DATA 118 SF154 119 SF155 120 SF156 121 SF157 (LOAD UNLOAD PREVIEW
MAP DATA 122 SN16 123 SF161 124 SF162 125 SF163 (LOAD UNLOAD PREVIEW
MAP DATA 126 SF164 127 SF165 128 SF166 129 SF167 (LOAD UNLOAD PREVIEW
MAP DATA 130 SN17 131 SF171 132 SF172 133 SF173 (LOAD UNLOAD PREVIEW
MAP DATA 134 SF174 135 SF175 136 SF176 137 SF177 (LOAD UNLOAD PREVIEW
MAP DATA 138 SN18 139 SF181 140 SF182 141 SF183 (LOAD UNLOAD PREVIEW
MAP DATA 142 SF184 143 SF185 144 SF186 145 SF187 (LOAD UNLOAD PREVIEW
MAP DATA 146 SN19 147 SF191 148 SF192 149 SF193 (LOAD UNLOAD PREVIEW
MAP DATA 150 SF194 151 SF195 152 SF196 153 SF197 (LOAD UNLOAD PREVIEW
MAP DATA 154 SN20 155 SF201 156 SF202 157 SF203 (LOAD UNLOAD PREVIEW
MAP DATA 158 SF204 159 SF205 160 SF206 161 SF207 (LOAD UNLOAD PREVIEW

&COMMAND EXECIO 1 DISKR INIT TEMP X 1 (FINIS
&READ VAR &NS &NU &NY
&COMMAND EXECIO &NS DISKR SOURCEN TEMP X 1 (FINIS
&M = 0
&LOOP 3 &NS
&M = &M + 1
&NAME = &CONCAT OF SN &M
&READ STRING &&NAME

&NSRC = &NS + 1
&NAME = &CONCAT OF SN &NSRC
&NAME = DEFICIT
&COMMAND EXECIO / DISKR YEAR TEMP X 1 (FINIS
&READ STRING &YEAR

&NL = &NS + 2
&COMMAND EXECIO &NL DISKR OPTION1 DATA X 1 (FINIS
&M = 0
&LOOP -OPT1YR1 &NSRC
&M = &M + 1
&V1 = &CONCAT OF SF &M 1
&V2 = &CONCAT OF SF &M 2
&V3 = &CONCAT OF SF &M 3
&V4 = &CONCAT OF SF &M 4
&V5 = &CONCAT OF SF &M 5
&V6 = &CONCAT OF SF &M 6
&V7 = &CONCAT OF SF &M 7
&READ VAR &V1 &V2 &V3 &V4 &V5 &V6 &V7
&V1 = &RIGHT OF &V1 6
&V2 = &RIGHT OF &V2 6
&V3 = &RIGHT OF &V3 6
&V4 = &RIGHT OF &V4 6
&V5 = &RIGHT OF &V5 6
&V6 = &RIGHT OF &V6 6
&V7 = &RIGHT OF &V7 6

-OPT1YR1
&M = &NS + 2
&V1 = &CONCAT OF SF &M 1
&V2 = &CONCAT OF SF &M 2
&V3 = &CONCAT OF SF &M 3
&V4 = &CONCAT OF SF &M 4
&V5 = &CONCAT OF SF &M 5
&V6 = &CONCAT OF SF &M 6
&V7 = &CONCAT OF SF &M 7
&V1 = 
&V2 = 
&V3 = 
&V4 = 
&V5 = 
&V6 = 
&V7 = 
&M = &NS + 3
&V1 = &CONCAT OF SF &M 1
&V2 = &CONCAT OF SF &M 2
&V3 = &CONCAT OF SF &M 3
&V4 = &CONCAT OF SF &M 4
&V5 = &CONCAT OF SF &M 5
&V6 = &CONCAT OF SF &M 6
&V7 = &CONCAT OF SF &M 7
&READ VAR &V1 &V2 &V3 &V4 &V5 &V6 &V7
&V1 = &RIGHT OF &V1 6
&V2 = &RIGHT OF &V2 6
&V3 = &RIGHT OF &V3 6
&V4 = &RIGHT OF &V4 6
&V5 = &RIGHT OF &V5 6
&V6 = &RIGHT OF &V6 6
&V7 = &RIGHT OF &V7 6
&NAME = &CONCAT OF SN &M
&NAME = TOTAL
DISPLAY

* SUCCEEDING YEARS

USE FUNSRC2
MAP DATA 1 YEAR 2 YRNO (LOAD UNLOAD PREVIEW
MAP DATA 3 SN1 4 SF11 5 SF12 6 SF13 (LOAD UNLOAD PREVIEW
MAP DATA 7 SF14 8 SF15 9 SF16 10 SF17 (LOAD UNLOAD PREVIEW
MAP DATA 11 SN2 12 SF21 13 SF22 14 SF23 (LOAD UNLOAD PREVIEW
MAP DATA 15 SF24 16 SF25 17 SF26 18 SF27 (LOAD UNLOAD PREVIEW
MAP DATA 19 SN3 20 SF31 21 SF32 22 SF33 (LOAD UNLOAD PREVIEW

Appendix A. LISTING OF EXEC 2 PROGRAMS 176
Appendix A. LISTING OF EXEC 2 PROGRAMS

177
&V6 = &CONCAT OF SF &M 6
&V7 = &CONCAT OF SF &M 7
&READ VAR &&V1 &&V2 &&V3 &&V4 &&V5 &&V6 &&V7
&&V1 = &RIGHT OF &&V1 6
&&V2 = &RIGHT OF &&V2 6
&&V3 = &RIGHT OF &&V3 6
&&V4 = &RIGHT OF &&V4 6
&&V5 = &RIGHT OF &&V5 6
&&V6 = &RIGHT OF &&V6 6
&&V7 = &RIGHT OF &&V7 6
-OPT1YR2

&V1 = &CONCAT OF SF &M 1
&V2 = &CONCAT OF SF &M 2
&V3 = &CONCAT OF SF &M 3
&V4 = &CONCAT OF SF &M 4
&V5 = &CONCAT OF SF &M 5
&V6 = &CONCAT OF SF &M 6
&V7 = &CONCAT OF SF &M 7
&&NAME = &CONCAT OF SN &M
&&NAME = TOTAL
DISPLAY
-OPT1YRS
&RETURN

* OPTION 2 - FUND REQUIREMENT BY USE

-OPTION2
&CALL -OPT2
&GOTO -MENU
-OPT2

* FIRST YEAR

USE FUNUSE1
MAP DATA 1 YEAR (LOAD UNLOAD PREVIEW
MAP DATA 2 UNI 3 UF11 4 UF12 5 UF13 (LOAD UNLOAD PREVIEW
MAP DATA 6 UF14 7 UF15 8 UF16 (LOAD UNLOAD PREVIEW
MAP DATA 9 UN2 10 UF21 11 UF22 12 UF23 (LOAD UNLOAD PREVIEW
MAP DATA 13 UF24 14 UF25 15 UF26 (LOAD UNLOAD PREVIEW

Appendix A. LISTING OF EXEC 2 PROGRAMS 178
MAP DATA 16 UN3 17 UF31 18 UF32 19 UF33 (LOAD UNLOAD PREVIEW
MAP DATA 20 UF34 21 UF35 22 UF36 (LOAD UNLOAD PREVIEW
MAP DATA 23 UN4 24 UF41 25 UF42 26 UF43 (LOAD UNLOAD PREVIEW
MAP DATA 27 UF44 28 UF45 29 UF46 (LOAD UNLOAD PREVIEW
MAP DATA 30 UN5 31 UF51 32 UF52 33 UF53 (LOAD UNLOAD PREVIEW
MAP DATA 34 UF54 35 UF55 36 UF56 (LOAD UNLOAD PREVIEW
MAP DATA 37 UN6 38 UF61 39 UF62 40 UF63 (LOAD UNLOAD PREVIEW
MAP DATA 41 UF64 42 UF65 43 UF66 (LOAD UNLOAD PREVIEW
MAP DATA 44 UN7 45 UF71 46 UF72 47 UF73 (LOAD UNLOAD PREVIEW
MAP DATA 48 UF74 49 UF75 50 UF76 (LOAD UNLOAD PREVIEW
MAP DATA 51 UN8 52 UF81 53 UF82 54 UF83 (LOAD UNLOAD PREVIEW
MAP DATA 55 UF84 56 UF85 57 UF86 (LOAD UNLOAD PREVIEW
MAP DATA 58 UN9 59 UF91 60 UF92 61 UF93 (LOAD UNLOAD PREVIEW
MAP DATA 62 UF94 63 UF95 64 UF96 (LOAD UNLOAD PREVIEW
MAP DATA 65 UN10 66 UF101 67 UF102 68 UF103 (LOAD UNLOAD PREVIEW
MAP DATA 69 UF104 70 UF105 71 UF106 (LOAD UNLOAD PREVIEW
MAP DATA 72 UN11 73 UF111 74 UF112 75 UF113 (LOAD UNLOAD PREVIEW
MAP DATA 76 UF114 77 UF115 78 UF116 (LOAD UNLOAD PREVIEW
MAP DATA 79 UN12 80 UF121 81 UF122 82 UF123 (LOAD UNLOAD PREVIEW
MAP DATA 83 UF124 84 UF125 85 UF126 (LOAD UNLOAD PREVIEW
MAP DATA 86 UN13 87 UF131 88 UF132 89 UF133 (LOAD UNLOAD PREVIEW
MAP DATA 90 UF134 91 UF135 92 UF136 (LOAD UNLOAD PREVIEW
MAP DATA 93 UN14 95 UF142 96 UF143 (LOAD UNLOAD PREVIEW
MAP DATA 97 UF144 98 UF145 99 UF146 (LOAD UNLOAD PREVIEW
MAP DATA 100 UN15 101 UF151 102 UF152 103 UF153 (LOAD UNLOAD PREVIEW
MAP DATA 104 UF154 105 UF155 106 UF156 (LOAD UNLOAD PREVIEW
MAP DATA 107 UN16 108 UF161 109 UF162 110 UF163 (LOAD UNLOAD PREVIEW
MAP DATA 111 UF164 112 UF165 113 UF166 (LOAD UNLOAD PREVIEW
MAP DATA 114 UN17 115 UF171 116 UF172 117 UF173 (LOAD UNLOAD PREVIEW
MAP DATA 118 UF174 119 UF175 120 UF176 (LOAD UNLOAD PREVIEW
MAP DATA 121 UN18 122 UF181 123 UF182 124 UF183 (LOAD UNLOAD PREVIEW
MAP DATA 125 UF184 126 UF185 127 UF186 (LOAD UNLOAD PREVIEW
MAP DATA 128 UN19 129 UF191 130 UF192 131 UF193 (LOAD UNLOAD PREVIEW
MAP DATA 132 UF194 133 UF195 134 UF196 (LOAD UNLOAD PREVIEW
MAP DATA 135 UN20 136 UF201 137 UF202 138 UF203 (LOAD UNLOAD PREVIEW
MAP DATA 139 UF204 140 UF205 141 UF206 (LOAD UNLOAD PREVIEW

&COMMAND EXECIO 1 DISKR INIT TEMP X 1 (FINIS
&READ VAR &NU &NU &NU
&COMMAND EXECIO &NU DISKR USEN TEMP X 1 (FINIS
&NU = 0
&LOOP 3 &NU
&M = &M + 1
&NAME = &CONCAT OF UN &M
&READ STRING &NAME

&COMMAND EXECIO 1 DISKR YEAR TEMP X 1 (FINIS
&READ STRING &YEAR

&NL = &NU + 1
&COMMAND EXECIO &NL DISKR OPTION2 DATA X 1 (FINIS
&M = 0
&LOOP -OPT2YR1 &NU
&M = &M + 1
&V1 = &CONCAT OF UF &M 1
&V2 = &CONCAT OF UF &M 2
&V3 = &CONCAT OF UF &M 3
&V4 = &CONCAT OF UF &M 4
&V5 = &CONCAT OF UF &M 5
&V6 = &CONCAT OF UF &M 6
&READ VAR &V1 &V2 &V3 &V4 &V5 &V6
&V1 = RIGHT OF &V1 6
&V2 = RIGHT OF &V2 6
&V3 = RIGHT OF &V3 6
&V4 = RIGHT OF &V4 6
&V5 = RIGHT OF &V5 6
&V6 = RIGHT OF &V6 6
-OPT2YR1
&M = &NU + 1
&V1 = &CONCAT OF UF &M 1
&V2 = &CONCAT OF UF &M 2

Appendix A. LISTING OF EXEC 2 PROGRAMS

179
&V3 = &CONCAT OF UF &M 3  
&V4 = &CONCAT OF UF &M 4  
&V5 = &CONCAT OF UF &M 5  
&V6 = &CONCAT OF UF &M 6  
&V1 =      
&V2 =      
&V3 =      
&V4 =      
&V5 =      
&V6 =      
&M = &NU + 2  
&V1 = &CONCAT OF UF &M 1  
&V2 = &CONCAT OF UF &M 2  
&V3 = &CONCAT OF UF &M 3  
&V4 = &CONCAT OF UF &M 4  
&V5 = &CONCAT OF UF &M 5  
&V6 = &CONCAT OF UF &M 6  
&READ VAR &V1 &V2 &V3 &V4 &V5 &V6  
&V1 = &RIGHT OF &V1 6  
&V2 = &RIGHT OF &V2 6  
&V3 = &RIGHT OF &V3 6  
&V4 = &RIGHT OF &V4 6  
&V5 = &RIGHT OF &V5 6  
&V6 = &RIGHT OF &V6 6  
&NAME = &CONCAT OF UN &M  
&&NAME = TOTAL  
DISPLAY  

** SUCCEEDING YEARS **

USE FUNUSE2  
MAP DATA 1 YEAR 2 YRNO (LOAD UNLOAD PREVIEW)  
MAP DATA 3 UN1 4 UF11 5 UF12 6 UF13 (LOAD UNLOAD PREVIEW)  
MAP DATA 7 UF14 8 UF15 9 UF16 10 UF17 (LOAD UNLOAD PREVIEW)  
MAP DATA 11 UN2 12 UF21 13 UF22 14 UF23 (LOAD UNLOAD PREVIEW)  
MAP DATA 15 UF24 16 UF25 17 UF26 18 UF27 (LOAD UNLOAD PREVIEW)  
MAP DATA 19 UN3 20 UF31 21 UF32 22 UF33 (LOAD UNLOAD PREVIEW)  
MAP DATA 23 UF34 24 UF35 25 UF36 26 UF37 (LOAD UNLOAD PREVIEW)  
MAP DATA 27 UN4 28 UF41 29 UF42 30 UF43 (LOAD UNLOAD PREVIEW)  
MAP DATA 31 UF44 32 UF45 33 UF46 34 UF47 (LOAD UNLOAD PREVIEW)  
MAP DATA 35 UN5 36 UF51 37 UF52 38 UF53 (LOAD UNLOAD PREVIEW)  
MAP DATA 39 UF54 40 UF55 41 UF56 42 UF57 (LOAD UNLOAD PREVIEW)  
MAP DATA 43 UN6 44 UF61 45 UF62 46 UF63 (LOAD UNLOAD PREVIEW)  
MAP DATA 47 UF64 48 UF65 49 UF66 50 UF67 (LOAD UNLOAD PREVIEW)  
MAP DATA 51 UN7 52 UF71 53 UF72 54 UF73 (LOAD UNLOAD PREVIEW)  
MAP DATA 57 UN8 58 UF75 59 UF76 60 UF77 (LOAD UNLOAD PREVIEW)  
MAP DATA 59 UN8 60 UF81 61 UF82 62 UF83 (LOAD UNLOAD PREVIEW)  
MAP DATA 63 UF84 64 UF85 65 UF86 66 UF87 (LOAD UNLOAD PREVIEW)  
MAP DATA 67 UN9 68 UF91 69 UF92 70 UF93 (LOAD UNLOAD PREVIEW)  
MAP DATA 71 UF94 72 UF95 73 UF96 74 UF97 (LOAD UNLOAD PREVIEW)  
MAP DATA 75 UN10 76 UF101 77 UF102 78 UF103 (LOAD UNLOAD PREVIEW)  
MAP DATA 79 UF104 80 UF105 81 UF106 82 UF107 (LOAD UNLOAD PREVIEW)  
MAP DATA 83 UN11 84 UF111 85 UF112 86 UF113 (LOAD UNLOAD PREVIEW)  
MAP DATA 87 UF114 88 UF115 89 UF116 90 UF117 (LOAD UNLOAD PREVIEW)  
MAP DATA 91 UN12 92 UF121 93 UF122 94 UF123 (LOAD UNLOAD PREVIEW)  
MAP DATA 95 UF124 96 UF125 97 UF126 98 UF127 (LOAD UNLOAD PREVIEW)  
MAP DATA 99 UN13 100 UF121 101 UF122 102 UF123 (LOAD UNLOAD PREVIEW)  
MAP DATA 103 UF134 104 UF135 105 UF136 106 UF137 (LOAD UNLOAD PREVIEW)  
MAP DATA 107 UN14 108 UF141 109 UF142 110 UF143 (LOAD UNLOAD PREVIEW)  
MAP DATA 111 UF144 112 UF145 113 UF146 114 UF147 (LOAD UNLOAD PREVIEW)  
MAP DATA 115 UN15 116 UF151 117 UF152 118 UF153 (LOAD UNLOAD PREVIEW)  
MAP DATA 119 UF154 120 UF155 121 UF156 122 UF157 (LOAD UNLOAD PREVIEW)  
MAP DATA 123 UN16 124 UF161 125 UF162 126 UF163 (LOAD UNLOAD PREVIEW)  
MAP DATA 127 UF164 128 UF165 129 UF166 130 UF167 (LOAD UNLOAD PREVIEW)  
MAP DATA 131 UN17 132 UF171 133 UF172 134 UF173 (LOAD UNLOAD PREVIEW)  
MAP DATA 135 UF174 136 UF175 137 UF176 138 UF177 (LOAD UNLOAD PREVIEW)  
MAP DATA 139 UN18 140 UF181 141 UF182 142 UF183 (LOAD UNLOAD PREVIEW)  
MAP DATA 143 UF184 144 UF185 145 UF186 146 UF187 (LOAD UNLOAD PREVIEW)  
MAP DATA 147 UN19 148 UF191 149 UF192 150 UF193 (LOAD UNLOAD PREVIEW)
MAP DATA 151 UF194 152 UF195 153 UF196 154 UF197 (LOAD UNLOAD PREVIEW
MAP DATA 155 UN20 156 UF201 157 UF202 158 UF203 (LOAD UNLOAD PREVIEW
MAP DATA 159 UF204 160 UF205 161 UF206 162 UF207 (LOAD UNLOAD PREVIEW

&COMMAND EXECIO &NU DISKR USEN TEMP X 1 (FINIS
&M = 0
&LOOP 3 &NU
&M = &M + 1
&NAME = &CONCAT OF UN &M
&READ STRING &NAME

&N = 1
&NYLEFT = &NY - 1
&LOOP -OPT2YRS &NYLEFT
&N = &N + 1

&COMMAND EXECIO 1 DISKR YEAR TEMP X &N (FINIS
&READ STRING &YEAR

&YRNO = &N
&YRNO = &CONCAT OF &YRNO YR

&M = &N - 1
&NL = &NU + 1
&LN = &MULT OF &NL &M
&LN = &LN + 1
&COMMAND EXECIO &NL DISKR OPTION2 DATA X &LN (FINIS
&M = 0
&LOOP -OPT2YR2 &NU
&M = &M + 1
&V1 = &CONCAT OF UF &M 1
&V2 = &CONCAT OF UF &M 2
&V3 = &CONCAT OF UF &M 3
&V4 = &CONCAT OF UF &M 4
&V5 = &CONCAT OF UF &M 5
&V6 = &CONCAT OF UF &M 6
&V7 = &CONCAT OF UF &M 7
&READ VAR &&V1 &&V2 &&V3 &&V4 &&V5 &&V6 &&V7
&&V1 = &RIGHT OF &&V1 6
&&V2 = &RIGHT OF &&V2 6
&&V3 = &RIGHT OF &&V3 6
&&V4 = &RIGHT OF &&V4 6
&&V5 = &RIGHT OF &&V5 6
&&V6 = &RIGHT OF &&V6 6
&&V7 = &RIGHT OF &&V7 6
-OPT2YR2

&M = &NU + 1
&V1 = &CONCAT OF UF &M 1
&V2 = &CONCAT OF UF &M 2
&V3 = &CONCAT OF UF &M 3
&V4 = &CONCAT OF UF &M 4
&V5 = &CONCAT OF UF &M 5
&V6 = &CONCAT OF UF &M 6
&V7 = &CONCAT OF UF &M 7
&&V1 =
&&V2 =
&&V3 =
&&V4 =
&&V5 =
&&V6 =
&&V7 =

&M = &NU + 2
&V1 = &CONCAT OF UF &M 1
&V2 = &CONCAT OF UF &M 2
&V3 = &CONCAT OF UF &M 3
&V4 = &CONCAT OF UF &M 4
&V5 = &CONCAT OF UF &M 5
&V6 = &CONCAT OF UF &M 6
&V7 = &CONCAT OF UF &M 7

Appendix A. LISTING OF EXEC 2 PROGRAMS 181
&READ VAR &&V1 &&V2 &&V3 &&V4 &&V5 &&V6 &&V7
&&V1 = &RIGHT OF &&V1 6
&&V2 = &RIGHT OF &&V2 6
&&V3 = &RIGHT OF &&V3 6
&&V4 = &RIGHT OF &&V4 6
&&V5 = &RIGHT OF &&V5 6
&&V6 = &RIGHT OF &&V6 6
&&V7 = &RIGHT OF &&V7 6
&NAME = &CONCAT OF UN &M
&&NAME = TOTAL
DISPLAY
-OPT2YRS
&RETURN

*************************************************************************

* OPTION 3 - SOURCE EXPENDITURES
*************************************************************************

-OPTION3

&CALL -OPT3
&GOTO -MENU
-OPT3

* SELECT SOURCE

&COMMAND EXECIO 1 DISKR INIT TEMP X 1 (FINIS
&READ VAR &NS &NU &NY

&COMMAND EXECIO &NS DISKR SOURCEN TEMP X 1 (FINIS
&M = 0
&LOOP 3 &NS
&M = &M + 1
&NAME = &CONCAT OF SNAM &M
&READ STRING &NAME

&COMMAND EXECIO &NU DISKR USEN TEMP X 1 (FINIS
&M = 0
&LOOP 3 &NU
&M = &M + 1
&NAME = &CONCAT OF UNAM &M
&READ STRING &NAME

-SELSRC

&QUIT = NO

USE SELSRC

MAP DATA 1 SN1 2 SN2 3 SN3 4 SN4 5 SN5 (LOAD UNLOAD PREVIEW
MAP DATA 6 SN6 7 SN7 8 SN8 9 SN9 10 SN10 (LOAD UNLOAD PREVIEW
MAP DATA 11 SN11 12 SN12 13 SN13 14 SN14 15 SN15 (LOAD UNLOAD PREVIEW
MAP DATA 16 SN16 17 SN17 18 SN18 19 SN19 20 SN20 (LOAD UNLOAD PREVIEW
MAP DATA 21 ECODE (LOAD UNLOAD PREVIEW

&NSRC = &NS + 1

&M = 0
&LOOP 5 &NS
&M = &M + 1
&NAME = &CONCAT OF SN &M
&NAME1 = &CONCAT OF SNAM &M
&&NAME = &NAME1
&NAME = &CONCAT OF &BLANK &&NAME

&NAME = &CONCAT OF SN &NSRC
&NAME = &CONCAT OF &BLANK DEFICIT

Appendix A. LISTING OF EXEC 2 PROGRAMS
&ALLS = &NSRC + 1
&NAME = &CONCAT OF SN &ALLS
&NAME = &CONCAT OF &BLANK ALL &BLANK SOURCES

&TEMPN = &ALLS

&IF &TEMPN GE 20 &GOTO -DISPSRC
&TEMPN = &TEMPN + 1
&NAME = &CONCAT OF SN &TEMPN
SET &NAME (PRO
&SKIP -4
-DISPSRC
&SN = 0
DISPLAY

&IF &RSTATUS = PF10 &RETURN
&IF &RCURSOR = SN1 &SN = 1
&IF &RCURSOR = SN2 &SN = 2
&IF &RCURSOR = SN3 &SN = 3
&IF &RCURSOR = SN4 &SN = 4
&IF &RCURSOR = SN5 &SN = 5
&IF &RCURSOR = SN6 &SN = 6
&IF &RCURSOR = SN7 &SN = 7
&IF &RCURSOR = SN8 &SN = 8
&IF &RCURSOR = SN9 &SN = 9
&IF &RCURSOR = SN10 &SN = 10
&IF &RCURSOR = SN11 &SN = 11
&IF &RCURSOR = SN12 &SN = 12
&IF &RCURSOR = SN13 &SN = 13
&IF &RCURSOR = SN14 &SN = 14
&IF &RCURSOR = SN15 &SN = 15
&IF &RCURSOR = SN16 &SN = 16
&IF &RCURSOR = SN17 &SN = 17
&IF &RCURSOR = SN18 &SN = 18
&IF &RCURSOR = SN19 &SN = 19
&IF &RCURSOR = SN20 &SN = 20
&IF &RSTATUS EQ ENTER &GOTO -SRCSLCTD
&ECODE = &STRING OF UNDEFINED PF KEY!
SIGNAL
&GOTO -DISPSRC

-SRCSLCTD
&IF &SN NE &ALLS &GOTO -SPECSRC
&M = 0
&LOOP -ALLSRC &NSRC
&M = &M + 1
&CALL -OPT3SUB
&IF &QUIT EQ .YES &GOTO -SLSRC
-ALLSRC
&GOTO -SLSRC
-SPECSRC
&M = &SN
&CALL -OPT3SUB
&GOTO -SLSRC

-OPT3SUB

USE EXPSE!
MAP DATA 1 SNAME 2 YEAR (LOAD UNLOAD PREVIEW
MAP DATA 3 DF11 4 DF12 5 DF13 6 DF14 7 DF15 (LOAD UNLOAD PREVIEW
MAP DATA 8 DF21 9 DF22 10 DF23 11 DF24 12 DF25 (LOAD UNLOAD PREVIEW
MAP DATA 13 DF31 14 DF32 15 DF33 16 DF34 17 DF35 (LOAD UNLOAD PREVIEW
MAP DATA 18 UN1 19 UF11 20 UF12 21 UF13 (LOAD UNLOAD PREVIEW
MAP DATA 22 UF14 23 UF15 24 UF16 (LOAD UNLOAD PREVIEW
MAP DATA 25 UN2 26 UF21 27 UF22 28 UF23 (LOAD UNLOAD PREVIEW
MAP DATA 29 UF24 30 UF25 31 UF26 (LOAD UNLOAD PREVIEW
MAP DATA 32 UN3 33 UF31 34 UF32 35 UF33 (LOAD UNLOAD PREVIEW
MAP DATA 36 UF34 37 UF35 38 UF36 (LOAD UNLOAD PREVIEW
MAP DATA 39 UN4 40 UF41 41 UF42 42 UF43 (LOAD UNLOAD PREVIEW

Appendix A. LISTING OF EXEC 2 PROGRAMS 183
&NAME = &CONCAT OF SN &M
&NAME = &NAME

&COMMAND EXECIO 1 DISKR YEAR TEMP X 1 (FINIS
&READ STRING &YEAR

&N = &M - 1
&NJ = &NU + 5
&LN = &MULT OF &N &NJ
&LN = &MULT OF &LN &NY
&LN = &LN + 1

&COMMAND EXECIO &NJ DISKR OPTION3 DATA X &LN (FINIS

&N = 0
&LOOP -OPT31YR1 3
&N = &N + 1
&V1 = &CONCAT OF DF &N 1
&V2 = &CONCAT OF DF &N 2
&V3 = &CONCAT OF DF &N 3
&V4 = &CONCAT OF DF &N 4
&V5 = &CONCAT OF DF &N 5
&READ VAR &V1 &V2 &V3 &V4 &V5
&&V1 = &RIGHT OF &V1 6
&&V2 = &RIGHT OF &V2 6
&&V3 = &RIGHT OF &V3 6
&&V4 = &RIGHT OF &V4 6
&&V5 = &RIGHT OF &V5 6
-OPT31YR1

&J = 0
&LOOP 3 &NJ
&J = &J + 1
&NAME = &CONCAT OF I &J
&NAME = 0

&N = 0
&J = 0
&LOOP -OPT32YR1 &NJ
&N = &N + 1
&READ VAR &V1 &V2 &V3 &V4 &V5 &V6
&IF &V1 EQ 0 &GOTO -OPT32YR1

&NAME = &CONCAT OF I &N
&NAME = 1
&J = &J + 1
&NAME = &CONCAT OF UN &J

Appendix A. LISTING OF EXEC 2 PROGRAMS 184
&NAME1 = &CONCAT OF UNAM &N
&NAME = &NAME1

&V1 = &CONCAT OF UF &J 1
&V2 = &CONCAT OF UF &J 2
&V3 = &CONCAT OF UF &J 3
&V4 = &CONCAT OF UF &J 4
&V5 = &CONCAT OF UF &J 5
&V6 = &CONCAT OF UF &J 6

&&V1 = &VV1
&&V2 = &VV2
&&V3 = &VV3
&&V4 = &VV4
&&V5 = &VV5
&&V6 = &VV6

&&V1 = &RIGHT OF &&V1 6
&&V2 = &RIGHT OF &&V2 6
&&V3 = &RIGHT OF &&V3 6
&&V4 = &RIGHT OF &&V4 6
&&V5 = &RIGHT OF &&V5 6
&&V6 = &RIGHT OF &&V6 6

-OPT32YR1

&&N = &J + 1
&&V1 = &CONCAT OF UF &&N 1
&&V2 = &CONCAT OF UF &&N 2
&&V3 = &CONCAT OF UF &&N 3
&&V4 = &CONCAT OF UF &&N 4
&&V5 = &CONCAT OF UF &&N 5
&&V6 = &CONCAT OF UF &&N 6

&&V1 = ------
&&V2 = ------
&&V3 = ------
&&V4 = ------
&&V5 = ------
&&V6 = ------

&&N = &J + 2
&&V1 = &CONCAT OF UF &&N 1
&&V2 = &CONCAT OF UF &&N 2
&&V3 = &CONCAT OF UF &&N 3
&&V4 = &CONCAT OF UF &&N 4
&&V5 = &CONCAT OF UF &&N 5
&&V6 = &CONCAT OF UF &&N 6

&READ VAR &&V1 &&V2 &&V3 &&V4 &&V5 &&V6
&&V1 = &RIGHT OF &&V1 6
&&V2 = &RIGHT OF &&V2 6
&&V3 = &RIGHT OF &&V3 6
&&V4 = &RIGHT OF &&V4 6
&&V5 = &RIGHT OF &&V5 6
&&V6 = &RIGHT OF &&V6 6

&&NAME = &CONCAT OF UN &&N
&&NAME = TOTAL

&&N = &J + 3
&&V2 = &CONCAT OF UF &&N 2
&&V3 = &CONCAT OF UF &&N 3
&&V4 = &CONCAT OF UF &&N 4
&&V5 = &CONCAT OF UF &&N 5
&&V6 = &CONCAT OF UF &&N 6

&&V2 = = = = = =
&&V3 = = = = = =
&&V4 = = = = = =
&&V5 = = = = = =
&&V6 = = = = = =

&&N = &J + 4
&&V2 = &CONCAT OF UF &&N 2
&&V3 = &CONCAT OF UF &&N 3
&V4 = &CONCAT OF UF &N 4
&V5 = &CONCAT OF UF &N 5
&V6 = &CONCAT OF UF &N 6
&READ VAR &V2 &V3 &V4 &V5 &V6
&V2 = &RIGHT OF &V2 6
&V3 = &RIGHT OF &V3 6
&V4 = &RIGHT OF &V4 6
&V5 = &RIGHT OF &V5 6
&V6 = &RIGHT OF &V6 6
&NAME = &CONCAT OF UN &N
&NAME = &CONCAT OF ENDING &BLANK BALANCE

DISPLAY
&IF &RSTATUS = PF10 &GOTO -OPT3QUIT
&IF &RSTATUS EQ ENTER &GOTO -OPT3CONT
&ECODE = &STRING OF UNDEFINED PF KEY!
&SKIP -5

-OPT3CONT

&YR = 1
&YRLEFT = &NY - 1
&LOOP -OPT3YRL &YRLEFT
&YR = &YR + 1

USE EXPUSE2
MAP DATA 1 SNAME 2 YEAR (LOAD UNLOAD PREVIEW
MAP DATA 3 DF1 4 DF12 5 DF13 6 DF14 7 DF15 (LOAD UNLOAD PREVIEW
MAP DATA 8 DF21 9 DF22 10 DF23 11 DF24 12 DF25 (LOAD UNLOAD PREVIEW
MAP DATA 13 DF31 14 DF32 15 DF33 16 DF34 17 DF35 (LOAD UNLOAD PREVIEW
MAP DATA 18 YRNO (LOAD UNLOAD PREVIEW
MAP DATA 19 UN1 20 UF11 21 UF12 22 UF13 (LOAD UNLOAD PREVIEW
MAP DATA 23 UF14 24 UF15 25 UF16 26 UF17 (LOAD UNLOAD PREVIEW
MAP DATA 27 UN2 28 UF21 29 UF22 30 UF23 (LOAD UNLOAD PREVIEW
MAP DATA 31 UF24 32 UF25 33 UF26 34 UF27 (LOAD UNLOAD PREVIEW
MAP DATA 35 UN3 36 UF31 37 UF32 38 UF33 (LOAD UNLOAD PREVIEW
MAP DATA 39 UF34 40 UF35 41 UF36 42 UF37 (LOAD UNLOAD PREVIEW
MAP DATA 43 UN4 44 UF41 45 UF42 46 UF43 (LOAD UNLOAD PREVIEW
MAP DATA 47 UF44 48 UF45 49 UF46 50 UF47 (LOAD UNLOAD PREVIEW
MAP DATA 51 UN5 52 UF51 53 UF52 54 UF53 (LOAD UNLOAD PREVIEW
MAP DATA 55 UF54 56 UF55 57 UF56 58 UF57 (LOAD UNLOAD PREVIEW
MAP DATA 59 UN6 60 UF61 61 UF62 62 UF63 (LOAD UNLOAD PREVIEW
MAP DATA 63 UF64 64 UF65 65 UF66 66 UF67 (LOAD UNLOAD PREVIEW
MAP DATA 67 UN7 68 UF71 69 UF72 70 UF73 (LOAD UNLOAD PREVIEW
MAP DATA 71 UF74 72 UF75 73 UF76 74 UF77 (LOAD UNLOAD PREVIEW
MAP DATA 75 UN8 76 UF81 77 UF82 78 UF83 (LOAD UNLOAD PREVIEW
MAP DATA 79 UF84 80 UF85 81 UF86 82 UF87 (LOAD UNLOAD PREVIEW
MAP DATA 83 UN9 84 UF91 85 UF92 86 UF93 (LOAD UNLOAD PREVIEW
MAP DATA 87 UF94 88 UF95 89 UF96 90 UF97 (LOAD UNLOAD PREVIEW
MAP DATA 91 UN10 92 UF101 93 UF102 94 UF103 (LOAD UNLOAD PREVIEW
MAP DATA 95 UF104 96 UF105 97 UF106 98 UF107 (LOAD UNLOAD PREVIEW
MAP DATA 99 UN11 100 UF111 101 UF112 102 UF113 (LOAD UNLOAD PREVIEW
MAP DATA 101 UF114 102 UF115 103 UF116 104 UF117 (LOAD UNLOAD PREVIEW
MAP DATA 107 UN12 108 UF121 109 UF122 110 UF123 (LOAD UNLOAD PREVIEW
MAP DATA 111 UF124 112 UF125 113 UF126 114 UF127 (LOAD UNLOAD PREVIEW
MAP DATA 115 UN13 116 UF131 117 UF132 118 UF133 (LOAD UNLOAD PREVIEW
MAP DATA 119 UF134 120 UF135 121 UF136 122 UF137 (LOAD UNLOAD PREVIEW
MAP DATA 123 UN14 124 UF141 125 UF142 126 UF143 (LOAD UNLOAD PREVIEW
MAP DATA 127 UF144 128 UF145 129 UF146 130 UF147 (LOAD UNLOAD PREVIEW
MAP DATA 131 UN15 132 UF151 133 UF152 134 UF153 (LOAD UNLOAD PREVIEW
MAP DATA 135 UF154 136 UF155 137 UF156 138 UF157 (LOAD UNLOAD PREVIEW
MAP DATA 139 ECODE (LOAD UNLOAD PREVIEW

&NAME = &CONCAT OF SN &M
&SNAMEx = &NAME

&COMMAND EXECIO 1 DISKR YEAR TEMP X &YR (FINIS
&READ STRING &YEAR
&YRNO = &CONCAT OF &YR YR

Appendix A. LISTING OF EXEC 2 PROGRAMS
186
&N = &M - 1
&N1 = &NU + 5
&N2 = &YR - 1
&N3 = &MULT OF &N1 &N2
&LN = &MULT OF &N &N1
&LN = &MULT OF &LN &NY
&LN = &LN + &N3
&LN = &LN + 1

&COMMAND EXECIO &N1 DISKR OPTION3 DATA X &LN (FINIS)

&N = 0
&LOOP -OPT31YRL 3
&N = &N + 1
&V1 = &CONCAT OF DF &N 1
&V2 = &CONCAT OF DF &N 2
&V3 = &CONCAT OF DF &N 3
&V4 = &CONCAT OF DF &N 4
&V5 = &CONCAT OF DF &N 5
&READ VAR &V1 &V2 &V3 &V4 &V5
&&V1 = &RIGHT OF &V1 6
&&V2 = &RIGHT OF &V2 6
&&V3 = &RIGHT OF &V3 6
&&V4 = &RIGHT OF &V4 6
&&V5 = &RIGHT OF &V5 6
-OPT31YRL

&N = 0
&J = 0
&LOOP -OPT32YRL &NU
&N = &N + 1
&READ VAR &V1 &V2 &V3 &V4 &V5 &V6 &V7
&&NAME = &CONCAT OF 1 &N
&IF .&&NAME EQ .0 &GOTO -OPT32YRL
&J = &J + 1
&&NAME = &CONCAT OF UN &J
&&NAME1 = &CONCAT OF UNAM &N
&&NAME = &&NAME1
&&V1 = &CONCAT OF UF &J 1
&&V2 = &CONCAT OF UF &J 2
&&V3 = &CONCAT OF UF &J 3
&&V4 = &CONCAT OF UF &J 4
&&V5 = &CONCAT OF UF &J 5
&&V6 = &CONCAT OF UF &J 6
&&V7 = &CONCAT OF UF &J 7
&&V1 = &V1
&&V2 = &V2
&&V3 = &V3
&&V4 = &V4
&&V5 = &V5
&&V6 = &V6
&&V7 = &V7

&&V1 = &RIGHT OF &&V1 6
&&V2 = &RIGHT OF &&V2 6
&&V3 = &RIGHT OF &&V3 6
&&V4 = &RIGHT OF &&V4 6
&&V5 = &RIGHT OF &&V5 6
&&V6 = &RIGHT OF &&V6 6
&&V7 = &RIGHT OF &&V7 6
-OPT32YRL

&N = &J + 1
&&V1 = &CONCAT OF UF &N 1
&&V2 = &CONCAT OF UF &N 2
&&V3 = &CONCAT OF UF &N 3
&&V4 = &CONCAT OF UF &N 4

Appendix A. LISTING OF EXEC 2 PROGRAMS 187
&V1 = &CONCAT OF UF &N 1
&V2 = &CONCAT OF UF &N 2
&V3 = &CONCAT OF UF &N 3
&V4 = &CONCAT OF UF &N 4
&V5 = &CONCAT OF UF &N 5
&V6 = &CONCAT OF UF &N 6
&V7 = &CONCAT OF UF &N 7
&READ VAR &&V1 &&V2 &&V3 &&V4 &&V5 &&V6 &&V7
&&V1 = &RIGHT OF &&V1 6
&&V2 = &RIGHT OF &&V2 6
&&V3 = &RIGHT OF &&V3 6
&&V4 = &RIGHT OF &&V4 6
&&V5 = &RIGHT OF &&V5 6
&&V6 = &RIGHT OF &&V6 6
&&V7 = &RIGHT OF &&V7 6
&NAME = &CONCAT OF UN &N
&&NAME = TOTAL

&N = &J + 3
&V2 = &CONCAT OF UF &N 2
&V3 = &CONCAT OF UF &N 3
&V4 = &CONCAT OF UF &N 4
&V5 = &CONCAT OF UF &N 5
&V6 = &CONCAT OF UF &N 6
&&V2 = = = = =
&&V3 = = = = =
&&V4 = = = = =
&&V5 = = = = =
&&V6 = = = = =

&N = &J + 4
&V2 = &CONCAT OF UF &N 2
&V3 = &CONCAT OF UF &N 3
&V4 = &CONCAT OF UF &N 4
&V5 = &CONCAT OF UF &N 5
&V6 = &CONCAT OF UF &N 6
&READ VAR &&V2 &&V3 &&V4 &&V5 &&V6 &&V7
&&V2 = &RIGHT OF &&V2 6
&&V3 = &RIGHT OF &&V3 6
&&V4 = &RIGHT OF &&V4 6
&&V5 = &RIGHT OF &&V5 6
&&V6 = &RIGHT OF &&V6 6
&NAME = &CONCAT OF UN &N
&&NAME = &CONCAT OF ENDING &BLANK BALANCE

DISPLAY
&IF &RSTATUS = PF10 &GOTO -OPT3QUIT
&IF &RSTATUS EQ ENTER &GOTO -OPT3YRL
&ECODE = &STRING OF UNDEFINED PF KEY!
SIGNAL
&SKIP -5

-OPT3YRL
&RETURN

-OPT3QUIT
&QUIT = YES
&RETURN
OPTION 4 - SOURCE EXPENDITURES

-OPTION4

&CALL -OPT4
&GOTO -MENU

-OPT4

* SELECT USE

&COMMAND EXECIO &DISKR INIT TEMP X 1 (FINIS
&READ VAR &NS &NU &NY

&COMMAND EXECIO &NS DISKR SOURCEN TEMP X 1 (FINIS
&M = 0
&LOOP 3 &NS
&M = &M + 1
&NAME = &CONCAT OF SNAM &M
&READ STRING &&NAME

&NSRC = &M + 1
&NAME = &CONCAT OF SNAM &NSRC
&NAME = DEFICIT

&COMMAND EXECIO &NU DISKR USEN TEMP X 1 (FINIS
&M = 0
&LOOP 3 &NU
&M = &M + 1
&NAME = &CONCAT OF UNAM &M
&READ STRING &&NAME

-SELUSE

&QUIT = NO

USE SELUSE

MAP DATA 1 UN1 2 UN2 3 UN3 4 UN4 5 UN5 (LOAD UNLOAD PREVIEW
MAP DATA 6 UN6 7 UN7 8 UN8 9 UN9 10 UN10 (LOAD UNLOAD PREVIEW
MAP DATA 11 UN11 12 UN12 13 UN13 14 UN14 15 UN15 (LOAD UNLOAD PREVIEW
MAP DATA 16 UN16 17 UN17 18 UN18 19 UN19 20 UN20 (LOAD UNLOAD PREVIEW
MAP DATA 21 ECODE (LOAD UNLOAD PREVIEW

&M = 0
&LOOP 5 &NU
&M = &M + 1
&NAME = &CONCAT OF UN &M
&NAME! = &CONCAT OF UNAM &M
&NAME = &&NAME!
&NAME = &CONCAT OF &BLANK &&NAME

&ALLU = &NU + 1
&NAME = &CONCAT OF UN &ALLU
&NAME = &CONCAT OF &BLANK ALL &BLANK USES

&TEMPN = &ALLU

&IF &TEMPN GE 20 &GOTO -DISPUSE
&TEMPN = &TEMPN + 1
&NAME = &CONCAT OF UN &TEMPN
SET &NAME (PRO
&SKIP -4

-DISPUSE
&UN = 0

Appendix A. LISTING OF EXEC 2 PROGRAMS
DISPLAY

&IF &RSTATUS = PFIO &RETURN
&IF &RCURSOR = UN1 &UN = 1
&IF &RCURSOR = UN2 &UN = 2
&IF &RCURSOR = UN3 &UN = 3
&IF &RCURSOR = UN4 &UN = 4
&IF &RCURSOR = UN5 &UN = 5
&IF &RCURSOR = UN6 &UN = 6
&IF &RCURSOR = UN7 &UN = 7
&IF &RCURSOR = UN8 &UN = 8
&IF &RCURSOR = UN9 &UN = 9
&IF &RCURSOR = UN10 &UN = 10
&IF &RCURSOR = UN11 &UN = 11
&IF &RCURSOR = UN12 &UN = 12
&IF &RCURSOR = UN13 &UN = 13
&IF &RCURSOR = UN14 &UN = 14
&IF &RCURSOR = UN15 &UN = 15
&IF &RCURSOR = UN16 &UN = 16
&IF &RCURSOR = UN17 &UN = 17
&IF &RCURSOR = UN18 &UN = 18
&IF &RCURSOR = UN19 &UN = 19
&IF &RCURSOR = UN20 &UN = 20
&IF &RSTATUS EQ ENTER &GOTO -USESLLCTD
&ECODE = &STRING OF UNDEFINED PF KEY!
&SIGNAL &GOTO -DISPSE
-USESLLCTD
&IF &UN NE &ALLU &GOTO -SPECUSE
&M = 0
&LOOP -ALLUSE &NU
&M = &M + 1
&CALL -OPT4SUB
&IF .&QUIT EQ ,YES &GOTO -SELUSE
-ALLUSE

&GOTO -SELUSE

-SPECUSE
&M = &UN
&CALL -OPT4SUB
&GOTO -SELUSE

-OPT4SUB

USE EXPSRC1

MAP DATA 1 UNAME 2 YEAR (LOAD UNLOAD PREVIEW
MAP DATA 3 SN1 4 SF11 5 SF12 6 SF13 (LOAD UNLOAD PREVIEW
MAP DATA 7 SF14 8 SF15 9 SF16 (LOAD UNLOAD PREVIEW
MAP DATA 10 SN2 11 SF21 12 SF22 13 SF23 (LOAD UNLOAD PREVIEW
MAP DATA 14 SF24 15 SF25 16 SF26 (LOAD UNLOAD PREVIEW
MAP DATA 17 SN3 18 SF31 19 SF32 20 SF33 (LOAD UNLOAD PREVIEW
MAP DATA 21 SF34 22 SF35 23 SF36 (LOAD UNLOAD PREVIEW
MAP DATA 24 SN4 25 SF41 26 SF42 27 SF43 (LOAD UNLOAD PREVIEW
MAP DATA 28 SF44 29 SF45 30 SF46 (LOAD UNLOAD PREVIEW
MAP DATA 31 SN5 32 SF51 33 SF52 34 SF53 (LOAD UNLOAD PREVIEW
MAP DATA 35 SF54 36 SF55 37 SF56 (LOAD UNLOAD PREVIEW
MAP DATA 38 SN6 39 SF61 40 SF62 41 SF63 (LOAD UNLOAD PREVIEW
MAP DATA 42 SF64 43 SF65 44 SF66 (LOAD UNLOAD PREVIEW
MAP DATA 45 SN7 46 SF71 47 SF72 48 SF73 (LOAD UNLOAD PREVIEW
MAP DATA 49 SF74 50 SF75 51 SF76 (LOAD UNLOAD PREVIEW
MAP DATA 52 SN8 53 SF81 54 SF82 55 SF83 (LOAD UNLOAD PREVIEW
MAP DATA 56 SF84 57 SF85 58 SF86 (LOAD UNLOAD PREVIEW
MAP DATA 59 SN9 60 SF91 61 SF92 62 SF93 (LOAD UNLOAD PREVIEW
MAP DATA 63 SF94 64 SF95 65 SF96 (LOAD UNLOAD PREVIEW
MAP DATA 66 SN10 67 SF101 68 SF102 69 SF103 (LOAD UNLOAD PREVIEW
MAP DATA 70 SF104 71 SF105 72 SF106 (LOAD UNLOAD PREVIEW
MAP DATA 73 SN11 74 SF111 75 SF112 76 SF113 (LOAD UNLOAD PREVIEW
MAP DATA 77 SF114 78 SF115 79 SF116 (LOAD UNLOAD PREVIEW
MAP DATA 80 SN12 81 SF121 82 SF122 83 SF123 (LOAD UNLOAD PREVIEW
MAP DATA 84 SF124 85 SF125 86 SF126 (LOAD UNLOAD PREVIEW

Appendix A. LISTING OF EXEC 2 PROGRAMS 190
APPENDIX A. LISTING OF EXEC 2 PROGRAMS

&NAME = &CONCAT OF UN &M
&UNAME = &&NAME

&COMMAND EXECIO 1 DISKR YEAR TEMP X 1 (FINIS
&READ STRING &YEAR

&N = &M + 1
&N1 = &NSRC + 1
&LN = &MULT OF &N &N1
&LN = &MULT OF &LN &NY
&LN = &LN + 1

&COMMAND EXECIO &N1 DISKR OPTION4 DATA X &LN (FINIS

&J = 0
&LOOP 3 &NSRC
&J = &J + 1
&NAME = &CONCAT OF I &J
&&NAME = 0

&N = 0
&J = 0
&LOOP -OPT42YR1 &NSRC
&N = &N + 1
&READ VAR &V1 &V2 &V3 &V4 &V5 &V6
&IF &V1 EQ 0 &GOTO -OPT42YR1

&NAME = &CONCAT OF I &N
&&NAME = 1
&J = &J + 1
&NAME = &CONCAT OF SN &J
&NAME1 = &CONCAT OF SNAM &N
&&NAME = &&NAME1

&V1 = &CONCAT OF SF &J 1
&V2 = &CONCAT OF SF &J 2
&V3 = &CONCAT OF SF &J 3
&V4 = &CONCAT OF SF &J 4
&V5 = &CONCAT OF SF &J 5
&V6 = &CONCAT OF SF &J 6

&&V1 = &V1
&&V2 = &V2
&&V3 = &V3
&&V4 = &V4
&&V5 = &V5
&&V6 = &V6

Appendix A. LISTING OF EXEC 2 PROGRAMS

191
&N = &I + 1
&V1 = &CONCAT OF SF &N 1
&V2 = &CONCAT OF SF &N 2
&V3 = &CONCAT OF SF &N 3
&V4 = &CONCAT OF SF &N 4
&V5 = &CONCAT OF SF &N 5
&V6 = &CONCAT OF SF &N 6
&V1 = 
&V2 = 
&V3 = 
&V5 = 
&V6 = 

&N = &I + 2
&V1 = &CONCAT OF SF &N 1
&V2 = &CONCAT OF SF &N 2
&V3 = &CONCAT OF SF &N 3
&V4 = &CONCAT OF SF &N 4
&V5 = &CONCAT OF SF &N 5
&V6 = &CONCAT OF SF &N 6
&READ VAR &&VI &&V2 &&V3 &&V4 &&VS &&V6
&&VI = &RIGHT OF &&VI 6
&&V2 = &RIGHT OF &&V2 6
&&V3 = &RIGHT OF &&V3 6
&&V4 = &RIGHT OF &&V4 6
&&VS = &RIGHT OF &&VS 6
&&V6 = &RIGHT OF &&V6 6
&NAME = &CONCAT OF SN &N
&&NAME = TOTAL

DISPLAY
&IF &RSTATUS = PF10 &GOTO -OPT4QUIT
&IF &RSTATUS EQ ENTER &GOTO -OPT4CONT
&ECODE = &STRING OF UNDEFINED PF KEY!
SIGNAL
&SKIP -5

-OPT4CONT

&YR = 1
&YRLEFT = &NY - 1
&LOOP -OPT4YRL &YRLEFT
&YR = &YR + 1

USE EXPSRC2
MAP DATA 1 UNAME 2 YEAR 3 YRNO (LOAD UNLOAD PREVIEW
MAP DATA 4 SN1 5 SF11 6 SF12 7 SF13 (LOAD UNLOAD PREVIEW
MAP DATA 8 SF14 9 SF15 10 SF16 11 SF17 (LOAD UNLOAD PREVIEW
MAP DATA 12 SN2 13 SF21 14 SF22 15 SF23 (LOAD UNLOAD PREVIEW
MAP DATA 16 SF24 17 SF25 18 SF26 19 SF27 (LOAD UNLOAD PREVIEW
MAP DATA 20 SN3 21 SF31 22 SF32 23 SF33 (LOAD UNLOAD PREVIEW
MAP DATA 24 SF34 25 SF35 26 SF36 27 SF37 (LOAD UNLOAD PREVIEW
MAP DATA 28 SN4 29 SF41 30 SF42 31 SF43 (LOAD UNLOAD PREVIEW
MAP DATA 32 SF44 33 SF45 34 SF46 35 SF47 (LOAD UNLOAD PREVIEW
MAP DATA 36 SN5 37 SF51 38 SF52 39 SF53 (LOAD UNLOAD PREVIEW
MAP DATA 40 SF54 41 SF55 42 SF56 43 SF57 (LOAD UNLOAD PREVIEW
MAP DATA 44 SN6 45 SF61 46 SF62 47 SF63 (LOAD UNLOAD PREVIEW
MAP DATA 48 SF64 49 SF65 50 SF66 51 SF67 (LOAD UNLOAD PREVIEW
MAP DATA 52 SN7 53 SF71 54 SF72 55 SF73 (LOAD UNLOAD PREVIEW
MAP DATA 56 SF74 57 SF75 58 SF76 59 SF77 (LOAD UNLOAD PREVIEW
MAP DATA 60 SN8 61 SF81 62 SF82 63 SF83 (LOAD UNLOAD PREVIEW
MAP DATA 64 SF84 65 SF85 66 SF86 67 SF87 (LOAD UNLOAD PREVIEW
MAP DATA 68 SN9 69 SF91 70 SF92 71 SF93 (LOAD UNLOAD PREVIEW
MAP DATA 72 SN10 73 SF101 74 SF102 75 SF103 (LOAD UNLOAD PREVIEW
MAP DATA 76 SN10 77 SF101 78 SF102 79 SF103 (LOAD UNLOAD PREVIEW
MAP DATA 80 SF104 81 SF105 82 SF106 83 SF107 (LOAD UNLOAD PREVIEW
MAP DATA 84 SN11 85 SF111 86 SF112 87 SF113 (LOAD UNLOAD PREVIEW

Appendix A. LISTING OF EXEC 2 PROGRAMS 192
Appendix A. LISTING OF EXEC 2 PROGRAMS
&&V3 = &RIGHT OF &&V3 6
&&V4 = &RIGHT OF &&V4 6
&&V5 = &RIGHT OF &&V5 6
&&V6 = &RIGHT OF &&V6 6
&&V7 = &RIGHT OF &&V7 6

-OPT42YRL

&&V1 = &RIGHT OF &&V1 6
&&V2 = &RIGHT OF &&V2 6
&&V3 = &RIGHT OF &&V3 6
&&V4 = &RIGHT OF &&V4 6
&&V5 = &RIGHT OF &&V5 6
&&V6 = &RIGHT OF &&V6 6
&&V7 = &RIGHT OF &&V7 6

-OPT4YRL

&RETURN

-OPT4QUIT

&QUIT = YES

&RETURN

********************************************************************
*
* OPTION 5 - SOURCE EXPENDITURES THRU TIME
*
********************************************************************

-OPTIONS

&CALL -OPT5
&GOTO -MENU
-OPTS

* FIRST YEAR

USE SRCEXP1
MAP DATA 2 SN1 3 SF11 4 SF12 5 SF13 (LOAD UNLOAD PREVIEW)
MAP DATA 6 SF14 7 SF15 8 SF16 9 SF17 (LOAD UNLOAD PREVIEW)
MAP DATA 10 SN2 11 SF21 12 SF22 13 SF23 (LOAD UNLOAD PREVIEW)
MAP DATA 14 SF24 15 SF25 16 SF26 17 SF27 (LOAD UNLOAD PREVIEW)
MAP DATA 18 SN3 19 SF31 20 SF32 21 SF33 (LOAD UNLOAD PREVIEW)
MAP DATA 22 SF34 23 SF35 24 SF36 25 SF37 (LOAD UNLOAD PREVIEW)
MAP DATA 26 SN4 27 SF41 28 SF42 29 SF43 (LOAD UNLOAD PREVIEW)
MAP DATA 30 SF44 31 SF45 32 SF46 33 SF47 (LOAD UNLOAD PREVIEW)
MAP DATA 34 SN5 35 SF51 36 SF52 37 SF53 (LOAD UNLOAD PREVIEW)
MAP DATA 38 SF54 39 SF55 40 SF56 41 SF57 (LOAD UNLOAD PREVIEW)
MAP DATA 42 SN6 43 SF61 44 SF62 45 SF63 (LOAD UNLOAD PREVIEW)
MAP DATA 46 SF64 47 SF65 48 SF66 49 SF67 (LOAD UNLOAD PREVIEW)
MAP DATA 50 SN7 51 SF71 52 SF72 53 SF73 (LOAD UNLOAD PREVIEW)
MAP DATA 54 SF74 55 SF75 56 SF76 57 SF77 (LOAD UNLOAD PREVIEW)
MAP DATA 58 SN8 59 SF81 60 SF82 61 SF83 (LOAD UNLOAD PREVIEW)
MAP DATA 62 SF84 63 SF85 64 SF86 65 SF87 (LOAD UNLOAD PREVIEW)
MAP DATA 66 SN9 67 SF91 68 SF92 69 SF93 (LOAD UNLOAD PREVIEW)
MAP DATA 70 SN10 71 SF94 72 SF95 73 SF96 (LOAD UNLOAD PREVIEW)
MAP DATA 74 SF97 75 SF101 76 SF102 77 SF103 (LOAD UNLOAD PREVIEW)
MAP DATA 78 SF104 79 SF105 80 SF106 81 SF107 (LOAD UNLOAD PREVIEW)
MAP DATA 82 SN11 83 SF111 84 SF112 85 SF113 (LOAD UNLOAD PREVIEW)
MAP DATA 86 SF114 87 SF115 88 SF116 89 SF117 (LOAD UNLOAD PREVIEW)
MAP DATA 90 SN12 91 SF121 92 SF122 93 SF123 (LOAD UNLOAD PREVIEW)
MAP DATA 94 SF124 95 SF125 96 SF126 97 SF127 (LOAD UNLOAD PREVIEW)
MAP DATA 98 SN13 99 SF131 100 SF132 101 SF133 (LOAD UNLOAD PREVIEW)
MAP DATA 102 SF134 103 SF135 104 SF136 105 SF137 (LOAD UNLOAD PREVIEW)
MAP DATA 106 SN14 107 SF141 108 SF142 109 SF143 (LOAD UNLOAD PREVIEW)
MAP DATA 110 SF144 111 SF145 112 SF146 113 SF147 (LOAD UNLOAD PREVIEW)
MAP DATA 114 SN15 115 SF151 116 SF152 117 SF153 (LOAD UNLOAD PREVIEW)
MAP DATA 118 SF154 119 SF155 120 SF156 121 SF157 (LOAD UNLOAD PREVIEW)
MAP DATA 122 SN16 123 SF161 124 SF162 125 SF163 (LOAD UNLOAD PREVIEW)
MAP DATA 126 SF164 127 SF165 128 SF166 129 SF167 (LOAD UNLOAD PREVIEW)
MAP DATA 130 SN17 131 SF171 132 SF172 133 SF173 (LOAD UNLOAD PREVIEW)
MAP DATA 134 SF174 135 SF175 136 SF176 137 SF177 (LOAD UNLOAD PREVIEW)
MAP DATA 138 SN18 139 SF181 140 SF182 141 SF183 (LOAD UNLOAD PREVIEW)
MAP DATA 142 SF184 143 SF185 144 SF186 145 SF187 (LOAD UNLOAD PREVIEW)
MAP DATA 146 SN19 147 SF191 148 SF192 149 SF193 (LOAD UNLOAD PREVIEW)
MAP DATA 150 SF194 151 SF195 152 SF196 153 SF197 (LOAD UNLOAD PREVIEW)
MAP DATA 154 SN20 155 SF201 156 SF202 157 SF203 (LOAD UNLOAD PREVIEW)
MAP DATA 158 SF204 159 SF205 160 SF206 161 SF207 (LOAD UNLOAD PREVIEW)

&COMMAND EXECIO 1 DISKR INIT TEMP X 1 (FINIS)
&READ VAR &NS &NU &NY
&NSRC = &NS + 1
&COMMAND EXECIO &NS DISKR SOURCEN TEMP X 1 (FINIS)
&M = 0
&LOOP 3 &NS
&M = &M + 1
&NAME = &CONCAT OF SN &M
&READ STRING &NAME
&NAME = &CONCAT OF SN &NSRC
&NAME = DEFICIT
&COMMAND EXECIO 1 DISKR YEAR TEMP X 1 (FINIS)
&READ STRING &YEAR

&NL = &NSRC + 1
&COMMAND EXECIO &NL DISKR OPTION5 DATA X 1 (FINIS)
&M = 0
&LOOP -OPT5YR1 &NSRC
&M = &M + 1
&VI = &CONCAT OF SF &M 1
&V2 = &CONCAT OF SF &M 2

Appendix A. LISTING OF EXEC 2 PROGRAMS 195
&V3 = &CONCAT OF SF &M 3
&V4 = &CONCAT OF SF &M 4
&V5 = &CONCAT OF SF &M 5
&V6 = &CONCAT OF SF &M 6
&V7 = &CONCAT OF SF &M 7

&READ VAR &V1 &V2 &V3 &V4 &V5 &V6 &V7

&V1 = &RIGHT OF &V1 6
&V2 = &RIGHT OF &V2 6
&V3 = &RIGHT OF &V3 6
&V4 = &RIGHT OF &V4 6
&V5 = &RIGHT OF &V5 6
&V6 = &RIGHT OF &V6 6
&V7 = &RIGHT OF &V7 6

-OPTSYR1

&M = &NSRC + 1
&V1 = &CONCAT OF SF &M 1
&V2 = &CONCAT OF SF &M 2
&V3 = &CONCAT OF SF &M 3
&V4 = &CONCAT OF SF &M 4
&V5 = &CONCAT OF SF &M 5
&V6 = &CONCAT OF SF &M 6
&V7 = &CONCAT OF SF &M 7

&VJ = &RIGHT OF &VI 6
&V2 = &RIGHT OF &V2 6
&V3 = &RIGHT OF &V3 6
&V4 = &RIGHT OF &V4 6
&V5 = &RIGHT OF &V5 6
&V6 = &RIGHT OF &V6 6
&V7 = &RIGHT OF &V7 6

&NAME = &CONCAT OF SN &M

&NAME = TOTAL DISPLAY

* SUCCEEDING YEARS

USE SRCEXP2

MAP DATA 1 YEAR 2 YRNO (LOAD UNLOAD PREVIEW)
MAP DATA 3 SN1 4 SF11 5 SF12 6 SF13 (LOAD UNLOAD PREVIEW)
MAP DATA 7 SF14 8 SF15 9 SF16 10 SF17 (LOAD UNLOAD PREVIEW)
MAP DATA 11 SN2 12 SF21 13 SF22 14 SF23 (LOAD UNLOAD PREVIEW)
MAP DATA 15 SF24 16 SF25 17 SF26 18 SF27 (LOAD UNLOAD PREVIEW)
MAP DATA 19 SN3 20 SF31 21 SF32 22 SF33 (LOAD UNLOAD PREVIEW)
MAP DATA 23 SF34 24 SF35 25 SF36 26 SF37 (LOAD UNLOAD PREVIEW)
MAP DATA 27 SN4 28 SF41 29 SF42 30 SF43 (LOAD UNLOAD PREVIEW)
MAP DATA 31 SF44 32 SF45 33 SF46 34 SF47 (LOAD UNLOAD PREVIEW)
MAP DATA 35 SN5 36 SF51 37 SF52 38 SF53 (LOAD UNLOAD PREVIEW)
MAP DATA 39 SF54 40 SF55 41 SF56 42 SF57 (LOAD UNLOAD PREVIEW)
MAP DATA 43 SN6 44 SF61 45 SF62 46 SF63 (LOAD UNLOAD PREVIEW)
MAP DATA 47 SF64 48 SF65 49 SF66 50 SF67 (LOAD UNLOAD PREVIEW)
MAP DATA 51 SN7 52 SF71 53 SF72 54 SF73 (LOAD UNLOAD PREVIEW)
MAP DATA 55 SF74 56 SF75 57 SF76 58 SF77 (LOAD UNLOAD PREVIEW)
MAP DATA 59 SN8 60 SF81 61 SF82 62 SF83 (LOAD UNLOAD PREVIEW)
MAP DATA 63 SF84 64 SF85 65 SF86 66 SF87 (LOAD UNLOAD PREVIEW)

Appendix A. LISTING OF EXEC 2 PROGRAMS 196
&COMMAND EXECIO &NS DISKR SOURCEN TEMP X 1 (FINIS
&M = 0
&LOOP 3 &&NS
&M = &M + 1
&NAME = &CONCAT OF SN &M
&READ STRING &&NAME

&N = 1
&NYLEFT = &NY - 1
&LOOP -OPT5YRS &NYLEFT
&N = &N + 1

&COMMAND EXECIO 1 DISKR YEAR TEMP X &N (FINIS
&READ STRING &YEAR

&YRNO = &N
&YRNO = &CONCAT OF &YRNO YR
&M = &N - 1
&NL = &NSRC + 1
&LN = &MULT OF &NL &M
&LN = &LN + 1
&COMMAND EXECIO &NL DISKR OPTIONS DATA X &LN (FINIS
&M = 0
&LOOP -OPT5YR2 &NSRC
&M = &M + 1
&V1 = &CONCAT OF SF &M 1
&V2 = &CONCAT OF SF &M 2
&V3 = &CONCAT OF SF &M 3
&V4 = &CONCAT OF SF &M 4
&V5 = &CONCAT OF SF &M 5
&V6 = &CONCAT OF SF &M 6
&V7 = &CONCAT OF SF &M 7
&READ VAR &&V1 &&V2 &&V3 &&V4 &&V5 &&V6 &&V7
&V1 = &RIGHT OF &&V1 6
&V2 = &RIGHT OF &&V2 6
&V3 = &RIGHT OF &&V3 6
&V4 = &RIGHT OF &&V4 6
&V5 = &RIGHT OF &&V5 6
&V6 = &RIGHT OF &&V6 6
&V7 = &RIGHT OF &&V7 6
-OPT5YR2

Appendix A. LISTING OF EXEC 2 PROGRAMS 197
&M = &NSRC + 1
&V1 = &CONCAT OF SF &M 1
&V2 = &CONCAT OF SF &M 2
&V3 = &CONCAT OF SF &M 3
&V4 = &CONCAT OF SF &M 4
&V5 = &CONCAT OF SF &M 5
&V6 = &CONCAT OF SF &M 6
&V7 = &CONCAT OF SF &M 7
&&V1 =
&&V2 =
&&V3 =
&&V4 =
&&V5 =
&&V6 =
&&V7 =

&M = &NSRC + 2
&V1 = &CONCAT OF SF &M 1
&V2 = &CONCAT OF SF &M 2
&V3 = &CONCAT OF SF &M 3
&V4 = &CONCAT OF SF &M 4
&V5 = &CONCAT OF SF &M 5
&V6 = &CONCAT OF SF &M 6
&V7 = &CONCAT OF SF &M 7
&READ VAR &&V1 &&V2 &&V3 &&V4 &&V5 &&V6 &&V7
&&V1 = &RIGHT OF &V1 6
&&V2 = &RIGHT OF &V2 6
&&V3 = &RIGHT OF &V3 6
&&V4 = &RIGHT OF &V4 6
&&V5 = &RIGHT OF &V5 6
&&V6 = &RIGHT OF &V6 6
&&V7 = &RIGHT OF &V7 6
&NAME = &CONCAT OF SN &M
&&NAME = TOTAL
&DISPLAY
-OPTSYRS
&RETURN

*******************************************************************************
*                  OPTION 6 - ALL REPORTS
*******************************************************************************

-OPTION6
&CALL -OPT1
&CALL -OPT2
&CALL -OPT3
&CALL -OPT4
&CALL -OPT5
&GOTO -MENU

*******************************************************************************
*                  OPTION 7 - PRINT ALL REPORTS
*******************************************************************************

-OPTION7
&PRESUME &COMMAND
FILEDEF FT01F001 DISK INIT  TEMP X
FILEDEF FT02F001 DISK SOURCEN TEMP X
FILEDEF FT03F001 DISK USERN TEMP X
FILEDEF FT04F001 DISK YEAR TEMP X
FILEDEF FT11F001 DISK OPTION1 DATA X
FILEDEF FT12F001 DISK OPTION2 DATA X
FILEDEF FT13F001 DISK OPTION3 DATA X
FILEDEF FT14F001 DISK OPTION4 DATA X
FILEDEF FT15F001 DISK OPTION5 DATA X
FILEDEF FT21F001 DISK REPTS LISTING X (LRECL 132 BLKSIZE 132 RECFM F

Appendix A. LISTING OF EXEC 2 PROGRAMS 198
PRNTRPTS
PRINT REPTS LISTING X
ERASE REPTS LISTING X

EUDEXEC2
&PRESUME &SUBCOMMAND DISPLAY

USE SELOUT
MAP DATA 1 ECODE (LOAD UNLOAD PREVIEW
&ECODE = &STRING OF REPORTS SENT TO PRINTER
SIGNAL
&GOTO -ERRMAIN

-END

&PRESUME &COMMAND

ERASE OPTION1 DATA X
ERASE OPTION2 DATA X
ERASE OPTION3 DATA X
ERASE OPTION4 DATA X
ERASE OPTION5 DATA X
ERASE YEAR TEMP X
ERASE INIT TEMP X
ERASE CONST TEMP X
ERASE USEN TEMP X
ERASE USED TEMP X
ERASE SOURCEN TEMP X
ERASE SOURCED TEMP X
ERASE ALLOCATN TEMP X

&EXIT
A.8 RUNMODEL

* OPTION 6 - RUN X MODEL *

&TRACE OFF

EUDEXEC2
&PRESUME &SUBCOMMAND DISPLAY

* DISPLAY PLANNING HORIZON AND NUMBER OF SOURCES AND USES *

USE MODWARN
MAP DATA 1 ECODE (LOAD UNLOAD PREVIEW
-ERRWARN DISPLAY
&IF &RSTATUS = PF10 &GOTO -QUIT
&IF &RSTATUS EQ ENTER &SKIP 3
&ECODE = &STRING OF UNDEFINED PF KEY!
SIGNAL
&GOTO -ERRWARN

&COMMAND EXECIO 1 DISKR INIT DATA X 1 (FINIS
&READ VAR &NS &NU &NY &STYR

&COMMAND EXECIO &NU DISKR USEN DATA X 1 (FINIS
&N = 0
&LOOP 3 &NU
&N = &N + 1
&NAME = &CONCAT OF U &N
&READ STRING &NAME

&COMMAND EXECIO &NS DISKR SOURCEN DATA X 1 (FINIS
&N = 0
&LOOP 3 &NS
&N = &N + 1
&NAME = &CONCAT OF S &N
&READ STRING &NAME

USE MODDATA
MAP DATA 1 NSRC 2 NUSE 3 NYRS 4 STARYR 5 ECODE (LOAD UNLOAD PREVIEW
&NSRC = &NS
&NUSE = &NU
&NYRS = &NY
&STARYR = &STYR
-ERRMODD DISPLAY
&IF &RSTATUS = PF10 &GOTO -QUIT
&IF &RSTATUS EQ ENTER &SKIP 3
&ECODE = &STRING OF UNDEFINED PF KEY!
SIGNAL
&GOTO -ERRMODD

* MODEL OPTION - EXISTING VS NEW *

-MODLOPTN.
&COMMAND EXECIO &NU DISKR USEN DATA X 1 (FINIS
&N = 0
&LOOP 3 &NU
&N = &N + 1
&NAME = &CONCAT OF U &N
&READ STRING &NAME

&COMMAND EXECIO &NS DISKR SOURCEN DATA X 1 (FINIS
&N = 0
&LOOP 3 &NS
&N = &N + 1
&NAME = &CONCAT OF S &N
&READ STRING &NAME

&COMMAND EXECIO &NS DISKR CONST DATA X 1 (FINIS
&N = 0
&LOOP 9 &NS
&READ VAR &Y1 &Y2 &Y3 &Y4 &Y5 &Y6 &Y7 &Y8 &Y9 &Y10 &Y11 &Y12 &Y13 &Y14 &Y15 &Y16
&M = 0
&LOOP 4 &NU
&M = &M + 1
&NAME1 = &CONCAT OF C &N &M
&NAME2 = &CONCAT OF Y &M
&NAME1 = &NAME2
&M = &NY + 1
&M = &MULT OF &M &NS
&COMMAND EXECIO &M DISKR SOURCED DATA X 1 (FINIS
&N = 0
&LOOP -EACHSRC &NS
&N = &N + 1
&K = 0
&IBAL = &CONCAT OF T &N &K
&READ VAR &IBAL
&M = -4
&LOOP -EACHYEAR &NY
&K = &K + 4
&Q1 = &K + 1
&Q2 = &K + 2
&Q3 = &K + 3
&Q4 = &K + 4
&VAL1 = &CONCAT OF T &N &Q1
&VAL2 = &CONCAT OF T &N &Q2
&VAL3 = &CONCAT OF T &N &Q3
&VAL4 = &CONCAT OF T &N &Q4
&READ VAR &VAL1 &VAL2 &VAL3 &VAL4
&NAME = &CONCAT OF T &N &I
&NAME = &NAME + &IBAL
-EACHSRC

&M = &NY
&M = &MULT OF &M &NU
&COMMAND EXECIO &M DISKR USED DATA X 1 (FINIS
&N = 0
&LOOP -EACHUSE &NU
&N = &N + 1
&K = 4
&LOOP -EACHYR &NY
&K = &K + 4
&Q1 = &K + 1
&Q2 = &K + 2
&Q3 = &K + 3
&Q4 = &K + 4
&VAL1 = &CONCAT OF V &N &Q1
&VAL2 = &CONCAT OF V &N &Q2
&VAL3 = &CONCAT OF V &N &Q3
&VAL4 = &CONCAT OF V &N &Q4
&READ VAR &VAL1 &VAL2 &VAL3 &VAL4

Appendix A. LISTING OF EXEC 2 PROGRAMS 201
-EACHYR
-EACHUSE

&M = &MULT OF &NY 4
&K = 0
&LOOP -INGOAL1 &NS
&K = &K + 1
&L = 0
&LOOP -INGOAL1 &NU
&L = &L + 1
&N = 0
&LOOP -INGOAL1 &M
&N = &N + 1
&NAME = &CONCAT OF G 1 &K &L &N
&&NAME = &BLANK
&NAME = &CONCAT OF X 1 &K &L &N
&&NAME = &BLANK
-INGOAL1

&K = 0
&LOOP -INGOAL2 &NS
&K = &K + 1
&L = 0
&LOOP -INGOAL2 &NU
&L = &L + 1
&N = 0
&LOOP -INGOAL2 &NY
&N = &N + 1
&NAME = &CONCAT OF G 2 &K &L &N
&&NAME = &BLANK
&NAME = &CONCAT OF X 2 &K &L &N
&&NAME = &BLANK
-INGOAL2

&K = 0
&LOOP -INGOAL3 &NS
&K = &K + 1
&L = 0
&LOOP -INGOAL3 &NU
&L = &L + 1
&N = 0
&LOOP -INGOAL3 &NY
&N = &N + 1
&NAME = &CONCAT OF G 3 &K &L &N
&&NAME = &BLANK
&NAME = &CONCAT OF X 3 &K &L &N
&&NAME = &BLANK
-INGOAL3

&M = &MULT OF &NY 4
&K = 0
&LOOP -INITIAL &NS
&K = &K + 1
&L = 0
&LOOP -INITIAL &NU
&L = &L + 1
&N = 0
&LOOP -INITIAL &M
&N = &N + 1
&NAME = &CONCAT OF X &K &L &N
&&NAME = &BLANK
-INITIAL

USE PANEL0
MAP DATA | ECODE  (LOAD UNLOAD PREVIEW
-EMODLOPN
DISPLAY
&IF &RSTATUS = PF1 &GOTO -GPCONT
&IF &RSTATUS = PF2 &GOTO -MODEL
&IF &RSTATUS = PF10 &GOTO -QUIT
&ECODE = &STRING OF UNDEFINED PF KEY!

Appendix A. LISTING OF EXEC 2 PROGRAMS 202
SIGNAL
&GOTO -EMODLOPN

-GPCONT

&COMMAND EXECIO 1 DISKR GOALS DATA X 1 (FINIS
&READ VAR &NG0 &NG1 &NG2 &NG3

&N = 0
&LOOP -READGOAL 3
&N = &N + 1
&NAME = &CONCAT OF NG &N
&NL = &NAME
&NAME = &CONCAT OF GOAL &N
&COMMAND EXECIO &NL DISKR &NAME DATA X (FINIS
&READ VAR

&NL = &NL - 1
&LOOP -READGOAL &NL
&IF &N = 1 &SKIP 8

&READ VAR &I &J &K &Y1 &Y2 &Y3 &Y4 &Y5 &Y6 &Y7 &Y8 &Y9 &Y10 &Y11 &Y12
&NAME = &CONCAT OF G &N &I &J &K
&&NAME = &STRING OF &Y1 &Y2 &Y3 &Y4
&NAME = &CONCAT OF X &N &I &J &K
&NAME = &STRING OF &Y5 &Y6 &Y7 &Y8 &Y9 &Y10 &Y11 &Y12
&GOTO -READGOAL

&READ VAR &I &J &K &Y1 &Y2 &Y3 &Y4 &Y5 &Y6 &Y7 &Y8
&NAME = &CONCAT OF G &N &I &J &K
&&NAME = &STRING OF &Y1 &Y2 &Y3 &Y4
&NAME = &CONCAT OF X &N &I &J &K
&NAME = &STRING OF &Y5 &Y6 &Y7 &Y8

&READGOAL

&COMMAND EXECIO &NG0 DISKR RIGID DATA X (FINIS
&READ VAR

&NL = &NG0 - 1
&LOOP 4 &NL
&READ VAR &I &J &K &Y1
&NAME = &CONCAT OF X &I &J &K
&NAME = &Y1

-MODEL

&COMMAND ERASE RIGID DATA X
&COMMAND ERASE GOAL1 DATA X
&COMMAND ERASE GOAL2 DATA X
&COMMAND ERASE GOAL3 DATA X
&COMMAND ERASE GOALS DATA X

&PRESUME &COMMAND EUDEXEC2
&PRESUME &SUBCOMMAND DISPLAY

******************************************************************
* MENU FOR MODEL FORMULATION
******************************************************************

USE PANEL1
MAP DATA 1 ECODE            (LOAD UNLOAD PREVIEW
-EMODLOPN
DISPLAY
&IF &RRSTATUS = PF1 &GOTO -REPTS
&IF &RRSTATUS = PF2 &GOTO -RIGID

Appendix A. LISTING OF EXEC 2 PROGRAMS

203
&IF &RSTATUS = PF3 &GOTO -GOALS
&IF &RSTATUS = PF4 &GOTO -VIEW
&IF &RSTATUS = PF5 &GOTO -EXECUTE
&IF &RSTATUS = PF10 &GOTO -MODLOPTN
&ECODE = &STRING OF UNDEFINED PF KEY!
SIGNAL
&GOTO -EMODOPN

* DISPLAY RESULTS OF PREVIOUS MODEL

-REPTS
&PRESUME &COMMAND
COPY YEAR DATA X YEAR TEMP X
COPY INIT DATA X INIT TEMP X
COPY CONST DATA X CONST TEMP X
COPY USED DATA X USED TEMP X
COPY USEN DATA X USEN TEMP X
COPY SOURCED DATA X SOURCED TEMP X
COPY SOURCEN DATA X SOURCEN TEMP X
COPY ALLOCATN DATA X ALLOCATN TEMP X

EXEC RESULTS
EUDEXEC2
&PRESUME &SUBCOMMAND DISPLAY
&GOTO -MODEL

* FORM RIGID CONSTRAINTS

-RIGID

USE PANEL2
MAP DATA 1 SN1 2 UN1 3 SN2 4 UN2 (LOAD UNLOAD PREVIEW
MAP DATA 5 SN3 6 UN3 7 SN4 8 UN4 (LOAD UNLOAD PREVIEW
MAP DATA 9 SN5 10 UN5 11 SN6 12 UN6 (LOAD UNLOAD PREVIEW
MAP DATA 13 SN7 14 UN7 15 SN8 16 UN8 (LOAD UNLOAD PREVIEW
MAP DATA 17 SN9 18 UN9 19 SN10 20 UN10 (LOAD UNLOAD PREVIEW
MAP DATA 21 SN11 22 UN11 23 SN12 24 UN12 (LOAD UNLOAD PREVIEW
MAP DATA 25 SN13 26 UN13 27 SN14 28 UN14 (LOAD UNLOAD PREVIEW
MAP DATA 29 SN15 30 UN15 31 SN16 32 UN16 (LOAD UNLOAD PREVIEW
MAP DATA 33 SN 34 UN 35 ECODE (LOAD UNLOAD PREVIEW

&N = 0
&LOOP 5 &NS
&N = &N + 1
&NAME = &CONCAT OF SN &N
&NAMEI = &CONCAT OF S &N
&NAME = &CONCAT OF &N . &BLANK &NAMEI
&IF &N LT 10 &&NAME = &CONCAT OF &BLANK &NAME

&N = 0
&LOOP 5 &NU
&N = &N + 1
&NAME = &CONCAT OF UN &N
&NAMEI = &CONCAT OF U &N
&NAME = &CONCAT OF &N . &BLANK &NAMEI
&IF &N LT 10 &&NAME = &CONCAT OF &BLANK &NAME

-ERIGID

DISPLAY

Appendix A. LISTING OF EXEC 2 PROGRAMS
&IF &RSTATUS = 'PF10' &GOTO -MODEL
&IF &RSTATUS = 'ENTER' &SKIP 3
&ECODE = &STRING OF USE RETURN KEY!
SIGNAL
&GOTO -ERIGID

&IF &SN EQ &BLANK &GOTO -GTERIGID
&IF &UN EQ &BLANK &GOTO -GTERIGID
&NAME1 = &LEFT OF &SN 1
&IF &NAME1 = .&BLANK &SN = &RIGHT OF &SN 1
&SN = &TRIM OF &SN
&NAME1 = &LEFT OF &UN 1
&IF &NAME1 = .&BLANK &UN = &RIGHT OF &UN 1
&UN = &TRIM OF &UN
&IF &SN LT 1 &GOTO -GTERIGID
&IF &SN GT &NS &GOTO -GTERIGID
&IF &UN LT 1 &GOTO -GTERIGID
&IF &UN GT &NU &GOTO -GTERIGID
&NAME = &CONCAT OF C &SN &UN
&IF &NAME = 1 &GOTO -RIGCONT
&ECODE = &STRING OF NOT ELIGIBLE!
SIGNAL
&GOTO -ERIGID

-GTERIGID
&ECODE = &STRING OF BLANK/IMPROPER NUMBER!
SIGNAL
&GOTO -ERIGID

-RIGCONT

USE PANEL3
MAP DATA 1 SNAM 2 UNAM 3 YNO
MAP DATA 4 AV1 5 AV2 6 AV3 7 AV4
MAP DATA 8 RE1 9 RE2 10 RE3 11 RE4
MAP DATA 12 AL1 13 AL2 14 AL3 15 AL4
MAP DATA 16 ECODE

&NAME = &CONCAT OF S &SN
&SNAM = &NAME
&NAME = &CONCAT OF U &UN
&UNAM = &NAME

&L = 0
&K = -4
&LOOPO-GETYRALLOC &NY
&L = ...
&IF &&NAME NE &BLANK &USED1 = &USED1 + &&NAME

-IQTR

&M = 1
&LOOP -RESTQTR 3
&M = &M + 1
&QTR = &CONCAT OF Q &M
&NAME = &CONCAT OF GAV &M
&NAME1 = &CONCAT OF T &SN &&QTR
&&NAME = &&NAME1
&USED = &CONCAT OF USED &M
&&USED = 0
&N = 0
&LOOP -RESTQTR &NU
&N = &N + 1
&NAME = &CONCAT OF X &SN &N &&QTR
&IF &&NAME NE &BLANK &&USED = &&USED + &&NAME

-RESTQTR

&M = 0
&LOOP -AMTAVAIL 4
&M = &M + 1
&GAVAIL = &CONCAT OF GAV &M
&USED = &CONCAT OF USED &M
&NAME = &CONCAT OF AV &M
&&NAME = &&GAVAIL - &&USED
-AMTAVAIL

&M = 5
&LOOP -NEGAMT 3
&M = &M - 1
&N = &M - 1
&NAME1 = &CONCAT OF AV &M
&NAME2 = &CONCAT OF AV &N
&&NAME1 GE 0 &GOTO -NEGAMT
&&NAME2 = &&NAME2 + &&NAME1
&&NAME1 = 0
-NEGAMT

&M = 0
&LOOP -IQTR1 4
&M = &M + 1
&QTR = &CONCAT OF Q &M
&USED = &CONCAT OF USED &M
&&USED = 0
&N = 0
&LOOP -IQTR1 &NS
&N = &N + 1
&NAME = &CONCAT OF X &N &UN &&QTR
&IF &&NAME NE &BLANK &&USED = &&USED + &&NAME

-IQTR1

&VAL1 = &CONCAT OF V &UN &Q1
&VAL2 = &CONCAT OF V &UN &Q2
&VAL3 = &CONCAT OF V &UN &Q3
&VAL4 = &CONCAT OF V &UN &Q4
&RE1 = &&VAL1 - &&USED1
&RE2 = &&VAL2 - &&USED2
&RE3 = &&VAL3 - &&USED3
&RE4 = &&VAL4 - &&USED4

&M = 0
&LOOP -ADJRE 4
&M = &M + 1
&QTR = &CONCAT OF Q &M
&NAME = &CONCAT OF X &SN &UN &&QTR
&IF &&NAME = &BLANK &GOTO -ADJRE
&&NAME1 = &CONCAT OF RE &M
&&NAME2 = &CONCAT OF AL &M
&&NAME1 = &&NAME1 + &&NAME
&&NAME2 = &&NAME

Appendix A. LISTING OF EXEC 2 PROGRAMS
&AV1 = &AV1 + &&NAME
-ADJRE

-IQTRI
SET AL1 (PRO
SET AL2 (PRO
SET AL3 (PRO
SET AL4 (PRO

&M = 0
&LOOP -GETALLOC 4
&M = &M + 1
&NAME = &CONCAT OF AL &M
RESET &NAME

-RESHOW

DISPLAY

&ECODE = &BLANK
&AVAL = &CONCAT OF AV &M
&REQD = &CONCAT OF RE &M
&ALLOC = &CONCAT OF AL &M
&&ALLOC = &TRIM OF &&ALLOC
&IF .&&ALLOC EQ .&BLANK &SKIP 6
&IF &&ALLOC GE 0 &SKIP 2
&&ALLOC = &BLANK
&SKIP 3
&IF &&ALLOC GT &&REQD &GOTO -CHECKERR
&&ALLOC GT &&AVAL &GOTO -CHECKERR

&IF &M = 4 &GOTO -GETALLOC

&N = &M + 1
&AVAL1 = &CONCAT OF AV &N
&IF .&&ALLOC = .&BLANK &&AVAL1 = &&AVAL1 + &&AVAL
&IF .&&ALLOC NE .&BLANK &&AVAL1 = &&AVAL1 + &&AVAL - &&ALLOC
SET &&ALLOC (PRO
&GOTO -GETALLOC

-CHECKERR
&ECODE = &STRING OF IMPROPER ALLOCATION!
SIGNAL
&GOTO -RESHOW

-GETALLOC

&M = 0
&LOOP -GETYRALLOC 4
&M = &M + 1
&QTR = &CONCAT OF Q &M
&NAME = &CONCAT OF X &SN &UN &QTR
&NAME1 = &CONCAT OF AL &M
&IF .&&NAME1 = .&BLANK &GOTO -GETYRALLOC
&&NAME = &&NAME1

-GETYRALLOC

&GOTO -MODEL

*****************************************************************************
* FORM GOALS
*****************************************************************************

-GOALS

*****************************************************************************
* MENU FOR SELECTING GOAL TYPE
*****************************************************************************

Appendix A. LISTING OF EXEC 2 PROGRAMS
USE PANEL4
MAP DATA 1 ECODE (LOAD UNLOAD PREVIEW)
-EGOALS
DISPLAY
&SG = 0
&IF &RSTATUS = PF1 &SG = 1
&IF &RSTATUS = PF2 &SG = 2
&IF &RSTATUS = PF3 &SG = 3
&IF &RSTATUS = PF10 &GOTO -MODEL
&IF &SG NE 0 &GOTO -GOALCONT
&ECODE = &STRING OF UNDEFINED PF KEY!
SIGNAL
&GOTO -EGOALS
-GOALCONT
&IF &SG = 1 USE PANEL41
&IF &SG = 2 USE PANEL42
&IF &SG = 3 USE PANEL43
MAP DATA 1 SN1 2 UN1 3 SN2 4 UN2 (LOAD UNLOAD PREVIEW)
MAP DATA 5 SN3 6 UN3 7 SN4 8 UN4 (LOAD UNLOAD PREVIEW)
MAP DATA 9 SN5 10 UN5 11 SN6 12 UN6 (LOAD UNLOAD PREVIEW)
MAP DATA 13 SN7 14 UN7 15 SN8 16 UN8 (LOAD UNLOAD PREVIEW)
MAP DATA 17 SN9 18 UN9 19 SN10 20 UN10 (LOAD UNLOAD PREVIEW)
MAP DATA 21 SN11 22 UN11 23 SN12 24 UN12 (LOAD UNLOAD PREVIEW)
MAP DATA 25 SN13 26 UN13 27 SN14 28 UN14 (LOAD UNLOAD PREVIEW)
MAP DATA 29 SN15 30 UN15 31 SN16 32 UN16 (LOAD UNLOAD PREVIEW)
MAP DATA 33 SN 34 UN 35 ECODE (LOAD UNLOAD PREVIEW)

&N = 0
&LOOP 5 &NS
&N = &N + 1
&NAME = &CONCAT OF SN &N
&NAME1 = &CONCAT OF S &N
&&NAME = &CONCAT OF &N . &BLANK &&NAME1
&IF &N LT 10 &&NAME = &CONCAT OF &BLANK &&NAME
&NAME = &NAME
&NAME1 = &NAME1
&&NAME = &CONCAT OF &N . &BLANK &&NAME1
&IF &N LT 10 &&NAME = &CONCAT OF &BLANK &&NAME

-GOALSANDU
DISPLAY
&IF &RSTATUS = ENTER &SKIP 3
&ECODE = &STRING OF USE RETURN KEY!
SIGNAL
&GOTO -EGOALSANDU
&IF &SN EQ .&BLANK &GOTO -GTEGOAL
&IF &UN EQ .&BLANK &GOTO -GTEGOAL
&NAME1 = &LEFT OF &SN 1
&IF &NAME1 = .&BLANK &SN = &RIGHT OF &SN 1
&SN = &TRIM OF &SN
&NAME1 = &LEFT OF &UN 1
&IF &NAME1 = .&BLANK &UN = &RIGHT OF &UN 1
&UN = &TRIM OF &UN
&IF &SN LT 1 &GOTO -GTEGOAL
&IF &SN GT &NS &GOTO -GTEGOAL
&IF &UN LT 1 &GOTO -GTEGOAL
&IF &UN GT &NU &GOTO -GTEGOAL
&NAME = &CONCAT OF C &SN &UN
&IF &&NAME = 1 &GOTO -GLCONT
&ECODE = &STRING OF NOT ELIGIBLE!
SIGNAL &GOTO -EGOALSANDU

-GTEGOAL
&ECODE = &STRING OF BLANK/IMPROPER NUMBER!
SIGNAL &GOTO -EGOALSANDU

-GLCONT
&IF &SG = 1 &GOTO -GOAL1
&IF &SG = 2 &GOTO -GOAL2
&IF &SG = 3 &GOTO -GOAL3

*****************************************************************************
* GOAL TYPE I
*****************************************************************************

-GOAL1

USE PANEL412
MAP DATA 1 SNAM 2 UNAM 3 YNO
MAP DATA 4 AV1 5 AV2 6 AV3 7 AV4
MAP DATA 8 RE1 9 RE2 10 RE3 11 RE4
MAP DATA 12 AL1 13 AL2 14 AL3 15 AL4
MAP DATA 16 DT1 17 DT2 18 DT3 19 DT4
MAP DATA 20 PR1 21 PR2 22 PR3 23 PR4
MAP DATA 24 WT1 25 WT2 26 WT3 27 WT4
MAP DATA 28 DQ1 29 DQ2 30 DQ3 31 DQ4
MAP DATA 32 TG1 33 TG2 34 TG3 35 TG4
MAP DATA 36 AG1 37 AG2 38 AG3 39 AG4
MAP DATA 40 AD1 41 AD2 42 AD3 43 AD4
MAP DATA 44 PD1 45 PD2 46 PD3 47 PD4
MAP DATA 48 ECODE

&NAME = &CONCAT OF S &SN
&SNAM = &&NAME
&NAME = &CONCAT OF U &UN
&UNAM = &&NAME

&K = -4
&L = 0
&LOOP -GETGOAL1 &NY
&L = &L + 1
&COMMAND EXECIO 1 DISKR YEAR DATA X &L (FINIS
&READ VAR &YNO

&N = 0
&LOOP -GINITI 4
&N = &N + 1
&AL = &CONCAT OF AL &N
&DT = &CONCAT OF DT &N
&PR = &CONCAT OF PR &N
&WT = &CONCAT OF WT &N
&DQ = &CONCAT OF DQ &N
&TG = &CONCAT OF TG &N
&AG = &CONCAT OF AG &N
&AD = &CONCAT OF AD &N
&PD = &CONCAT OF PD &N
&&AL = &BLANK
&&DT = &BLANK
&&PR = &BLANK
&&TG = &BLANK
&&AG = &BLANK
&&AD = &BLANK
&&PD = &BLANK
&&WT = 1
&&DQ = N
-GINITI
&K = &K + 4
&Q1 = &K + 1
&Q2 = &K + 2
&Q3 = &K + 3
&Q4 = &K + 4

&N = 0
&LOOP -G1INIT2 4
&N = &N + 1
&QTR = &CONCAT OF Q &N
&NAME1 = &CONCAT OF T &SN &QTR
&NAME2 = &CONCAT OF AV &N
&NAME2 = &CONCAT OF T &SN &QTR
&NAME2 = &CONCAT OF T &SN &QTR
&NAME2 = &CONCAT OF V &UN &QTR
&NAME2 = &CONCAT OF RE &N
&NAME2 = &CONCAT OF V &UN &QTR
&NAME2 = &CONCAT OF T &SN &QTR

&N = 0
&LOOP -G1INIT3 4
&N = &N + 1
&QTR = &CONCAT OF Q &N
&TG = &CONCAT OF TG &N
&AG = &CONCAT OF AG &N
&AD = &CONCAT OF AD &N
&PD = &CONCAT OF PD &N
&NAME = &CONCAT OF X 1 &SN &UN &QTR
&STACK &NAME
&NAME = &CONCAT OF T &SN &QTR
&NAME = &CONCAT OF V &UN &QTR
&IF .&NAME = .&BLANK &GOTO -G1INIT3
&AL = &CONCAT OF AL &N
&DQ = &CONCAT OF DQ &N
&IF .&AL EQ .&BLANK &GOTO -CKGOAL1
&IF .&AL LT 0 &ECODE = &STRING OF NEGATIVE AMOUNT!
&IF .&AL LT 0 &ECODE = &STRING OF NEGATIVE AMOUNT!
&IF .&AL LT 0 &ECODE = &STRING OF NEGATIVE AMOUNT!
&IF .&AL LT 0 &ECODE = &STRING OF NEGATIVE AMOUNT!
&AL = &CONCAT OF AL &N
&DT = &CONCAT OF DT &N
&PR = &CONCAT OF PR &N
&WT = &CONCAT OF WT &N
&STACK &NAME
&READ VAR &AL &DT &PR &WT
&IF .&DT = 1 &DT = <
&IF .&DT = 2 &DT = >
&IF .&DT = 3 &DT = =
&STACK &NAME
&READ VAR &AL &DT &PR &WT
&IF .&AL EQ .&BLANK &GOTO -CKGOAL1
&IF .&AL EQ .&BLANK &GOTO -CKGOAL1
&IF .&AL EQ .&BLANK &GOTO -CKGOAL1
&IF .&AL EQ .&BLANK &GOTO -CKGOAL1
&IF .&AL EQ .&BLANK &GOTO -CKGOAL1
&IF .&AL EQ .&BLANK &GOTO -CKGOAL1
&IF .&AL EQ .&BLANK &GOTO -CKGOAL1
&IF .&AL EQ .&BLANK &GOTO -CKGOAL1
&IF .&AL EQ .&BLANK &GOTO -CKGOAL1
&AL = &CONCAT OF AL &N
&DT = &CONCAT OF DT &N
&PR = &CONCAT OF PR &N
&WT = &CONCAT OF WT &N
&DQ = &CONCAT OF DQ &N
&IF .&AL LT 0 &ECODE = &STRING OF NEGATIVE AMOUNT!
&IF .&ECODE NE .&BLANK &GOTO -ELG1
&IF .&ECODE NE .&BLANK &GOTO -ELG1
&IF .&ECODE NE .&BLANK &GOTO -ELG1
&IF .&ECODE NE .&BLANK &GOTO -ELG1
&AL = &CONCAT OF AL &N
&DT = &CONCAT OF DT &N
&PR = &CONCAT OF PR &N
&WT = &CONCAT OF WT &N
&DQ = &CONCAT OF DQ &N
&E CODE = &STRING OF NO DEVIATIONAL TYPE!
&IF .&ECODE NE .&BLANK &ECODE = &STRING OF NO DEVIATIONAL TYPE!
&IF .&ECODE NE .&BLANK &ECODE = &STRING OF NO DEVIATIONAL TYPE!
&A M = &LOCATION OF &DT < = >
&IF &M = 0   &ECODE = &STRING OF INVALID DEVIATIONAL TYPE!
&IF .&ECODE NE .&BLANK &GOTO -ELG1
&IF .&PR = .&BLANK   &ECODE = &STRING OF NO PRIORITY!
&IF .&ECODE NE .&BLANK &GOTO -ELG1
&IF .&PR LT 1   &ECODE = &STRING OF INVALID PRIORITY!
&IF .&ECODE NE .&BLANK &GOTO -ELG1
&IF .&&Vf = .&BLANK   &ECODE = &STRING OF NO WEIGHT!
&IF .&ECO DE NE .&BLANK &GOTO -ELG1
&IF .&&PR LT 0   &ECODE = &STRING OF INVALID WEIGHT!
&IF .&&DQ NE .&BLANK &GOTO -ELG1
&IF .&&DQ EQ .Y &GOTO -G!NOGOAL
&IF .&&OT EQ .&BLANK &GOTO -GINOGOAL
&IF .&&DT EQ .1 &GOTO -GINOGOAL
&IF .&&DT = < .&&DT = 1
&IF .&&DT = > .&&DT = 2
&IF .&&DT = = .&&DT = 3
&NAME1 = &STRING OF &&AL &&DT &&PR &&WT
&NAME = &CONCAT OF G 1 &SN &UN &&QTR
&&NAME = &&NAME1
&GOTO -GININIT4
-GINO GOAL
&&NAME = &CONCAT OF G 1 &SN &UN &&QTR
&&NAME = &BLANK
-GINO INIT4
-GETGOAL1
&GOTO -GOALS

*******************************************************************************
* GOAL TYPE II
*******************************************************************************

-GOAL2

USE PANElA21
MAP DATA 1 SNAM 2 UNAM 3 YNO (LOAD UNLOAD PREVIEW
MAP DATA 4 AV1 5 REI 6 AV2 7 RE2 8 AV3 9 RE3 (LOAD UNLOAD PREVIEW
MAP DATA 10 AL 11 DT 12 PR 13 WT 14 DQ (LOAD UNLOAD PREVIEW
MAP DATA 15 GT1 16 GT2 17 AT1 18 AT2 (LOAD UNLOAD PREVIEW
MAP DATA 19 AD1 20 AD2 21 PD1 22 PD2 (LOAD UNLOAD PREVIEW
MAP DATA 23 ECO DE (LOAD UNLOAD PREVIEW
&NAME = &CONCAT OF S &SN
&SNAM = &&NAME
&NAME = &CONCAT OF U &UN
&UNAM = &&NAME
&AV1 = 0
&AV2 = 0
&AV3 = 0
&REI = 0
&RE2 = 0
&RE3 = 0
&M = &MULT OF &NY 4
&K = 0

Appendix A. LISTING OF EXEC 2 PROGRAMS
&LOOP -AVREG2 &M
&K = &K + 1
&NAME = &CONCAT OF T &SN &K
&AV3 = &AV3 + &NAME
&NAME = &CONCAT OF V &UN &K
&RE3 = &RE3 + &NAME
-AVREG2

&L = 0
&LOOP -GETGOAL2 &NY
&L = &L + 1
&COMMAND EXECIO 1 DISKR YEAR DATA X &L (FINIS
&READ VAR &YN0

&AL = &BLANK
&DT = &BLANK
&PR = &BLANK
&DQ = N
&WT = 1
&AV1 = 0
&RE1 = 0
&GT1 = &BLANK
&AT1 = &BLANK
&AD1 = &BLANK
&PD1 = &BLANK
&GT2 = &BLANK
&AT2 = &BLANK
&AD2 = &BLANK
&PD2 = &BLANK

&K = &MULT OF &L 4
&M = &L - 1
&M = &MULT OF &M 4
&LOOP -COMGOAL2 4
&M = &M + 1
&NAME = &CONCAT OF T &SN &M
&AV1 = &AV1 + &NAME
&NAME = &CONCAT OF V &UN &M
&RE1 = &RE1 + &NAME
-COMGOAL2

&AV2 = &AV2 + &AV1
&RE2 = &RE2 + &RE1

&NAME = &CONCAT OF X 2 &SN &UN &L
&STACK &NAME
&READ VAR &GT1 &GT2 &AT1 &AT2 &AD1 &AD2 &PD1 &PD2

&NAME = &CONCAT OF G 2 &SN &UN &L
&IF .&NAME = .&BLANK &GOTO -EG2

&STACK &NAME
&READ VAR &AL &DT &PR &WT
&IF &DT = 1 &DT = <
&IF &DT = 2 &DT = >
&IF &DT = 3 &DT = =
-EG2

DISPLAY
&IF &RSTATUS EQ ENTER &SKIP 4
&ECODE = &STRING OF USE RETURN KEY!
-ELG2
SIGNAL
&GOTO -EG2

&ECODE = &BLANK
&IF .&AL EQ .&BLANK &SKIP 1
&IF .&DQ NE .Y &SKIP 3
&NAME = &CONCAT OF G 2 &SN &UN &L
&NAME = &STRING OF &BLANK
&GOTO -GETGOAL2

* &IF &AL LT 0 &ECODE = &STRING OF INVALID PERCENTAGE!
* &IF &ECODE NE .&BLANK &GOTO -ELG2
* &IF &AL GT 100 &ECODE = &STRING OF INVALID PERCENTAGE!
* &IF &ECODE NE .&BLANK &GOTO -ELG2
&IF &DT = .&BLANK &ECODE = &STRING OF NO DEVIATIONAL TYPE!
&IF .&ECODE = .&BLANK &GOTO -ELG2
* &IF &AL GT 100 &ECODE = &STRING OF INVALID PERCENTAGE!
* &IF .&ECODE NE .&BLANK &GOTO -ELG2
&IF .&ECO DE = &STRING OF NO DEVIATIONAL TYPE!
&IF .&ECODE NE .&BLANK &GOTO -ELG2
&IF .&DT = .&BLANK &ECO DE = &STRING OF NO DEVIATIONAL TYPE!
&IF .&ECO DE NE .&BLANK &GOTO -ELG2
&IF .&PR LT I &ECODE = &STRING OF INVALID PRIORITY!
&IF .&ECO DE NE .&BLANK &GOTO -ELG2
&IF .&PR LT I &ECODE = &STRING OF INVALID PRIORITY!
&IF .&ECO DE NE .&BLANK &GOTO -ELG2
&IF .&PR = .&BLANK &ECODE = &STRING OF NO WEIGHT!
&IF .&ECO DE NE .&BLANK &GOTO -ELG2
&IF .&DT = .&BLANK &ECODE = &STRING OF ENTER Y/N FOR DELETE?
&IF .&ECO DE NE .&BLANK &GOTO -ELG2
&MM = &LOCATION OF .&AL
&IF &MM = 0 &AL = &CONCAT OF .&AL .0
&NAME! = &STRING OF .&AL &DT &PR &WT
&NAME = &CONCAT OF G 2 &SN &UN &L
&NAME = &NAME!

-GOAL2

&GOTO -GOALS

******************************************************************************
* GOAL TYPE III
******************************************************************************

-GOAL3

USE PANELS31
MAP DATA 1 SNAM 2 UNAM 3 YNO
MAP DATA 4 AV1 5 REI 6 AV2 7 RE2 8 AV3 9 RE3
MAP DATA 10 AL 11 DT 12 PR 13 WT 14 DQ
MAP DATA 15 GT1 16 GT2 17 AT1 18 AT2
MAP DATA 19 AD1 20 AD2 21 PD1 22 PD2
MAP DATA 23 ECODE

&NAME = &CONCAT OF S &SN
&SNAM = &&NAME
&NAME = &&NAME
&UNAM = &&NAME

&AV1 = 0
&AV2 = 0
&AV3 = 0
&REI = 0
&RE2 = 0
&RE3 = 0

&M = &MULT OF &NY 4
&K = 0
&LOOP -AVREG3 &M
&K = &K + 1
&NAME = &CONCAT OF T &SN &K
&AV3 = &AV3 + &NAME
&NAME = &CONCAT OF V &UN &K

Appendix A. LISTING OF EXEC 2 PROGRAMS 213
&RE3 = &RE3 + &NAME

AVREG3

&L = 0
&LOOP -GETGOAL3 &NY
&L = &L + 1
&COMMAND EXECIO 1 DISKR YEAR DATA X &L (FINIS
&READ VAR &YNO

&AL = &BLANK
&DT = &BLANK
&PR = &BLANK
&DQ = N
&WT = 1
&AV1 = 0
&RE1 = 0
&GT1 = &BLANK
&AT1 = &BLANK
&AD1 = &BLANK
&PD1 = &BLANK
&GT2 = &BLANK
&AT2 = &BLANK
&AD2 = &BLANK
&PD2 = &BLANK

&K = &MUL OF &L 4
&M = &L - 1
&M = &MUL OF &M 4
&LOOP .COMGOAL3 4
&M = &M + 1
&NAME = &CONCAT OF T &SN &M
&AV1 = &AV1 + &NAME
&NAME = &CONCAT OF V &UN &M
&RE1 = &RE1 + &NAME
-COMGOAL3

&AV2 = &AV2 + &AV1
&RE2 = &RE2 + &RE1

&NAME = &CONCAT OF X 3 &SN &UN &L
&STACK &NAME
&READ VAR &GT1 &GT2 &AT1 &AT2 &AD1 &AD2 &PD1 &PD2

&NAME = &CONCAT OF G 3 &SN &UN &L
&IF .&NAME = .&BLANK &GOTO -EG3

&STACK &NAME
&READ VAR &AL .&DT &PR &WT
&IF &DT = 1 &DT = <
&IF &DT = 2 &DT = >
&IF &DT = 3 &DT = = -EG3

DISPLAY
&IF &RSTATUS EQ ENTER &SKIP 4
&ECODE = &STRING OF USE RETURN KEY!
-ELG3
SIGNAL
&GOTO -EG3

&ECODE = &BLANK
&IF .&AL EQ .&BLANK &SKIP 1
&IF .&DQ NE .Y &SKIP 3
&NAME = &CONCAT OF G 3 &SN &UN &L
&NAME = &STRING OF &BLANK
&GOTO -GETGOAL3

* &IF &AL LT 0 &ECODE = &STRING OF INVALID PERCENTAGE!
* &IF .&ECODE NE .&BLANK &GOTO -ELG3

Appendix A. LISTING OF EXEC 2 PROGRAMS 214
* &IF &AL GT 100 &ECODE = &STRING OF INVALID PERCENTAGE!
* &IF &ECODE NE &BLANK &GOTO -ELG3
&IF &DT = &BLANK &ECODE = &STRING OF NO DEVIATIONAL TYPE!
&IF &ECODE NE &BLANK &GOTO -ELG3
&M = &LOCATION OF &DT < = >
&IF &M = 0 &ECODE = &STRING OF INVALID DEVIATIONAL TYPE!
&IF &ECODE NE &BLANK &GOTO -ELG3
&IF &AL = &CONCAT OF &AL .0
&NAME1 = &STRING OF &AL &DT &PR &WT
&NAME = &CONCAT OF G3 &SN &UN &L
&&NAME = &NAME!
-GETGOAL3
&GOTO -GOALS

******************************************************************
* VIEW GOALS EXISTING IN THE PRESENT MODEL
******************************************************************

-VIEW

&PRESUME &COMMAND
* WRITE RIGID CONSTRAINTS

&STACK RIGID CONSTRAINTS

&I = 1
&M = &MULT OF &NY 4
&K = 0
&LOOP -RIGCONS &NS
&K = &K + 1
&L = 0
&LOOP -RIGCONS &NU
&L = &L + 1
&N = 0
&LOOP -RIGCONS &M
&N = &N + 1
&NAME = &CONCAT OF X &K &L &N
&IF .&&NAME = .&BLANK &SKIP 2
&I = &I + 1
&STACK &K &L &N &NAME
-RIGCONS

EXECIO &I DISKW RIGID DATA1 X 1 (FINIS COPYFILE RIGID DATA1 X (LRECL 80 RECFM F

* WRITE TYPE 1 GOALS

&STACK TYPE 1 GOALS

&I = 1
&M = &MULT OF &NY 4
&K = 0
&loop -goal1con &ns
&k = &k + 1
&l = 0
&loop -goal1con &nu
&l = &l + 1
&n = 0
&loop -goal1con &m
&n = &n + 1
&name = &concat of g 1 &k &l &n
&if .&&name = .&blank &skip 2
&i = &i + 1
&stack &k &l &n &name
-goal1con

execio &i diskw goal1 data1 x 1 (finis copyfile goal1 data1 x (lrecl 80 recfm f

* write type 2 goals

&stack type 2 goals

&i = 1

&k = 0
&loop -goal2con &ns
&k = &k + 1
&l = 0
&loop -goal2con &nu
&l = &l + 1
&n = 0
&loop -goal2con &ny
&n = &n + 1
&name = &concat of g 2 &k &l &n
&if .&&name = .&blank &skip 2
&i = &i + 1
&stack &k &l &n &name
-goal2con

execio &i diskw goal2 data1 x 1 (finis copyfile goal2 data1 x (lrecl 80 recfm f

* write type 3 goals

&stack type 3 goals

&i = 1

&k = 0
&loop -goal3con &ns
&k = &k + 1
&l = 0
&loop -goal3con &nu
&l = &l + 1
&n = 0
&loop -goal3con &ny
&n = &n + 1
&name = &concat of g 3 &k &l &n
&if .&&name = .&blank &skip 2
&i = &i + 1
&stack &k &l &n &name
-goal3con

execio &i diskw goal3 data1 x 1 (finis copyfile goal3 data1 x (lrecl 80 recfm f

exec viewgoal
erase rigid data1 x
erase goal1 data1 x
erase goal2 data1 x
erase goal3 data1 x

appendix a. listing of exec 2 programs 216
EUDEXEC2
&PRESUME &SUBCOMMAND DISPLAY
&GOTO -MODEL

* EXECUTE THE GP MODEL USING LINDOGP

-EXECUTE
&PRESUME &COMMAND

CLEAR
&BEGTYPE 22

EXECUTING ............

* WRITE RIGID CONSTRAINTS

&STACK RIGID CONSTRAINTS

&I = 1
&M = &MULT OF &NY 4
&K = 0
&LOOP -RIGCONS &NS
&K = &K + 1
&L = 0
&LOOP -RIGCONS &NU
&L = &L + 1
&N = 0
&LOOP -RIGCONS &M
&N = &N + 1
&NAME = &CONCAT OF X &K &L &N
&IF .&NAME = .&BLANK &SKIP 2
&I = &I + 1
&STACK &K &L &N &NAME
-RIGCONS

EXECIO &I DISKW RIGID DATA X (FINIS
COPYFILE RIGID DATA X (LRECL 80 RECFM F
&NRC = &I

* WRITE TYPE 1 GOALS

&STACK TYPE 1 GOALS

&I = 1
&M = &MULT OF &NY 4
&K = 0
&LOOP -GOALICON &NS
&K = &K + 1
&L = 0
&LOOP -GOALICON &NU
&L = &L + 1
&N = 0
&LOOP -GOALICON &M
&N = &N + 1
&NAME = &CONCAT OF G 1 &K &L &N
&IF .&&NAME = .&BLANK &SKIP 2
&I = &I + 1
&STACK &K &L &N &&NAME -GOALICON

EXECIO &I DISKW GOAL1 DATA X 1 (FINIS
COPYFILE GOAL1 DATA X (LRECL 80 RECFM F

* WRITE TYPE 2 GOALS

&STACK TYPE 2 GOALS

&I = 1

&K = 0
&LOOP -GOAL2CON &NS
&K = &K + 1
&L = 0
&LOOP -GOAL2CON &NU
&L = &L + 1
&N = 0
&LOOP -GOAL2CON &NY
&N = &N + 1
&NAME = &CONCAT OF G 2 &K &L &N
&IF .&&NAME = .&BLANK &SKIP 2
&I = &I + 1
&STACK &K &L &N &&NAME -GOAL2CON

EXECIO &I DISKW GOAL2 DATA X 1 (FINIS
COPYFILE GOAL2 DATA X (LRECL 80 RECFM F

* WRITE TYPE 3 GOALS

&STACK TYPE 3 GOALS

&I = 1

&K = 0
&LOOP -GOAL3CON &NS
&K = &K + 1
&L = 0
&LOOP -GOAL3CON &NU
&L = &L + 1
&N = 0
&LOOP -GOAL3CON &NY
&N = &N + 1
&NAME = &CONCAT OF G 3 &K &L &N
&IF .&&NAME = .&BLANK &SKIP 2
&I = &I + 1
&STACK &K &L &N &&NAME -GOAL3CON

EXECIO &I DISKW GOAL3 DATA X 1 (FINIS
COPYFILE GOAL3 DATA X (LRECL 80 RECFM F

FILEDEF FT01F001 DISK INIT DATA X
FILEDEF FT02F001 DISK SOURCED DATA X
FILEDEF FT03F001 DISK USED DATA X
FILEDEF FT04F001 DISK CONST DATA X
FILEDEF FT16F001 DISK RIGID DATA X
FILEDEF FT17F001 DISK GOAL1 DATA X
FILEDEF FT18F001 DISK GOAL2 DATA X

Appendix A. LISTING OF EXEC 2 PROGRAMS
FILEDEF FT19F001 DISK GOAL3 DATA X
FILEDEF FT11F001 DISK ROW DATA X
FILEDEF FT12F001 DISK COLUMN DATA X
FILEDEF FT13F001 DISK RHS DATA X
FILEDEF FT14F001 DISK BOUNDS DATA X
COPYFILE ROW DATA X (LRECL 80 RECFM F
COPYFILE COLUMN DATA X (LRECL 80 RECFM F
COPYFILE RHS DATA X (LRECL 80 RECFM F
COPYFILE BOUNDS DATA X (LRECL 80 RECFM F

FILEDEF FT01F001 DISK COLUMN DATA X
FILEDEF FT11F001 DISK COLS DATA X
DLCLMTTL
COPYFILE COLS DATA X (LRECL 80 RECFM F
ERASE COLUMN DATA X

SET CMSTYPE HT
&STACK (5,8,CH,A,19,4,B1,A)
SSORT COLS DATA X COLSTD DATA X
SET CMSTYPE RT
ERASE COLS DATA X
COPYFILE COLSTD DATA X (LRECL 80 RECFM F

FILEDEF FT01F001 DISK COLSTD DATA X
FILEDEF FT11F001 DISK COLM DATA X
ADCLMTTL
COPYFILE COLM DATA X (LRECL 80 RECFM F
ERASE COLSTD DATA X
COPY COLM DATA X COLUMN DATA X
ERASE COLM DATA X

FILEDEF FT01F001 DISK ROW DATA X
FILEDEF FT02F001 DISK COLUMN DATA X
FILEDEF FT03F001 DISK RHS DATA X
FILEDEF FT04F001 DISK BOUNDS DATA X
FILEDEF FT25F001 DISK FILE FT25F001 X
CONSOL
COPYFILE FILE FT25F001 X (LRECL 80 RECFM F
ERASE ROW DATA X
ERASE COLUMN DATA X
ERASE RHS DATA X
ERASE BOUNDS DATA X

FILEDEF FT01F001 DISK GOAL1 DATA X
FILEDEF FT02F001 DISK GOAL2 DATA X
FILEDEF FT03F001 DISK GOAL3 DATA X
FILEDEF FT11F001 DISK SGOAL DATA X
FILEDEF FT12F001 DISK NGOAL DATA X
FILEDEF FT13F001 DISK GOALS DATA X
PREPRIOR
COPYFILE SGOAL DATA X (LRECL 80 RECFM F
COPYFILE NGOAL DATA X (LRECL 80 RECFM F
COPYFILE GOALS DATA X (LRECL 80 RECFM F

EXECIO 1 DISKR GOALS DATA X 1 (FINIS
&READ STRING &YY
&STACK &NRC &YY
ERASE GOALS DATA X
EXECIO 1 DISKW GOALS DATA X 1 (FINIS
COPYFILE GOALS DATA X (LRECL 80 RECFM F

SET CMSTYPE HT
&STACK 21 22
SORT SGOAL DATA X STDGOAL DATA X
SET CMSTYPE RT
COPYFILE STDGOAL DATA X (LRECL 80 RECFM F
ERASE SGOAL DATA X

FILEDEF FT01F001 DISK NGOAL DATA X
FILEDEF FT02F001 DISK STDGOAL DATA X

Appendix A. LISTING OF EXEC 2 PROGRAMS 219
FILEDEF FT75F001 DISK FILE FT75F001 X
PRIOR
ERASE NGOAL DATA X
ERASE STDGOAL DATA X
COPYFILE FILE FT75F001 X (LRECL 80 RECFM F

SET CMSTYPE HT
FILEDEF FT06F001 DISK ZZ X
FILEDEF 12 CLEAR
&STACK RMPS
&STACK 25
&STACK MIN
&STACK USER
&STACK 75
&STACK NO
&STACK NO
&STACK NO
&STACK NO
&STACK NO
&STACK NO
&STACK NO
&STACK NO
&STACK NO
&STACK NO
&STACK NO
&STACK NO
&STACK NO
&STACK NO
&STACK NO
&STACK NO
&STACK NO
&STACK NO
&STACK NO
&STACK NO
&STACK NO
&STACK NO
&STACK NO
&STACK NO
&STACK NO
&STACK NO
&STACK NO
&STACK QUlT
LINDOGP
SET CMSTYPE RT
RENAME FILE FT12F001 A DECVARS DATA A
COPYFILE DECVARS DATA A (LRECL 80 RECFM F
FILEDEF FT01F001 DISK DECVARS DATA A
FILEDEF FT02F001 DISK ALLOCATN DATA X
ALLOCATN
COPYFILE ALLOCATN DATA X (LRECL 80 RECFM F
ERASE DECVARS DATA A
ERASE FILE GPTEMP A
ERASE FILE FT25F001 X
ERASE FILE FT75F001 X
ERASE FILE FT12F001 A
ERASE ZZ X
COPY YEAR DATA X YEAR TEMP X
COPY INIT DATA X INIT TEMP X
COPY CONST DATA X CONST TEMP X
COPY USED DATA X USED TEMP X
COPY USEN DATA X USEN TEMP X
COPY SOURCED DATA X SOURCED TEMP X
COPY SOURCEN DATA X SOURCEN TEMP X
COPY ALLOCATN DATA X ALLOCATN TEMP X

* Display Results

EXEC RESULTS

* Option - View Goal Achievements

EXEC ACHVMNT

Appendix A. LISTING OF EXEC 2 PROGRAMS

220
EUDEXEC2
&PRESUME &SUBCOMMAND DISPLAY

******************************************************************
* OPTION TO SAVE MODEL AS PERMANENT MODEL
******************************************************************

-CHKMOD
USE PANEL22
MAP DATA 1 REPLY 2 ECODE (LOAD UNLOAD PREVIEW
&REPLY = N
DISPLAY
&IF .&REPLY = .N &GOTO -NONPMODL
&IF .&REPLY = .Y &GOTO -SAVEMODL
&ECODE = STRING OF ENTER Y/N
&SKIP -4

-SAVEMODL

&PRESUME &COMMAND
ERASE SOURCED PERM A
ERASE SOURCEN PERM A
ERASE USED PERM A
ERASE USEN PERM A
ERASE YEAR PERM A
ERASE INIT PERM A
ERASE CONST PERM A
ERASE GOALS PERM A
ERASE GOAL1 PERM A
ERASE GOAL2 PERM A
ERASE GOAL3 PERM A
ERASE RIGID PERM A
ERASE ALLOCATN PERM A
COPY SOURCED DATA X SOURCED PERM A
COPY SOURCEN DATA X SOURCEN PERM A
COPY USED DATA X USED PERM A
COPY USEN DATA X USEN PERM A
COPY YEAR DATA X YEAR PERM A
COPY INIT DATA X INIT PERM A
COPY CONST DATA X CONST PERM A
COPY GOALS DATA X GOALS PERM A
COPY GOAL1 DATA X GOAL1 PERM A
COPY GOAL2 DATA X GOAL2 PERM A
COPY GOAL3 DATA X GOAL3 PERM A
COPY RIGID DATA X RIGID PERM A
COPY ALLOCATN DATA X ALLOCATN PERM A

EUDEXEC2
&PRESUME &SUBCOMMAND DISPLAY

-NONPMODL

&GOTO -GPCONT

-QUIT
&COMMAND ERASE ALLOCATN DATA X
&COMMAND ERASE FILE FT32F001 A
&COMMAND ERASE FILE FT37F001 A
&EXIT
A.9 SANDU

*********************************************************************
* THE CONTROL PROGRAM *
*********************************************************************

&TRACE OFF
GLOBAL LOADLIB VFLODLIB

SET CMSTYPE HT
EXEC TDISK 6 X 150
SET CMSTYPE RT

*********************************************************************
* RESET DATA BASE & CREATE DMS ENVIRONMENT *
*********************************************************************

COPY SOURCED PERM A SOURCED DATA X
COPY SOURCEN PERM A SOURCEN DATA X
COPY USED PERM A USED DATA X
COPY USEN PERM A USEN DATA X
COPY YEAR PERM A YEAR DATA X
COPY INIT PERM A INIT DATA X
COPY CONST PERM A CONST DATA X
COPY ALLOCATN PERM A ALLOCATN DATA X
COPY GOALS PERM A GOALS DATA X
COPY GOAL1 PERM A GOAL1 DATA X
COPY GOAL2 PERM A GOAL2 DATA X
COPY GOAL3 PERM A GOAL3 DATA X
COPY RIGID PERM A RIGID DATA X

EUDEXEC2
&PRESUME &SUBCOMMAND DISPLAY

*********************************************************************
* INTRODUCTORY PANEL *
*********************************************************************

-INTRO
USE INTRO
DISPLAY

*********************************************************************
* DISPLAY MAIN MENU *
*********************************************************************

-MAINMENU
USE MAINMENU
-ERRORMAIN
DISPLAY
MAP DATA ! ECODE (LOAD UNLOAD PREVIEW
&IF &RSTATUS = PF1 &GOTO -OPTION1
&IF &RSTATUS = PF2 &GOTO -OPTION2
&IF &RSTATUS = PF3 &GOTO -OPTION3
&IF &RSTATUS = PF4 &GOTO -OPTION4
&IF &RSTATUS = PF5 &GOTO -OPTION5
&IF &RSTATUS = PF6 &GOTO -OPTION6
&IF &RSTATUS = PF10 &GOTO -END
&ECODE = &STRING OF UNDEFINED PF KEY!
SIGNAL
&GOTO -ERRORMAIN
* OPTION1 - RUN CURRENT GP MODEL

-OPTION1
&PRESUME &COMMAND
COPY SOURCED PERM A SOURCED TEMP X
COPY SOURCEN PERM A SOURCEN TEMP X
COPY USED PERM A USED TEMP X
COPY USEN PERM A USEN TEMP X
COPY YEAR PERM A YEAR TEMP X
COPY INIT PERM A INIT TEMP X
COPY CONST PERM A CONST TEMP X
COPY ALLOCATN PERM A ALLOCATN TEMP X
EXEC RESULTS
EUDEXEC2
&PRESUME &SUBCOMMAND DISPLAY
&GOTO -MAINMENU

* OPTION2 - MAKE TEMPORARY CHANGES

-OPTION2
&COMMAND EXEC TEMPCHNG
&GOTO -MAINMENU

* OPTION3 - LOAD ORIGINAL DATA BASE

-OPTION3
&PRESUME &COMMAND
ERASE SOURCED DATA X
ERASE SOURCEN DATA X
ERASE USED DATA X
ERASE USEN DATA X
ERASE YEAR DATA X
ERASE INIT DATA X
ERASE CONST DATA X
ERASE RIGID DATA X
ERASE GOAL1 DATA X
ERASE GOAL2 DATA X
ERASE GOAL3 DATA X
ERASE GOALS DATA X
ERASE ALLOCATN DATA X
COPY SOURCED PERM A SOURCED DATA X
COPY SOURCEN PERM A SOURCEN DATA X
COPY USED PERM A USED DATA X
COPY USEN PERM A USEN DATA X
COPY YEAR PERM A YEAR DATA X
COPY INIT PERM A INIT DATA X
COPY CONST PERM A CONST DATA X
COPY GOALS PERM A GOALS DATA X
COPY GOAL1 PERM A GOAL1 DATA X
COPY GOAL2 PERM A GOAL2 DATA X

Appendix A. LISTING OF EXEC 2 PROGRAMS
COPY GOAL3 PERM A GOAL3 DATA X
COPY RIGID PERM A RIGID DATA X
COPY ALLOCATN PERM A ALLOCATN DATA X
EUDEXEC2
&PRESUME &SUBCOMMAND DISPLAY

&GOTO -INTRO

*******************************************************************************
| * OPTION4 - MAKE TEMPORARY CHANGES PERMANENT |
*******************************************************************************

-OPTION4

USE TEMPPERM
MAP DATA I ECODE 
 (LOAD UNLOAD PREVIEW
-ERRQUIT
DISPLAY
&IF &RSTATUS = PFI &GOTO -SAVE
&IF &RSTATUS = PFIO &GOTO -MAINMENU
&ECODE = &STRING OF UNDEFINED PF KEY
SIGNAL
&GOTO -ERRQUIT

-SAVE

&PRESUME &COMMAND
ERASE SOURCED PERM A
ERASE SOURCEN PERM A
ERASE USED PERM A
ERASE USEN PERM A
ERASE INIT PERM A
ERASE CONST PERM A
COPY SOURCED DATA X SOURCED PERM A
COPY SOURCEN DATA X SOURCEN PERM A
COPY USED DATA X USED PERM A
COPY USEN DATA X USEN PERM A
COPY YEAR DATA X YEAR PERM A
COPY INIT DATA X INIT PERM A
COPY CONST DATA X CONST PERM A
EUDEXEC2
&PRESUME &SUBCOMMAND DISPLAY

&GOTO -INTRO

*******************************************************************************
| * OPTION5 - MAKE PERMANENT CHANGES |
*******************************************************************************

-OPTION5

&COMMAND EXEC PERMCHNG

&GOTO -MAINMENU

*******************************************************************************
| * OPTION6 - RUN GP MODEL |
*******************************************************************************

-OPTION6

&COMMAND EXEC RUNMODEL

&GOTO -MAINMENU

Appendix A. LISTING OF EXEC 2 PROGRAMS 224
END - QUIT THE MODEL

-END
USE QUITMODL
-ERRQUITMODL
DISPLAY
MAP DATA 1 ECODE (LOAD UNLOAD PREVIEW
&IF &RSTATUS = PF1 &GOTO MAINMENU
&IF &RSTATUS = PF10 &GOTO -ENDALL
&ECODE = &STRING OF UNDEFINED PF KEY!
SIGNAL
&GOTO -ERRQUITMODL

-ENDALL
&PRESUME &COMMAND
EXEC DETACH 150

&EXIT
A.10 TEMPCHNG

* OPTION 2 - MAKE TEMPORARY CHANGES TO DATA

&TRACE OFF

* DECIDE ON PLANNING HORIZON

EXEC TEMPHRZN

EUDEXEC2
&PRESUME &SUBCOMMAND DISPLAY

* DISPLAY MAIN MENU

-MAIN

USE TEMPMAIN
-ERRORMAIN

DISPLAY
MAP DATA 1 ECODE (LOAD UNLOAD PREVIEW
&IF &RSTATUS = PF1 &GOTO -OPTION1
&IF &RSTATUS = PF2 &GOTO -OPTION2
&IF &RSTATUS = PF3 &GOTO -OPTION3
&IF &RSTATUS = PF4 &GOTO -OPTION4
&IF &RSTATUS = PFIO &GOTO END
&ECODE = &STRING OF UNDEFINED PF KEY!
SIGNAL
&GOTO -ERRORMAIN

* OPTION1 - MAKE CHANGES TO SOURCES

-OPTION1

* DISPLAY SOURCE CHANGE MENU

-SRCEMENU

USE TSRCOPTN
MAP DATA 1 ECODE (LOAD UNLOAD PREVIEW
-ERRSRCEOPTN
DISPLAY
&IF &RSTATUS = PF1 &GOTO -SRCEOPT1
&IF &RSTATUS = PF2 &GOTO -SRCEOPT2
&IF &RSTATUS = PF3 &GOTO -SRCEOPT3
&IF &RSTATUS = PF4 &GOTO -SRCEOPT4
&IF &RSTATUS = PFIO &GOTO :MAIN
&ECODE = &STRING OF UNDEFINED PF KEY!
SIGNAL
&GOTO -ERRSRCEOPT

**********************************************************************
* MODIFY X SOURCE
* SELECT SOURCE
**********************************************************************

-SRCEOPT1

USE TMPSRC

MAP DATA 1 SN1 2 SN2 3 SN3 4 SN4 5 SN5 (LOAD UNLOAD PREVIEW
MAP DATA 6 SN6 7 SN7 8 SN8 9 SN9 10 SN10 (LOAD UNLOAD PREVIEW
MAP DATA 11 SN11 12 SN12 13 SN13 14 SN14 15 SN15 (LOAD UNLOAD PREVIEW
MAP DATA 16 SN16 17 ECODE (LOAD UNLOAD PREVIEW

&COMMAND EXECIO 1 DISKR INIT DATA X 1 (FINIS
&READ VAR &NS &NU &NY &STYR &STYRNO

&COMMAND EXECIO &NU DISKR USEN DATA X 1 (FINIS
&N = 0
&LOOP 3 &NU
&N = &N + 1
&NAME = &CONCAT OF U &N
&READ STRING &NAME

&COMMAND EXECIO &NS DISKR SOURCEN DATA X 1 (FINIS
&N = 0
&LOOP 6 &NS
&N = &N + 1
&NAME = &CONCAT OF S &N
&READ STRING &NAME
&NAME1 = &CONCAT OF SN &N
&NAME1 = &CONCAT OF &BLANK &N , &BLANK &NAME
&IF &N LT 10 &NAME1 = &CONCAT OF &BLANK &NAME1

&N = &N + 1
&IF &N GT 16 &SKIP -3
&TEMP = &CONCAT OF SN &N
SET &TEMP (PRO
&SKIP -4

&SN = 0

-ERRSRCEOPT1

DISPLAY

&IF &RSTATUS = PF10 &GOTO -SRCEMENU
&IF &RCURSOR = SN1 &SN = 1
&IF &RCURSOR = SN2 &SN = 2
&IF &RCURSOR = SN3 &SN = 3
&IF &RCURSOR = SN4 &SN = 4
&IF &RCURSOR = SN5 &SN = 5
&IF &RCURSOR = SN6 &SN = 6
&IF &RCURSOR = SN7 &SN = 7
&IF &RCURSOR = SN8 &SN = 8
&IF &RCURSOR = SN9 &SN = 9
&IF &RCURSOR = SN10 &SN = 10
&IF &RCURSOR = SN11 &SN = 11
&IF &RCURSOR = SN12 &SN = 12
&IF &RCURSOR = SN13 &SN = 13
&IF &RCURSOR = SN14 &SN = 14
&IF &RCURSOR = SN15 &SN = 15
&IF &RCURSOR = SN16 &SN = 16
&IF &RSTATUS EQ ENTER &GOTO -MODSOU
&ECODE = &STRING OF UNDEFINED PF KEY!
SIGNAL
&GOTO -ERRSRCEOPT1
MODSOU

&STACK &NS &NU &SN &NY
&COMMAND EXECIO 1 DISKR SRCE DATA X 1 F 80 (FINIS

&PRESUME &COMMAND

FILEDEF FT01F001 DISK SRCE  DATA X
FILEDEF FT02F001 DISK SOURCED DATA X
FILEDEF FT03F001 DISK CONST  DATA X
FILEDEF FT07F001 DISK RETSRC DATA X
FILEDEF FT08F001 DISK RETCONT DATA X
RETSRC
COPYFILE RETSRC DATA X (LRECL 80 RECFM F
COPYFILE RETCONT DATA X (LRECL 80 RECFM F

EUDEEXEC2
&PRESUME &SUBCOMMAND DISPLAY

* MODIFY INITIAL BALANCE

USE TMSRCBAL
MAP DATA 1 SNAME 2 CIBAL 3 IBAL 4 ECODE (LOAD UNLOAD PREVIEW

&NAME = &CONCAT OF S &SN
&SNAME = &&NAME
&COMMAND EXECIO 1 DISKR RETSRC DATA X 1 (FINIS
&READ VAR &CIBAL
DISPLAY

&IF .&IBAL NE .&BLANK &SKIP 3
&IF .&IBAL = .&BLANK &IBAL = &CIBAL
DISPLAY

&STACK &IBAL
&COMMAND EXECIO 1 DISKR MODSRC DATA X 1 F 80 (FINIS

* MODIFY QUARTERLY FUNDS

USE TMSRCQTR
MAP DATA 1 SNAME 2 YEAR (LOAD UNLOAD PREVIEW
MAP DATA 3 QTR01 4 QTRN1 5 QTR02 6 QTRN2 (LOAD UNLOAD PREVIEW
MAP DATA 7 QTR03 8 QTRN3 9 QTR04 10 QTRN4 (LOAD UNLOAD PREVIEW
MAP DATA 11 ECODE (LOAD UNLOAD PREVIEW

&N = 0
&LOOP .-MSRCQTR &NY
&N = &N + 1
&M = &N + 1
&QTRN1 = &BLANK
&QTRN2 = &BLANK
&QTRN3 = &BLANK
&QTRN4 = &BLANK

&NAME = &&CONCAT OF S &SN
&SNAME = &&NAME

&COMMAND EXECIO 1 DISKR YEAR DATA X &N (FINIS
&READ VAR &YEAR

Appendix A. LISTING OF EXEC 2 PROGRAMS
&COMMAND EXECIO 1 DISKR RETSRC DATA X &M (FINIS
&READ VAR &QTR01 &QTR02 &QTR03 &QTR04

&NB = 0
DISPLAY

&IF &QTRN1 EQ .&BLANK &NB = 1
&IF &QTRN2 EQ .&BLANK &NB = 1
&IF &QTRN3 EQ .&BLANK &NB = 1
&IF &QTRN4 EQ .&BLANK &NB = 1
&IF &QTRN1 EQ .&BLANK &QTRN1 = &QTR01
&IF &QTRN2 EQ .&BLANK &QTRN2 = &QTR02
&IF &QTRN3 EQ .&BLANK &QTRN3 = &QTR03
&IF &QTRN4 EQ .&BLANK &QTRN4 = &QTR04

&IF &NB = 0 &SKIP 2
DISPLAY

&STACK &QTRN1 &QTRN2 &QTRN3 &QTRN4
&COMMAND EXECIO 1 DISKW MODSRC DATA X &M F 80 (FINIS

-MSRQTR

USE TSCRLIST
MAP DATA 1 SNAME 2 REPLY 3 ECODE (LOAD UNLOAD PREVIEW

&NAME = &CONCAT OF S &SN
&SNAME = &&NAME
&REPLY = N
DISPLAY

&IF &REPLY = N &GOTO -NMSRCELIG
&IF &REPLY = Y &GOTO -MSRCELIG
&ECLASS = &STRING OF ENTER 'Y' OR 'N'
SIGNAL
&SKIP -6

-MSRCELIG

USE TMCSRC
MAP DATA 1 SNAME (LOAD UNLOAD PREVIEW
MAP DATA 2 UNI 3 EI 4 UN2 5 E2 6 UN3 7 E3 (LOAD UNLOAD PREVIEW
MAP DATA 8 UN4 9 E4 10 UN5 11 E5 12 UN6 13 E6 (LOAD UNLOAD PREVIEW
MAP DATA 14 UN7 15 E7 16 UN8 17 E8 18 UN9 19 E9 (LOAD UNLOAD PREVIEW
MAP DATA 20 UN10 21 E10 22 UN11 23 E11 (LOAD UNLOAD PREVIEW
MAP DATA 24 UN12 25 E12 26 UN13 27 E13 (LOAD UNLOAD PREVIEW
MAP DATA 28 UN14 29 E14 30 UN15 31 E15 (LOAD UNLOAD PREVIEW
MAP DATA 32 UN16 33 E16 34 ECODE (LOAD UNLOAD PREVIEW

&NAME = &CONCAT OF S &SN
&SNAME = &&NAME

&COMMAND EXECIO &NU DISKR RETCONT DATA X 1 (FINIS
&N = 0
&LOOP 6 &NU
&N = &N + 1
&NAME = &CONCAT OF E &N
&READ VAR &&NAME
&NAME1 = &CONCAT OF UN &N
&NAME1 = &CONCAT OF U &N
&NAME = &&NAME1

&IF &N GE 16 &SKIP 4
&N = &N + 1
&NAME = &CONCAT OF E &N
SET &&NAME (PRO
&SKIP 4

-MSRCLEER

Appendix A. LISTING OF EXEC 2 PROGRAMS 229
DISPLAY

&N = 0
&LOOP -MSRCCONT &NU
&N = &N + 1
&NAME = &CONCAT OF E &N
&IF .&NAME EQ .Y &GOTO -MSRCCONT
&IF .&NAME EQ .N &GOTO -MSRCCONT
&ECODE = &STRING OF ENTER 'Y' OR 'N'
SIGNAL
&GOTO -MSRCLERR

-MSRCCONT

&N = 0
&LOOP 3 &NU
&N = &N + 1
&NAME = &CONCAT OF E &N
&STACK &&NAME
&COMMAND EXECJO &NU DISKW MODCONT DATA X 1 F 80 (FINISH
&GOTO -MSDONE

-MSRCELIG
&COMMAND COPY RETCONT DATA X MODCONT DATA X

-MSDONE
&PRESUME &COMMAND
FILEDEF FT01F001 DISK SRCE DATA X
FILEDEF FT02F001 DISK SOURCED DATA X
FILEDEF FT03F001 DISK CONST DATA X
FILEDEF FT08F001 DISK MODSRC DATA X
FILEDEF FT09F001 DISK MODCONT DATA X
FILEDEF FT10F001 DISK NEWSRCE DATA X
FILEDEF FT11F001 DISK NEWCONT DATA X
FILEDEF FT21F001 DISK RIGID DATA X
FILEDEF FT22F001 DISK GOAL1 DATA X
FILEDEF FT23F001 DISK GOAL2 DATA X
FILEDEF FT24F001 DISK GOAL3 DATA X
FILEDEF FT31F001 DISK RIGID DATA1 X
FILEDEF FT32F001 DISK GOAL1 DATA1 X
FILEDEF FT33F001 DISK GOAL2 DATA1 X
FILEDEF FT34F001 DISK GOAL3 DATA1 X
FILEDEF FT35F001 DISK GOAL5 DATA1 X
MODSRC
COPYFILE NEWSRCE DATA X (LRECL 80 RECFM F
COPYFILE NEWCONT DATA X (LRECL 80 RECFM F
ERASE SOURCED DATA X
ERASE CONST DATA X
COPY NEWSRCE DATA X SOURCED DATA X
COPY NEWCONT DATA X CONST DATA X
ERASE NEWSRCE DATA X
ERASE NEWCONT DATA X
ERASE SRCE DATA X
ERASE MODSRC DATA X
ERASE RETSRC DATA X
ERASE MODCONT DATA X
ERASE RETCONT DATA X
ERASE RIGID DATA X
ERASE GOAL1 DATA X
ERASE GOAL2 DATA X
ERASE GOAL3 DATA X
ERASE GOALS DATA X
COPY RIGID DATA1 X RIGID DATA X (LRECL 100 RECFM F
COPY GOAL1 DATA1 X GOAL1 DATA X (LRECL 100 RECFM F
COPY GOAL2 DATA1 X GOAL2 DATA X (LRECL 100 RECFM F
COPY GOAL3 DATA1 X GOAL3 DATA X (LRECL 100 RECFM F
COPY GOALS DATA1 X GOALS DATA X (LRECL 100 RECFM F

Appendix A. LISTING OF EXEC 2 PROGRAMS 230
ERASE RIGID DATA1 X
ERASE GOAL1 DATA1 X
ERASE GOAL2 DATA1 X
ERASE GOAL3 DATA1 X
ERASE GOAL5 DATA1 X

EUDEXEC2
&PRESUMESUBCOMMAND DISPLAY
&GOTO -SRCEMENU

**********************************************************************
* DELETE X SOURCE
* SELECT SOURCE
**********************************************************************

-SRCEOPT2

USE TMPSRCED
MAP DATA 1 SN1 2 SN2 3 SN3 4 SN4 5 SN5 (LOAD UNLOAD PREVIEW
MAP DATA 6 SN6 7 SN7 8 SN8 9 SN9 10 SN10 (LOAD UNLOAD PREVIEW
MAP DATA 11 SN11 12 SN12 13 SN13 14 SN14 15 SN15 (LOAD UNLOAD PREVIEW
MAP DATA 16 SN16 17 ECODE (LOAD UNLOAD PREVIEW

&COMMAND EXECIO 1 DISKR INIT DATA X 1 (FINIS
&READ VAR &NS &NU &NY &STYR &STYRNO

&COMMAND EXECIO &NU DISKR USEN DATA X 1 (FINIS
&N = 0
&LOOP 3 &NU
&N = &N + 1
&NAME = &CONCAT OF U &N
&READ STRING &&NAME

&COMMAND EXECIO &NS DISKR SOURCEN DATA X 1 (FINIS
&N = 0
&LOOP 6 &NS
&N = &N + 1
&NAME = &CONCAT OF S &N
&READ STRING &&NAME
&NAME1 = &CONCAT OF SN &N
&&NAME1 = &CONCAT OF &BLANK &N . &BLANK &NAME
&IF &N LT 10 &&NAME1 = &CONCAT OF &BLANK &&NAME1

&N = &N + 1
&IF &N GT 16 &SKIP 3
&TEMP = &CONCAT OF SN &N
SET &TEMP (PRO
&SKIP -4

&SN = 0

-ERRSRCEOPT2

DISPLAY

&IF &RSTATUS = PF10 &GOTO -SRCEMENU
&IF &RCURSOR = SN1 &SN = 1
&IF &RCURSOR = SN2 &SN = 2
&IF &RCURSOR = SN3 &SN = 3
&IF &RCURSOR = SN4 &SN = 4
&IF &RCURSOR = SN5 &SN = 5
&IF &RCURSOR = SN6 &SN = 6
&IF &RCURSOR = SN7 &SN = 7
&IF &RCURSOR = SN8 &SN = 8
&IF &RCURSOR = SN9 &SN = 9
&IF &RCURSOR = SN10 &SN = 10
&IF &RCURSOR = SN11 &SN = 11
&IF &RCURSOR = SN12 &SN = 12
&IF &RCURSOR = SN13 &SN = 13

Appendix A. LISTING OF EXEC 2 PROGRAMS
&IF &RCURSOR = SN14 &SN = 14
&IF &RCURSOR = SN15 &SN = 15
&IF &RCURSOR = SN16 &SN = 16
&IF &RSTATUS EQ ENTER &GOTO -DELSOU
&ECODE = &STRING OF UNDEFINED PF KEY!
SIGNAL
&GOTO -ERRSRCOPT2

-DELSOU

USE TSRCDCK
MAP DATA 1 SNAME 2 REPLY 3 ECODE
-SRCDCHKE
&NAME = &CONCAT OF S &SN
&SNAME = &SNAME
&REPLY = &BLANK
DISPLAY
&IF &REPLY = Y &GOTO -SRCDYES
&IF &REPLY = N &GOTO -SRCEMENU
&ECODE = &STRING OF ENTER 'Y' OR 'N'
SIGNAL
&GOTO -SRCDCHKE

***********************************************************************
* DELETE X SOURCE
* UPDATE FILES
***********************************************************************

-SRCDYES

&LN = &NS - 1
&N = 0
&LOOP 5 &NS
&N = &N + 1
&IF &N = &SN &SKIP 2
&NAME = &CONCAT OF S &N
&STACK &&NAME

&COMMAND ERASE SOURCEN DATA X
&COMMAND EXECIO &LN DISKW SOURCEN DATA X 1 F 80 (FINIS
&STACK &NS &SN &NY
&COMMAND EXECIO 1 DISKW SRCE DATA X 1 F 80 (FINIS
&PRESUME &COMMAND
FILEDEF FT01F001 DISK SRCE DATA X
FILEDEF FT02F001 DISK SOURCED DATA X
FILEDEF FT03F001 DISK CONST DATA X
FILEDEF FT07F001 DISK NEWSRCE DATA X
FILEDEF FT08F001 DISK NEWCONT DATA X
FILEDEF FT11F001 DISK RIGID DATA X
FILEDEF FT12F001 DISK GOAL1 DATA X
FILEDEF FT13F001 DISK GOAL2 DATA X
FILEDEF FT14F001 DISK GOAL3 DATA X
FILEDEF FT21F001 DISK RIGID DATA1 X
FILEDEF FT22F001 DISK GOAL1 DATA1 X
FILEDEF FT23F001 DISK GOAL2 DATA1 X
FILEDEF FT24F001 DISK GOAL3 DATA1 X
FILEDEF FT25F001 DISK GOAL5 DATA1 X
DELSRCE
COPYFILE NEWSRCE DATA X (LRECL 80 RECFM F
COPYFILE NEWCONT DATA X (LRECL 80 RECFM F
ERASE SOURCED DATA X
ERASE CONST DATA X
COPY NEWSRCE DATA X SOURCED DATA X
COPY NEWCONT DATA X CONST DATA X
ERASE NEWSRCE DATA X
ERASE NEWCONT DATA X
ERASE SRCE DATA X

Appendix A. LISTING OF EXEC 2 PROGRAMS

232
ERASE RIGID DATA X
ERASE GOAL1 DATA X
ERASE GOAL2 DATA X
ERASE GOAL3 DATA X
ERASE GOALS DATA X

COPY RIGID DATA1 X RIGID DATA X (LRECL 100 RECFM F
COPY GOAL1 DATA1 X GOAL1 DATA X (LRECL 100 RECFM F
COPY GOAL2 DATA1 X GOAL2 DATA X (LRECL 100 RECFM F
COPY GOAL3 DATA1 X GOAL3 DATA X (LRECL 100 RECFM F
COPY GOALS DATA1 X GOALS DATA X (LRECL 100 RECFM F

ERASE RIGID DATA1 X
ERASE GOAL1 DATA1 X
ERASE GOAL2 DATA1 X
ERASE GOAL3 DATA1 X
ERASE GOALS DATA1 X

&NS = &NS - 1
&STACK &NS &NU &NY &STYR &STYRNO
&COMMAND EXECIO I DISKW INIT DATA X 1 (FINIS

EUDEXEC2
&RESUME &SUBCOMMAND DISPLAY
USE TMPSRCDL
MAP DATA 1 SNAM 
MAP DATA 2 SN1 3 SN2 4 SN3 5 SN4 6 SN5 
MAP DATA 7 SN6 8 SN7 9 SN8 10 SN9 11 SN10 
MAP DATA 12 SN11 13 SN12 14 SN13 15 SN14 16 SN15 
MAP DATA 17 SN16 

&NAME = &CONCAT OF SN &SN
&SNAM = &NAME

&COMMAND EXECIO &NS DISKR SOURCEN DATA X 1 (FINIS
&N = 0
&LOOP 5 &NS
&N = &N + 1
&NAME = &CONCAT OF SN &N
&READ STRING &NAME
&NAME = &CONCAT OF &BLANK &N . &BLANK &NAME
&IF &N LT 10 &NAME = &CONCAT OF &BLANK &NAME

DISPLAY
&GOTO -SRCEMENU

**********************************************************************
* ADD X NEW SOURCE
* GET SOURCE NAME
**********************************************************************

-SRCEOPT3

USE TNSRCBAL
MAP DATA 1 SNAM 2 IBAL 3 ECODE (LOAD UNLOAD PREVIEW
-NSRCNAMER
DISPLAY
&IF &SNAM NE &BLANK &SKIP 3
&ECODE = &STRING OF ENTER SOURCE NAME SIGNAL
&GOTO -NSRCNAMER
&IF &IBAL NE &BLANK &SKIP 2
&IF &IBAL = &BLANK &IBAL = 0
DISPLAY
&COMMAND EXECIO I DISKR INIT DATA X 1 (FINIS
&READ VAR &NS &NU &NY &STYR &STYRNO

Appendix A. LISTING OF EXEC 2 PROGRAMS 233
&COMMAND EXECIO &NU DISKR USEN DATA X 1 (FINIS
&N = 0
&LOOP 3 &NU
&N = &N + 1
&NAME = &CONCAT OF U &N
&READ STRING &NAME

&COMMAND EXECIO &NS DISKR SOURCEN DATA X 1 (FINIS
&N = 0
&LOOP 3 &NS
&N = &N + 1
&NAME = &CONCAT OF S &N
&READ STRING &NAME

&N = &NS + 1
&STACK &SNAM
&COMMAND EXECIO 1 DISKW SOURCEN DATA X &N F 80 (FINIS
&STACK &IBAL
&COMMAND EXECIO 1 DISKW NSRCE DATA X 1 F 80 (FINIS

**********************************************************************
* READ QUARTERLY FUNDS
**********************************************************************

USE TNRCQTR
MAP DATA 1 SNAME 2 YEAR  (LOAD UNLOAD PREVIEW
MAP DATA 3 QTR1 4 QTR2 5 QTR3 6 QTR4 7 ECODE  (LOAD UNLOAD PREVIEW

&N = 0
&LOOP -NSRCQTR &NY
&N = &N + 1
&M = &N + 1
&QTR1 = &BLANK
&QTR2 = &BLANK
&QTR3 = &BLANK
&QTR4 = &BLANK
&COMMAND EXECIO 1 DISKR YEAR DATA X &N (FINIS
&READ VAR &YEAR
&SNAME = &SNAM
&NB = 0

DISPLAY

&IF .&QTR1 EQ .&BLANK &NB = 1
&IF .&QTR2 EQ .&BLANK &NB = 1
&IF .&QTR3 EQ .&BLANK &NB = 1
&IF .&QTR4 EQ .&BLANK &NB = 1
&IF .&QTR1 EQ .&BLANK &QTR1 = 0
&IF .&QTR2 EQ .&BLANK &QTR2 = 0
&IF .&QTR3 EQ .&BLANK &QTR3 = 0
&IF .&QTR4 EQ .&BLANK &QTR4 = 0
&IF &NB = 0 &SKIP 2

DISPLAY

&STACK &QTR1 &QTR2 &QTR3 &QTR4
&COMMAND EXECIO 1 DISKW NSRCE DATA X &M F 80 (FINIS

-NSRCQTR

USE TNCKSRC
MAP DATA 1 SNAME  (LOAD UNLOAD PREVIEW
MAP DATA 2 UN1 3 EN1 4 UN2 5 EN2 6 UN3 7 E3  (LOAD UNLOAD PREVIEW
MAP DATA 8 UN4 9 EN4 10 UN5 11 EN5 12 UN6 13 EN6  (LOAD UNLOAD PREVIEW
MAP DATA 14 UN7 15 EN7 16 UN8 17 EN8 18 UN9 19 EN9  (LOAD UNLOAD PREVIEW
MAP DATA 20 UN10 21 EN10 22 UN11 23 EN11  (LOAD UNLOAD PREVIEW
MAP DATA 24 UN12 25 EN12 26 UN13 27 EN13  (LOAD UNLOAD PREVIEW

Appendix A. LISTING OF EXEC 2 PROGRAMS  234
MAP DATA 28 UN14 29 E14 30 UN15 31 E15
MAP DATA 32 UN16 33 E16 34 ECODE

&$NAME = &$SNAM
&N = 0
&LOOP 4 &NU
&N = &N + 1
&NAME = &CONCAT OF UN &N
&NAME1 = &CONCAT OF U &N
&NAME = &&NAME1
&IF &N GE 16 &SKIP 4
&N = &N + 1
&NAME = &CONCAT OF E &N
SET &NAME (PRO
&SKIP -4
-NSRCLERR
DISPLAY
&N = 0
&LOOP -NSRCCONT &NU
&N = &N + 1
&NAME = &CONCAT OF E &N
&IF &NAME EQ .Y &GOTO -NSRCCONT
&IF &NAME EQ .N &GOTO -NSRCCONT
&ECODE = &STRING OF ENTER 'Y' OR 'N'
SIGNAL
&GOTO -NSRCLERR
-NSRCCONT
&N = 0
&LOOP 3 &NU
&N = &N + 1
&NAME = &CONCAT OF E &N
&COMMAND EXECIO &NU DISKW NCONT DATA X 1 F 80 (FINIS
&STACK &NS &NU &NY
&COMMAND EXECIO 1 DISKW SRCE DATA X 1 (FINIS
-NSDONE
&PRESUME &COMMAND
FILEDEF FT01F001 DISK SRCE DATA X
FILEDEF FT02F001 DISK SOURCED DATA X
FILEDEF FT03F001 DISK CONST DATA X
FILEDEF FT08F001 DISK NSRCE DATA X
FILEDEF FT09F001 DISK NCONT DATA X
FILEDEF FT10F001 DISK NEWSRCE DATA X
FILEDEF FT11F001 DISK NEWCONT DATA X
ADDSRCE
COPYFILE NEWSRCE DATA X (LRECL 80 RECFM F
COPYFILE NEWCONT DATA X (LRECL 80 RECFM F
ERASE SOURCED DATA X
ERASE CONST DATA X
COPY NEWSRCE DATA X SOURCED DATA X
COPY NEWCONT DATA X CONST DATA X
ERASE NEWSRCE DATA X
ERASE NEWCONT DATA X
ERASE SRCE DATA X
ERASE NSRCE DATA X
ERASE NCONT DATA X
&NS = &NS + 1
&STACK &NS &NU &NY &STYR &STYRNO
&COMMAND EXECIO 1 DISKW INIT DATA X 1 (FINIS

Appendix A. LISTING OF EXEC 2 PROGRAMS 235
EUDEXEC2
&PRESUME &SUBCOMMAND DISPLAY

USE TMPSRCLN
MAP DATA 1 SNAMEx (LOAD UNLOAD PREVIEW
MAP DATA 2 SN1 3 SN2 4 SN3 5 SN4 6 SN5 (LOAD UNLOAD PREVIEW
MAP DATA 7 SN6 8 SN7 9 SN8 10 SN9 11 SN10 (LOAD UNLOAD PREVIEW
MAP DATA 12 SN11 13 SN12 14 SN13 15 SN14 16 SN15 (LOAD UNLOAD PREVIEW
MAP DATA 17 SN16 (LOAD UNLOAD PREVIEW

&SNAME = &SNAMEx

&COMMAND EXECIO &NS DISKR SOURCEN DATA X 1 (FINIS
&N = 0
&LOOP 5 &NS
&N = &N + 1
&NAME = &CONCAT OF SN &N
&READ STRING &NAME
&NAME = &CONCAT OF &BLANK &N . &BLANK &NAME
&IF &N LT 10 &NAME = &CONCAT OF &BLANK &NAME

DISPLAY
&GOTO -SRCEMENU

**********************************************************************
* SORT SOURCES
**********************************************************************

-SRCEOPT4

&PRESUME &COMMAND
EXEC TMPSRSTSR
EUDEXEC2
&PRESUME &SUBCOMMAND DISPLAY

&GOTO -SRCEMENU

**********************************************************************
* DISPLAY USE CHANGE MENU
**********************************************************************

-OPTION2

-USEMENU

USE TUSEOPTN
MAP DATA 1 ECODE (LOAD UNLOAD PREVIEW
-ERRUSEOPN

DISPLAY
&IF &RSTATUS = PF1 &GOTO -USEOPT1
&IF &RSTATUS = PF2 &GOTO -USEOPT2
&IF &RSTATUS = PF3 &GOTO -USEOPT3
&IF &RSTATUS = PF4 &GOTO -USEOPT4
&IF &RSTATUS = PF10 &GOTO -MAIN
&ECODE = &STRING OF UNDEFINED PF KEY!
SIGNAL
&GOTO -ERRUSEOPN

**********************************************************************
* MODIFY X USE
* SELECT USE
**********************************************************************

-USEOPT1

Appendix A. LISTING OF EXEC 2 PROGRAMS 236
USE TMPUSEM
MAP DATA 1 UN1 2 UN2 3 UN3 4 UN4 5 UN5 (LOAD UNLOAD PREVIEW
MAP DATA 6 UN6 7 UN7 8 UN8 9 UN9 10 UN10 (LOAD UNLOAD PREVIEW
MAP DATA 11 UN11 12 UN12 13 UN13 14 UN14 15 UN15 (LOAD UNLOAD PREVIEW
MAP DATA 16 UN16 17 ECODE (LOAD UNLOAD PREVIEW

&COMMAND EXECIO 1 DISKR INIT DATA X 1 (FINIS
&READ VAR &NS &NU &NY &STYR &STYRNO

&COMMAND EXECIO &NU DISKR USEN DATA X 1 (FINIS
&N = 0
&LOOP 6 &NU
&N = &N + 1
&NAME = &CONCAT OF U &N
&READ STRING &NAME
&NAME1 = &CONCAT OF UN &N
&NAME2 = &CONCAT OF &BLANK &N . &BLANK &NAME
&IF &N LT 10 &&NAME1 = &CONCAT OF &BLANK &NAME1

&COMMAND EXECIO &NS DISKR SOURCEN DATA X 1 (FINIS
&N = 0
&LOOP 3 &NS
&N = &N + 1
&NAME = &CONCAT OF S &N
&READ STRING &NAME
&N = &NU
&N = &N + 1
&IF &N GT 16 &&SKIP 3
&TEMP = &CONCAT OF UN &N
SET &TEMP (PRO
&&SKIP 4
&UN = 0

-ERRUSEOPT1

DISPLAY

&IF &RSTATUS = PF10 &GOTO -USEMENU
&IF &RCURSOR = UN1 &UN = 1
&IF &RCURSOR = UN2 &UN = 2
&IF &RCURSOR = UN3 &UN = 3
&IF &RCURSOR = UN4 &UN = 4
&IF &RCURSOR = UN5 &UN = 5
&IF &RCURSOR = UN6 &UN = 6
&IF &RCURSOR = UN7 &UN = 7
&IF &RCURSOR = UN8 &UN = 8
&IF &RCURSOR = UN9 &UN = 9
&IF &RCURSOR = UN10 &UN = 10
&IF &RCURSOR = UN11 &UN = 11
&IF &RCURSOR = UN12 &UN = 12
&IF &RCURSOR = UN13 &UN = 13
&IF &RCURSOR = UN14 &UN = 14
&IF &RCURSOR = UN15 &UN = 15
&IF &RCURSOR = UN16 &UN = 16
&IF &RSTATUS EQ ENTER &GOTO -MODUSE
&ECODE = &STRING OF UNDEFINED PF KEY!
SIGNAL
&GOTO -ERRUSEOPT1

-MODUSE

&STACK &NS &NU &UN &NY
&COMMAND EXECIO 1 DISKW USE DATA X 1 F 80 (FINIS

&PRESUME &COMMAND
FILEDEF FT01F001 DISK USE DATA X
FILEDEF FT02F001 DISK USED DATA X
FILEDEF FT03F001 DISK CONST DATA X

Appendix A. LISTING OF EXEC 2 PROGRAMS 237
FILEDEF FT07F001 DISK RETUSE DATA X
FILEDEF FT08F001 DISK RETCONT DATA X
RETUSE
COPYFILE RETUSE DATA X (LRECL 80 RECFM F
COPYFILE RETCONT DATA X (LRECL 80 RECFM F
EUDEXEC2 &PRESUME &SUBCOMMAND DISPLAY

**********************************************************************
*
** MODIFY QUARTERLY FUNDS **
**********************************************************************

USE TMUSEQTR
MAP DATA 1 UNAME 2 YEAR (LOAD UNLOAD PREVIEW
MAP DATA 3 QTRO1 4 QTNRN1 5 QTRO2 6 QTNRN2 (LOAD UNLOAD PREVIEW
MAP DATA 7 QTRO3 8 QTNRN3 9 QTRO4 10 QTNRN4 (LOAD UNLOAD PREVIEW
MAP DATA 11 ECODE (LOAD UNLOAD PREVIEW

&N = 0
&LOOP -MUSEQTR &NY
&N = &N + 1
&QTNRN1 = &BLANK
&QTNRN2 = &BLANK
&QTNRN3 = &BLANK
&QTNRN4 = &BLANK
&NAME = &CONCAT OF U &UNAME
&UNAME = &NAME
&COMMAND EXECIO 1 DISKR YEAR DATA X &N (FINIS
&READ VAR &YEAR
&COMMAND EXECIO 1 DISKR RETUSE DATA X &N (FINIS
&READ VAR &QTRO1 &QTRO2 &QTRO3 &QTRO4

&NB = 0
DISPLAY

&IF .&QTNRN1 EQ .&BLANK &NB = 1
&IF .&QTNRN2 EQ .&BLANK &NB = 1
&IF .&QTNRN3 EQ .&BLANK &NB = 1
&IF .&QTNRN4 EQ .&BLANK &NB = 1
&IF .&QTNRN1 EQ .&BLANK &QTNRN1 = &QTRO1
&IF .&QTNRN2 EQ .&BLANK &QTNRN2 = &QTRO2
&IF .&QTNRN3 EQ .&BLANK &QTNRN3 = &QTRO3
&IF .&QTNRN4 EQ .&BLANK &QTNRN4 = &QTRO4
&IF &NB = 0 &SKIP 2
DISPLAY

&STACK &QTNRN1 &QTNRN2 &QTNRN3 &QTNRN4
&COMMAND EXECIO 1 DISKW MODUSE DATA X &N F 80 (FINIS

-MUSEQTR

USE TUSELIST
MAP DATA 1 UNAME 2 REPLY 3 ECODE (LOAD UNLOAD PREVIEW

&NAME = &CONCAT OF U &UNAME
&UNAME = &NAME
&REPLY = &NAME
DISPLAY

&IF &REPLY = N &GOTO -NMUSEELIG
&IF &REPLY = Y &GOTO -MUSEELIG
&ECODE = &STRING OF ENTER ‘Y’ OR ‘N’

Appendix A. LISTING OF EXEC 2 PROGRAMS
USE TMCKUSE
MAP DATA I UNAME (LOAD UNLOAD PREVIEW
MAP DATA 2 SN1 3 E1 4 SN2 5 E2 6 SN3 7 E3 (LOAD UNLOAD PREVIEW
MAP DATA 8 SN4 9 E4 10 SN5 11 E5 12 SN6 13 E6 (LOAD UNLOAD PREVIEW
MAP DATA 14 SN7 15 E7 16 SN8 17 E8 18 SN9 19 E9 (LOAD UNLOAD PREVIEW
MAP DATA 20 SN10 21 E10 22 SN11 23 E11 (LOAD UNLOAD PREVIEW
MAP DATA 24 SN12 25 E12 26 SN13 27 E13 (LOAD UNLOAD PREVIEW
MAP DATA 28 SN14 29 E14 30 SN15 31 E15 (LOAD UNLOAD PREVIEW
MAP DATA 32 SN16 33 E16 34 ECODE (LOAD UNLOAD PREVIEW

&NAME = &CONCAT OF U &UN
&UNAME = &\&NAME

&COMMAND EXECIO &NS DISKR RETCONT DATA X 1 (FINIS
&N = 0
&LOOP 6 &NS
&N = &N + 1
&NAME = &CONCAT OF E &N
&READ VAR &\&NAME
&NAME1 = &CONCAT OF S &N
&\&NAME = &\&NAME1

&IF &N GE 16 &SKIP 4
&N = &N + 1
&NAME = &CONCAT OF E &N
SET &NAME (PRO
&SKIP -4

-MUSELERR

DISPLAY

&N = 0
&LOOP -MUSECONT &NS
&N = &N + 1
&NAME = &CONCAT OF E &N
&IF &\&NAME EQ .Y &GOTO -MUSECONT
&IF &\&NAME EQ .N &GOTO -MUSECONT
&ECODE = &STRING OF ENTER 'Y' OR 'N'
SIGNAL
&GOTO -MUSELERR

-MUSECONT

&N = 0
&LOOP 3 &NS
&N = &N + 1
&NAME = &CONCAT OF E &N
&STACK &\&NAME
&COMMAND EXECIO &NS DISKW MODCONT DATA X 1 F 80 (FINIS
&GOTO -MUDONE

-NMUSEELIG
&COMMAND COPY RETCONT DATA X MODCONT DATA X

-MUDONE
&PRESUME &COMMAND
FILEDEF FT01F001 DISK USE DATA X
FILEDEF FT02F001 DISK USED DATA X
FILEDEF FT03F001 DISK CONST DATA X
FILEDEF FT08F001 DISK MODUSE DATA X
FILEDEF FT09F001 DISK MODCONT DATA X
FILEDEF FT10F001 DISK NEWUSE DATA X
FILEDEF FT11F001 DISK NEWCONT DATA X
FILEDEF FT21F001 DISK RIGID DATA X
FILEDEF FT22F001 DISK GOAL DATA X
FILEDEF FT23F001 DISK GOAL2 DATA X
FILEDEF FT24F001 DISK GOAL3 DATA X
FILEDEF FT31F001 DISK RIGID DATA1 X
FILEDEF FT32F001 DISK GOAL1 DATA1 X
FILEDEF FT33F001 DISK GOAL2 DATA1 X
FILEDEF FT34F001 DISK GOAL3 DATA1 X
FILEDEF FT35F001 DISK GOAL5 DATA1 X
MODUSE
COPYFILE NEWUSE DATA X (LRECL 80 RECFM F
COPYFILE NEWCONT DATA X (LRECL 80 RECFM F
ERASE USED DATA X
ERASE CONST DATA X
COPY NEWUSE DATA X USED DATA X
COPY NEWCONT DATA X CONST DATA X
ERASE NEWUSE DATA X
ERASE NEWCONT DATA X
ERASE USE DATA X
ERASE MODUSE DATA X
ERASE RETUSE DATA X
ERASE MODCONT DATA X
ERASE RETCONT DATA X
ERASE RIGID DATA X
ERASE GOAL1 DATA X
ERASE GOAL2 DATA X
ERASE GOAL3 DATA X
ERASE GOALS DATA X
COPY RIGID DATA1 X RIGID DATA X (LRECL 100 RECFM F
COPY GOAL1 DATA1 X GOAL1 DATA X (LRECL 100 RECFM F
COPY GOAL2 DATA1 X GOAL2 DATA X (LRECL 100 RECFM F
COPY GOAL3 DATA1 X GOAL3 DATA X (LRECL 100 RECFM F
COPY GOALS DATA1 X GOALS DATA X (LRECL 100 RECFM F
ERASE RIGID DATA1 X
ERASE GOAL1 DATA1 X
ERASE GOAL2 DATA1 X
ERASE GOAL3 DATA1 X
ERASE GOALS DATA1 X
EUDEXEC2
&PRESUME &SUBCOMMAND DISPLAY
&GOTO -USEMENU

*******************************************************************************
* DELETE X USE
* SELECT USE
*******************************************************************************

-USEOPT2
USE TMPUSED
MAP DATA 1 UN1 2 UN2 3 UN3 4 UN4 5 UN5 (LOAD UNLOAD PREVIEW
MAP DATA 6 UN6 7 UN7 8 UN8 9 UN9 10 UN10 (LOAD UNLOAD PREVIEW
MAP DATA 11 UN11 12 UN12 13 UN13 14 UN14 15 UN15 (LOAD UNLOAD PREVIEW
MAP DATA 16 UN16 17 ECODE (LOAD UNLOAD PREVIEW

&COMMAND EXECIO 1 DISKR INIT DATA X 1 (FINIS
&READ VAR &NS &NU &NY &STYR &STYRNO

&COMMAND EXECIO &NU DISKR USEN DATA X 1 (FINIS
&N = 0
&LOOP 6 &NU
&N = &N + 1
&NAME = &CONCAT OF U &N
&READ STRING &NAME
&NAME1 = &CONCAT OF UN &N
&&NAME1 = &CONCAT OF &BLANK &N . &BLANK &NAME
&IF &N LT 10 &NAME1 = &CONCAT OF &BLANK &NAME1

Appendix A. LISTING OF EXEC 2 PROGRAMS 240
&COMMAND EXECIO &NS DISKR SOURCEN DATA X 1 (FINIS
&N = 0
&LOOP 3 &NS
&N = &N + 1
&NAME = &CONCAT OF S &N
&READ STRING &NAME
&N = &NU
&N = &N + 1
&IF &N GT 16 &SKIP 3
&TEMP = &CONCAT OF UN &N
SET &TEMP (PRO
&SKIP -4
&N = 0
-ERRUSEOPT2

DISPLAY
IF &RSTATUS = PF10 &GOTO -USEMENU
&IF &RCURSOR = UN1 &UN = 1
&IF &RCURSOR = UN2 &UN = 2
&IF &RCURSOR = UN3 &UN = 3
&IF &RCURSOR = UN4 &UN = 4
&IF &RCURSOR = UN5 &UN = 5
&IF &RCURSOR = UN6 &UN = 6
&IF &RCURSOR = UN7 &UN = 7
&IF &RCURSOR = UN8 &UN = 8
&IF &RCURSOR = UN9 &UN = 9
&IF &RCURSOR = UN10 &UN = 10
&IF &RCURSOR = UN11 &UN = 11
&IF &RCURSOR = UN12 &UN = 12
&IF &RCURSOR = UN13 &UN = 13
&IF &RCURSOR = UN14 &UN = 14
&IF &RCURSOR = UN15 &UN = 15
&IF &RCURSOR = UN16 &UN = 16
&IF &RSTATUS EQ ENTER &GOTO -DELUSE
&ECODE = &STRING OF UNDEFINED PF KEY!
SIGNAL
&GOTO -ERRUSEOPT2

-DELUSE

USE TUSEDCK
MAP DATA 1 UNAME 2 REPLY 3 ECODE (LOAD UNLOAD PREVIEW
-USEDCHKE
&NAME = &CONCAT OF U &UN
&UNAME = &NAME
&REPLY = &BLANK
DISPLAY
&IF &REPLY = Y &GOTO -USEDYES
&IF &REPLY = N &GOTO -USEMENU
&ECODE = &STRING OF ENTER 'Y' OR 'N'
SIGNAL
&GOTO -USEDCHKE

*******************************************************************************
* DELETE X USE
* UPDATE FILES
*******************************************************************************

-USEDYES
&LN = &NU - 1
&N = 0
&LOOP 5 &NU
&N = &N + 1
&IF &N = &UN &SKIP 2

Appendix A. LISTING OF EXEC 2 PROGRAMS 241
Appendix A. LISTING OF EXEC 2 PROGRAMS
&N = &N + 1
&NAME = &CONCAT OF UN &N
&READ STRING &&NAME
&NAME = &CONCAT OF &BLANK &N. &BLANK &NAME
&IF &N LT 10 &NAME = &CONCAT OF &BLANK &NAME

DISPLAY
&GOTO -USEMENU

**********************************************************************
* ADD X NEW USE
* GET USE NAME
**********************************************************************

-USEOPT3
USE TNUSEBAL
MAP DATA 1 UNAM 2 ECODE (LOAD UNLOAD PREVIEW
-NUSENAMER
DISPLAY
&IF .&UNAM NE .&BLANK &SKIP 3
&ECODE = &STRING OF ENTER USE NAME SIGNAL
&GOTO -NUSENAMER

&COMMAND EXECIO 1 DISKR INIT DATA X 1 (FINIS
&READ VAR &NS &NU &NY &STYR &STYRNO

&COMMAND EXECIO &NU DISKR USEN DATA X 1 (FINIS
&N = 0
&LOOP 3 &NU
&N = &N + 1
&NAME = &CONCAT OF U &N
&READ STRING &&NAME

&COMMAND EXECIO &NS DISKR SOURCEN DATA X 1 (FINIS
&N = 0
&LOOP 3 &NS
&N = &N + 1
&NAME = &CONCAT OF S &N
&READ STRING &&NAME

&N = &NU + 1
&STACK &UNAM
&COMMAND EXECIO 1 DISKW USEN DATA X &N F 80 (FINIS

**********************************************************************
* READ QUARTERLY FUNDS
**********************************************************************

USE TNUSEQTR
MAP DATA 1 UNAME 2 YEAR (LOAD UNLOAD PREVIEW
MAP DATA 3 QTR1 4 QTR2 5 QTR3 6 QTR4 7 ECODE (LOAD UNLOAD PREVIEW

&N = 0
&LOOP -NUSEQTR &NY
&N = &N + 1
&QTR1 = &BLANK
&QTR2 = &BLANK
&QTR3 = &BLANK
&QTR4 = &BLANK
&COMMAND EXECIO 1 DISKR YEAR DATA X &N (FINIS
&READ VAR &YEAR
&UNAME = &UNAM
&NB = 0

Appendix A. LISTING OF EXEC 2 PROGRAMS 243
DISPLAY

&IF .&QTR1 EQ .&BLANK &NB = 1
&IF .&QTR2 EQ .&BLANK &NB = 1
&IF .&QTR3 EQ .&BLANK &NB = 1
&IF .&QTR4 EQ .&BLANK &NB = 1
&IF .&QTR1 EQ .&BLANK &QTR1 = 0
&IF .&QTR2 EQ .&BLANK &QTR2 = 0
&IF .&QTR3 EQ .&BLANK &QTR3 = 0
&IF .&QTR4 EQ .&BLANK &QTR4 = 0
&IF &NB = 0 &SKIP 2

DISPLAY

&STACK &QTR1 &QTR2 &QTR3 &QTR4
&COMMAND EXECIO 1 DISKW NUSE DATA X &N F 80 (FINIS

-NUSEQTR

USE TNCKUSE

MAP DATA 1 UNAME (LOAD UNLOAD PREVIEW
MAP DATA 2 SN1 3 E1 4 SN2 5 E2 6 SN3 7 E3 (LOAD UNLOAD PREVIEW
MAP DATA 8 SN4 9 E4 10 SN5 11 E5 12 SN6 13 E6 (LOAD UNLOAD PREVIEW
MAP DATA 14 SN7 15 E7 16 SN8 17 E8 18 SN9 19 E9 (LOAD UNLOAD PREVIEW
MAP DATA 20 SN10 21 E10 22 SN11 23 E11 (LOAD UNLOAD PREVIEW
MAP DATA 24 SN12 25 E12 26 SN13 27 E13 (LOAD UNLOAD PREVIEW
MAP DATA 28 SN14 29 E14 30 SN15 31 E15 (LOAD UNLOAD PREVIEW
MAP DATA 32 SN16 33 E16 34 ECOD (LOAD UNLOAD PREVIEW

&UNAME = &UNAM

&N = 0
&LOOP 4 &NS
&N = &N + 1
&NAME = &CONCAT OF SN &N
&NAME1 = &CONCAT OF S &N
&NAME = &NAME1

&IF &N GE 16 &SKIP 4
&N = &N + 1
&NAME = &CONCAT OF E &N
SET &NAME (PRO
&SKIP -4

-NUSELERR

DISPLAY

&N = 0
&LOOP -NUSECONT &NS
&N = &N + 1
&NAME = &CONCAT OF E &N
&IF .&NAME EQ .Y &GOTO -NUSECONT
&IF .&NAME EQ .N &GOTO -NUSECONT
&ECOD = &STRING OF ENTER 'Y' OR 'N'
SIGNAL
&GOTO -NUSELERR

-NUSECONT

&N = 0
&LOOP 3 &NS
&N = &N + 1
&NAME = &CONCAT OF E &N
&STACK &NAME
&COMMAND EXECIO &NS DISKW NCONT DATA X 1 F 80 (FINIS

&STACK &NS &NU &NY
&COMMAND EXECIO 1 DISKW USE DATA X 1 (FINIS

Appendix A. LISTING OF EXEC 2 PROGRAMS 244
-NSDONE

&PRESUME &COMMAND

FILEDEF FT01F001 DISK USE DATA X
FILEDEF FT02F001 DISK USED DATA X
FILEDEF FT03F001 DISK CONST DATA X
FILEDEF FT08F001 DISK NUSE DATA X
FILEDEF FT09F001 DISK NCONT DATA X
FILEDEF FT10F001 DISK NEWUSE DATA X
FILEDEF FT11F001 DISK NEWCONT DATA X
ADUDE
COPYFILE NEWUSE DATA X (LRECL 80 RECFM F)
COPYFILE NEWCONT DATA X (LRECL 80 RECFM F)
ERASE USED DATA X
ERASE CONST DATA X
COPY NEWUSE DATA X USED DATA X
COPY NEWCONT DATA X CONST DATA X
ERASE NEWUSE DATA X
ERASE NEWCONT DATA X
ERASE USE DATA X
ERASE NUSE DATA X
ERASE NCONT DATA X

&NU = &NU + 1
&STACK &NS &NU &NY &STYR &STYRNO
&COMMAND EXECIO 1 DISKW INIT DATA X 1 (FINIS

EUDEXEC2
&PRESUME &SUBCOMMAND DISPLAY

USE TMPUSENL
MAP DATA 1 UNAME (LOAD UNLOAD PREVIEW
MAP DATA 2 UN1 3 UN2 4 UN3 5 UN4 6 UN5 (LOAD UNLOAD PREVIEW
MAP DATA 7 UN6 8 UN7 9 UN8 10 UN9 11 UN10 (LOAD UNLOAD PREVIEW
MAP DATA 12 UN11 13 UN12 14 UN13 15 UN14 16 UN15 (LOAD UNLOAD PREVIEW
MAP DATA 17 UN16 (LOAD UNLOAD PREVIEW

&UNAME = &UNAM

&COMMAND EXECIO &NU DISKR USEN DATA X 1 (FINIS
&N = 0
&LOOP 5 &NU
&N = &N + 1
&NAME = &CONCAT OF UN &N
&READ STRING &&NAME
&IF &N LT 10 &&NAME = &CONCAT OF &BLANK &N . &BLANK &&NAME
&IF &N LT 10 &&NAME = &CONCAT OF &BLANK &&NAME

DISPLAY
&GOTO -USEMENU

**********************************************************************
* SORT SOURCES
**********************************************************************

-USEOPT4

&PRESUME &COMMAND
EXEC TMPSRTUS EUDEXEC2
&PRESUME &SUBCOMMAND DISPLAY

&GOTO -USEMENU

-END

&EXIT

Appendix A. LISTING OF EXEC 2 PROGRAMS 245
**A.11 TEMPHRZN**

* OPTION - TEMPORARILY CHANGE PLANNING HORIZON
* THIS EXEC PERMITS USER TO CHANGE NUMBER OF YEARS IN PLANNING HORIZON
* AND/OR STARTING YEAR OF THE PLANNING HORIZON

&TRACE OFF

* DISPLAY CURRENT SETTINGS FOR PLANNING HORIZON

EUDEEXEC2
&PREUSE &SUBCOMMAND DISPLAY
-TOP

&COMMAND EXCEIO 1 DISKR INIT DATA X 1 (FINIS
&READ VARS &NS &NY &STYR &STYRNO

USE TEMPLAN
MAP DATA 1 VOID 2 YEARS 3 STYEAR 4 ECODE (LOAD UNLOAD PREVIEW
&YEARS = &NY
&STYEAR = &STYR

-ERRPLNTIME
DISPLAY

* CHECK IF USER HAS CHANGED PLANNING HORIZON

&IF &STYEAR NE &STYR &GOTO -CHSTYR
&IF &YEARS NE &NY &GOTO -CHNOYR
&GOTO -NOCHANGE

* CHANGE IN STARTING YEAR

-CHSTYR

&N = 1

-REFYRCT

&COMMAND EXCEIO 1 DISKR REFYEAR DATA Z &N (FINIS
&READ VAR &NRFYR
&IF &NRFYR = &STYEAR &GOTO -CHYRCONT
&N = &N + 1
&IF &N LE 19 &GOTO -REFYRCT
&ECODE = &STRING OF INCORRECT STARTING YEAR!
SIGNAL
&GOTO -ERRPLNTIME
* CHANGE IN NUMBER OF YEARS

-CHNOYR
&N = &STYRNO

-CHYRCON
&OL = &STYRNO
&OU = &OL + &NY - 1
&TL = &N
&TU = &TL + &YEARS - 1

&X = 0
&IF &TL LT &OL &X = &X + &OL - &TL
&IF &TU GT &OU &X = &X + &TU - &OU
&IF &TL GT &OU &X = &YEARS
&IF &TU LT &OL &X = &YEARS

&IF &X LE 0 &GOTO -CHREFYR

* WARN USER ABOUT NUMBER OF DATA ENTRIES THAT WILL BE NEEDED

USE TCHPLYR
MAP DATA 1 ENTRIES 2 ECODE (LOAD UNLOAD PREVIEW
&ENTRIES = &NS + &NU
&ENTRIES = &MULT OF &ENTRIES 4
&ENTRIES = &MULT OF &ENTRIES &X
&FLAG = 0
&IF &X = &YEARS &FLAG = 1
&IF &TL NE &OL &FLAG = 1
&IF &FLAG = 1 &ENTRIES = &ENTRIES + &NS

-CHKPYERR
DISPLAY
&IF &RSTATUS = PF1 &GOTO -CHREFYR
&IF &RSTATUS = PF10 &GOTO -NOCHANGE
&ECODE = &STRING OF UNDEFINED PF KEY!
SIGNAL
&GOTO -CHKPYERR

* READ ADDITIONAL DATA THAT IS NEEDED FOR NEW PLANNING HORIZON

-CHREFYR

&M = 1
&YN = &N
&COMMAND ERASE YEAR DATA X

-CREFYRCT
&COMMAND EXECIO 1 DISKR REFYEAR DATA Z &YN (FINIS
&READ VAR &YEARREAD
&STACK &YEARREAD
&COMMAND EXECIO 1 DISKW YEAR DATA X &M F 80 (FINIS
&M = &M + 1
&YN = &YN + 1
&IF &M LE &YEARS &GOTO -CREFYRCT

-DATAFILES
&STACK &NS &NU &YEARS &STYEAR &N
&COMMAND EXECIO 1 DISKW INIT DATA X 1 F 80 (FINIS

Appendix A. LISTING OF EXEC 2 PROGRAMS 247
&M = 0
&Y = &NY + 1
&LOOP -SRCPLCH UNTIL &M = &NS
&L = &MULT OF &M &Y
&M = &M + 1
&COMMAND EXECIO 1 DISKR SOURCEN DATA X &M (FINIS
&READ STRING &SNAME

&LINE = &L + 1
&IF &FLAG = 1 &GOTO -NEWSTBAL

USE TSRCBALO
MAP DATA 1 SN 2 IBAL 3 ECODE (LOAD UNLOAD PREVIEW
&COMMAND EXECIO 1 DISKR SOURCED DATA X &LINE (FINIS
&READ VAR &IBAL
&SN = &SNAME
DISPLAY
&IF &RSTATUS = PF10 &GOTO -QUIT
&GOTO -WRBAL

-NewSTBal
USE TSRCBALN
MAP DATA 1 SN 2 IBAL 3 ECODE (LOAD UNLOAD PREVIEW
&SN = &SNAME
DISPLAY
&IF &RSTATUS = PF10 &GOTO -QUIT
&IF .&IBAL NE .&BLANK &GOTO 2
&IF .&IBAL = .&BLANK &IBAL = 0
DISPLAY
&IF &RSTATUS = PF10 &GOTO -QUIT

-WRBAL

&STACK &IBAL
&COMMAND EXECIO 1 DISKW SRCE DATA X

&I = -1
&LOOP -SRCEDATA &YEARS
&I = &I + 1
&J = &TL + &I
&IF &J GE &OL &GOTO 2
&CALL -NSRCQTR
&GOTO -SRCEDATA
&IF &J LE &OL &GOTO 2
&CALL -NSRCQTR
&GOTO -SRCEDATA
&CALL -OSRCQTR
-SRCEDATA

&COMMAND FINIS YEAR DATA X

-SRCPPLCH

&COMMAND FINIS SRCE DATA X

&M = 0
&Y = &NY
&LOOP -USEPLCH UNTIL &M = &NU
&L = &MULT OF &M &Y
&LINE = &L
&M = &M + 1
&COMMAND EXECIO 1 DISKR USEN DATA X &M (FINIS
&READ STRING &UNAME

&I = -1
&LOOP -USEDATA &YEARS
&I = &I + 1
&J = &TL + &I
&IF &J GE &OL &GOTO 2
&CALL -NUSEQTR
&GOTO -USEDATA
Appendix A. LISTING OF EXEC 2 PROGRAMS

249
&COMMAND EXECIO 1 DISKR USED DATA X &LINE (FINIS
&READ VARS &QTR1 &QTR2 &QTR3 &QTR4
&COMMAND EXECIO 1 DISKR YEAR DATA X
&READ VAR &YEAR
&UNAM = &UNAME
DISPLAY
&IF &RSTATUS = PF10 &GOTO -QUIT
&STACK &QTR1 &QTR2 &QTR3 &QTR4
&COMMAND EXECIO 1 DISKW USE DATA X

&RETURN

-NUSEQTR

USE TUSEQTRN
MAP DATA 1 UNAM 2 YEAR (LOAD UNLOAD PREVIEW
MAP DATA 3 QTR1 4 QTR2 5 QTR3 6 QTR4 7 ECODE (LOAD UNLOAD PREVIEW

&QTR1 = &BLANK
&QTR2 = &BLANK
&QTR3 = &BLANK
&QTR4 = &BLANK
&COMMAND EXECIO 1 DISKR YEAR DATA X
&READ VAR &YEAR
&UNAM = &UNAME
&NB = 0
DISPLAY
&IF &RSTATUS = PF10 &GOTO -QUIT
&IF &QTR1 EQ &BLANK &NB = 1
&IF &QTR2 EQ &BLANK &NB = 1
&IF &QTR3 EQ &BLANK &NB = 1
&IF &QTR4 EQ &BLANK &NB = 1
&IF &QTR1 EQ &BLANK &QTR1 = 0
&IF &QTR2 EQ &BLANK &QTR2 = 0
&IF &QTR3 EQ &BLANK &QTR3 = 0
&IF &QTR4 EQ &BLANK &QTR4 = 0
&IF &NB = 0 &SKIP 1
DISPLAY
&IF &RSTATUS = PF10 &GOTO -QUIT
&STACK &QTR1 &QTR2 &QTR3 &QTR4
&COMMAND EXECIO 1 DISKW USE DATA X

&RETURN

******************************************************************************
* UPDATE DATA FILES
******************************************************************************

-UPDATE

&PRESUME &COMMAND
COPYFILE YEAR DATA X (LRECL 80 RECFM F
COPYFILE SRCX DATA X (LRECL 80 RECFM F
COPYFILE USE DATA X (LRECL 80 RECFM F
ERASE SOURCED DATA X
ERASE USED DATA X

&STACK &NS &NU &YEARS
EXECIO 1 DISKW TMPPLYR DATA X (FINIS
COPYFILE TMPPLYR DATA X (LRECL 80 RECFM F
FILEDEF FT01F001 DISK TMPPLYR DATA X
FILEDEF FT02F001 DISK SRCX DATA X
FILEDEF FT03F001 DISK USE DATA X
FILEDEF FT08F001 DISK SOURCED DATA X
FILEDEF FT09F001 DISK USED DATA X
PLANYEAR
COPYFILE SOURCED DATA X (LRECL 80 RECFM F

Appendix A. LISTING OF EXEC 2 PROGRAMS

250
COPYFILE USED DATA X (LRECL 80 RECFM F)
ERASE TMPPL YR DATA X
ERASE SRCE DATA X
ERASE USE DATA X
ERASE RIGID DATA X
ERASE GOALS DATA X
ERASE GOAL1 DATA X
ERASE GOAL2 DATA X
ERASE GOAL3 DATA X
&STACK
EXECIO 1 DISKW RIGID DATA X 1 F 80 (FINIS
&STACK
EXECIO 1 DISKW GOAL1 DATA X 1 F 80 (FINIS
&STACK
EXECIO 1 DISKW GOAL2 DATA X 1 F 80 (FINIS
&STACK
EXECIO 1 DISKW GOAL3 DATA X 1 F 80 (FINIS
&STACK 1 1 1 1 1
EXECIO 1 DISKW GOALS DATA X 1 F 80 (FINIS
&EXIT

-NOCHANGE
&PRESUME &COMMAND
&EXIT

-QUIT
&PRESUME &COMMAND
ERASE INIT DATA X
ERASE YEAR DATA X
COPY INIT PERM A INIT DATA X
COPY YEAR PERM A YEAR DATA X
ERASE TMPPL YR DATA X
ERASE SRCE DATA X
ERASE USE DATA X
EUDEXEC2
&PRESUME &SUBCOMMAND DISPLAY
&GOTO -TOP

Appendix A. LISTING OF EXEC 2 PROGRAMS 251
A.12 TMPSRTSR

* SORTING (TEMPORARY) OPTIONS FOR SOURCES

&TRACE OFF

EXECIO 1 DISKR INIT DATA X 1 (FINIS
&READ VAR &NS &NU &NY

EUDEXEC2
&PRESUME &SUBCOMMAND DISPLAY

-RANKSRC

USE TRANKSRC
MAP DATA 1 ECODE
-ERANKSRC
DISPLAY
&IF &RSTATUS = PF1 &GOTO -RSRCOPT1
&IF &RSTATUS = PF2 &GOTO -RSRCOPT3
&IF &RSTATUS = PF3 &GOTO -RSRCOPT4
&IF &RSTATUS = PF4 &GOTO -RSRCOPT5
&IF &RSTATUS = PF5 &GOTO -RSRCOPT2
&IF &RSTATUS = PF10 &GOTO &-QUIT
&ECODE = &STRING OF UNDEFINED PF KEY!
SIGNAL
&GOTO &-ERANKSRC

-RSRCOPT1
&S0 = 1
&GOTO &-RANKSOURCE

-RSRCOPT2

USE TUSR SRC
MAP DATA 1 SN1 2 R1 3 SN2 4 R2 5 SN3 6 R3
MAP DATA 7 SN4 8 R4 9 SN5 10 R5 11 SN6 12 R6
MAP DATA 13 SN7 14 R7 15 SN8 16 R8 17 SN9 18 R9
MAP DATA 19 SN10 20 R10 21 SN11 22 R11 23 SN12 24 R12
MAP DATA 25 SN13 26 R13 27 SN14 28 R14 29 SN15 30 R15
MAP DATA 31 SN16 32 R16 33 SN17 (LOAD UNLOAD PREVIEW

&COMMAND EXECIO &NS DISKR SOURCEN DATA X 1 (FINIS
&N = 0
&LOOP 5 &NS
&N = &N + 1
&NAME = &CONCAT OF SN &N
&READ STRING &NAME
&NAME = &CONCAT OF &BLANK &N . &BLANK &NAME
&IF &N LT 10 &NAME = &CONCAT OF &BLANK &NAME

&N = &N + 1
&IF &N GT 16 &SKIP 3
&TEMP = &CONCAT OF R &N
SET &TEMP (PRO
&SKIP -4

-EOPT2SRCE
DISPLAY

&SUM1 = 0
&SUM2 = 0
&N = 0
&LOOP 11 &NS
&N = &N + 1

Appendix A. LISTING OF EXEC 2 PROGRAMS 252
&NAME = &CONCAT OF R &N
&NAME1 = &LEFT OF &NAME 1
&IF .&NAME1 = .&BLANK &&NAME = &RIGHT OF &NAME 1
&IF .&&NAME NE .&BLANK &SKIP 3
&ECODE = &STRING OF BLANK ENTRY!
SIGNAL
&GOTO -EOPT2SRC
&&NAME = &TRIM OF &&NAME
&SUM1 = &SUM1 + &N
&SUM2 = &SUM2 + &&NAME

&IF .&SUM1 = &SUM2 &SKIP 3
&ECODE = &STRING OF IMPROPER ORDERING!
SIGNAL
&GOTO -EOPT2SRC

&N = 0
&LOOP 4 &NS
&N = &N + 1
&IF &&NAME LT 10 &&NAME = &CONCAT OF &BLANK &&NAME
&STACK &&NAME
&COMMAND EXECIO &NS DISKW SRC1 DATA X 1 (FINIS
&COMMAND COPYFILE SRC1 DATA X (LRECL 80 RECFM F

&N = 0
&LOOP 2 &NS
&N = &N + 1
&STACK &N
&COMMAND EXECIO &NS DISKW SRC2 DATA X 1 (FINIS
&COMMAND COPYFILE SRC2 DATA X (LRECL 80 RECFM F

&COMMAND SET CMSTYPE HT
&STACK 1-50 51
&COMMAND COPYFILE SRC2 DATA X SRC1 DATA X (SPECS NOPROMPT OVLY LRECL 80 RECFM F

&STACK 1 3
&COMMAND SORT SRC1 DATA X SRC DATA X

&STACK 51-52 1
&COMMAND COPYFILE SRC DATA X SRC DATA X (SPECS NOPROMPT LRECL 80 RECFM F
&COMMAND SET CMSTYPE RT

&COMMAND ERASE SRC DATA X
&COMMAND ERASE SRC1 DATA X
&COMMAND ERASE SRC2 DATA X

&SO = 2

&GOTO -RANKSOURCE
-RSRCOPT3

&COMMAND COPYFILE SOURCEN DATA X SRC1 DATA X
&N = 0
&LOOP 2 &NS
&N = &N + 1
&STACK &N
&COMMAND EXECIO &NS DISKW SRC2 DATA X 1 (FINIS
&COMMAND COPYFILE SRC2 DATA X (LRECL 80 RECFM F

&COMMAND SET CMSTYPE HT
&STACK 1-50 51
&COMMAND COPYFILE SRC2 DATA X SRC1 DATA X (SPECS NOPROMPT OVLY LRECL 80 RECFM F

&STACK 1 20
&COMMAND SORT SRC1 DATA X SRC DATA X

&STACK 51-52 1
&COMMAND COPYFILE SRC DATA X SRCCE DATA X (SPECS NOPROMPT LRECL 80 RECFM F
&COMMAND SET CMSTYPE RT

Appendix A. LISTING OF EXEC 2 PROGRAMS 253
&COMMAND ERASE SRC DATA X
&COMMAND ERASE SRC1 DATA X
&COMMAND ERASE SRC2 DATA X

&SO = 3

&GOTO -RANKSOURCE
-RSRCOPT4

&SO = 4

&GOTO -RANKSOURCE
-RSRCOPT5

&SO = 5

-RANKSOURCE

&PRESUME &COMMAND

&IF &SO = 1 &GOTO -DISPSRC
&IF &SO = 2 &GOTO -RUNSRCSORT
&IF &SO = 3 &GOTO -RUNSRCSORT

&STACK &SO
&STACK &NS &NU &NY

EXECIO 2 DISKW SRC DATA X 1 (FINIS
COPYFILE SRC DATA X (LRECL 80 RECFM F

FILEDEF FT01F001 DISK SRC DATA X
FILEDEF FT02F001 DISK SOURCED DATA X
FILEDEF FT11F001 DISK SRC DATA X
SRCAMT

COPYFILE SRC DATA X (LRECL 80 RECFM F
ERASE SRC DATA X

-RUNSRCSORT

FILEDEF FT01F001 DISK INIT DATA X
FILEDEF FT02F001 DISK SRC DATA X
FILEDEF FT03F001 DISK SOURCN DATA X
FILEDEF FT04F001 DISK SOURCED DATA X
FILEDEF FT08F001 DISK CONST DATA X
FILEDEF FT21F001 DISK RIGID DATA X
FILEDEF FT22F001 DISK GOAL1 DATA X
FILEDEF FT23F001 DISK GOAL2 DATA X
FILEDEF FT24F001 DISK GOAL3 DATA X
FILEDEF FT11F001 DISK SN DATA X
FILEDEF FT12F001 DISK SD DATA X
FILEDEF FT13F001 DISK CONS DATA X
FILEDEF FT31F001 DISK RIGID DATA1 X
FILEDEF FT32F001 DISK GOAL1 DATA1 X
FILEDEF FT33F001 DISK GOAL2 DATA1 X
FILEDEF FT34F001 DISK GOAL3 DATA1 X
SRCSORT

ERASE SRC DATA X
ERASE SOURCN DATA X
ERASE SOURCED DATA X
ERASE CONST DATA X
COPYFILE SN DATA X SOURCN DATA X (LRECL 80 RECFM F
COPYFILE SD DATA X SOURCED DATA X (LRECL 80 RECFM F
COPYFILE CONS DATA X CONST DATA X (LRECL 80 RECFM F
ERASE SN DATA X
ERASE SD DATA X
ERASE CONS DATA X
ERASE RIGID DATA X
ERASE GOAL1 DATA X
ERASE GOAL2 DATA X

Appendix A. LISTING OF EXEC 2 PROGRAMS 254
ERASE GOAL3 DATA X
COPYFILE RIGID DATA1 X RIGID DATA X (LRECL 100 RECFM F
COPYFILE GOAL1 DATA1 X GOAL1 DATA X (LRECL 100 RECFM F
COPYFILE GOAL2 DATA1 X GOAL2 DATA X (LRECL 100 RECFM F
COPYFILE GOAL3 DATA1 X GOAL3 DATA X (LRECL 100 RECFM F
ERASE RIGID DATA1 X
ERASE GOAL1 DATA1 X
ERASE GOAL2 DATA1 X
ERASE GOAL3 DATA1 X

******************************************************************
*
DISPLAY LIST OF SORTED SOURCES
******************************************************************

-DISPSRC

EUDEXEC2
&PRESUME &SUBCOMMAND DISPLAY

USE TSRTDSRC
MAP DATA 1 SCHEME (LOAD UNLOAD PREVIEW
MAP DATA 2 SN1 3 SN2 4 SN3 5 SN4 6 SN5 (LOAD UNLOAD PREVIEW
MAP DATA 7 SN6 8 SN7 9 SN8 10 SN9 11 SN10 (LOAD UNLOAD PREVIEW
MAP DATA 12 SN11 13 SN12 14 SN13 15 SN14 16 SN15 (LOAD UNLOAD PREVIEW
MAP DATA 17 SN16 (LOAD UNLOAD PREVIEW

&IF &SO = 1 &SCHEME = &STRING OF CURRENT ORDERING
&IF &SO = 2 &SCHEME = &STRING OF USER SPECIFIED
&IF &SO = 3 &SCHEME = &STRING OF ALPHABETICAL
&IF &SO = 4 &SCHEME = &STRING OF DECREASING FUNDS
&IF &SO = 5 &SCHEME = &STRING OF INCREASING FUNDS

&COMMAND EXECIO &NS DISKR SOURCEN DATA X 1 (FINIS
&N = 0
&LOOP =1 &NS
&N = &N + 1
&NAME = &CONCAT OF SN &N
&READ STRING &NAME
&NAME = &CONCAT OF &BLANK &N . &BLANK &NAME
&IF &N LT 10 &NAME = &CONCAT OF &BLANK &NAME

DISPLAY

&GOTO -RANKSRC

-QUIT

&PRESUME &COMMAND

&EXIT
**A.13 TMPSRTUS**

------------------------------------------------------------------------
* SORTING (TEMPORARY) OPTIONS FOR USES
------------------------------------------------------------------------

&TRACE OFF

EXECIO 1 DISKR INIT DATA X 1 (FINIS
&READ VAR &NS &NU &NY

EUDEXEC2
&PRESUME &SUBCOMMAND DISPLAY

-RANKUSE

USE TRANKUSE
MAP DATA 1 ECODE  (LOAD UNLOAD PREVIEW
-ERANKUSE
DISPLAY
&IF &RSTATUS = PF1 &GOTO -RUSEOPT1
&IF &RSTATUS = PF2 &GOTO -RUSEOPT3
&IF &RSTATUS = PF3 &GOTO -RUSEOPT4
&IF &RSTATUS = PF4 &GOTO -RUSEOPT5
&IF &RSTATUS = PF5 &GOTO -RUSEOPT2
&IF &RSTATUS = PF10 &GOTO -QUIT
&ECODE = &STRING OF UNDEFINED PF KEY!
SIGNAL
&GOTO -ERANKUSE

-RUSEOPT1

&UO = 1
&GOTO -RANKPROJ

-RUSEOPT2

USE TUSTRUSE
MAP DATA 1 UN1 2 R1 3 UN2 4 R2 5 UN3 6 R3  (LOAD UNLOAD PREVIEW
MAP DATA 7 UN4 8 R4 9 UN5 10 R5 11 UN6 12 R6  (LOAD UNLOAD PREVIEW
MAP DATA 13 UN7 14 R7 15 UN8 16 R8 17 UN9 18 R9  (LOAD UNLOAD PREVIEW
MAP DATA 19 UN10 20 R10 21 UN11 22 R11 23 UN12 24 R12  (LOAD UNLOAD PREVIEW
MAP DATA 25 UN13 26 R13 27 UN14 28 R14 29 UN15 30 R15  (LOAD UNLOAD PREVIEW
MAP DATA 31 UN16 32 R16 33 ECODE  (LOAD UNLOAD PREVIEW

&COMMAND EXECIO &NU DISKR USEN  DATA X 1 (FINIS
&N = 0
&LOOP 5 &NU
&N = &N + 1
&NAME = &CONCAT OF UN &N
&READ STRING &NAME
&NAME = &CONCAT OF &BLANK &N . &BLANK &NAME
&IF &N LT 10 &NAME = &CONCAT OF &BLANK &NAME

&N = &N + 1
&IF &N GT 16 &SKIP 3
&TEMP = &CONCAT OF R &N
SET &TEMP (PRO
&SKIP 4

-EOPT2USE
DISPLAY

&SUM1 = 0
&SUM2 = 0
&N = 0
&LOOP 11 &NU
&N = &N + 1

Appendix A. LISTING OF EXEC 2 PROGRAMS 256
&NAME = &CONCAT OF R &N
&NAME1 = &LEFT OF &NAME
&IF .&NAME = .&BLANK &NAME = &RIGHT OF &NAME
&IF .&NAME NE .&BLANK &SKIP 3
&ECODE = &STRING OF BLANK ENTRY!
SIGNAL
&GOTO -EOPT2USE
&NAME = &TRIM OF &NAME
&SUM1 = &SUM1 + &N
&SUM2 = &SUM2 + &N
&IF .&SUM1 = .&SUM2 &SKIP 3
&ECODE = &STRING OF IMPROPER ORDERING!
SIGNAL
&GOTO -EOPT2USE

&N = 0
&LOOP 4 &NU
&N = &N + 1
&NAME = &CONCAT OF R &N
&IF .&NAME LT 10 &NAME = &CONCAT OF &BLANK &NAME
&STACK &NAME
&COMMAND EXECIO &NU DISKW USE1 DATA X 1 (FINIS
&COMMAND COPYFILE USE1 DATA X (LRECL 80 RECFM F

&N = 0
&LOOP 2 &NU
&N = &N + 1
&STACK &N
&COMMAND EXECIO &NU DISKW USE2 DATA X 1 (FINIS
&COMMAND COPYFILE USE2 DATA X (LRECL 80 RECFM F

&COMMAND SET CMSTYPE HT
&STACK 1-50 51
&COMMAND COPYFILE USE2 DATA X USE1 DATA X (SPECS NOPROMPT OVLY LRECL 80 RECFM F

&STACK 1 3
&COMMAND SORT USE1 DATA X USE DATA X

&STACK 51-52 1
&COMMAND COPYFILE USE DATA X USE DATA X (SPECS NOPROMPT LRECL 80 RECFM F
&COMMAND SET CMSTYPE RT

&COMMAND ERASE USE DATA X
&COMMAND ERASE USE1 DATA X
&COMMAND ERASE USE2 DATA X
&UO = 2
&GOTO -RANKPROJ
-RUSEOPT3

&COMMAND COPYFILE USEN DATA X USE1 DATA X
&N = 0
&LOOP 2 &NU
&N = &N + 1
&STACK &N
&COMMAND EXECIO &NU DISKW USE2 DATA X 1 (FINIS
&COMMAND COPYFILE USE2 DATA X (LRECL 80 RECFM F

&COMMAND SET CMSTYPE HT
&STACK 1-50 51
&COMMAND COPYFILE USE2 DATA X USE1 DATA X (SPECS NOPROMPT OVLY LRECL 80 RECFM F

&STACK 1 20
&COMMAND SORT USE1 DATA X USE DATA X

&STACK 51-52 1
&COMMAND COPYFILE USE DATA X USE DATA X (SPECS NOPROMPT LRECL 80 RECFM F
&COMMAND SET CMSTYPE RT

Appendix A. LISTING OF EXEC 2 PROGRAMS

257
&COMMAND ERASE USE DATA X
&COMMAND ERASE USE1 DATA X
&COMMAND ERASE USE2 DATA X

&UO = 3

&GOTO -RANKPROJ
-RUSEOPT4

&UO = 4

&GOTO -RANKPROJ
-RUSEOPT5

&UO = 5

-RANKPROJ

&PRESUME &COMMAND

&IF &UO = 1 &GOTO -DISPUSE
&IF &UO = 2 &GOTO -RUNUSESORT
&IF &UO = 3 &GOTO -RUNUSESORT

&STACK &UO
&STACK &NS &NU &NY

EXECIO 2 DISKW USE DATA X 1 (FINIS
COPYFILE USE DATA X (LRECL 80 RECFM F

FILEDEF FT01F001 DISK USE DATA X
FILEDEF FT02F001 DISK USED DATA X
FILEDEF FT11F001 DISK USEE DATA X
USEAMT
COPYFILE USEE DATA X (LRECL 80 RECFM F

ERASE USE DATA X

-RUNUSESORT

FILEDEF FT01F001 DISK INIT DATA X
FILEDEF FT02F001 DISK USEE DATA X
FILEDEF FT03F001 DISK USEN DATA X
FILEDEF FT04F001 DISK USED DATA X
FILEDEF FT08F001 DISK CONST DATA X
FILEDEF FT21F001 DISK RIGID DATA X
FILEDEF FT22F001 DISK GOAL1 DATA X
FILEDEF FT23F001 DISK GOAL2 DATA X
FILEDEF FT24F001 DISK GOAL3 DATA X
FILEDEF FT11F001 DISK UN DATA X
FILEDEF FT12F001 DISK UD DATA X
FILEDEF FT13F001 DISK CONS DATA X
FILEDEF FT31F001 DISK RIGID DATA1 X
FILEDEF FT32F001 DISK GOAL1 DATA1 X
FILEDEF FT33F001 DISK GOAL2 DATA1 X
FILEDEF FT34F001 DISK GOAL3 DATA1 X
USESORT

ERASE USEE DATA X
ERASE USEN DATA X
ERASE USED DATA X
ERASE CONST DATA X
COPYFILE UN DATA X USEN DATA X (LRECL 80 RECFM F
COPYFILE UD DATA X USED DATA X (LRECL 80 RECFM F
COPYFILE CONS DATA X CONST DATA X (LRECL 80 RECFM F
ERASE UN DATA X
ERASE UD DATA X
ERASE CONS DATA X
ERASE RIGID DATA X
ERASE GOAL1 DATA X
ERASE GOAL2 DATA X

Appendix A. LISTING OF EXEC 2 PROGRAMS 258
ERASE GOAL3 DATA X
COPYFILE RIGID DATA1 X RIGID DATA X (LRECL 100 RECFM F
COPYFILE GOAL1 DATA1 X GOAL1 DATA X (LRECL 100 RECFM F
COPYFILE GOAL2 DATA1 X GOAL2 DATA X (LRECL 100 RECFM F
COPYFILE GOAL3 DATA1 X GOAL3 DATA X (LRECL 100 RECFM F
ERASE RIGID DATA1 X
ERASE GOAL1 DATA1 X
ERASE GOAL2 DATA1 X
ERASE GOAL3 DATA1 X

* DISPLAY LIST OF SORTED USES

******************************************************************
** DISPLAY LIST OF SORTED USES

******************************************************************

-DISPUSE

EUDEXEC2
&PRESUME &SUBCOMMAND DISPLAY

USE TSRTDUSE
MAP DATA 1 SCHEME (LOAD UNLOAD PREVIEW
MAP DATA 2 UN1 3 UN2 4 UN3 5 UN4 6 UN5 (LOAD UNLOAD PREVIEW
MAP DATA 7 UN6 8 UN7 9 UN8 10 UN9 11 UN10 (LOAD UNLOAD PREVIEW
MAP DATA 12 UN11 13 UN12 14 UN13 15 UN14 16 UN15 (LOAD UNLOAD PREVIEW
MAP DATA 17 UN16 (LOAD UNLOAD PREVIEW

&IF &UO = 1 &SCHEME = &STRING OF CURRENT ORDERING
&IF &UO = 2 &SCHEME = &STRING OF USER SPECIFIED
&IF &UO = 3 &SCHEME = &STRING OF ALPHABETICAL
&IF &UO = 4 &SCHEME = &STRING OF DECREASING FUNDS
&IF &UO = 5 &SCHEME = &STRING OF INCREASING FUNDS

&COMMAND EXECIO &NU DISKR USEN DATA X 1 (FINIS
&N = 0
&LOOP 5 &NU
&N = &N + 1
&NAME = &CONCAT OF UN &N
&READ STRING &NAME
&NAME = &CONCAT OF &BLANK &N &BLANK &NAME
&IF &N LT 10 &NAME = &CONCAT OF &BLANK &NAME
DISPLAY

&GOTO -RANKUSE

-QUIT

&PRESUME &COMMAND

&EXIT

Appendix A. LISTING OF EXEC 2 PROGRAMS  259
A.14 VIEWGOAL

* OPTION - VIEW GOALS IN THE CURRENT MODEL
* THIS EXEC CREATES AND DISPLAYS ALL REPORTS ASSOCIATED WITH THE OPTION

&TRACE OFF

FILEDEF * CLEAR

* WRITE RIGID CONSTRAINTS/GOALS FILES IN FORMATTED FORM

FILEDEF FT01F001 DISK GOAL1 DATA X
FILEDEF FT02F001 DISK GOAL2 DATA X
FILEDEF FT03F001 DISK GOAL3 DATA X
FILEDEF FT04F001 DISK RIGID DATA X
FILEDEF FT11F001 DISK G1 DATA X
FILEDEF FT12F001 DISK G2 DATA X
FILEDEF FT13F001 DISK G3 DATA X
FILEDEF FT17F001 DISK G0 DATA X
FILEDEF FT18F001 DISK NG DATA X
FILEDEF FT19F001 DISK R DATA X
PREVUGLS
COPYFILE NG DATA X (LRECL 80 RECFM F)

EXECIO 1 DISKR NG DATA X 1 (FINIS
&READ VAR &CT1 &CT2 &CT3 &CT0 &CT

* SORT BY DECREASING ORDER OF PRIORITY

SET CMSTYPE HT
&IF &CT1 = 0 &SKIP 3
COPYFILE G1 DATA X (LRECL 80 RECFM F
&STACK 21 22 8 9
SORT G1 DATA X G11 DATA X

&IF &CT2 = 0 &SKIP 3
COPYFILE G2 DATA X (LRECL 80 RECFM F
&STACK 21 22 8 9
SORT G2 DATA X G21 DATA X

&IF &CT3 = 0 &SKIP 3
COPYFILE G3 DATA X (LRECL 80 RECFM F
&STACK 21 22 8 9
SORT G3 DATA X G31 DATA X

&IF &CT = 0 &SKIP 3
COPYFILE G0 DATA X (LRECL 80 RECFM F
&STACK 21 22 29 30 89
SORT G0 DATA X G01 DATA X

&IF &CT0 = 0 &SKIP 6
COPYFILE R DATA X (LRECL 80 RECFM F
&STACK 23 8 9
SORT R DATA X R1 DATA X

&STACK 5 6 8 9
SORT R DATA X R2 DATA X

Appendix A. LISTING OF EXEC 2 PROGRAMS
SET CMSTYPE RT

**********************************************************************
* GENERATE REPORTS
**********************************************************************

FILEDEF FTOIFOOI DISK INIT DATA X
FILEDEF FT02FO01 DISK SOURCEN DATA X
FILEDEF FT03F001 DISK USEN DATA X
FILEDEF FT04F001 DISK NG DATA X
FILEDEF FT09F001 DISK R1 DATA X
FILEDEF FT10F001 DISK R2 DATA X
FILEDEF FT11F001 DISK G11 DATA X
FILEDEF FT12F001 DISK G21 DATA X
FILEDEF FT13F001 DISK G31 DATA X
FILEDEF FT17F001 DISK G01 DATA X
FILEDEF FT19F001 DISK R11 DATA X
FILEDEF FT20F001 DISK R21 DATA X
FILEDEF FT21F001 DISK G13 DATA X
FILEDEF FT22F001 DISK G23 DATA X
FILEDEF FT23F001 DISK G33 DATA X
FILEDEF FT27F001 DISK G03 DATA X

VIEWGLS

&IF &CT1 = 0 &SKIP 1
COPYFILE G13 DATA X (LRECL 80 RECFM F
&IF &CT2 = 0 &SKIP 1
COPYFILE G23 DATA X (LRECL 80 RECFM F
&IF &CT3 = 0 &SKIP 1
COPYFILE G33 DATA X (LRECL 80 RECFM F
&IF &CT = 0 &SKIP 1
COPYFILE G03 DATA X (LRECL 80 RECFM F
&IF &CT0 = 0 &SKIP 2
COPYFILE R11 DATA X (LRECL 80 RECFM F
COPYFILE R21 DATA X (LRECL 80 RECFM F

ERASE G0 DATA X
ERASE G1 DATA X
ERASE G2 DATA X
ERASE G3 DATA X
ERASE R DATA X
ERASE G01 DATA X
ERASE G11 DATA X
ERASE G21 DATA X
ERASE G31 DATA X
ERASE R1 DATA X
ERASE R2 DATA X

EUDEXEC2
&PRESUME &SUBCOMMAND DISPLAY
&COMMAND EXECIO | DISKR NG DATA X | FINIS
&READ VAR &C2 &C3 &C4 &C1 &C

**********************************************************************
* DISPLAY MENU FOR REPORTS
**********************************************************************

-MAIN

USE PANEL9
MAP DATA 1 ECODE (LOAD UNLOAD PREVIEW
-ERRDIS
DISPLAY
&IF &RSTATUS = PF1 &GOTO -OPN1
&IF &RSTATUS = PF2 &GOTO -OPN2
&IF &RSTATUS = PF3 &GOTO -OPN3
&IF &RSTATUS = PF4 &GOTO -OPN4
&IF &RSTATUS = PF5 &GOTO -OPN5
&IF &RSTATUS = PF6 &GOTO -OPN6
&IF &RSTATUS = PF7 &GOTO -OPN7
&IF &RSTATUS = PF10 &GOTO -QUIT
&ECODE = &STRING OF UNDEFINED PF KEY!
SIGNAL
&GOTO -ERRDIS

**********************************************************************
* OPTION 1 - RIGID CONSTRAINTS SORTED BY SOURCES
**********************************************************************
-OPN1
&CALL -OPT1
&GOTO -MAIN

**********************************************************************
* OPTION 2 - RIGID CONSTRAINTS SORTED BY USES
**********************************************************************
-OPN2
&CALL -OPT2
&GOTO -MAIN

**********************************************************************
* OPTION 3 - GOAL I BY DECREASING ORDER OF PRIORITY
**********************************************************************
-OPN3
&CALL -OPT3
&GOTO -MAIN

**********************************************************************
* OPTION 4 - GOAL II BY DECREASING ORDER OF PRIORITY
**********************************************************************
-OPN4
&CALL -OPT4
&GOTO -MAIN

**********************************************************************
* OPTION 5 - GOAL III BY DECREASING ORDER OF PRIORITY
**********************************************************************
-OPN5
&CALL -OPT5
&GOTO -MAIN

**********************************************************************
* OPTION 6 - ALL GOALS BY DECREASING ORDER OF PRIORITY
**********************************************************************
-OPN6
&CALL -OPT6
&GOTO -MAIN

**********************************************************************
* OPTION 7 - PRINT ALL REPORTS
**********************************************************************
-OPN7

Appendix A. LISTING OF EXEC 2 PROGRAMS
&CALL -OPT7
&GOTO -MAIN

-OPT1

&IF &C1 = 0 &SKIP 1
&COMMAND EXECIO &C1 DISKR R11 DATA X 1 (FINIS

&N = 0
&LOOP 3 &C1
&N = &N + 1
&NAME = &CONCAT OF X1 &N
&READ STRING &NAME

USE PANEL91!
MAP DATA 1 Y1 2 Y2 3 Y3 4 Y4 5 Y5 (LOAD UNLOAD PREVIEW
MAP DATA 6 Y6 7 Y7 8 Y8 9 Y9 10 Y10 (LOAD UNLOAD PREVIEW
MAP DATA 11 Y11 12 Y12 13 Y13 14 Y14 15 Y15 (LOAD UNLOAD PREVIEW
MAP DATA 16 Y16 17 Y17 18 Y18 19 ECODE (LOAD UNLOAD PREVIEW

&SL = 0

-CONTI
&LN = &SL
&N = 0
&LOOP -RSI 18
&N = &N + 1
&NAME1 = &CONCAT OF Y &N
&&NAME1 = &BLANK
&IF &LN EQ &C1 &GOTO -RSI
&LN = &LN + 1
&NAME2 = &CONCAT OF X1 &LN
&&NAME1 = &&NAME2

-ED1

-DISP1

-ED1
DISPLAY
&ECODE = &BLANK
&IF &RSTATUS = PF7 &S KIP 6
&IF &RSTATUS = PF8 &S KIP 5
&IF &RSTATUS = PF10 &RETURN
&ECODE = &STRING OF IMPROPER PFKEY!
-GERRI
SIGNAL
&GOTO -ED1

&IF &RSTATUS = PF8 &S KIP 5
&IF &SL NE 0 &S KIP 2
&ECODE = &STRING OF NO PREVIOUS ALLOCATIONS!
&GOTO -GERRI
&SL = &SL - 18
&GOTO -CONTI
&IF &LN NE &C1 &S KIP 2
&ECODE = &STRING OF NO MORE ALLOCATIONS!
&GOTO -GERRI
&SL = &SL + 18
&GOTO -CONTI

-OPT2

&IF &C1 = 0 &S KIP 1
&COMMAND EXECIO &C1 DISKR R21 DATA X 1 (FINIS

&N = 0
&LOOP 3 &C1
&N = &N + 1
&NAME = &CONCAT OF X2 &N
&READ STRING &NAME

Appendix A. LISTING OF EXEC 2 PROGRAMS 263
USE PANEL92
MAP DATA 1 Y1 2 Y2 3 Y3 4 Y4 5 Y5 (LOAD UNLOAD PREVIEW
MAP DATA 6 Y6 7 Y7 8 Y8 9 Y9 10 Y10 (LOAD UNLOAD PREVIEW
MAP DATA 11 Y11 12 Y12 13 Y13 14 Y14 15 Y15 (LOAD UNLOAD PREVIEW
MAP DATA 16 Y16 17 Y17 18 Y18 19 ECODE (LOAD UNLOAD PREVIEW

&SL = 0

-CONT2
&LN = &SL
&N = 0
&LOOP -RS2 18
&N = &N + 1
&NAME1 = &CONCAT OF Y &N
&NAME1 = &BLANK
&IF &LN EQ &C1 &GOTO -RS2
&LN = &LN + 1
&NAME2 = &CONCAT OF X2 &LN
&NAME1 = &&NAME2
-RS2

-DISP2

-ED2
DISPLAY
&ECODE = &BLANK
&IF &RSTATUS = PF7 &SKIP 6
&IF &RSTATUS = PF8 &SKIP 5
&IF &RSTATUS = PF10 &RETURN
&ECODE = &STRING OF IMPROPER PFKEY!
-GERR2
SIGNAL
&GOTO -ED2

&IF &RSTATUS = PF8 &SKIP 5
&IF &SL NE 0 &SKIP 2
&ECODE = &STRING OF NO PREVIOUS ALLOCATIONS!
&GOTO -GERR2
&SL = &SL - 18
&GOTO -CONT2
&IF &LN NE &C1 &SKIP 2
&ECODE = &STRING OF NO MORE ALLOCATIONS!
&GOTO -GERR2
&SL = &SL + 18
&GOTO -CONT2

-OPT3

&IF &C2 = 0 &SKIP 1
&COMMAND EXECIO &C2 DISKR G13 DATA X 1 (FINIS

&N = 0
&LOOP 3 &C2
&N = &N + 1
&NAME = &CONCAT OF X3 &N
&READ STRING &&NAME

USE PANEL93
MAP DATA 1 Y1 2 Y2 3 Y3 4 Y4 5 Y5 (LOAD UNLOAD PREVIEW
MAP DATA 6 Y6 7 Y7 8 Y8 9 Y9 10 Y10 (LOAD UNLOAD PREVIEW
MAP DATA 11 Y11 12 Y12 13 Y13 14 Y14 15 Y15 (LOAD UNLOAD PREVIEW
MAP DATA 16 Y16 17 Y17 18 Y18 19 ECODE (LOAD UNLOAD PREVIEW

&SL = 0

-CONT3
&LN = &SL
&N = 0
&LOOP -RS3 18
&N = &N + 1
&NAME1 = &CONCAT OF Y &N

Appendix A. LISTING OF EXEC 2 PROGRAMS 264
&NAME1 = &BLANK
&IF &LN EQ &C2 &GOTO -RS3
&LN = &LN + 1
&NAME2 = &CONCAT OF X3 &LN
&NAME1 = &NAME2
-RS3

-DISP3

-ED3
DISPLAY
&ECODE = &BLANK
&IF &RSTATUS = PF7 &SKIP 6
&IF &RSTATUS = PF8 &SKIP 5
&IF &RSTATUS = PF10 &RETURN
&ECODE = &STRING OF UNDEFINED PFKEY!
-GERR3
SIGNAL
&GOTO -ED3

&IF &RSTATUS = PF8 &SKIP 5
&IF &SL NE 0 &SKIP 2
&ECODE = &STRING OF NO PREVIOUS GOALS!
&GOTO -GERR3
&SL = &SL - 18
&GOTO -CONT3
&IF &LN NE &C2 &SKIP 2
&ECODE = &STRING OF NO MORE GOALS!
&GOTO -GERR3
&SL = &SL + 18
&GOTO -CONT3

-OPT4

&IF &C3 = 0 &SKIP 1
&COMMAND EXECIO &C3 DISKR G23 DATA X 1 (FINIS

&N = 0
&LOOP 3 &C3
&N = &N + 1
&NAME = &CONCAT OF X4 &N
&READ STRING &NAME

USE PANEL94
MAP DATA 1 Y1 2 Y2 3 Y3 4 Y4 5 Y5 (LOAD UNLOAD PREVIEW
MAP DATA 6 Y6 7 Y7 8 Y8 9 Y9 10 Y10 (LOAD UNLOAD PREVIEW
MAP DATA 11 Y11 12 Y12 13 Y13 14 Y14 15 Y15 (LOAD UNLOAD PREVIEW
MAP DATA 16 Y16 17 Y17 18 Y18 19 Y19 (LOAD UNLOAD PREVIEW

&SL = 0

-CONT4
&LN = &SL
&N = 0
&LOOP -RS4 18
&N = &N + 1
&NAME1 = &CONCAT OF Y &N
&NAME1 = &BLANK
&IF &LN EQ &C3 &GOTO -RS4
&LN = &LN + 1
&NAME2 = &CONCAT OF X4 &LN
&NAME1 = &NAME2
-RS4

-DISP4

-ED4
DISPLAY
&ECODE = &BLANK
&IF &RSTATUS = PF7 &SKIP 6
&IF &RSTATUS = PF8 &SKIP 5
&IF &RSTATUS = PF10 &RETURN
&ECODE = &STRING OF IMPROPER PFKEY!
-GERR4
SIGNAL
&GOTO -ED4

&IF &RSTATUS = PF8 &SKIP 5
&IF &SL NE 0 &SKIP 2
&ECODE = &STRING OF NO PREVIOUS GOALS!
&GOTO -GERR4
&SL = &SL - 18
&GOTO -CONT4
&IF &LN NE &C3 &SKIP 2
&ECODE = &STRING OF NO MORE GOALS!
&GOTO -GERR4
&SL = &SL + 18
&GOTO -CONT4

-OPTS

&IF &C4 = 0 &SKIP 1
&COMMAND EXECIO &C4 DISKR G33 DATA X 1 (FINIS

&N = 0
&LOOP 3 &C4
&N = &N + 1
&NAME = &CONCAT OF X5 &N
&READ STRING &&NAME

USE PANEL95
MAP DATA 1 Y1 2 Y2 3 Y3 4 Y4 5 Y5 (LOAD UNLOAD PREVIEW
MAP DATA 6 Y6 7 Y7 8 Y8 9 Y9 10 Y10 (LOAD UNLOAD PREVIEW
MAP DATA 11 Y11 12 Y12 13 Y13 14 Y14 15 Y15 (LOAD UNLOAD PREVIEW
MAP DATA 16 Y16 17 Y17 18 Y18 19 ECODE (LOAD UNLOAD PREVIEW

&SL = 0

-CONT5
&LN = &SL
&N = 0
&LOOP -RS5 18
&N = &N + 1
&NAME1 = &CONCAT OF Y &N
&&NAME1 = &BLANK
&IF &LN EQ &C4 &GOTO -RS5
&LN = &LN + 1
&NAME2 = &CONCAT OF X5 &LN
&&NAME2 = &&NAME2

-RS5

-DISP5

-EDS
DISPLAY
&ECODE = &BLANK
&IF &RSTATUS = PF7 &SKIP 6
&IF &RSTATUS = PF8 &SKIP 5
&IF &RSTATUS = PF10 &RETURN
&ECODE = &STRING OF IMPROPER PFKEY!
-GERR5
SIGNAL
&GOTO -EDS

&IF &RSTATUS = PF8 &SKIP 5
&IF &SL NE 0 &SKIP 2
&ECODE = &STRING OF NO PREVIOUS GOALS!
&GOTO -GERR5
&SL = &SL - 18
&GOTO -CONT5
&IF &LN NE &C4 &SKIP 2
&ECODE = &STRING OF NO MORE GOALS!
&GOTO -GERR5
&SL = &SL + 18
&GOTO -CONT5

-OPT6

&IF &C = 0 &SKIP 1
&COMMAND EXECIO &C DISKR G03 DATA X 1 (FINIS

&N = 0
&LOOP 3 &C
&N = &N + 1
&NAME = &CONCAT OF X6 &N
&READ STRING &NAME

USE PANEL96
MAP DATA 1 Y1 1 Y2 3 Y3 4 Y4 5 Y5 (LOAD UNLOAD PREVIEW
MAP DATA 6 Y6 7 Y7 8 Y8 9 Y9 10 Y10 (LOAD UNLOAD PREVIEW
MAP DATA 11 Y11 12 Y12 13 Y13 14 Y14 15 Y15 (LOAD UNLOAD PREVIEW
MAP DATA 16 Y16 17 Y17 18 Y18 19 ECODE (LOAD UNLOAD PREVIEW

&SL = 0

-CONT6
&LN = &SL
&N = 0
&LOOP -RS6 18
&N = &N + 1
&NAME1 = &CONCAT OF Y &N
&NAME1 = &BLANK
&IF &LN EQ &C &GOTO -RS6
&LN = &LN + 1
&NAME2 = &CONCAT OF X6 &LN
&NAME1 = &NAME2
-RS6

-ED6
DISPLAY
&ECODE = &BLANK
&IF &RSTATUS = PF7 &SKIP 6
&IF &RSTATUS = PF8 &SKIP 5
&IF &RSTATUS = PF10 &RETURN
&ECODE = &STRING OF IMPROPER PFKEY!
-GERR6
SIGNAL
&GOTO -ED6

&IF &RSTATUS = PF8 &SKIP 5
&IF &SL NE 0 &SKIP 2
&ECODE = &STRING OF NO PREVIOUS GOALS!
&GOTO -GERR6
&SL = &SL - 18
&GOTO -CONT6
&IF &LN NE &C &SKIP 2
&ECODE = &STRING OF NO MORE GOALS!
&GOTO -GERR6
&SL = &SL + 18
&GOTO -CONT6

-OPT7

&PRESUME &COMMAND

FILEDEF FT01F001 DISK NG DATA X
FILEDEF FT11F001 DISK R11 DATA X
FILEDEF FT12F001 DISK R21 DATA X
FILEDEF FT13F001 DISK G13 DATA X
FILEDEF FT14F001 DISK G23 DATA X
FILEDEF FT15F001 DISK G33 DATA X
FILEDEF FT16F001 DISK G03 DATA X

Appendix A. LISTING OF EXEC 2 PROGRAMS 267
FILEDEF FT21F001 DISK GLREPTS LISTING X (LRECL 132 BLKSIZE 132 RECFM F)
PRNTGLS

PRINT GLREPTS LISTING X
ERASE GLREPTS LISTING X

EUDEXEC2
&PRESUME &SUBCOMMAND DISPLAY

USE PANEL9
MAP DATA 1 ECODE (LOAD UNLOAD PREVIEW &ECODE = &STRING OF REPORTS SENT TO PRINTER SIGNAL &GOTO -ERRDIS

-QUIT
&PRESUME &COMMAND
ERASE RIGID DATA1 X
ERASE GOAL1 DATA1 X
ERASE GOAL2 DATA1 X
ERASE GOAL3 DATA1 X
ERASE R11 DATA X
ERASE R21 DATA X
ERASE G03 DATA X
ERASE G13 DATA X
ERASE G23 DATA X
ERASE G33 DATA X
ERASE NG DATA X

&EXIT
Appendix B. LISTING OF FORTRAN PROGRAMS
B.1 ADCLMTTL

C***********************************************************
C
PUTS BACK THE TITLE CARD AFTER 'COLUMN' HAS BEEN SORTED
C
***********************************************************

DIMENSION A(80)
WRITE(1,1020)
50 READ(1,1000, END = 100) A
WRITE(11,1000) A
GO TO 50
100 CONTINUE
1000 FORMAT(80A1)
1020 FORMAT('COLUMNS')
STOP
END
B.2 ADDSRCE

C*********************************************************************
C UPDATES THE DATABASE WHENEVER A NEW SOURCE IS CREATED
C*********************************************************************

REAL X(80), V(25)
INTEGER Y(4), Z(25)
REAL YES, NO
DATA YES, NO/'Y','N'/
READ(1,*), NSRCE, NUSE, NY
K = NY + 1
DO 30 I = 1,NSRCE
 DO 30 J = 1,K
 READ(2,100) X
 WRITE(10,100) X
30 CONTINUE
READ(8,*), Y(1)
WRITE(10,110) Y(1)
DO 50 J = 1,NY
 READ(8,*), Y
 WRITE(10,110) Y
50 CONTINUE
DO 60 I = 1,NSRCE
 READ(3,100) X
60 WRITE(11,100) X
 DO 70 J = 1,NUSE
 READ(9,10) V(J)
 IF (V(J) .EQ. NO) Z(J) = 0
70 IF (V(J) .EQ. YES) Z(J) = 1
 WRITE(11,120) (Z(J),J = 1,NUSE)
10 FORMAT(2A1)
100 FORMAT(80A1)
110 FORMAT(417)
120 FORMAT(4012)
STOP
END
B.3 ADDUSE

C*********************************************************************
C UPDATES THE DATABASE WHENEVER A NEW USE IS CREATED
C*********************************************************************
REAL X(80)
INTEGER Y(4), Z(25)
REAL YES, NO
DATA YES, NO/'Y','N'/
READ(1,*) NSRCE, NUSE, NY
NU = NUSE + 1
DO 30 I = 1,NUSE
DO 30 J = 1, NY
READ(2,100) X
WRITE(10,100) X
30 CONTINUE
DO 50 J = 1,NY
READ(8,*) Y
WRITE(10,110) Y
50 CONTINUE
DO 80 I = 1, NSRCE
READ(3,*)(Z(J),J = 1,NUSE)
READ(9,10) REPLY
IF (REPLY .EQ. NO) Z(NU) = 0
IF (REPLY .EQ. YES) Z(NU) = 1
WRITE(11,120)(Z(J),J = 1,NU)
80 CONTINUE
10 FORMAT(2AI)
100 FORMAT(80AI)
110 FORMAT(417)
120 FORMAT(3012)
STOP
END
B.4 ALLOCATN

C*****************************************************************************
C READS THE VALUES OF THE DECISION VARIABLES AFTER
C THE GP MODEL HAS BEEN SOLVED
C*****************************************************************************

REAL Y
INTEGER AMT
DATA X/'X'/
100 READ(1,110, END=200) Y, QTY
   IF (Y .NE. X) GO TO 100
   AMT = QTY
   WRITE(2,120) AMT
110 FORMAT(2X,A1,8X,F10.2)
120 FORMAT(17)
   GO TO 100
200 STOP
END
B.5 CONSOL

CONSOLIDATES THE THREE MPS FILES INTO ONE TO CREATE THE MPS FORMAT INPUT FOR LINDO

DIMENSION A(80)
WRITE(25,1000)
50 READ(1,1010, END = 100) A
WRITE(25,1010) A
GO TO 50
100 CONTINUE
150 READ(2,1010, END = 200) A
WRITE(25,1010) A
GO TO 150
200 CONTINUE
250 READ(3,1010, END = 300) A
WRITE(25,1010) A
GO TO 250
300 WRITE(25,1020)
1000 FORMAT('NAME GP MODEL FOR SANDU')
1010 FORMAT(80A1)
1020 FORMAT('ENDATA')
STOP
END
B.6 DELSRCE

C*********************************************************************
C UPDATES THE DATABASE WHENEVER A SOURCE IS DELETED
C*********************************************************************
REAL X(80)
READ(1,*) NSRCE, NS, NY
K = NY + 1
DO 50 I = 1,NSRCE
   DO 20 J = 1,K
      READ(2,100) X
      IF (I .EQ. NS) GO TO 20
      WRITE(7,100) X
   20 CONTINUE
50 CONTINUE
DO 70 I = 1,NSRCE
   READ(3,100) X
   IF (I .EQ. NS) GO TO 70
   WRITE(8,100) X
70 CONTINUE
100 FORMAT(80A1)
STOP
END
B.7 DELUSE

C*****************************************************************************
C UPDATES THE DATABASE WHENEVER A USE IS DELETED
C*****************************************************************************

REAL X(80)
INTEGER Z(25)
READ(1,*) NSRCE, NUSE, NU, NY
DO 50 I = 1,NUSE
DO 20 J = 1,NU
READ(2,100) X
IF (I .EQ. NU) GO TO 20
WRITE(7,100) X
20 CONTINUE
50 CONTINUE
K1 = NU - 1
K2 = NU + 1
DO 70 I = 1,NSRCE
READ(3,*) (Z(J),J = I,NUSE)
IF (NU .EQ. NUSE) GO TO 60
IF (NU .EQ. 1) GO TO 65
WRITE(8,110) (Z(J),J = 1,K1),(Z(J),J = K2,NUSE)
GO TO 70
60 WRITE(8,110) (Z(J),J = 1,K1)
GO TO 70
65 WRITE(8,110) (Z(J),J = 2,NUSE)
70 CONTINUE
100 FORMAT(80A1)
110 FORMAT(3012)
STOP
END
**B.8 DLCLMTTL**

```
C******************************************************************************
C DELETES THE TITLE CARD FROM 'COLUMN' FILE
C******************************************************************************
DIMENSION A(80)
READ(1,1000)
50 READ(1,1000, END = 100) A
   WRITE(11,1000) A
   GO TO 50
100 CONTINUE
1000 FORMAT(80A1)
   STOP
   END
```
B.9 GAREPTS

C REWRITES THE GOAL ACHIEVEMENTS IN THE FORM OF REPORTS

REAL S(25,20), U(25,20)
REAL L, G, E
INTEGER C1, C2, C3
INTEGER QTY1, DT, PR, WT, GT
INTEGER TG, AC, AD
INTEGER NG(J)
DATA L, G, E/'<','>','='/
READ(1,*) NS, NU, NY
QTR = NY*4
DO 10 I = 1, NS
10 READ(2,1000) (S(I,J), J = 1,20)
DO 20 I = I, NU
20 READ(J,1000) (U(I,J), J = 1,20)
READ(I,*)
READ(12,*)
READ(4,*) C1, C2, C3
IF (C1 .EQ. 0) GO TO 200
C*******************************************************************
C TYPE 1 GOALS
C*******************************************************************
IC = 0
G = 1
110 READ(11,1010, END=200) I, J, K, QTY, DT, PR, WT, TG, AC, AD, PD
N = K/4 + 1
M = K - K/4^K
IC = IC + 1
IF (DT .EQ. 1) X = L
IF (DT .EQ. 2) X = G
IF (DT .EQ. 3) X = E
WRITE(21,1100) IC, (S(I,J), J = 1,16), (U(J,I), I = 1,16), N, M,
X, PR, WT, TG, AC, AD, PD
WRITE(27,1200) GT, (S(I,J), J = 1,7), (U(J,I), I = 1,7), N, M,
X, PR, WT, TG, AC, AD, PD
WRITE(31,1300) IC, (S(I,J), J = 1,20), (U(J,I), I = 1,20), N, M,
X, PR, WT, TG, AC, AD, PD
WRITE(37,1400) GT, (S(I,J), J = 1,20), (U(J,I), I = 1,20), N, M,
X, PR, WT, TG, AC, AD, PD
GO TO 110
200 IF (C2 .EQ. 0) GO TO 300
C*******************************************************************
C TYPE 2 GOALS
C*******************************************************************
IC = 0
G = 2
210 READ(12,1020, END = 300) I, J, K, QTY, DT, PR, WT, TG, AC, AD, PD,
1PD, PD
IC = IC + 1
IF (DT .EQ. 1) X = L
IF (DT .EQ. 2) X = G
IF (DT .EQ. 3) X = E
WRITE(22,1110) IC, (S(I,J), J = 1,9), (U(J,I), I = 1,9), K,
X, PR, WT, TG, AC, AD, PD
WRITE(27,1210) GT, (S(I,J), J = 1,7), (U(J,I), I = 1,7), K,
X, PR, WT, TG, AC, AD, PD
WRITE(32,1310) IC, (S(I,J), J = 1,20), (U(J,I), I = 1,20), K,
X, PR, WT, TG, AC, AD, PD
WRITE(37,1410) GT, (S(I,J), J = 1,20), (U(J,I), I = 1,20), K,
X, PR, WT, TG, AC, AD, PD
GO TO 210
300 IF (C3 .EQ. 0) GO TO 400
C*******************************************************************
C TYPE 3 GOALS

IC = 0
GT = 3

310  READ(13,1020, END=400) I,J,K,QTY,DT,PR,WT,TGP,ACP,ADP,AD,
PDP, PD

IC = IC + 1
IF (DT .EQ. 1) X = L
IF (DT .EQ. 2) X = G
IF (DT .EQ. 3) X = E
WRITE(23,1110) IC, (S(I,II),II = 1,9), (U(J,II),II = 1,9), K,
1X, PR, WT, TG, TGP, AC, ACP, AD, ADP, PDP
WRITE(27,1210) GT, (S(I,II),II = 1,7), (U(J,II),II = 1,7), K,
1X, PR, WT, TG, TGP, AC, ACP, AD, ADP, PDP
WRITE(33,1310) IC, (S(I,II),II = 1,20), (U(J,II),II = 1,20), K,
1X, PR, WT, TG, TGP, AC, ACP, AD, ADP, PDP
WRITE(37,1410) GT, (S(I,II),II = 1,20), (U(J,II),II = 1,20), K,
1X, PR, WT, TG, TGP, AC, ACP, AD, ADP, PDP
GO TO 310

400  CONTINUE

1000 FORMAT(20A1)
1010 FORMAT(1X,I2,1X,I2,1X,I2,1X,I7,1X,I1,1X,I2,1X,I4,3(I17),1X,F5.1)
1020 FORMAT(1X,I2,1X,I2,1X,I2,1X,I7,1X,I1,1X,I2,1X,I4,3(I17),1X,F5.1)

1100 FORMAT(I2,'.',1X,16A1,'.',16A1,I1X,I1,'/',11,3X,A1
1X,I2,1X,I2,2(I16),2X,I6,1X,F5.1)
1110 FORMAT(I2,'.',1X,9A1,'.',9A1,I1X,I1,2X,A1,1X,
1I2,1X,I2,3(I16,'/',F5.1),1X,F5.1)
1200 FORMAT(I1,1X,7A1,'.',7A1,1X,I1,'/',11,3X,A1
1X,I2,1X,I2,3(I16,6X),1X,F5.1)
1210 FORMAT(I1,1X,7A1,'.',7A1,1X,I4,A1,
1I2,1X,I2,1X,I2,3(I16,'/',F5.1),1X,F5.1)
1300 FORMAT(I1,1X,I2,'.',2X,20A1,'.',20A1,2X,I1,'/',11,5X,A1
1X,I2,1X,I2,2(2X,I6),3X,I6,6X,F5.1)
1310 FORMAT(6X,I2,'.',2X,20A1,'.',20A1,2X,I1,3X,A1,2X,
1I2,2X,I2,3(2X,I6,'/',F5.1),2X,F5.1)
1400 FORMAT(I1,2X,20A1,'.',20A1,2X,I1,'/',11,3X,A1
1X,I2,1X,I2,1X,I2,3(2X,I6,6X),2X,F5.1)
1410 FORMAT(I1,2X,20A1,'.',20A1,2X,I1,'/',11,3X,A1
1X,I2,1X,I2,1X,I2,3(2X,I6,'/',F5.1),2X,F5.1)
STOP
END

Appendix B. LISTING OF FORTRAN PROGRAMS
B.10 GLACHMNT

C*********************************************************************
C COMPUTES GOAL ACHIEVEMENTS AFTER THE GP MODEL HAS BEEN SOLVED
C*********************************************************************
INTEGER S(25,20), U(25,20), X(25,25,20)
INTEGER ROW, QTR, DT, QTY!, PR, WT, TG, AC, AD
INTEGER SUM1, SUM2, GT
REAL QTY
READ(*,*) NS, NU, NY
NSRC = NS + 1
QTR = NY*4
DO 20 I = 1, NS
READ(2,1005) IBAL
READ(2,1005) (S(l,J),J= 1,QTR)
S(l,1) = S(l,1) + IBAL
20 CONTINUE
DO 40 I = 1, NU
READ(3,1005) (U(l,J),J = 1,QTR)
40 CONTINUE
DO 60 I = 1, NSRC
DO 60 J = 1, NU
DO 60 K = 1, QTR
60 READ(4,!) X(l,J,K)
WRITE(I,*)
WRITE(12,*)
WRITE(13,*)
C*******************************************************************
C TYPE 1 GOALS
C*******************************************************************
IC1 = 0
GT = I
410 READ(17,1000, END=500) I, J, K, QTY1, DT, PR, WT
IC1 = IC1 + 1
TG = QTY1
AC = X(I,J,K)
AD = AC - TG
IF (AD .EQ. 0) GO TO 450
IF (AD .GT. 0) GO TO 430
AD = AD*(-1)
IF (DT .EQ. 1) AD = 0
GO TO 450
430 IF (DT .EQ. 2) AD = 0
450 IF (TG .NE. 0) GO TO 455
IF (AD .NE. 0) PD = 100.0
IF (AD .EQ. 0) PD = 0.0
GO TO 458
455 PD = AD*100.0/TG
458 WRITE(11,*)
WRITE(12,*)
WRITE(13,*)
GOTO 410
500 CONTINUE
C*******************************************************************
C TYPE 2 GOALS
C*******************************************************************
IC2 = 0
GT = 2
510 READ(18,1010, END=600) I, J, K, QTY1, DT, PR, WT
IC2 = IC2 + 1
M = (K-1)*4
SUM1 = S(I,M+1) + S(I,M+2) + S(I,M+3) + S(I,M+4)
SUM2 = X(I,J,M+1) + X(I,J,M+2) + X(I,J,M+3) + X(I,J,M+4)
TG = SUM1*QTY1/100.0
TGP = QTY
AC = SUM2
IF (SUM1 .NE. 0) ACP = SUM2*100.0/SUM1
IF (SUM1 .EQ. 0) ACP = 100.0
AD = AC - TG
ADP = ACP - TGP

Appendix B. LISTING OF FORTRAN PROGRAMS
IF (ADP .LT. 0) ADP = ADP*(-1)
IF (ADP .EQ. 0) GO TO 550
IF (ADP .GT. 0) GO TO 530
AD = ADP*(-1)
IF (1D .EQ. 1) AD = 0
GO TO 550
530 IF (DT .EQ. 2) AD = 0
550 IF (TG .NE. 0) GO TO 555
IF (AD .NE. 0) PD = 100.0
IF (AD .EQ. 0) PD = 0.0
GO TO 560
555 PD = AD*100.0/TG
560 IF (TG .NE. 0) GO TO 565
IF (AD .NE. 0) PD = 100.0
IF (AD .EQ. 0) PD = 0.0
GO TO 570
565 PD = ADP*100.0/TGP
570 WRITE(12,1110) I, J, K, QTY, DT, PR, WT, TGP, TG, ACP, AC, ADP, AD, 1PDP, PD
WRITE(14,1110) I, J, K, QTY, DT, PR, WT, TGP, TG, ACP, AC, ADP, AD, 1PDP, PD
GO TO 510
600 CONTINUE
C************************************************************************
C TYPE 3 GOALS
C************************************************************************
IC3 = 0
GT = 3
610 READ(19,1010, END=700) I, J, K, QTY, DT, PR, WT
IC3 = IC3 + 1
M = (K-1)*4
SUM1 = U(I,M+1) + U(I,M+2) + U(I,M+3) + U(I,M+4)
SUM2 = X(I,J,M+1) + X(I,J,M+2) + X(I,J,M+3) + X(I,J,M+4)
TG = SUM1*QTY/100.0
TGP = QTY
AC = SUM2
IF (SUM1 .NE. 0) ACP = SUM2*100.0/SUM1
IF (SUM1 .EQ. 0) ACP = 100.0
AD = AC - TG
ADP = ACP - TGP
IF (ADP .LT. 0) ADP = ADP*(-1)
IF (ADP .EQ. 0) GO TO 650
IF (ADP .GT. 0) GO TO 630
AD = ADP*(-1)
IF (DT .EQ. 1) AD = 0
GO TO 650
630 IF (DT .EQ. 2) AD = 0
650 IF (TG .NE. 0) GO TO 655
IF (AD .NE. 0) PD = 100.0
IF (AD .EQ. 0) PD = 0.0
GO TO 660
655 PD = ADP*100.0/TG
660 IF (TG .NE. 0) GO TO 665
IF (ADP .NE. 0) PD = 100.0
IF (ADP .EQ. 0) PD = 0.0
GO TO 670
665 PD = ADP*100.0/TGP
670 WRITE(13,1110) I, J, K, QTY, DT, PR, WT, TGP, TG, ACP, AC, ADP, AD, 1PDP, PD
WRITE(14,1110) I, J, K, QTY, DT, PR, WT, TGP, TG, ACP, AC, ADP, AD, 1PDP, PD
GO TO 610
700 CONTINUE
1005 FORMAT(4I7)
1000 FORMAT(1X,I2,1X,I2,1X,I2,1X,I2,1X,I7,1X,I11,1X,I2,1X,I4)
1010 FORMAT(1X,I2,1X,I2,1X,I2,1X,I2,1X,F7.2,1X,I11,1X,I2,1X,I4)
1100 FORMAT(1X,I2,1X,I2,1X,I2,1X,I2,1X,I7,1X,I11,1X,I2,1X,I4,3(1X,I7), 1X,I5,1X,F5.1)
1110 FORMAT(1X,I2,1X,I2,1X,I2,1X,I2,1X,F7.2,1X,I11,1X,I2,1X,I4,3(1X,F5.1,1X, I17),1X,F5.1,1X,F5.1)
STOP
END
**B.11 MODSRCE**

C*********************************************************************
C UPDATES THE DATABASE WHENEVER A SOURCE IS MODIFIED
C*********************************************************************

REAL X(80), V(25)
INTEGER Y(4), Z(25)
REAL YES, NO
DATA YES, NO/'Y','N'/
READ(1,*) NSRCE, NUSE, NS, NY
K = NY + 1
DO 50 I = 1,NSRCE
IF (I .NE. NS) GO TO 30
READ(2,*)
READ(8,*) Y(I)
WRITE(I0,110) Y(I)
DO 20 J=1,NY
READ(2,*)
READ(8,*) Y
WRITE(I0,110) Y
20 CONTINUE
GO TO 50
30 DO 40 J = 1,K
READ(2,100) X
WRITE(10,100) X
40 CONTINUE
50 CONTINUE
DO 90 I = 1,NSRCE
IF (I .NE. NS) GO TO 80
READ(3,*)
DO 60 J=1,NUSE
READ(9,10) V(J)
IF (V(J) .EQ. NO) Z(J) = 0
60 IF (V(J) .EQ. YES) Z(J) = I
WRITE(11,120) (Z(J), J=1,NUSE)
GOTO 90
80 READ(3,100) X
WRITE(11,100) X
90 CONTINUE
10 FORMAT(2AI)
100 FORMAT(80AI)
110 FORMAT(4I7)
120 FORMAT(40I2)
STOP
END

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B.12 MODUSE

C*********************************************************************
C UPDATES THE DATABASE WHENEVER A USE IS MODIFIED
C*********************************************************************

REAL X(80)
INTEGER Y(4), Z(25)
REAL YES, NO
DATA YES, NO/'Y','N'/
READ(1,*) NSRCE, NUSE, NU, NY
DO 50 I = 1, NUSE
IF (I .NE. NU) GO TO 30
DO 20 J = I, NY
READ(8,*) Y
WRITE(10,110) Y
20 CONTINUE
GO TO 50
30 DO 40 J = I, NY
READ(2,100) X
WRITE(10,100) X
40 CONTINUE
50 CONTINUE
DO 80 I = 1, NSRCE
READ(3,*) (Z(J), J = I, NUSE)
READ(9,10) REPLY
IF (REPLY .EQ. NO) Z(NU) = 0
IF (REPLY .EQ. YES) Z(NU) = 1
WRITE(11,120) (Z(J), J = I, NUSE)
80 CONTINUE
10 FORMAT(2A1)
100 FORMAT(80A1)
110 FORMAT(4I2)
120 FORMAT(30I2)
STOP
END
B.13 MPSFILES

CREATE three files which are later on used to form the MPS format input for LINDO. These files contain:

- **Row**: The constraint type (\(<\), \(\leq\), \(\geq\))
- **Column**: Each term in the constraint (except the RHS)
- **RHS**: RHS for each constraint
- **Bounds**: Upper bounds on variables

---

INTEGER S(2S,20), CS(2S,20), U(2S,20), C(2S,2S)
INTEGER ROW, QTR, DT, QTY
REAL QTY
REAL N, L, G, E, BLANK
REAL SIGN
READ(1,*NS, NU, NY
NSRC = NS + 1
QTR = NY*4
DATA N, L, G, E, BLANK/'N','L','G','E',' '/
DO 20 I = 1, NS
READ(2,100S) (S(I,J),J = 1, QTR)
S(I,1) = S(I,1) + !BAL
20 CONTINUE
DO 40 I = 1, NU
READ(3,1005) (U(I,J),J = 1, QTR)
40 CONTINUE
DO 50 I = 1, NS
READ(4,1010) (C(I,J),J = 1, NU)
50 CONTINUE
C(ISRC,J) = 1
C*********************************************************************
C SYSTEM CONSTRAINTS
C*********************************************************************
C DELETE TITLE CARDS FROM INPUT FILES
C
READ(16,*)
READ(17,*)
READ(18,*)
READ(19,*)
C
TITLE CARD FOR ROW, COLUMN AND RHS FILES
C
WRITE(11,1015)
WRITE(12,1020)
WRITE(13,1025)
WRITE(14,1028)
C
OBJECTIVE FUNCTION
C
ROW = 1
SIGN = N
WRITE(11,1030) SIGN, ROW
CO = 1.0
WRITE(12,1035) ROW, CO
C
'CONSTRAINT MATRIX' CONSTRAINTS
C
CO = 0.0
DO 100 I = 1, NS
DO 90 J = 1, NU
IF (C(I,J) .EQ. 1) GO TO 90
DO 80 K = 1, QTR
IF (I .GE. 10) GO TO 75
IF (J .GE. 10) GO TO 72
IF (K .GE. 10) GO TO 71

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WRITE(14,1540) I, J, K, CO
GO TO 80
71 WRITE(14,1541) I, J, K, CO
GO TO 80
72 IF (K .GE. 10) GO TO 73
WRITE(14,1542) I, J, K, CO
GO TO 80
73 WRITE(14,1543) I, J, K, CO
GO TO 80
75 IF (J .GE. 10) GO TO 77
IF (K .GE. 10) GO TO 76
WRITE(14,1544) I, J, K, CO
GO TO 80
76 WRITE(14,1545) I, J, K, CO
GO TO 80
77 IF (K .GE. 10) GO TO 78
WRITE(14,1546) I, J, K, CO
GO TO 80
78 WRITE(14,1547) I, J, K, CO
80 CONTINUE
90 CONTINUE
100 CONTINUE

C FUNDS REQUIREMENT CONSTRAINTS
C
SIGN = E
CO = 1.0
DO 200 J = 1, NU
DO 190 K = 1, QTR
ROW = ROW + 1
WRITE(11,1030) SIGN, ROW
DO 150 I = 1, NSRC
IF (I .GE. 10) GO TO 125
IF (J .GE. 10) GO TO 122
IF (K .GE. 10) GO TO 121
WRITE(12,1040) I, J, K, ROW, CO
GO TO 150
121 WRITE(12,1041) I, J, K, ROW, CO
GO TO 150
122 IF (K .GE. 10) GO TO 123
WRITE(12,1042) I, J, K, ROW, CO
GO TO 150
123 WRITE(12,1043) I, J, K, ROW, CO
GO TO 150
125 IF (J .GE. 10) GO TO 127
IF (K .GE. 10) GO TO 126
WRITE(12,1044) I, J, K, ROW, CO
GO TO 150
126 WRITE(12,1045) I, J, K, ROW, CO
GO TO 150
127 IF (K .GE. 10) GO TO 128
WRITE(12,1046) I, J, K, ROW, CO
GO TO 150
128 WRITE(12,1047) I, J, K, ROW, CO
150 CONTINUE
RHS = U(J,K)
WRITE(13,1050) ROW, RHS
190 CONTINUE
200 CONTINUE
C
C FUNDS AVAILABILITY CONSTRAINTS
C
DO 210 I = 1, NS
CS(I,1) = S(I,1)
DO 210 K = 2, QTR
210 CS(I,K) = CS(I,K-1) + S(I,K)
SIGN = L
CO = 1.0
DO 300 I = 1, NS
DO 290 M = 1, QTR
ROW = ROW + 1
WRITE(11,1030) SIGN, ROW

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DO 250 K = 1, M
DO 240 J = 1, NU
IF (I .GE. 10) GO TO 225
IF (J .GE. 10) GO TO 222
IF (K .GE. 10) GO TO 221
WRITE(12,1040) I, J, K, ROW, CO
GO TO 240
221 WRITE(12,1041) I, J, K, ROW, CO
GO TO 240
222 IF (K .GE. 10) GO TO 223
WRITE(12,1042) I, J, K, ROW, CO
GO TO 240
223 WRITE(12,1043) I, J, K, ROW, CO
GO TO 240
225 IF (J .GE. 10) GO TO 227
IF (K .GE. 10) GO TO 226
WRITE(12,1044) I, J, K, ROW, CO
GO TO 240
226 WRITE(12,1045) I, J, K, ROW, CO
GO TO 240
227 IF (K .GE. 10) GO TO 228
WRITE(12,1046) I, J, K, ROW, CO
GO TO 240
228 WRITE(12,1047) I, J, K, ROW, CO
240 CONTINUE
250 CONTINUE
RHS = CS(I,M)
WRITE(13,1050) ROW, RHS
290 CONTINUE
300 CONTINUE
C*******************************************************************
C RIGID CONSTRAINTS
C*******************************************************************
SIGN = E
CO = 1.0
310 READ(16,* , END = 400) I, J, K, QTY1
ROW = ROW + 1
WRITE(11,1030) SIGN, ROW
IF (I .GE. 10) GO TO 325
IF (J .GE. 10) GO TO 322
IF (K .GE. 10) GO TO 321
WRITE(12,1040) I, J, K, ROW, CO
GO TO 350
321 WRITE(12,1041) I, J, K, ROW, CO
GO TO 350
322 IF (K .GE. 10) GO TO 323
WRITE(12,1042) I, J, K, ROW, CO
GO TO 350
323 WRITE(12,1043) I, J, K, ROW, CO
GO TO 350
325 IF (J .GE. 10) GO TO 327
IF (K .GE. 10) GO TO 326
WRITE(12,1044) I, J, K, ROW, CO
GO TO 350
326 WRITE(12,1045) I, J, K, ROW, CO
GO TO 350
327 IF (K .GE. 10) GO TO 328
WRITE(12,1046) I, J, K, ROW, CO
GO TO 350
328 WRITE(12,1047) I, J, K, ROW, CO
350 CONTINUE
RHS = QTY1
WRITE(13,1050) ROW, RHS
GO TO 310
400 CONTINUE
C*******************************************************************
C TYPE I GOALS
C*******************************************************************
SIGN = E
410 READ(17,* , END = 500) I, J, K, QTY1, DT
CO = 1.0
ROW = ROW + 1
WRITE(11,1030) SIGN, ROW
IF (I .GE. 10) GO TO 425
IF (J .GE. 10) GO TO 422
IF (K .GE. 10) GO TO 421
WRITE(12,1040) I, J, K, ROW, CO
GO TO 430
421 WRITE(12,1041) I, J, K, ROW, CO
GO TO 430
422 IF (K .GE. 10) GO TO 423
WRITE(12,1042) I, J, K, ROW, CO
GO TO 430
423 WRITE(12,1043) I, J, K, ROW, CO
GO TO 430
425 IF (J .GE. 10) GO TO 427
IF (K .GE. 10) GO TO 426
WRITE(12,1044) I, J, K, ROW, CO
GO TO 430
426 WRITE(12,1045) I, J, K, ROW, CO
GO TO 430
427 IF (K .GE. 10) GO TO 428
WRITE(12,1046) I, J, K, ROW, CO
GO TO 430
428 WRITE(12,1047) I, J, K, ROW, CO
CONTINUE
430 IF (DT .EQ. 2) GO TO 455
CO = 1.0
IF (I .GE. 10) GO TO 445
IF (J .GE. 10) GO TO 442
IF (K .GE. 10) GO TO 441
WRITE(12,1240) I, J, K, ROW, CO
GO TO 450
441 WRITE(12,1241) I, J, K, ROW, CO
GO TO 450
442 IF (K .GE. 10) GO TO 443
WRITE(12,1242) I, J, K, ROW, CO
GO TO 450
443 WRITE(12,1243) I, J, K, ROW, CO
GO TO 450
445 IF (J .GE. 10) GO TO 447
IF (K .GE. 10) GO TO 446
WRITE(12,1244) I, J, K, ROW, CO
GO TO 450
446 WRITE(12,1245) I, J, K, ROW, CO
GO TO 450
447 IF (K .GE. 10) GO TO 448
WRITE(12,1246) I, J, K, ROW, CO
GO TO 450
448 WRITE(12,1247) I, J, K, ROW, CO
CONTINUE
450 IF (DT .EQ. 1) GO TO 470
CO = -1.0
IF (I .GE. 10) GO TO 465
IF (J .GE. 10) GO TO 462
IF (K .GE. 10) GO TO 461
WRITE(12,1280) I, J, K, ROW, CO
GO TO 470
461 WRITE(12,1281) I, J, K, ROW, CO
GO TO 470
462 IF (K .GE. 10) GO TO 463
WRITE(12,1282) I, J, K, ROW, CO
GO TO 470
463 WRITE(12,1283) I, J, K, ROW, CO
GO TO 470
465 IF (J .GE. 10) GO TO 467
IF (K .GE. 10) GO TO 466
WRITE(12,1284) I, J, K, ROW, CO
GO TO 470
466 WRITE(12,1285) I, J, K, ROW, CO
GO TO 470
467 IF (K .GE. 10) GO TO 468
WRITE(12,1286) I, J, K, ROW, CO

Appendix B. LISTING OF FORTRAN PROGRAMS
GO TO 470
468 WRITE(12,1287) I, J, K, ROW, CO
470 CONTINUE
RHS = QTY
WRITE(13,1050) ROW, RHS
GO TO 410
500 CONTINUE

C*******************************************************************
C TYPE 2 GOALS
C*******************************************************************
SIGN = E
510 READ(18,*, END=600) I, J, M, QTY, DT
CO = 1.0
ROW = ROW + 1
WRITE(11,1030) SIGN, ROW
K1 = (M-1)*4 + 1
K2 = K1 + 3
DO 535 K = K1, K2
IF (I .GE. 10) GO TO 525
IF (J .GE. 10) GO TO 522
IF (K .GE. 10) GO TO 521
WRITE(12,1040) I, J, K, ROW, CO
GO TO 530
521 WRITE(12,1041) I, J, K, ROW, CO
GO TO 530
522 IF (K .GE. 10) GO TO 523
WRITE(12,1042) I, J, K, ROW, CO
GO TO 530
523 WRITE(12,1043) I, J, K, ROW, CO
GO TO 530
525 IF (J .GE. 10) GO TO 527
IF (K .GE. 10) GO TO 526
WRITE(12,1044) I, J, K, ROW, CO
GO TO 530
526 WRITE(12,1045) I, J, K, ROW, CO
GO TO 530
527 IF (K .GE. 10) GO TO 528
WRITE(12,1046) I, J, K, ROW, CO
GO TO 530
528 WRITE(12,1047) I, J, K, ROW, CO
530 CONTINUE
535 CONTINUE
K = M
IF (DT .EQ. 2) GO TO 555
CO = 1.0
IF (I .GE. 10) GO TO 545
IF (J .GE. 10) GO TO 542
IF (K .GE. 10) GO TO 541
WRITE(12,1340) I, J, K, ROW, CO
GO TO 550
541 WRITE(12,1341) I, J, K, ROW, CO
GO TO 550
542 IF (K .GE. 10) GO TO 543
WRITE(12,1342) I, J, K, ROW, CO
GO TO 550
543 WRITE(12,1343) I, J, K, ROW, CO
GO TO 550
545 IF (J .GE. 10) GO TO 547
IF (K .GE. 10) GO TO 546
WRITE(12,1344) I, J, K, ROW, CO
GO TO 550
546 WRITE(12,1345) I, J, K, ROW, CO
GO TO 550
547 IF (K .GE. 10) GO TO 548
WRITE(12,1346) I, J, K, ROW, CO
GO TO 550
548 WRITE(12,1347) I, J, K, ROW, CO
550 CONTINUE
555 IF (DT .EQ. 1) GO TO 570
CO = -1.0
IF (I .GE. 10) GO TO 565
IF (J .GE. 10) GO TO 562

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IF (K .GE. 10) GO TO 561
WRITE(12,1380) I, J, K, ROW, CO
GO TO 570
561 WRITE(12,1381) I, J, K, ROW, CO
GO TO 570
562 IF (K .GE. 10) GO TO 563
WRITE(12,1382) I, J, K, ROW, CO
GO TO 570
563 WRITE(12,1383) I, J, K, ROW, CO
GO TO 570
565 IF (J .GE. 10) GO TO 567
IF (K .GE. 10) GO TO 566
WRITE(12,1384) I, J, K, ROW, CO
GO TO 570
566 WRITE(12,1385) I, J, K, ROW, CO
GO TO 570
567 IF (K .GE. 10) GO TO 568
WRITE(12,1386) I, J, K, ROW, CO
GO TO 570
568 WRITE(12,1387) I, J, K, ROW, CO
570 CONTINUE
IRHS = 0
DO 580
K = K1, K2
580
IRHS = IRHS + S(I,K)
IRHS = IRHS*QTY/100.0 + .5
RHS = IRHS
WRITE(13,1050) ROW, RHS
GO TO 510
600 CONTINUE
C*******************************************************************
C TYPE 3 GOALS
C*******************************************************************
SIGN = E
610 READ(19*, END = 700) I, J, M, QTY, DT
CO = 1.0
ROW = ROW + 1
WRITE(11,1030) SIGN, ROW
K1 = (M-1)*4 + 1
K2 = K1 + 3
DO 635 K = K1, K2
IF (I .GE. 10) GO TO 625
IF (J .GE. 10) GO TO 622
IF (K .GE. 10) GO TO 621
WRITE(12,1040) I, J, K, ROW, CO
GO TO 630
621 WRITE(12,1041) I, J, K, ROW, CO
GO TO 630
622 IF (K .GE. 10) GO TO 623
WRITE(12,1042) I, J, K, ROW, CO
GO TO 630
623 WRITE(12,1043) I, J, K, ROW, CO
GO TO 630
625 IF (J .GE. 10) GO TO 627
IF (K .GE. 10) GO TO 626
WRITE(12,1044) I, J, K, ROW, CO
GO TO 630
626 WRITE(12,1045) I, J, K, ROW, CO
GO TO 630
627 IF (K .GE. 10) GO TO 628
WRITE(12,1046) I, J, K, ROW, CO
GO TO 630
628 WRITE(12,1047) I, J, K, ROW, CO
630 CONTINUE
635 CONTINUE
K = M
IF (DT .EQ. 2) GO TO 655
CO = 1.0
IF (I .GE. 10) GO TO 645
IF (J .GE. 10) GO TO 642
IF (K .GE. 10) GO TO 641
WRITE(12,1440) I, J, K, ROW, CO

Appendix B. LISTING OF FORTRAN PROGRAMS
GO TO 650
641 WRITE(12,1441) I, J, K, ROW, CO
GO TO 650
642 IF (K .GE. 10) GO TO 643
WRITE(12,1442) I, J, K, ROW, CO
GO TO 650
643 WRITE(12,1443) I, J, K, ROW, CO
GO TO 650
645 IF (J .GE. 10) GO TO 647
IF (K .GE. 10) GO TO 646
WRITE(12,1444) I, J, K, ROW, CO
GO TO 650
646 WRITE(12,1445) I, J, K, ROW, CO
GO TO 650
647 IF (K .GE. 10) GO TO 648
WRITE(12,1446) I, J, K, ROW, CO
GO TO 650
648 WRITE(12,1447) I, J, K, ROW, CO
CONTINUE
650 IF (DT .EQ. 1) GO TO 670
CO = -1.0
IF (I .GE. 10) GO TO 665
IF (J .GE. 10) GO TO 662
IF (K .GE. 10) GO TO 661
WRITE(12,1480) I, J, K, ROW, CO
GO TO 670
661 WRITE(12,1481) I, J, K, ROW, CO
GO TO 670
662 IF (K .GE. 10) GO TO 663
WRITE(12,1482) I, J, K, ROW, CO
GO TO 670
663 WRITE(12,1483) I, J, K, ROW, CO
GO TO 670
665 IF (J .GE. 10) GO TO 667
IF (K .GE. 10) GO TO 666
WRITE(12,1484) I, J, K, ROW, CO
GO TO 670
666 WRITE(12,1485) I, J, K, ROW, CO
GO TO 670
667 IF (K .GE. 10) GO TO 668
WRITE(12,1486) I, J, K, ROW, CO
GO TO 670
668 WRITE(12,1487) I, J, K, ROW, CO
CONTINUE
IRHS = 0
DO 680 K = K1, K2
IRHS = IRHS + U(J,K)
IRHS = IRHS * QTY/100.0 + .5
RHS = IRHS
WRITE(13,1050) ROW, RHS
GO TO 610
680 CONTINUE
C**************************************************************************
C GOAL TO MINIMIZE DEFICITS
C**************************************************************************
SIGN = E
CO = 1.0
ROW = ROW + 1
WRITE(11,1030) SIGN, ROW
I = NSRC
DO 730 J = 1, NU
DO 730 K = 1, QTR
IF (I .GE. 10) GO TO 725
IF (J .GE. 10) GO TO 722
IF (K .GE. 10) GO TO 721
WRITE(12,1040) I, J, K, ROW, CO
GO TO 730
721 WRITE(12,1041) I, J, K, ROW, CO
GO TO 730
722 IF (K .GE. 10) GO TO 723
WRITE(12,1042) I, J, K, ROW, CO
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GO TO 730
723 WRITE(12,1043) I, J, K, ROW, CO
GO TO 730
725 IF (J .GE. 10) GO TO 727
IF (K .GE. 10) GO TO 726
WRITE(12,1044) I, J, K, ROW, CO
GO TO 730
726 WRITE(12,1045) I, J, K, ROW, CO
GO TO 730
727 IF (K .GE. 10) GO TO 728
WRITE(t2,1046) I, J, K, ROW, CO
GO TO 730
728 WRITE(12,1047) I, J, K, ROW, CO
730 CONTINUE
C
co = 1.0
WRITE(12,1610) ROW, CO
co = -1.0
WRITE(12,1620) ROW, CO
RHS = 0.0
WRITE(13,1050) ROW, RHS
1000 FORMAT(5Al)
1005 FORMAT(417)
1010 FORMAT(4012)
1015 FORMAT('ROWS')
1020 FORMAT('COLUMNS')
1025 FORMAT('RHS')
1028 FORMAT('BOUNDS')
1030 FORMAT(2X,Al,1X,18)
1035 FORMAT(2X,'DUMMY',5X,18,4X,F10.2)
1040 FORMAT(4X,'X',0.'11',0.'11',0.'11',3X,18,4X,F10.2)
1041 FORMAT(4X,'X',0.'11',0.'11',12,3X,18,4X,F10.2)
1042 FORMAT(4X,'X',0.'11',12,0.'11',3X,18,4X,F10.2)
1043 FORMAT(4X,'X',0.'11',12,0.'11',12,3X,18,4X,F10.2)
1044 FORMAT(4X,'X',12,0.'11',0.'11',3X,18,4X,F10.2)
1045 FORMAT(4X,'X',12,0.'11',12,3X,18,4X,F10.2)
1046 FORMAT(4X,'X',12,0.'11',12,3X,18,4X,F10.2)
1047 FORMAT(4X,'X',12,12,3X,18,4X,F10.2)
1050 FORMAT(4X,'RHS',7X,18,4X,F10.2)
1240 FORMAT(4X,'D',0.'11',0.'11',0.'11',12,3X,18,4X,F10.2)
1241 FORMAT(4X,'D',0.'11',0.'11',12,0.'11',3X,18,4X,F10.2)
1242 FORMAT(4X,'D',0.'11',12,0.'11',3X,18,4X,F10.2)
1243 FORMAT(4X,'D',0.'11',12,0.'11',12,3X,18,4X,F10.2)
1244 FORMAT(4X,'D',12,0.'11',0.'11',3X,18,4X,F10.2)
1245 FORMAT(4X,'D',12,0.'11',12,3X,18,4X,F10.2)
1246 FORMAT(4X,'D',12,0.'11',12,3X,18,4X,F10.2)
1247 FORMAT(4X,'D',12,12,3X,18,4X,F10.2)
1280 FORMAT(4X,'D',0.'11',0.'11',0.'11',12,3X,18,4X,F10.2)
1281 FORMAT(4X,'D',0.'11',0.'11',12,0.'11',3X,18,4X,F10.2)
1282 FORMAT(4X,'D',0.'11',12,0.'11',3X,18,4X,F10.2)
1283 FORMAT(4X,'D',0.'11',12,0.'11',12,3X,18,4X,F10.2)
1284 FORMAT(4X,'D',12,0.'11',0.'11',3X,18,4X,F10.2)
1285 FORMAT(4X,'D',12,0.'11',12,3X,18,4X,F10.2)
1286 FORMAT(4X,'D',12,0.'11',12,3X,18,4X,F10.2)
1287 FORMAT(4X,'D',12,12,3X,18,4X,F10.2)
1340 FORMAT(4X,'E',0.'11',0.'11',0.'11',12,3X,18,4X,F10.2)
1341 FORMAT(4X,'E',0.'11',0.'11',12,0.'11',3X,18,4X,F10.2)
1342 FORMAT(4X,'E',0.'11',12,0.'11',3X,18,4X,F10.2)
1343 FORMAT(4X,'E',0.'11',12,0.'11',12,3X,18,4X,F10.2)
1344 FORMAT(4X,'E',12,0.'11',0.'11',3X,18,4X,F10.2)
1345 FORMAT(4X,'E',12,0.'11',12,3X,18,4X,F10.2)
1346 FORMAT(4X,'E',12,0.'11',12,3X,18,4X,F10.2)
1347 FORMAT(4X,'E',12,12,3X,18,4X,F10.2)
1380 FORMAT(4X,'E',0.'11',0.'11',12,3X,18,4X,F10.2)
1381 FORMAT(4X,'E',0.'11',12,3X,18,4X,F10.2)
1382 FORMAT(4X,'E',0.'11',12,3X,18,4X,F10.2)
1383 FORMAT(4X,'E',0.'11',12,3X,18,4X,F10.2)
1384 FORMAT(4X,'E',0.'11',12,3X,18,4X,F10.2)
1385 FORMAT(4X,'E',12,0.'11',12,3X,18,4X,F10.2)
1386 FORMAT(4X,'E',12,0.'11',12,3X,18,4X,F10.2)
1387 FORMAT(4X,'E',12,0.'11',12,3X,18,4X,F10.2)
1440 FORMAT(4X,'F',0.'11',0.'11',12,3X,18,4X,F10.2)
Appendix B. LISTING OF FORTRAN PROGRAMS
B.14 ORDGARPT

C*******************************************************************
C SORT 'ALL GOAL ACHIEVEMENTS' FILE BY PRIORITY
C*******************************************************************
REAL X(76)
IC = 0
50 READ(1,1000, END=100) X
   IC = IC + 1
   WRITE(2,1100) IC,X
   GO TO 50
100 CONTINUE
1000 FORMAT(76A1)
1100 FORMAT(12,' . ',76A1)
STOP
END
B.15 PLANYEAR

C******************************************************************************
C MODIFIES THE DATABASE ACCORDINGLY WHEN THE PLANNING HORIZON
C IS CHANGED
C******************************************************************************

INTEGER Y(4)
READ(1,*) NSRCE, NUSE, NY
DO 50 I = 1, NSRCE
READ(2,*) Y(I)
WRITE(8,110) Y(I)
DO 20 J = 1, NY
READ(2,*) Y
WRITE(8,110) Y
20 CONTINUE
50 CONTINUE
DO 80 I = 1, NUSE
DO 60 J = 1, NY
READ(3,*) Y
WRITE(9,110) Y
60 CONTINUE
80 CONTINUE
110 FORMAT(4I7)
STOP
END
B.16 PREGLACH

C*********************************************************************
C REWRITES THE THREE GOAL FILES IN FORMATTED FORMS WHICH
C WILL LATER BE USED TO CREATE "GOAL ACHIEVEMENT" REPORTS
C*********************************************************************

INTEGER QTY1, DT, PR, WT, GT, CTR1, CTR2, CTR3, CTR0, CTR
REAL QTY
READ(1,*)
READ(2,*)
READ(3,*)
READ(4,*)
CTR1 = 0
CTR2 = 0
CTR3 = 0
CTR = 0
GT = 1
50   READ(1,*, END=90) I, J, K, QTY1, DT, PR, WT
     WRITE(11,1000) I, J, K, QTY1, DT, PR, WT, GT
     QTY = QTY1
     WRITE(17,1010) I, J, K, QTY, DT, PR, WT, GT
     CTR1 = CTR1 + I
     GO TO 50
90   GT = 2
100  READ(2,*, END=190) I, J, K, QTY, DT, PR, WT
     CTR2 = CTR2 + I
     WRITE(12,1010) I, J, K, QTY, DT, PR, WT, GT
     WRITE(17,1010) I, J, K, QTY, DT, PR, WT, GT
     GO TO 100
190  GT = 3
200  READ(3,*, END=300) I, J, K, QTY, DT, PR, WT
     CTR3 = CTR3 + I
     WRITE(13,1010) I, J, K, QTY, DT, PR, WT, GT
     WRITE(17,1010) I, J, K, QTY, DT, PR, WT, GT
     GO TO 200
300  CTR0 = CTR1 + CTR2 + CTR3
     WRITE(18,*) CTR1, CTR2, CTR3, CTR0
     WRITE(14,*)
400  READ(4,*, END=500) I, J, K, QTY1
     CTR = CTR + I
     WRITE(14,1000) I, J, K, QTY1
     GO TO 400
500  WRITE(19,*) CTR
1000 FORMAT(1X,I2,1X,I2,1X,I2,1X,I2,1X,I2,1X,I2,1X,I2,1X,I2,1X,I4,1X,I1)
1010 FORMAT(1X,I2,1X,I2,1X,I2,1X,I2,1X,I2,1X,F7.2,1X,I1,I1,I1,I2,I2,I4,I1,I1)
STOP
END
B.17 PREP RIOR

C*****************************************************************************
C READS THE THREE GOALS FILES IN UNFORMATTED MODE AND
C WRITES THEM IN FORMATTED FORM WHICH WILL LATER BE
C USED TO CREATE THE ACHIEVEMENT FUNCTION FILE
C*****************************************************************************

INTEGER QTY1, DT, PR, WT, GT, CTR1, CTR2, CTR3, CTR
REAL QTY
READ(1,*),
READ(2,*),
READ(3,*),
CTR1 = 1
CTR2 = 1
CTR3 = 1
CTR = 0
GT = 1

50 READ(1,*, END=90) I, J, K, QTY1, DT, PR, WT
WRITE(11,1000) I, J, K, QTY1, DT, PR, WT, GT
CTR1 = CTR1 + 1
GO TO 50
90 GT = 2

100 READ(2,*, END=190) I, J, K, QTY, DT, PR, WT
CTR2 = CTR2 + 1
WRITE(11,1010) I, J, K, QTY, DT, PR, WT, GT
GO TO 100

190 GT = 3

200 READ(3,*, END=300) I, J, K, QTY, DT, PR, WT
CTR3 = CTR3 + 1
WRITE(11,1010) I, J, K, QTY, DT, PR, WT, GT
GO TO 200

300 CONTINUE
CTR = CTR1 + CTR2 + CTR3 - 3
WRITE(12,*) CTR
WRITE(13,*) CTR1, CTR2, CTR3

1000 FORMAT(1X,I2,1X,I2,1X,I2,1X,I2,1X,I7,1X,I1,1X,I2,1X,I4,1X,I1)
1010 FORMAT(1X,I2,1X,I2,1X,I2,1X,I2,1X,F7.2,1X,I1,1X,I2,1X,I4,1X,I1)
STOP
END

Appendix B. LISTING OF FORTRAN PROGRAMS
B.18 PREVUGLS

C*****************************************************************************
C REWRITES THE THREE GOAL FILES IN FORMATTED FORMS
C WHICH WILL LATER BE USED TO CREATE "VIEW GOAL" REPORTS
C*****************************************************************************

INTEGER QTY1, DT, PR, WT, GT, CTR1, CTR2, CTR3, CTR4, CTR
REAL QTY
READ(*,*)
READ(1,*)
READ(2,*)
READ(3,*)
READ(4,*)
CTR1 = 0
CTR2 = 0
CTR3 = 0
CTR4 = 0
GT = 1
50 READ(1,* , END=90) I, J, K, QTY1, DT, PR, WT
WRITE(11,1000) I, J, K, QTY1, DT, PR, WT, GT
QTY = QTY1
WRITE(17,1010) I, J, K, QTY, DT, PR, WT, GT
CTR1 = CTR1 + 1
GO TO 50
90 GT = 2
100 READ(2,* , END=190) I, J, K, QTY, DT, PR, WT
CTR2 = CTR2 + 1
WRITE(12,1010) I, J, K, QTY, DT, PR, WT, GT
WRITE(17,1010) I, J, K, QTY, DT, PR, WT, GT
GO TO 100
190 GT = 3
200 READ(3,* , END=300) I, J, K, QTY, DT, PR, WT
CTR3 = CTR3 + 1
WRITE(13,1010) I, J, K, QTY, DT, PR, WT, GT
WRITE(17,1010) I, J, K, QTY, DT, PR, WT, GT
GO TO 200
300 READ(4,* , END=400) I, J, K, QTY1
CTR4 = CTR4 + 1
WRITE(19,1000) I, J, K, QTY1
GO TO 300
400 CONTINUE
CTR = CTR1 + CTR2 + CTR3
WRITE(18,* ) CTR1, CTR2, CTR3, CTR4, CTR
1000 FORMAT(1X,J2,J2,J2,J2,J2,J2,J2,J2,F7.2,J2,J2,J2,J2,J2,J2,J2,J2)
1010 FORMAT(1X,J2,J2,J2,J2,J2,J2,J2,J2,F7.2,J2,J2,J2,J2,J2,J2,J2,J2)
STOP
END
B.19 PRIOR

CREATES THE PRIORITY STRUCTURE FOR LINDO USING THE THREE GOALS FILES

DIMENSION CODE(200,6), VAR(20,200,8), WT(20,200)
INTEGER DT(200), PR(200), W(200), GT(200)
INTEGER PCTR(20), SP(20)
INTEGER CTR
REAL D, E, F, M, P, Z, DV, G
DATA D, E, F, M, P, Z, G, B/'D';'E';'F';'M';'P';'G';'/'
READ(1,*), NG
DO 50 I = 1, NG
  READ(2,I00) (CODE(I,J),J=1,6), DT(I), PR(I), W(I), GT(I)
DO 40 J = 1, 6
  IF (CODE(I,J) .EQ. 8) CODE(I,J) = Z
50 CONTINUE
DO 60 J = 1, 20
60 PCTR(J) = 0
DO 300 I = 1, NG
  DV = B
  J = PR(I)
  IF (GT(I) .EQ. 1) DV = D
  IF (GT(I) .EQ. 2) DV = E
  IF (GT(I) .EQ. 3) DV = F
  IF (DT(I) .EQ. 1) GO TO 200
  PCTR(J) = PCTR(J) + 1
  N = PCTR(J)
  VAR(J,N,1) = DV
  VAR(J,N,2) = CODE(I,1)
  VAR(J,N,3) = CODE(I,2)
  VAR(J,N,4) = CODE(I,3)
  VAR(J,N,5) = CODE(I,4)
  VAR(J,N,6) = CODE(I,5)
  VAR(J,N,7) = CODE(I,6)
  VAR(J,N,8) = M
  WT(J,N) = W(I)
200 IF (DT(I) .EQ. 2) GO TO 300
  PCTR(J) = PCTR(J) + 1
  N = PCTR(J)
  VAR(J,N,1) = DV
  VAR(J,N,2) = CODE(I,1)
  VAR(J,N,3) = CODE(I,2)
  VAR(J,N,4) = CODE(I,3)
  VAR(J,N,5) = CODE(I,4)
  VAR(J,N,6) = CODE(I,5)
  VAR(J,N,7) = CODE(I,6)
  VAR(J,N,8) = P
  WT(J,N) = W(I)
300 CONTINUE
J = 20
PCTR(J) = PCTR(J) + 1
N = PCTR(J)
VAR(J,N,1) = G
VAR(J,N,2) = M
VAR(J,N,3) = B
VAR(J,N,4) = B
VAR(J,N,5) = B
VAR(J,N,6) = B
VAR(J,N,7) = B
VAR(J,N,8) = B
WT(J,N) = 1.0
J = 20
PCTR(J) = PCTR(J) + 1
N = PCTR(J)
VAR(J,N,1) = G
VAR(J,N,2) = P
VAR(J,N,3) = B
Appendix B. LISTING OF FORTRAN PROGRAMS 298
VAR(J,N,4) = B
VAR(J,N,5) = B
VAR(J,N,6) = B
VAR(J,N,7) = B
VAR(J,N,8) = B
WT(J,N) = 1.0

C
CTR = 0
DO 350 K = 1,20
IF (PCTR(K).EQ. 0) GO TO 350
CTR = CTR + 1
SP(CTR) = K
350 CONTINUE
C
C ************************************************************
C WRITE(75,500)
500 FORMAT('111111112222222233333334444444455555555666666666777777778888888')
WRITE(75,1200) CTR
WRITE(75,1210) (PCTR(SP(I)),I = 1,CTR)
DO 600 I = 1,CTR
M = SP(I)
L = PCTR(M)
WRITE(75,1220) ((VAR(M,J,K),K = 1,8),J = 1,L)
WRITE(75,1230) (WT(M,J),J = 1,L)
600 CONTINUE
1000 FORMAT(IOAI)
1100 FORMAT(!X,2AI ,IX,2AI ,IX,2AI ,IX,12,IX,14,IX,12,IX,12,IX,12,IX,12,IX,12,IX,12)
1200 FORMAT(I2,' SANDU GP MODEL')
1210 FORMAT(I2,20(2X,12))
1220 FORMAT(8(8AI))
1230 FORMAT(8(F8.2))
STOP
END

Appendix B. LISTING OF FORTRAN PROGRAMS 299
B.20 PRINTGARP

C*******************************************************************
C PRINT GOAL ACHIEVEMENT REPORTS
C*******************************************************************
DIMENSION S(20), U(20), X(120)
READ(1,*) 11, 12, 13, 10
C*******************************************************************
C PRINT TITLE
C*******************************************************************
WRITE(11,1000)
C*******************************************************************
C GOAL ACHIEVEMENT REPORT - TYPE I GOALS
C*******************************************************************
WRITE(11,1100)
WRITE(11,1110)
IF (II .EQ. 0) GO TO 100
50 READ(31,1500, END = 100) X
WRITE(11,1500) X
GO TO 50
100 CONTINUE
C*******************************************************************
C GOAL ACHIEVEMENT REPORT - TYPE II GOALS
C*******************************************************************
WRITE(11,1200)
WRITE(11,1205)
WRITE(11,1210)
IF (I2 .EQ. 0) GO TO 200
150 READ(32,1500, END = 200) X
WRITE(11,1500) X
GO TO 150
200 CONTINUE
C*******************************************************************
C GOAL ACHIEVEMENT REPORT - TYPE III GOALS
C*******************************************************************
WRITE(11,1203)
WRITE(11,1205)
WRITE(11,1210)
IF (I3 .EQ. 0) GO TO 300
250 READ(33,1500, END = 300) X
WRITE(11,1500) X
GO TO 250
300 CONTINUE
C*******************************************************************
C GOAL ACHIEVEMENT REPORT - ALL GOALS
C*******************************************************************
IC = 0
350 READ(37,1500, END = 400) X
IC = IC + 1
WRITE(11,1550) IC, X
GO TO 350
400 CONTINUE
1000 FORMAT('1',/99X,'GOAL ACHIEVEMENT REPORTS')
1100 FORMAT('1',/47X,
1 GOAL 1 : SPECIFIC ALLOCATION')
1110 FORMAT('/11X','SOURCE USE YR/QT
1R TY PR WT TARGET ACHVED ABS-DEV PRCNT-DEV')
1200 FORMAT('1'/'//,40X,
1 GOAL 2 : ALLOCATE PERCENTAGE OF SOURCE TO USE')
1203 FORMAT('1'/'//,39X,
1 GOAL 3 : ALLOCATE PERCENTAGE OF USE FROM SOURCE')
1205 FORMAT('1'/'//,6X,
1 TARGET ACHIEVED DEVIATION PRCNT')
1210 FORMAT('1'/'//,52X,
1 PR WT DOLLAR/PRCNT DOLLAR/PRCNT DOLLAR/PRCNT DEVN')

Appendix B. LISTING OF FORTRAN PROGRAMS
"ALL GOALS : BY PRIORITY"
1305 FORMAT(6X,')
1310 FORMAT(6X, 'TARGET ACHIEVED DEVIAION PRCNT')
1320 FORMAT(6X, 'GT SOURCE USE Y/Q T')
1330 FORMAT(6X, 'PR WT DOLLAR/PRCNT DOLLAR/PRCNT DOLLAR/PRCNT DOLLAR/PRCNT DEVTN')
1500 FORMAT(120A1)
1550 FORMAT(4X, I2, ' ', 2X, A1)
STOP
END
B.21 PRNTGLS

C*********************************************************************
C
PRINT "CURRENT GOALS" REPORTS
C*********************************************************************
C
REAL X(80)
READ(1,*) N1, N2, N3, NR, N0
WRITE(21,105)

C RIGID ALLOCATIONS (SORTED BY SOURCE)
C
IF (NR .EQ. 0) GO TO 25
WRITE(21,110)
WRITE(21,115)
DO 10 I = 1,NR
READ(11,100) X
10 WRITE(21,200) X

C RIGID ALLOCATIONS (SORTED BY USE)
C
WRITE(21,120)
WRITE(21,125)
DO 20 I = 1,NR
READ(12,100) X
20 WRITE(21,200) X

C GOAL 1 : SPECIFIC ALLOCATION
C
IF (N1 .EQ. 0) GO TO 35
WRITE(21,130)
WRITE(21,135)
DO 30 I = 1,N1
READ(13,100) X
30 WRITE(21,200) X

C GOAL 2 : ALLOCATE PERCENTAGE OF SOURCE TO USE
C
IF (N2 .EQ. 0) GO TO 45
WRITE(21,140)
WRITE(21,145)
DO 40 I = 1,N2
READ(14,100) X
40 WRITE(21,200) X

C GOAL 3 : ALLOCATE PERCENTAGE OF USE FROM SOURCE
C
IF (N3 .EQ. 0) GO TO 55
WRITE(21,150)
WRITE(21,155)
DO 50 I = 1,N3
READ(15,100) X
50 WRITE(21,200) X

C GOAL 3 : ALLOCATE PERCENTAGE OF USE FROM SOURCE
C
IF (N0 .EQ. 0) GO TO 80
WRITE(21,160)
WRITE(21,165)
DO 60 I = 1,N0
READ(16,100) X
60 WRITE(21,200) X
80 CONTINUE
100 FORMAT(80A1)
105 FORMAT(160X,'VIEW GP MODEL GOALS/RIGID ALLOCATIONS')
110 FORMAT(10X,'RIGID ALLOCATIONS (BY SOURCE)')
115 FORMAT(15X,'RIGID ALLOCATIONS (SORTED BY SOURCE)')

Appendix B. LISTING OF FORTRAN PROGRAMS
I'SOURCE USE YR/QTR AMOUNT')
120 FORMAT(' I',/////,20X,27X,
1'RIGID ALLOCATIONS (BY USE')
125 FORMAT(20X,10X,
1'SOURCE USE YR/QTR AMOUNT')
130 FORMAT(' I',/////,20X,26X,
1'GOAL 1 : SPECIFIC ALLOCATION')
135 FORMAT(20X,11X,
1'SOURCE USE YR/QTR AMOUNT TYPE PR
1 WT')
140 FORMAT(' I',/////,20X,17X,
1'GOAL 2 : ALLOCATE PERCENTAGE OF SOURCE TO USE')
145 FORMAT(20X,11X,
1'SOURCE USE YEAR PERCENT TYPE PR
1 WT')
150 FORMAT(' I',/////,20X,16X,
1'GOAL 3 : ALLOCATE PERCENTAGE OF USE FROM SOURCE')
155 FORMAT(20X,11X,
1'SOURCE USE YEAR PERCENT TYPE PR
1 WT')
160 FORMAT(' I',/////,20X,28X,
1'ALL GOALS : BY PRIORITY')
165 FORMAT(20X,5X,
1'GT SOURCE USE YR/QTR TARGET TYPE
1 PR WT')
200 FORMAT(20X,80A1)
STOP
END
B.22 PRNTRPTS

C*********************************************************************
C
PRINT ALLOCATION REPORTS
C*********************************************************************

REAL S(25,20), U(25,20), YR(5,7), HY(6), TOTAL(20), EQ(6)
REAL DEF(20)
INTEGER DATA(7), C(25)

DATA(NS,N,NU, NY)
DATA HY/T;'O';'A';'L','15*'/
DATA DEF/'D','E','F','I','C','T','13*'/
NSRC = NS + 1
DO 50  I=1,NSRC
50 READ(2,1010) (S(I,J), J=1,20)
DO 55 J=1,20
55 S(I,SRC,J) = DEF(J)
DO 60 I=1,NU
60 READ(3,1010) (U(I,J), J=1,20)
DO 70 I=1, NY
70 READ(4,1010) (YR(I,J), J=1,7)
WRITE(21,1000)

C*********************************************************************
C GENERATE REPORT - FUNDS AVAILABILITY BY SOURCE
C*********************************************************************

C FIRST YEAR
WRITE(21,1110) (YR(I,J), J=1,7)
WRITE(21,1120)
DO 140 I=1,NSRC
140 READ(11,1000) (DATA(J), J=1,7)
WRITE(21,1130) (S(I,K), K=1,20), (DATA(J), J=1,7)
WRITE(21,1140) HY,HY,HY,HY,HY,HY,HY
READ(12,1000) (DATA(J), J=1,7)
WRITE(21,1130) TOTAL, (DATA(J), J=1,7)

C SUCCEEDING YEARS
IF (NY.EQ.1) GO TO 200
DO 180 N=2, NY
WRITE(21,1110) (YR(N,J), J=1,7)
WRITE(21,1120)
DO 160 I=1, NSRC
160 READ(11,1000) (DATA(J), J=1,7)
WRITE(21,1130) (S(I,K), K=1,20), (DATA(J), J=1,7)
WRITE(21,1140) HY,HY,HY,HY,HY,HY,HY
READ(12,1000) (DATA(J), J=1,7)
WRITE(21,1130) TOTAL, (DATA(J), J=1,7)
180 CONTINUE
200 CONTINUE

C*********************************************************************
C GENERATE REPORT - FUNDS REQUIREMENT BY USE
C*********************************************************************

C FIRST YEAR
WRITE(21,1210) (YR(I,J), J=1,7)
WRITE(21,1220)
DO 240 I=1,NU
240 READ(12,1000) (DATA(J), J=1,6)
WRITE(21,1230) (U(I,K), K=1,20), (DATA(J), J=1,6)
WRITE(21,1240) HY,HY,HY,HY,HY,HY
READ(12,1000) (DATA(J), J=1,6)
WRITE(21,1230) TOTAL, (DATA(J), J=1,6)
C
C SUCCEEDING YEARS
C

Appendix B. LISTING OF FORTRAN PROGRAMS 304
IF (NY .EQ. 1) GO TO 300
DO 280 N = 2, NY
WRITE(21,1210) (YR(N,J),J = 1,7)
WRITE(21,1250) N
DO 260 I = 1, NU
READ(12,1000) (DATA(J), J = 1,7)
WRITE(21,1260) (U(I,K),K = 1,20),(DATA(J), J = 1,7)
WRITE(21,1270) HY,HY,HY,HY,HY, HY
READ(12,1000) (DATA(J), J = 1,7)
WRITE(21,1260) TOTAL, (DATA(J), J = 1,7)
280 CONTINUE
300 CONTINUE
C*********************************************************************
C GENERATE REPORT - SOURCE EXPENDITURES
C*********************************************************************
C FIRST YEAR
C DO 400 I = 1,NSRC
DO 310 L = 1, NU
310 C(L) = I
WRITE(21,1310) (S(I,J),J = 1,20), (YR(I,K), K = 1,7)
WRITE(21,1315)
READ(13,1000) (DATA(J), J = 1,5)
WRITE(21,1320) (DATA(J), J = 1,5)
READ(13,1000) (DATA(J), J = 1,5)
WRITE(21,1325) (DATA(J), J = 1,5)
WRITE(21,1330) HY, HY, HY, HY
READ(13,1000) (DATA(J), J = 1,5)
WRITE(21,1335) (DATA(J), J = 1,5)
WRITE(21,1340) HY, HY, HY, HY, HY
READ(13,1000) (DATA(J), J = 1,6)
IF (DATA(M), .EQ. 0) C(M) = 0
IF (C(M), .EQ. 0) GO TO 330
WRITE(21,1345) (U(M,K), K = 1,20),(DATA(J), J = 1,6)
330 CONTINUE
C SUCCEEDING YEARS
C IF (NY .EQ. 1) GO TO 400
DO 380 N = 2, NY
WRITE(21,1360) (S(I,J),J = 1,20), (YR(N,K), K = 1,7)
WRITE(21,1365)
READ(13,1000) (DATA(J), J = 1,5)
WRITE(21,1370) (DATA(J), J = 1,5)
READ(13,1000) (DATA(J), J = 1,5)
WRITE(21,1375) (DATA(J), J = 1,5)
WRITE(21,1380) HY, HY, HY, HY
READ(13,1000) (DATA(J), J = 1,5)
WRITE(21,1385) (DATA(J), J = 1,5)
WRITE(21,1390) N
DO 370 M = 1, NU
READ(13,1000) (DATA(J), J = 1,7)
IF (C(M), .EQ. 0) GO TO 370
WRITE(21,1395) (U(M,K), K = 1,20),(DATA(J), J = 1,7)
370 CONTINUE
WRITE(21,1397) HY, HY, HY, HY, HY
READ(13,1000) (DATA(J), J = 1,7)
WRITE(21,1395) TOTAL, (DATA(J), J = 1,7)
WRITE(21,1397) EQ,EQ,EQ,EQ,EQ
READ(13,1000) (DATA(J), J = 1,7)
WRITE(21,1399) (DATA(J), J = 1,5)
380 CONTINUE
400 CONTINUE
C*********************************************************************
 Appendix B. LISTING OF FORTRAN PROGRAMS

`GENERATE REPORT - EXPENDITURE SOURCES`

`FIRST YEAR`

```fortran
DO 500 I = 1, NU
DO 410 L = 1, NSRC
410 C(L) = 1
WRITE(21,1410) (U(I,J),J = 1,20), (YR(L,K),K = 1,7)
WRITE(21,1420)
DO 430 M = 1, NSRC
READ(14,1000) (DATA(J),J = 1,7)
IF (C(M) .EQ. 0) C(M) = 0
IF (C(M) .EQ. 0) GO TO 430
WRITE(21,1430) (S(M,K),K = 1,20),(DATA(J),J = 1,7)
430 CONTINUE
C SUCCEEDING YEARS
IF (NY .EQ. 1) GO TO 500
DO 480 N = 2, NY
WRITE(21,1450) (U(I,J),J = 1,20), (YR(N,K),K = 1,7)
WRITE(21,1460) N
DO 470 M = 1, NSRC
READ(14,1000) (DATA(J),J = 1,7)
IF (C(M) .EQ. 0) GO TO 470
WRITE(21,1470) (S(M,K),K = 1,20),(DATA(J),J = 1,7)
470 CONTINUE
WRITE(21,1480) HY,HY,HY,HY,HY,HY,HY
READ(15,1000) (DATA(J),J = 1,7)
WRITE(21,1470) TOTAL,(DATA(J),J = 1,7)
480 CONTINUE
500 CONTINUE
C GENERATE REPORT - SOURCE EXPENDITURES THROUGH TIME`

`FIRST YEAR`

```fortran
WRITE(21,1510) (YR(L,J),J = 1,7)
WRITE(21,1520)
DO 540 I = 1, NSRC
READ(15,1000) (DATA(J),J = 1,7)
540 WRITE(21,1530) (S(I,K),K = 1,20),(DATA(J),J = 1,7)
WRITE(21,1540)
READ(15,1000) (DATA(J),J = 1,7)
WRITE(21,1530) TOTAL, (DATA(J),J = 1,7)
C SUCCEEDING YEARS
IF (NY .EQ. 1) GO TO 600
DO 580 N = 2, NY
WRITE(21,1510) (YR(N,J),J = 1,7)
WRITE(21,1520) N
DO 560 I = 1, NSRC
READ(15,1000) (DATA(J),J = 1,7)
560 WRITE(21,1530) (S(I,K),K = 1,20),(DATA(J),J = 1,7)
WRITE(21,1540) HY,HY,HY,HY,HY,HY,HY
READ(15,1000) (DATA(J),J = 1,7)
WRITE(21,1530) TOTAL, (DATA(J),J = 1,7)
580 CONTINUE
600 CONTINUE
C LISTING OF FORTRAN PROGRAMS
1000 FORMAT(1017)
1005 FORMAT(/1111111111,20X,32X, 'ALLOCATION REPORTS')
1010 FORMAT(20A1)
1110 FORMAT('1 ',/////,20X,21X, 'FUNDS AVAILABILITY BY SOURCE - ',7A1)
1120 FORMAT(20X,8X, 'FUND TOTAL BAL FWD 1ST QT 2ND QT 3RD QT 4TH QT
Appendix B. LISTING OF FORTRAN PROGRAMS 306`
1 YEAR')
1130 FORMAT(1X,20X,20A1,2X,16,3X,16,4(2X,16),3X,16)
1140 FORMAT(20X,23X,6A1,3X,6A1,4(2X,6A1),3X,6A1)
1150 FORMAT(/,20X,8X,
      'FUND' CUM 1ST QT 2ND QT 3RD QT 4TH QT YEAR T
      1OT',1X,1I,'YR')
1210 FORMAT('l',/////,20X,23X,'FUNDS REQUIREMENT BY USE - ','7A1)
1220 FORMAT(/,20X,12X,
      'USE TOTAL 1ST QT 2ND QT 3RD QT 4TH QT YEAR')
1230 FORMAT((/X,20X,4X,20A1,2X,16,3X,16,4(2X,16))
1240 FORMAT((/X,20X,26X,6A1,3X,6A1,4(2X,6A1))
1250 FORMAT(/,20X,8X,
      'USE CUM 1ST QT 2ND QT 3RD QT 4TH QT YEAR T
      1OT',1X,1I,'YR')
1310 FORMAT((/X,20X,5X,20A1,1IX,'EXPENDITURES BY USE
      - ',7A1)
1315 FORMAT((/X,20X,12X,
      'USE TOTAL 1ST QT 2ND QT 3RD QT 4TH QT YEAR')
1320 FORMAT((/X,20X,4X,'BALANCE FORWARD','14X,5(2X,16))
1325 FORMAT(/,20X,4X,'QTRLY ADDITIONS','14X,5(2X,16))
1330 FORMAT(/,20X,4X,'TOTAL FUNDS AVAILABLE','8X,5(2X,16))
1340 FORMAT(/,20X,4X,'EXPENDITURES','11X,'TOTAL')
1345 FORMAT((/X,20X,4X,20A1,2X,16,3X,16,4(2X,16))
1347 FORMAT(/,20X,12X,3X,6A1,4(2X,6A1))
1350 FORMAT((/X,20X,4X,'ENDING BALANCE','15X,5(2X,16))
1360 FORMAT('/',/////,20X,11X,'EXPENDITURES BY USE - ','7A1)
1365 FORMAT(/,20X,32X,'1ST QT 2ND QT 3RD QT 4TH QT CUM')
1370 FORMAT(/,20X,10X,'BALANCE FORWARD','14X,5(2X,16))
1375 FORMAT(/,20X,4X,'QTRLY ADDITIONS','14X,5(2X,16))
1380 FORMAT((/X,20X,15X,14X,5(2X,6A1))
1385 FORMAT((/X,20X,TOTAL FUNDS AVAILABLE','8X,5(2X,16))
1390 FORMAT(/,20X,'EXPENDITURES','13X,CUM','43X,TOT','1X,1I,1YR')
1395 FORMAT((/X,20X,20A1,2X,16,3X,16,4(2X,16),3X,16)
1399 FORMAT(/,20X,'ENDING BALANCE','15X,5(2X,16))
1410 FORMAT('/',/////,20X,5X,20A1,5X,'EXPENDITURES BY SOURCES - ','7A1)
1420 FORMAT(/,20X,10X,
      'SOURCE TOTAL 1ST QT 2ND QT 3RD QT 4TH QT YEAR')
1430 FORMAT((/X,20X,4X,20A1,2X,16,3X,16,4(2X,16))
1440 FORMAT((/X,20X,26X,6A1,3X,6A1,4(2X,6A1))
1450 FORMAT('/',/////,20X,11X,'EXPENDITURES BY SOURCES - ','7A1)
1460 FORMAT(/,20X,6X,
      'SOURCE CUM 1ST QT 2ND QT 3RD QT 4TH QT YEAR
      1TOT',1X,1I,'YR')
1470 FORMAT(/,20X,20A1,2X,16,3X,16,4(2X,16),3X,16)
1480 FORMAT(/,20X,23X,6A1,3X,6A1,4(2X,6A1),3X,6A1)
1510 FORMAT('/',/////,20X,19X,SOURCE EXPENDITURES THROUGH TIME - ',
      17A1)
1520 FORMAT((/X,20X,7X,
      'SOURCE AVAIL USED 1ST QT 2ND QT 3RD QT 4TH QT
      1 YEAR')
1530 FORMAT((/X,20X,20A1,2X,16,3X,16,4(2X,16),3X,16)
1550 FORMAT((/X,20X,7X,
      'SOURCE CUM 1ST QT 2ND QT 3RD QT 4TH QT YEAR
      1TOT',1X,1I,'YR')
STOP
END

Appendix B. LISTING OF FORTRAN PROGRAMS 307
B.23 REPORTS

CREATES FILES FOR THE SOLUTION REPORTS

INTEGER S(25,5,4)
INTEGER U(25,5,4), UI(25,5,4)
INTEGER C(25,25), X(25,25,5,4)
INTEGER SY(25,5), SYC(25,5), ST(25), SQT(5,4), SYT(5), SYCT(5), STOTAL
INTEGER UY(25,5), UYC(25,5), UT(25), UQT(5,4), UYT(5), UYCT(5), UTOTAL
INTEGER STBAL
INTEGER IBAL(25), ISUM(25)
INTEGER SYBF(25,5,4), SYEB(25,5,4)
INTEGER SQE(5,4), SYE(5), SYCE(5)
READ(1,*), NS, NU, NY
NSRC = NS + 1
DO 10 I = 1, NS
READ(2,1000) IBAL(I)
DO 10 J = 1, NY
READ(2,1000) (S(I,J,K), K = 1, 4)
10 CONTINUE
DO 20 J = 1, NU
C(NSRC,J) = 1
20 CONTINUE
DO 30 N = 1, NY
DO 30 K = 1, 4
DO 30 J = 1, NU
DO 30 I = 1, NSRC
30 X(I,J,N,K) = 0
C
READ ALLOCATIONS
C
DO 200 I = 1, NSRC
DO 200 J = 1, NU
DO 200 K = 1, NY
DO 200 N = 1, 4
200 READ(20,1000) X(I,J,K,N)
IBAL(NSRC) = 0
DO 210 N = 1, NY
DO 210 K = 1, 4
DO 210 J = 1, NU
210 S(NSRC,N,K) = 0
DO 220 N = 1, NY
DO 220 K = 1, 4
DO 220 J = 1, NU
220 S(NSRC,N,K) = S(NSRC,N,K) + X(NSRC,J,N,K)
C
OPTION 1 - FUNDS AVAILABILITY
C
SY(I,N) : INDIVIDUAL YEARLY
SYC(I,N) : INDIVIDUAL YEARLY CUMMULATIVE
C ST(I) : INDIVIDUAL TOTAL
C SQ(N,K) : QUARTERLY TOTALS
C SY(N) : YEARLY TOTALS
C SYCT(N) : YEARLY CUMMULATIVE TOTALS
C STOTAL : TOTAL
C*******************************************************************
DO 301 I = 1,NSRC
ST(I) = 0
DO 300 N = 1,NY
SYC(I,N) = 0
300 SY(I,N) = 0
301 SY(I,1) = IBAL(I)
DO 305 N = 1,NY
SQT(N,K) = 0
305 SY(I,N) = 0
301 SY(I,1) = IBAL(I)
DO 315 K = 1,4
STOTAL = STOTAL + ST(I)
DO 320 I = 1,NSRC
SYC(I,1) = SY(I,1)
DO 320 N = 1,NY
SYT(N) = 0
SYCT(N) = 0
DO 335 K = 1,4
SYT(N) = SYT(N) + S(I,N,K)
335 SYC(I,N) = SYC(I,N) + SY(I,N)
DO 340 K = 1,4
SYCT(N) = SYCT(N) + S(I,N,K)
340 SY(I,N) = SYT(N)
DO 350 N = 1,NY
SYCT(N) = SYCT(N)
DO 360 I = 1,NSRC
SYCT(N) = SYC(I,N) + SY(I,N)
360 SY(I,N) = SYT(N)
DO 370 N = 1,NY
SYT(N) = SYT(N)
DO 380 I = 1,NSRC
SYT(N) = SYT(N)
DO 390 N = 1,NY
SYCT(N) = SYCT(N)
DO 400 I = 1,NSRC
SYCT(N) = SYC(I,N) + SY(I,N)
400 SY(I,N) = SYT(N)
C*******************************************************************
C OPTION 2 - FUND REQUIREMENTS
C*******************************************************************
C UY(I,N) : INDIVIDUAL YEARLY
C UYC(J,N) : INDIVIDUAL YEARLY CUMMULATIVE
C UT(J) : INDIVIDUAL TOTAL
C UQT(N,K) : QUARTERLY TOTALS
C UYT(N) : YEARLY TOTALS
C UYCT(N) : YEARLY CUMMULATIVE TOTALS
C UTOTAL : TOTAL
C*******************************************************************
DO 400 J = 1,NU
UT(J) = 0
DO 400 N = 1,NY
UYC(J,N) = 0
400 UY(J,N) = 0
DO 405 N = 1,NY
UYT(N) = 0
UYCT(N) = 0
Appendix B. LISTING OF FORTRAN PROGRAMS
DO 405 K = 1,4
405 UQT(N,K) = 0
UTOTAL = 0
DO 410 J = 1,NU
DO 413 N = 1,NY
DO 410 K = 1,4
410 UY(J,N) = UY(J,N) + U(J,N,K)
413 UT(J) = UT(J) + UY(J,N)
415 UTOTAL = UTOTAL + UT(J)
DO 420 J = 1,NU
420 UYC(J,1) = UY(J,1)
DO 420 N = 2,NY
M = N-1
425 UYT(N) = UYT(N) + UY(J,N)
UYCT(1) = UYT(1)
DO 430 N = 2,NY
M = N-1
430 UYCT(N) = UYCT(M) + UYT(N)
DO 440 N = 1,NY
440 SUQ(I,N,K) = UQT(N,K) + U(J,N,K)
N = 1
DO 450 J = 1,NU
450 WRITE(12,1020) UT(J), (U(J,N,K),K = 1,4), UY(J,N)
DO 460 N = 1,NY
M = N-1
460 WRITE(12,1020) UTOTAL, (UQT(N,K),K = 1,4), UYT(N)
DO 470 N = 2,NY
470 CONTINUE
C*******************************************************************
C OPTION 3 - EXPENDITURES BY USE
C*******************************************************************
DO 500 I = 1,NSRC
DO 500 J = 1,NU
DO 500 N = 1,NY
500 SUYC(I,J,N) = 0
DO 505 I = 1,NSRC
505 SUY(I,J,N,K) = 0
DO 505 N = 1,NY
SUT(I,N) = 0
505 SUQ(I,N,K) = 0
DO 510 I = 1,NSRC
510 SUY(I,J,N) = SUY(I,J,N) + X(I,J,N,K)
DO 520 I = 1,NSRC
520 SUYC(I,J,1) = SUY(I,J,1)
DO 520 N = 2,NY
M = N-1
520 SUYC(I,J,N) = SUYC(I,J,M) + SUY(I,J,N)
DO 525 I = 1,NSRC
525 SUT(I,N) = SUT(I,N) + SUY(I,J,N)
DO 530 I = 1,NSRC
530 SUTC(I,1) = SUT(I,1)
DO 530 N = 2,NY
M = N-1
530 SUTC(I,N) = SUTC(I,M) + SUT(I,N)
DO 540 I = 1,NSRC
DO 540 N = 1,NY
DO 540 K = 1,4
DO 540 J = 1,NU
540 SUQ(I,N,K) = SUQ(I,N,K) + X(I,J,N,K)
DO 560 I = 1,NSRC
DO 560 N = 1,NY
IF (N .GT. 1) GO TO 545
SQBF(I,N,1) = IBAL(I)
GO TO 550
545 M = N-1
SQBF(I,N,1) = SQBF(I,M,4) + S(I,M,4) - SUQ(I,M,4)
550 DO 560 K = 2,4
L = K-1
560 SQBF(I,N,K) = SQBF(I,N,L) + S(I,N,L) - SUQ(I,N,L)
DO 568 I = 1,NSRC
DO 568 N = 1,NY
DO 568 K = 1,4
SQFA(I,N,K) = SQBF(I,N,K) + S(I,N,K)
DO 570 I = 1,NSRC
DO 570 N = 1,NY
DO 570 K = 1,4
SQEB(I,N,K) = SQFA(I,N,K) - SUQ(I,N,K)
570 DO 575 J = 1,NU
575 WRITE(13,1020) (SQBF(I,J,N,K),K = 1,4),
575 SYBF(I,N)
DO 585 N = 2,NY
M = N-1
585 WRITE(13,1020) SQBF(I,N,K),K = 1,4), SYBF(I,N)
WRITE(13,1020) (S(I,N,K),K = 1,4), SYA(I,N)
WRITE(13,1020) (SQFA(I,N,K),K = 1,4), SYFA(I,N)
DO 580 J = 1,NU
580 WRITE(13,1020) (SQEB(I,N,K),K = 1,4), SYEB(I,N)
585 CONTINUE
590 CONTINUE
C*******************************************************************
C OPTION 4 - EXPENDITURES BY SOURCE
C*******************************************************************
C USY(I,N) : YEARLY ALLOCATIONS
C USYC(I,J,N) : YEARLY ALLOCATIONS CUMMULATIVE
C USQ(I,N,K) : QUARTERLY ALLOCATIONS
C UST(J,N) : YEARLY TOTAL ALLOCATIONS
C USTC(J,N) : YEARLY TOTAL ALLOCATIONS CUMMULATIVE
C*******************************************************************
DO 600 I = 1,NSRC
DO 600 J = 1,NU
DO 600 N = 1,NY
USY(I,N) = 0
600 USY(I,N) = 0
DO 605 J = I,NU
605 USYC(I,J,N) = 0
DO 610 I = 1,NSRC
DO 610 N = 1,NY
DO 610 K = 1,4
USY(I,N) = USY(I,N) + S(I,N,K)
610 USYC(I,J,N) = USYC(I,J,N) + USY(I,J,N)
DO 615 J = 1,NU
615 WRITE(13,1020) USYC(I,J,N),K = 1,4), USY(I,J,N)
DO 620 I = 1,NU
DO 620 N = 1,NY
DO 620 K = 1,4
USY(I,N) = USY(I,N) + S(I,N,K)
620 USYC(I,J,N) = USYC(I,J,N) + USY(I,J,N)
DO 625 J = 1,NU
625 WRITE(13,1020) USYC(I,J,N),K = 1,4), USY(I,J,N)
DO 630 I = 1,NSRC
DO 630 N = 1,NY
DO 630 K = 1,4
USY(I,N) = USY(I,N) + S(I,N,K)
630 USYC(I,J,N) = USYC(I,J,N) + USY(I,J,N)
DO 635 J = 1,NU
635 WRITE(13,1020) USYC(I,J,N),K = 1,4), USY(I,J,N)
DO 640 I = 1,NSRC
DO 640 N = 1,NY
DO 640 K = 1,4
USY(I,N) = USY(I,N) + S(I,N,K)
640 USYC(I,J,N) = USYC(I,J,N) + USY(I,J,N)
DO 645 J = 1,NU
645 WRITE(13,1020) USYC(I,J,N),K = 1,4), USY(I,J,N)
DO 650 I = 1,NSRC
DO 650 N = 1,NY
DO 650 K = 1,4
USY(I,N) = USY(I,N) + S(I,N,K)
650 USYC(I,J,N) = USYC(I,J,N) + USY(I,J,N)
DO 655 J = 1,NU
655 WRITE(13,1020) USYC(I,J,N),K = 1,4), USY(I,J,N)
DO 660 I = 1,NSRC
DO 660 N = 1,NY
DO 660 K = 1,4
USY(I,N) = USY(I,N) + S(I,N,K)
660 USYC(I,J,N) = USYC(I,J,N) + USY(I,J,N)
DO 665 J = 1,NU
665 WRITE(13,1020) USYC(I,J,N),K = 1,4), USY(I,J,N)
DO 670 I = 1,NSRC
DO 670 N = 1,NY
DO 670 K = 1,4
USY(I,N) = USY(I,N) + S(I,N,K)
670 USYC(I,J,N) = USYC(I,J,N) + USY(I,J,N)
DO 675 J = 1,NU
675 WRITE(13,1020) USYC(I,J,N),K = 1,4), USY(I,J,N)
DO 680 I = 1,NSRC
DO 680 N = 1,NY
DO 680 K = 1,4
USY(I,N) = USY(I,N) + S(I,N,K)
680 USYC(I,J,N) = USYC(I,J,N) + USY(I,J,N)
DO 685 J = 1,NU
685 WRITE(13,1020) USYC(I,J,N),K = 1,4), USY(I,J,N)
DO 690 I = 1,NSRC
DO 690 N = 1,NY
DO 690 K = 1,4
USY(I,N) = USY(I,N) + S(I,N,K)
690 USYC(I,J,N) = USYC(I,J,N) + USY(I,J,N)
DO 695 J = 1,NU
695 WRITE(13,1020) USYC(I,J,N),K = 1,4), USY(I,J,N)
DO 700 I = 1,NSRC
DO 700 J = 1,NU
DO 700 N = 1,NY
USY(I,N) = 0
700 USYC(I,J,N) = 0
DO 705 J = 1,NU
705 WRITE(13,1020) USYC(I,J,N),K = 1,4), USY(I,J,N)
DO 605 N = 1,NY
UST(J,N) = 0
USTC(J,N) = 0
DO 605 K = 1,4
605 USQ(J,N,K) = 0
DO 610 I = 1,NSRC
DO 610 J = 1,NU
DO 610 N = 1,NY
DO 610 K = 1,4
610 USY(I,J,N) = USY(I,J,N) + X(I,J,N,K)
DO 620 I = 1,NSRC
DO 620 J = 1,NU
USYC(I,J,I) = USY(I,J,I)
DO 620 N = 2,NY
M = N-1
620 USYC(I,J,N) = USYC(I,J,M) + USY(I,J,N)
DO 625 J = 1,NU
DO 625 N = 1,NY
DO 625 I = 1,NSRC
625 UST(J,N) = UST(J,N) + USY(I,J,N)
DO 630 I = 1,NSRC
DO 630 J = 1,NU
USTC(J,I) = UST(J,I)
DO 630 N = 2,NY
M = N-1
630 USTC(J,N) = USTC(J,M) + UST(J,N)
DO 640 I = 1,NSRC
DO 640 J = 1,NU
DO 640 N = 1,NY
DO 640 K = 1,4
640 USQ(J,N,K) = USQ(J,N,K) + X(I,J,N,K)
DO 690 J = 1,NU
N = 1
DO 675 I = 1,NSRC
WRITE(14,1020) USYC(I,J,NY), (X(I,J,N,K), K = 1,4), USY(I,J,N)
WRITE(14,1020) USYC(I,J,N), USY(I,J,N),USYC(I,J,N)
DO 690 CONTINUE
690 CONTINUE
C*******************************************************************
C OPTIONS 5 - SOURCE EXPENDITURES THRU TIME
C*******************************************************************
DO 700 N = 1,NY
SYE(N) = 0
SYCE(N) = 0
DO 700 K = 1,4
700 SQE(N,K) = 0
DO 710 N = 1,NY
DO 710 K = 1,4
DO 710 I = 1,NSRC
710 SQE(N,K) = SQE(N,K) + SUQ(I,N,K)
DO 720 N = 1,NY
DO 720 K = 1,4
720 SYE(N) = SYE(N) + SQE(N,K)
SYCE(I) = SYE(I)
DO 730 N = 2,NY
M = N-1
730 SYCE(N) = SYCE(M) + SYE(N)
N = 1

Appendix B. LISTING OF FORTRAN PROGRAMS
DO 750 I = 1, NSRC
750   WRITE(18,1020) ST(I), SUTC(I,NY), (SUQ(I,N,K), K = 1,4), SUT(I,N)
    WRITE(18,1020) STOTAL, SYCE(NY), (SQE(N,K), K = 1,4), SYE(N)
DO 790 N = 2, NY
    M = N-1
DO 770 I = 1, NSRC
770   WRITE(18,1020) SUTC(I,M), (SUQ(I,N,K), K = 1,4), SUT(I,N), SUTC(I,N)
    WRITE(18,1020) SYCE(M), (SQE(N,K), K = 1,4), SYE(N), SYCE(N)
790 CONTINUE
1000 FORMAT(417)
1010 FORMAT(4012)
1020 FORMAT(717)
    STOP
    END

Appendix B. LISTING OF FORTRAN PROGRAMS
B.24 RETSRCE

C******************************************************************************
C RETRIEVES 'CURRENT' DATA FOR A SOURCE WHEN THAT SOURCE IS TO BE MODIFIED
C******************************************************************************

REAL X(80), Z(25)
INTEGER Y(25)
REAL YES, NO
DATA YES, NO/'Y','N'/
READ(1,*) NSRCE, NUSE, NS, NY
K = NY + 1
DO 50 I = 1,NSRCE
   DO 20 J = 1,K
      READ(2,100) X
      IF (I .NE. NS) GO TO 20
      WRITE(7,100) X
   20 CONTINUE
50 CONTINUE
DO 70 J = 1,NSRCE
   IF (I .NE. NS) GO TO 60
   READ(3,*) (Y(J),J=1,NUSE)
   DO 55 J = 1,NUSE
      IF (Y(J) .EQ. 0) Z(J) = NO
      IF (Y(J) .EQ. 1) Z(J) = YES
      WRITE(8,10) Z(J)
55 CONTINUE
GO TO 70
60 READ(3,100) X
70 CONTINUE
10 FORMAT(2A1)
100 FORMAT(80A1)
STOP
END

Appendix B. LISTING OF FORTRAN PROGRAMS 314
B.25 RETUSE

C*****************************************************************************
C RETRIEVES 'CURRENT' DATA FOR A USE WHEN THAT USE
C IS TO BE MODIFIED
C*****************************************************************************

REAL X(80)
INTEGER Z(25)
REAL YES, NO
DATA YES, NO/'Y','N'/
READ(1,*) NSRCE, NUSE, NU, NY
DO 50 I = 1,NUSE
DO 20 J = 1,NY
READ(2,100) X
IF (I .NE. NU) GO TO 20
WRITE(7,100) X
20 CONTINUE
50 CONTINUE
DO 80 I = 1,NSRCE
READ(3,*) (Z(J),J = 1,NUSE)
IF (Z(NU) .EQ. 0) Y = NO
IF (Z(NU) .EQ. 1) Y = YES
WRITE(8,110) Y
80 CONTINUE
10 FORMAT(2A1)
100 FORMAT(80A1)
110 FORMAT(A1)
STOP
END

Appendix B. LISTING OF FORTRAN PROGRAMS
B.26  SRCAMT

C*********************************************************************
C GETS A LISTED OF SOURCES SORTED BY DECREASING OR INCREASING
C (AS REQUIRED) AMOUNT OF FUNDS
C*********************************************************************

INTEGER Y(25),Z(25), X(4), SO, HI
READ(1,*) SO
READ(1,*) NSRCE, NUSE, NY
DO 10 I = 1,NSRCE
  Z(I) = 0
10  DO 30 I = 1,NSRCE
    READ(2,110) X(I)
    Z(I) = Z(I) + X(I)
    DO 30 J = 1, NY
    READ(2,110) X
    Z(I) = Z(I) + X(I) + X(2) + X(3) + X(4)
30   CONTINUE
   DO 60 I = 1,NSRCE
     Y(I) = 1
     HI = Z(I)
80   DO 50 J = 1, NSRCE
90   IF (HI .GE. Z(J)) GO TO 50
   HI = Z(J)
   Y(I) = J
50   CONTINUE
   K = Y(I)
   Z(K) = -100
60   CONTINUE
   IF (SO .EQ. 5) GO TO 80
   DO 70 I = 1, NSRCE
   WRITE(11,*) Y(I)
70   CONTINUE
   GO TO 100
80   DO 90 I = 1, NSRCE
   J = NSRCE + 1 - I
   WRITE(11,*) Y(J)
90   CONTINUE
   GO TO 100
100  CONTINUE
110  FORMAT(417)
STOP
END
**B.27 SRCSORT**

C******************************************************************************
C MODIFIES THE DATABASE TO REFLECT THE NEW SORTING SCHEME
C FOR SOURCES
C******************************************************************************

REAL X(2S,5,80), SN(2S,25,80), C(25,80)
INTEGER SO(2S)
INTEGER Y(4), Z(25)
READ(1,*) NSRCE, NUSE, NY
DO 10 I = 1,NSRCE
READ(2,*) SO(I)
10 READ(3,130) (SN(I,J),J = 1,2S)
K = NY + 1
DO 50 I = 1,NSRCE
DO 40 J = 1,K
40 READ(4,IO0) (X(I,J,M),M = 1,80)
READ(8,IO0) (C(I,M),M = 1,80)
CONTINUE
DO 80 I = 1,NSRCE
M = SO(I)
WRITE(11,130) (SN(M,J),J = 1,2S)
WRITE(13,100) (C(M,J),J = 1,80)
DO 80 N = 1,K
WRITE(12,100) (X(M,N,J),J = 1,80)
80 CONTINUE
100 FORMAT(80A1)
130 FORMAT(25A1)
STOP
END
B.28 USEAMT

C*************************************************************
C GETS A LIST OF USES SORTED BY DECREASING OR INCREASING
C (AS REQUIRED) AMOUNT FO FUNDS
C*************************************************************
INTEGER Y(25),Z(25), X(4), UO, HI
READ(1,*) UO
READ(1,*) NSRCE, NUSE, NY
DO 10 I = 1, NUSE
   10 Z(I) = 0
   DO 30 J = I, NY
      READ(2,110) X
      Z(I) = Z(I) + X(1) + X(2) + X(3) + X(4)
   30 CONTINUE
   DO 60 I = 1, NUSE
      Y(I) = I
      HI = Z(I)
      DO 50 J = 2, NUSE
         IF (HI .GE. Z(J)) GO TO 50
         HI = Z(J)
      50 CONTINUE
      Y(I) = J
      K = Y(I)
      Z(K) = -100
   60 CONTINUE
   IF (UO .EQ. S) GO TO 80
   DO 70 I = 1, NUSE
      WRITE(I,*) Y(I)
   70 CONTINUE
   STOP
END

Appendix B. LISTING OF FORTRAN PROGRAMS
B.29 USESORT

C*********************************************************************
C MODIFIES THE DATABASE TO REFLECT THE NEW SORTING SCHEME
C*********************************************************************

REAL X(25,5,80), UN(25,25)
INTEGER UO(25), C(25,25), NC(25,25)
INTEGER Y(4), Z(25)
READ(1,*) NSRCE, NUSE, NY
DO 10 I = 1, NUSE
   READ(2,*) UO(I)
   10 READ(3,130) (UN(I,J),J = 1,25)
   DO 40 J = 1, NUSE
      DO 50 M = 1, NSRCE
         READ(8,110) (C(I,J),J = 1,NUSE)
         CONTINUE
      DO 60 M = 1, NSRCE
         M = UO(J)
         NC(I,J) = C(I,M)
         WRITE(11,130) (UN(M,J),J = 1,25)
         DO 80 N = 1, NY
            WRITE(12,100) (X(M,N,J),J = 1,80)
            CONTINUE
         WRITE(13,110) (NC(I,J),J = 1,NUSE)
      CONTINUE
      CONTINUE
   CONTINUE
100 FORMAT(80A1)
110 FORMAT(40I2)
130 FORMAT(2SA1)
STOP
END
B.30 VIEWGLS

C*********************************************************************
C CREATES RELEVANT FILES FOR THE OPTION - VIEW CURRENT GOALS
C*********************************************************************

REAL S(2S,20), U(2S,20)
REAL L, G, E
INTEGER C1, C2, C3, C4, C
INTEGER QTY!, DT, PR, WT, GT
INTEGER NG(J)
DATA L, G, E/'<','','=/'
READ(!,*)
NS, NU, NY
QTR = NY*4
DO 10 I = 1, NS
10 READ(2,1000) (S(I,J), J = 1,20)
DO 20 I=I, NU
20 READ(J,1000) (U(I,J), J = 1,20)
READ(4,*) Cl, C2, CJ, C4, C
IF (Cl .EQ. 0) GO TO 200
C*************************************************************************
C TYPE I GOALS
C*************************************************************************
IC=0
110 READ(11,1010, END=200) I, J, K, QTY, DT, PR, WT
N = K/4 + 1
M = K - K/4*4
IF (M .EQ. 0) N = N - 1
IF (M .EQ. 0) M = 4
IC = IC + 1
IF (DT .EQ. 1) X = L
IF (DT .EQ. 2) X = G
IF (DT .EQ. J) X = E
WRITE(21,I100) IC, (S(I,11),11=1,18), (U(J,11),11=1,18), N,M,QTY, IX,
PR, WT
GOTO 110
200 IF (C2 .EQ. 0) GO TO JOO
C*************************************************************************
C TYPE 2 GOALS
C*************************************************************************
IC=0
210 READ(12,1020, END=300) I, J, K, QTY, DT, PR, WT
IC = IC + 1
IF (DT .EQ. 1) X = L
IF (DT .EQ. 2) X = G
IF (DT .EQ. J) X = E
WRITE(22,I10) IC, (S(I,11),11=1,18), (U(J,11),11=1,18), K, QTY,
IX, PR, WT
GOTO 210
300 IF (C3 .EQ. 0) GO TO 400
C*************************************************************************
C TYPE 3 GOALS
C*************************************************************************
IC=0
310 READ(13,1020, END=400) I, J, K, QTY, DT, PR, WT
IC = IC + 1
IF (DT .EQ. 1) X = L
IF (DT .EQ. 2) X = G
IF (DT .EQ. J) X = E
WRITE(23,I110) IC, (S(I,11),11=1,18), (U(J,11),11=1,18), K, QTY,
IX, PR, WT
GOTO 310
400 IF (C .EQ. 0) GO TO 500
C*************************************************************************
C TYPE 3 GOALS
C*************************************************************************
IC = 0
410 READ(17,1020, END=500) I, J, K, QTY, DT, PR, WT, GT
IC = IC + 1
IF (DT .EQ. 1) X = L

Appendix B. LISTING OF FORTRAN PROGRAMS
IF (DT .EQ. 2) X = G
IF (DT .EQ. 3) X = E
IF (GT .NE. 1) GO TO 420
QTY1 = QTY
N = K/4 + 1
M = K - K/4*4
IF (M .EQ. 0) N = N - 1
IF (M .EQ. 0) M = 4
WRITE(27,1105) IC,GT,(S(I,J),J = 1,18),(U(I,J),J = 1,18),N,M,QTY1,
1X, PR, WT
GO TO 430
420 WRITE(27,1106) IC,GT,(S(I,J),J = 1,18),(U(I,J),J = 1,18), K, QTY,
1X, PR, WT
GO TO 410
C00 IF (C .EQ. 0) GO TO 500
C ALL GOALS
C RIGID CONSTRAINTS
C READ(17,1020, END = 500) I, J, K, QTY, DT, PR, WT, GT
C IP = PR
C NP = 1
C IC = 0
C02 NG(GT) = NG(GT) + 1
C IC = IC + 1
C IF (DT .EQ. 1) X = L
C IF (DT .EQ. 2) X = G
C IF (DT .EQ. 3) X = E
C IF (GT .NE. 1) GO TO 405
C N = K/4 + 1
C M = K - K/4*4
C IF (M .EQ. 0) N = N - 1
C IF (M .EQ. 0) M = 4
C WRITE(27,1100) IC,(S(I,J),J = 1,20),(U(I,J),J = 1,20),N,M,QTY1,
1X, PR, WT
C GO TO 410
C05 WRITE(27,1110) IC,(S(I,J),J = 1,20),(U(I,J),J = 1,20), K, QTY,
1X, PR, WT
C10 READ(17,1020, END = 500) I, J, K, QTY, DT, PR, WT, GT
C IF (PR .EQ. IP) GO TO 402
C NP = NP + 1
C WRITE(31,*) IP, NG
C NG(1) = 0
C NG(2) = 0
C NG(3) = 0
C IP = PR
C IC = 0
C GO TO 402
C00 WRITE(31,*) IP, NG
C WRITE(32,*) NP
500 CONTINUE
C RIGID CONSTRAINTS
C READ(9,1010, END = 600) I, J, K, QTY1
C IC = IC + 1
C N = K/4 + 1
C M = K - K/4*4
C IF (M .EQ. 0) N = N - 1
C IF (M .EQ. 0) M = 4
C WRITE(19,1120) IC,(S(I,J),J = 1,18),(U(I,J),J = 1,18), N, M,QTY1,
READ(10,1010, END = 400) I, J, K, QTY1
C N = K/4 + 1
C M = K - K/4*4
C IF (M .EQ. 0) N = N - 1
C IF (M .EQ. 0) M = 4
C WRITE(20,1120) IC,(S(I,J),J = 1,18),(U(I,J),J = 1,18), N, M,QTY1

Appendix B. LISTING OF FORTRAN PROGRAMS
Appendix B. LISTING OF FORTRAN PROGRAMS
Appendix C. LISTING OF DMS (DISPLAY MANAGEMENT SYSTEM) PANELS
Appendix C. LISTING OF DMS (DISPLAY MANAGEMENT SYSTEM) PANELS
C.2 MAINMENU

FUND SOURCES AND USES MODEL

SOURCES AND USES

PF1 VIEW RESULTS OF EXISTING MODEL
PF2 MAKE TEMPORARY CHANGES (WHAT-IF ANALYSES) TO DATA
PF3 RELOAD ORIGINAL (PERMANENT) DATA
PF4 MAKE TEMPORARY DATA CHANGES PERMANENT
PF5 MAKE PERMANENT CHANGES TO DATA
PF6 RUN A MODEL
PF10 QUIT

SELECT PF KEY
C.3 SELOUT

***********************************************************************
* *
* OUTPUT SELECTION *
* *
PF1 FUND AVAILABILITY BY SOURCE *
PF2 FUNDING REQUIREMENTS BY USE *
PF3 SOURCE EXPENDITURES *
PF4 EXPENDITURE SOURCES *
PF5 FUNDS USE THROUGH TIME *
PF6 ALL THE ABOVE *
PF7 PRINT ALL THESE REPORTS *
PF10 QUIT *

SELECT PF KEY *

***********************************************************************

Appendix C. LISTING OF DMS (DISPLAY MANAGEMENT SYSTEM) PANELS
### FUNDS AVAILABILITY BY SOURCE - 1985-86

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PRESS ENTER TO CONTINUE
SELECT SOURCE

GENERAL FUND  TUITION
FEES  LOCAL FUND
SALES AND SERVICES  PRIVATE MONEY
FEDERAL MONEY  STATE NON-GF
RESERVES  OTHER
OVERHEAD  DEBT
DEFICIT  ALL SOURCES

PF10  QUIT
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Notes:
- Press Enter to Continue
- PF10 Quit
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*
*
*
*
* SELECT USE *
*
*
* E AND G CAPITAL OUTLAY *
* SPONSORED PROGRAMS OTHER *
* AUXILIARIES STUDENT FINANCL ASS *
* ALL USES *
*
*
*
*
*
*
*
*
*
*
*
*
*
*
*
*
* PF10 QUIT *
*
*
**************
### E AND G EXPENDITURES BY SOURCES - 1985-86

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Press enter to continue or PF10 QUIT

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Appendix C. LISTING OF DMS (DISPLAY MANAGEMENT SYSTEM) PANELS
**SOURCE EXPENDITURES THROUGH TIME - 1985-86**

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<td>199785</td>
<td>82987</td>
<td>30211</td>
<td>43736</td>
<td>42851</td>
<td>199785</td>
</tr>
</tbody>
</table>

**PRESS ENTER TO CONTINUE**
C.11  TEMPPLAN

********************************************************************************
*  *
*  MAKE TEMPORARY CHANGES  
*  *
*  MODEL PLANNING HORIZON  
*  *
*  PLANNING PERIOD?  2 YEAR(S)
*  *
*  FIRST YEAR?  1985-86
*  *
*  PRESS ENTER TO CONTINUE
*  *
********************************************************************************

Appendix C. LISTING OF DMS (DISPLAY MANAGEMENT SYSTEM) PANELS
TEMPORARILY CHANGE PLANNING PERIOD

SOURCE: GENERAL FUND

INITIAL BALANCE  84527

PRESS ENTER TO CONTINUE         PF10 QUIT
LEVEL 2

TEMPORARILY CHANGE PLANNING PERIOD

SOURCE: GENERAL FUND

YEAR: 1985-86

FIRST QUARTER 0
SECOND QUARTER 0
THIRD QUARTER 0
FOURTH QUARTER 0

PRESS ENTER TO CONTINUE  PF10  QUIT
C.14 TSRCGTRN

***************************************************************
*                                                             *
*        TEMPORARILY CHANGE PLANNING PERIOD                      *
*                                                             *
*          SOURCE: GENERAL FUND                                  *
*                                                             *
*          YEAR : 1986-87                                       *
*                                                             *
*          LEAVE BLANK IF NO FUNDS AVAILABLE                    *
*                                                             *
*          FIRST        QUARTER   10000                         *
*                                                             *
*          SECOND       QUARTER  10000                           *
*                                                             *
*          THIRD        QUARTER  10000                           *
*                                                             *
*          FOURTH       QUARTER  10000                           *
*                                                             *
*                                                             *
*          PRESS ENTER TO CONTINUE       PF10       QUIT         *
*                                                             *
*                                                             *
 ***************************************************************

Appendix C. LISTING OF DMS (DISPLAY MANAGEMENT SYSTEM) PANELS 337
TEMPORARILY CHANGE PLANNING PERIOD

USE : E AND G

YEAR : 1985-86

FIRST QUARTER  37176
SECOND QUARTER  26270
THIRD QUARTER  40174
FOURTH QUARTER  38465

PRESS ENTER TO CONTINUE  PF10 QUIT
<table>
<thead>
<tr>
<th>Quarter</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIRST QUARTER</td>
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<td>SECOND QUARTER</td>
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<tr>
<td>THIRD QUARTER</td>
<td>4000</td>
</tr>
<tr>
<td>FOURTH QUARTER</td>
<td>4000</td>
</tr>
</tbody>
</table>

PRESS ENTER TO CONTINUE    PF10 QUIT
TEMPORARILY CHANGE PLANNING PERIOD

WARNING: IF YOU CHANGE THE PLANNING PERIOD, YOU WILL BE REQUIRED TO MAKE 72 ADDITIONAL DATA ENTRIES.

DO YOU STILL WISH TO CHANGE THE PLANNING PERIOD?

PF1  YES
PF10 NO

SELECT PF KEY
LEVEL 2

TEMPORARY CHANGES

PF1 MAKE TEMPORARY CHANGES TO SOURCES
PF2 MAKE TEMPORARY CHANGES TO USES
PF10 QUIT

SELECT PF KEY
Appendix C. Listing of DPS (Display Management System) Panels

C.19. TSRCOPTN

* * * * * *

LEVEL 3

* * * * *

TEMPORARY CHANGES TO SOURCES

PF1 MODIFY AN EXISTING SOURCE
PF2 DELETE A SOURCE
PF3 CREATE A NEW SOURCE
PF4 SORT SOURCES
PF10 QUIT

SELECT PF KEY
* * * * * * * * * * * * * * * * * * * * * * * * * * *

TEMPORARILY MODIFY A SOURCE

1. GENERAL FUND
2. TUITION
3. FEES
4. LOCAL FUND
5. SALES AND SERVICES
6. PRIVATE MONEY
7. FEDERAL MONEY
8. STATE NON-GF
9. RESERVES
10. OTHER
11. OVERHEAD
12. DEBT

PF10 QUIT

* * * * * * * * * * * * * * * * * * * * * * * * * * *
TEMPORARILY MODIFY A SOURCE

SOURCE: GENERAL FUND

CURRENT  NEW

INITIAL BALANCE  84527  80000

* * LEAVE BLANK TO RETAIN CURRENT VALUE

PRESS ENTER TO CONTINUE
TEMPORARILY MODIFY A SOURCE

SOURCE: GENERAL FUND

YEAR: 1985-86

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Current</th>
<th>New</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIRST QUARTER</td>
<td>0</td>
<td>5000</td>
</tr>
<tr>
<td>SECOND QUARTER</td>
<td>0</td>
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</tr>
<tr>
<td>THIRD QUARTER</td>
<td>0</td>
<td>5000</td>
</tr>
<tr>
<td>FOURTH QUARTER</td>
<td>0</td>
<td>5000</td>
</tr>
</tbody>
</table>

* LEAVE BLANK TO RETAIN CURRENT VALUE

PRESS ENTER TO CONTINUE
TEMPORARILY MODIFY A SOURCE

SOURCE: GENERAL FUND

DO YOU WANT TO CHANGE THE LIST OF USES THAT ARE ELIGIBLE TO RECEIVE FUNDS FROM THIS SOURCE?

ENTER Y/N

PRESS ENTER TO CONTINUE
TEMPORARILY MODIFY A NEW SOURCE
SOURCE : GENERAL FUND

USE ELIGIBLE?

E AND G
CAPITAL OUTLAY
SPONSORED PROGRAMS
OTHER
AUXILIARIES
STUDENT FINANCL ASSISTNCE

PRESS ENTER TO CONTINUE
### TEMPORARILY DELETE A SOURCE

<table>
<thead>
<tr>
<th>Level 4</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. GENERAL FUND</td>
<td>2. TUITION</td>
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<tr>
<td>3. FEES</td>
<td>4. LOCAL FUND</td>
</tr>
<tr>
<td>5. SALES AND SERVICES</td>
<td>6. PRIVATE MONEY</td>
</tr>
<tr>
<td>7. FEDERAL MONEY</td>
<td>8. STATE NON-GF</td>
</tr>
<tr>
<td>9. RESERVES</td>
<td>10. OTHER</td>
</tr>
<tr>
<td>11. OVERHEAD</td>
<td>12. DEBT</td>
</tr>
</tbody>
</table>

**PF10 QUIT**
TEMPORARILY DELETE A SOURCE

SOURCE: GENERAL FUND

ARE YOU SURE YOU WANT TO DELETE THIS SOURCE?

ENTER Y/N Y

PRESS ENTER TO CONTINUE
TEMPORARILY DELETE A SOURCE

NEW LIST OF SOURCES AFTER DELETING SOURCE: GENERAL FUND

1. TUITION  2. FEES
3. LOCAL FUND  4. SALES AND SERVICES
5. PRIVATE MONEY  6. FEDERAL MONEY
7. STATE NON-GF  8. RESERVES
9. OTHER  10. OVERHEAD
11. DEBT

PRESS ENTER TO CONTINUE
**LEVEL 4**

TEMPORARILY CREATE A NEW SOURCE

SOURCE NAME : NEW SOURCE

INITIAL BALANCE : 1000

PRESS ENTER TO CONTINUE
C.29 TNSRCQTR

********************************************************************************************
*
* TEMPORARILY CREATE A NEW SOURCE  LEVEL 4  *
* SOURCE: NEW SOURCE  *
* YEAR : 1985-86  *
* *
* LEAVE BLANK IF NO FUNDS AVAILABLE  *
* *
* FIRST QUARTER :  2000  *
* SECOND QUARTER :  0  *
* THIRD QUARTER :  2000  *
* FOURTH QUARTER :  0  *
* *
* PRESS ENTER TO CONTINUE  *
* *
****************************************************************************************
TEMPORARILY CREATE A NEW SOURCE

SOURCE : NEW SOURCE

USE

ELIGIBLE?

E AND G
 CAPITAL OUTLAY
 SPONSORED PROGRAMS
 OTHER
 AUXILIARIES
 STUDENT FINANCIAL ASSISTANCE

PRESS ENTER TO CONTINUE

******************************************************************

Appendix C. LISTING OF DMS (DISPLAY MANAGEMENT SYSTEM) PANELS

353
TEMPORARILY CREATE A NEW SOURCE

NEW LIST OF SOURCES AFTER ADDING SOURCE: NEW SOURCE

1. TUITION
2. FEES
3. LOCAL FUND
4. SALES AND SERVICES
5. PRIVATE MONEY
6. FEDERAL MONEY
7. STATE NON-GF
8. RESERVES
9. OTHER
10. OVERHEAD
11. DEBT
12. NEW SOURCE

PRESS ENTER TO CONTINUE
Temporary Changes to Uses

PF1 Modify an Existing Use
PF2 Delete a Use
PF3 Create a New Use
PF4 Sort Uses
PF10 Quit

Select PF Key
TEMPORARILY MODIFY A USE

LEVEL 4

1. E AND G  
2. CAPITAL OUTLAY

3. SPONSORED PROGRAMS  
4. OTHER

5. AUXILIARIES  
6. STUDENT FINANCL ASSISTANCE

PF10 QUIT
TEMORARILY MODIFY A USE LEVEL 4

USE : E AND G

YEAR : 1985-86

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Current</th>
<th>New</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIRST</td>
<td>37176</td>
<td>25000</td>
</tr>
<tr>
<td>SECOND</td>
<td>26270</td>
<td>25000</td>
</tr>
<tr>
<td>THIRD</td>
<td>40174</td>
<td>25000</td>
</tr>
<tr>
<td>FOURTH</td>
<td>38465</td>
<td>25000</td>
</tr>
</tbody>
</table>

* LEAVE BLANK TO RETAIN CURRENT VALUE

PRESS ENTER TO CONTINUE
TEMPORARILY MODIFY A USE

USE: E AND G

DO YOU WANT TO CHANGE THE LIST OF SOURCES THAT ARE ELIGIBLE TO PROVIDE FUNDS TO THIS USE?

ENTER Y/N y

PRESS ENTER TO CONTINUE
### TEMPORARILY MODIFY A USE

**LEVEL 4**

**USE: E AND G**

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>ELIGIBLE?</th>
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<tbody>
<tr>
<td>GENERAL FUND</td>
<td>Y</td>
</tr>
<tr>
<td>TUITION</td>
<td>Y</td>
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<tr>
<td>FEES</td>
<td>Y</td>
</tr>
<tr>
<td>LOCAL FUND</td>
<td>Y</td>
</tr>
<tr>
<td>SALES AND SERVICES</td>
<td>Y</td>
</tr>
<tr>
<td>PRIVATE MONEY</td>
<td>Y</td>
</tr>
<tr>
<td>FEDERAL MONEY</td>
<td>Y</td>
</tr>
<tr>
<td>STATE NON-GF</td>
<td>Y</td>
</tr>
<tr>
<td>RESERVES</td>
<td>N</td>
</tr>
<tr>
<td>OTHER</td>
<td>Y</td>
</tr>
<tr>
<td>OVERHEAD</td>
<td>Y</td>
</tr>
<tr>
<td>DEBT</td>
<td>Y</td>
</tr>
</tbody>
</table>

**PRESS ENTER TO CONTINUE**
Appendix C. LISTING OF DMS (DISPLAY MANAGEMENT SYSTEM) PANELS
TEMPORARILY DELETE A USE  LEVEL 4

USE :  E AND G

ARE YOU SURE YOU WANT TO DELETE THIS USE ?

ENTER Y/N  y

PRESS ENTER TO CONTINUE
TEMPORARILY DELETE A USE

NEW LIST OF USES AFTER DELETING USE: E AND G

1. CAPITAL OUTLAY        2. SPONSORED PROGRAMS
3. OTHER                  4. AUXILIARIES
5. STUDENT FINANCI ASSI

PRESS ENTER TO CONTINUE
LEVEL 4

TEMPORARILY CREATE A NEW USE

USE NAME : NEW USE

PRESS ENTER TO CONTINUE
TEMPORARILY CREATE A NEW USE

USE: NEW USE

YEAR: 1985-86

LEAVE BLANK IF NO FUNDS AVAILABLE

FIRST QUARTER: 10000
SECOND QUARTER: 5000
THIRD QUARTER: 5000
FOURTH QUARTER: 5000

PRESS ENTER TO CONTINUE
TEMPORARILY CREATE A NEW USE

USE : NEW USE

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>ELIGIBLE?</th>
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</thead>
<tbody>
<tr>
<td>GENERAL FUND</td>
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</tr>
<tr>
<td>TUITION</td>
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<td>FEES</td>
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</tr>
<tr>
<td>LOCAL FUND</td>
<td>n</td>
</tr>
<tr>
<td>SALES AND SERVICES</td>
<td>n</td>
</tr>
<tr>
<td>PRIVATE MONEY</td>
<td>n</td>
</tr>
<tr>
<td>FEDERAL MONEY</td>
<td>n</td>
</tr>
<tr>
<td>STATE NON-GF</td>
<td>n</td>
</tr>
<tr>
<td>RESERVES</td>
<td>n</td>
</tr>
<tr>
<td>OTHER</td>
<td>y</td>
</tr>
<tr>
<td>OVERHEAD</td>
<td>y</td>
</tr>
<tr>
<td>DEBT</td>
<td>y</td>
</tr>
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</table>

PRESS ENTER TO CONTINUE

------------------------------------------------------------------------------------------------------------------------
TEMPORARILY CREATE A NEW USE

NEW LIST OF USES AFTER ADDING USE: NEW USE

1. CAPITAL OUTLAY 2. SPONSORED PROGRAMS
3. OTHER 4. AUXILIARIES
5. STUDENT FINANCIAL ASSISTANCE 6. NEW USE

PRESS ENTER TO CONTINUE
******* LEVEL 4 ****

TEMPORARILY SORT SOURCES

SORTING SCHEME FOR SOURCES

PF1 DISPLAY CURRENT SORTING SCHEME
PF2 ALPHABETICALLY
PF3 DECREASING AMOUNT OF FUNDS
PF4 INCREASING AMOUNT OF FUNDS
PF5 USER SPECIFIED
PF10 QUIT

SELECT PF KEY

***************************************************************************
TEMPORARILY SORT SOURCES  LEVEL 5
SORTING OF SOURCES BY USER

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<tr>
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<td>OVERHEAD</td>
<td>5</td>
</tr>
<tr>
<td>OTHER</td>
<td>8</td>
</tr>
<tr>
<td>RESERVES</td>
<td>7</td>
</tr>
<tr>
<td>STATE NON-GF</td>
<td>9</td>
</tr>
<tr>
<td>FEDERAL MONEY</td>
<td>10</td>
</tr>
<tr>
<td>PRIVATE MONEY</td>
<td>6</td>
</tr>
<tr>
<td>SALES AND SERVICES</td>
<td>11</td>
</tr>
<tr>
<td>LOCAL FUND</td>
<td>12</td>
</tr>
<tr>
<td>FEES</td>
<td>1</td>
</tr>
<tr>
<td>TUITION</td>
<td>2</td>
</tr>
<tr>
<td>GENERAL FUND</td>
<td>3</td>
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</tbody>
</table>

PRESS ENTER TO CONTINUE

*******************************************************************************
TEMPORARILY SORT SOURCES

SORTED LIST OF SOURCES

SORTING SCHEME : USER SPECIFIED

1. FEES
2. TUITION

3. GENERAL FUND
4. DEBT

5. OVERHEAD
6. PRIVATE MONEY

7. RESERVES
8. OTHER

9. STATE NON-GF
10. FEDERAL MONEY

11. SALES AND SERVICES
12. LOCAL FUND

PRESS ENTER TO CONTINUE

Appendix C. LISTING OF DMS (DISPLAY MANAGEMENT SYSTEM) PANELS
C.47 TRANKUSE

****************************************************************************************
* * * * * * * * * * * * * * * * * * * * * * * * * * *
Pfl
PF2
PF3
PF4
PF5
PF10

TEMPORARILY SORT USES

SORTING SCHEME FOR USES

PF1 DISPLAY CURRENT SORTING SCHEME
PF2 ALPHABETICALLY
PF3 DECREASING AMOUNT OF FUNDS
PF4 INCREASING AMOUNT OF FUNDS
PF5 USER SPECIFIED
PF10 QUIT

SELECT PF KEY

****************************************************************************************
TEMPORARILY SORT USES

SORTED LIST OF USES

SORTING SCHEME : ALPHABETICAL

1. AUXILIARIES

2. CAPITAL OUTLAY

3. E AND G

4. OTHER

5. SPONSORED PROGRAMS

6. STUDENT FINANCIAL ASSISTANCE

PRESS ENTER TO CONTINUE
MAKE TEMPORARY CHANGES TO DATA PERMANENT

ARE YOU SURE YOU WANT TO MAKE TEMPORARY CHANGES PERMANENT?

PF1  YES
PF10 NO

SELECT PF KEY
LEVEL 2

MAKE PERMANENT CHANGES

MODEL PLANNING HORIZON

PLANNING PERIOD? 2 YEAR(S)

FIRST YEAR? 1985-86

PRESS ENTER TO CONTINUE

****************************************************************************************
PERMANENTLY CHANGE PLANNING PERIOD

WARNING: IF YOU CHANGE THE PLANNING PERIOD, YOU WILL BE REQUIRED TO MAKE 72 ADDITIONAL DATA ENTRIES.

DO YOU STILL WISH TO CHANGE THE PLANNING PERIOD?

PF1 YES
PF10 NO

SELECT PF KEY
PERMANENTLY CHANGE PLANNING PERIOD

SOURCE: GENERAL FUND

INITIAL BALANCE  84527

PRESS ENTER TO CONTINUE  PF10 QUIT
PERMANENTLY CHANGE PLANNING PERIOD

SOURCE: GENERAL FUND

YEAR: 1985-86

FIRST QUARTER  0
SECOND QUARTER 0
THIRD QUARTER  0
FOURTH QUARTER 0

PRESS ENTER TO CONTINUE PF10 QUIT

Appendix C. LISTING OF DMS (DISPLAY MANAGEMENT SYSTEM) PANELS
PERMANENTLY CHANGE PLANNING PERIOD

SOURCE: GENERAL FUND

YEAR : 1986-87

LEAVE BLANK IF NO FUNDS AVAILABLE

FIRST QUARTER 10000
SECOND QUARTER 10000
THIRD QUARTER 10000
FOURTH QUARTER 10000

PRESS ENTER TO CONTINUE

PF10 QUIT
PERMANENTLY CHANGE PLANNING PERIOD

USE : E AND G

YEAR : 1985-86

FIRST QUARTER 37176
SECOND QUARTER 26270
THIRD QUARTER 40174
FOURTH QUARTER 38465

PRESS ENTER TO CONTINUE    PF10 QUIT
PERMANENTLY CHANGE PLANNING PERIOD

USE : E AND G

YEAR : 1986-87

LEAVE BLANK IF NO FUNDS REQUIRED

FIRST QUARTER  2000
SECOND QUARTER  2000
THIRD QUARTER  4000
FOURTH QUARTER  4000

PRESS ENTER TO CONTINUE  PF10 QUIT
PERMANENT CHANGES

PF1  MAKE PERMANENT CHANGES TO SOURCES
PF2  MAKE PERMANENT CHANGES TO USES
PF10 QUIT

SELECT PF KEY

LEVEL 2
LEVEL 3

PERMANENT CHANGES TO SOURCES

PF1  MODIFY AN EXISTING SOURCE
PF2  DELETE A SOURCE
PF3  CREATE A NEW SOURCE
PF4  SORT SOURCES
PF10 QUIT

SELECT PF KEY
PERMANENTLY MODIFY A SOURCE

1. GENERAL FUND
2. TUITION
3. FEES
4. LOCAL FUND
5. SALES AND SERVICES
6. PRIVATE MONEY
7. FEDERAL MONEY
8. STATE NON-GF
9. RESERVES
10. OTHER
11. OVERHEAD
12. DEBT

PF10 QUIT
PERMANENTLY MODIFY A SOURCE

SOURCE: GENERAL FUND

CURRENT     NEW

INITIAL BALANCE  84527  80000

* LEAVE BLANK TO RETAIN CURRENT VALUE

PRESS ENTER TO CONTINUE

****************************************************************************************
PERMANENTLY MODIFY A SOURCE

SOURCE: GENERAL FUND

YEAR: 1985-86

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Current</th>
<th>New</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Quarter</td>
<td>0</td>
<td>5000</td>
</tr>
<tr>
<td>Second Quarter</td>
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<td>5000</td>
</tr>
<tr>
<td>Third Quarter</td>
<td>0</td>
<td>5000</td>
</tr>
<tr>
<td>Fourth Quarter</td>
<td>0</td>
<td>5000</td>
</tr>
</tbody>
</table>

* LEAVE BLANK TO RETAIN CURRENT VALUE

* PRESS ENTER TO CONTINUE

---

Appendix C. LISTING OF DMS (DISPLAY MANAGEMENT SYSTEM) PANELS

384
PERMANENTLY MODIFY A SOURCE

SOURCE: GENERAL FUND

DO YOU WANT TO CHANGE THE LIST OF USES THAT ARE ELIGIBLE TO RECEIVE FUNDS FROM THIS SOURCE?

ENTER Y/N y

PRESS ENTER TO CONTINUE
PERMANENTLY MODIFY A NEW SOURCE

SOURCE: GENERAL FUND

USE

ELIGIBLE?

LEVEL 4

- E AND G
- CAPITAL OUTLAY
- SPONSORED PROGRAMS
- OTHER
- AUXILIARIES
- STUDENT FINANCL ASSISTNCE

Y
Y
N
N
N
Y

PRESS ENTER TO CONTINUE
PERMANENTLY DELETE A SOURCE

1. GENERAL FUND
2. TUITION
3. FEES
4. LOCAL FUND
5. SALES AND SERVICES
6. PRIVATE MONEY
7. FEDERAL MONEY
8. STATE NON-GF
9. RESERVES
10. OTHER
11. OVERHEAD
12. DEBT

PF10 QUIT
PERMANENTLY DELETE A SOURCE  
SOURCE: GENERAL FUND  
ARE YOU SURE YOU WANT TO DELETE THIS SOURCE ?  
ENTER Y/N  Y  
PRESS ENTER TO CONTINUE  

PERMANENTLY DELETE A SOURCE

NEW LIST OF SOURCES AFTER DELETING SOURCE: GENERAL FUND

1. TUITION
2. FEES
3. LOCAL FUND
4. SALES AND SERVICES
5. PRIVATE MONEY
6. FEDERAL MONEY
7. STATE NON-GF
8. RESERVES
9. OTHER
10. OVERHEAD
11. DEBT

PRESS ENTER TO CONTINUE

Appendix C. LISTING OF DMS (DISPLAY MANAGEMENT SYSTEM) PANELS
PERMANENTLY CREATE A NEW SOURCE

SOURCE NAME : NEW SOURCE

INITIAL BALANCE : 1000

PRESS ENTER TO CONTINUE
PERMANENTLY CREATE A NEW SOURCE
SOURCE: NEW SOURCE
YEAR: 1985-86

LEAVE BLANK IF NO FUNDS AVAILABLE

FIRST QUARTER: 2000
SECOND QUARTER: 0
THIRD QUARTER: 2000
FOURTH QUARTER: 0

PRESS ENTER TO CONTINUE
PERMANENTLY CREATE A NEW SOURCE

SOURCE : NEW SOURCE

USE ELIGIBLE?

E AND G Y
CAPITAL OUTLAY Y
SPONSORED PROGRAMS N
OTHER N
AUXILIARIES N
STUDENT FINANCIAL ASSISTANCE N

PRESS ENTER TO CONTINUE
PERMANENTLY CREATE A NEW SOURCE

NEW LIST OF SOURCES AFTER ADDING SOURCE: NEW SOURCE

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>TUITION</td>
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<tr>
<td>2.</td>
<td>FEES</td>
</tr>
<tr>
<td>3.</td>
<td>LOCAL FUND</td>
</tr>
<tr>
<td>4.</td>
<td>SALES AND SERVICES</td>
</tr>
<tr>
<td>5.</td>
<td>PRIVATE MONEY</td>
</tr>
<tr>
<td>6.</td>
<td>FEDERAL MONEY</td>
</tr>
<tr>
<td>7.</td>
<td>STATE NON-GF</td>
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<td>8.</td>
<td>RESERVES</td>
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<td>OTHER</td>
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<td>10.</td>
<td>OVERHEAD</td>
</tr>
<tr>
<td>11.</td>
<td>DEBT</td>
</tr>
<tr>
<td>12.</td>
<td>NEW SOURCE</td>
</tr>
</tbody>
</table>

PRESS ENTER TO CONTINUE
PERMANENT CHANGES TO USES

PF1  MODIFY AN EXISTING USE
PF2  DELETE A USE
PF3  CREATE A NEW USE
PF4  SORT USES
PF10 QUIT

SELECT PF KEY
PERMANENTLY MODIFY A USE

LEVEL 4

1. E AND G

2. CAPITAL OUTLAY

3. SPONSORED PROGRAMS

4. OTHER

5. AUXILIARIES

6. STUDENT FINANCIALSESSIS

PF10 QUIT
PERMANENTLY MODIFY A USE

USE : E AND G

YEAR : 1985-86

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Current</th>
<th>New</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIRST QUARTER</td>
<td>37176</td>
<td>25000</td>
</tr>
<tr>
<td>SECOND QUARTER</td>
<td>26270</td>
<td>25000</td>
</tr>
<tr>
<td>THIRD QUARTER</td>
<td>40174</td>
<td>25000</td>
</tr>
<tr>
<td>FOURTH QUARTER</td>
<td>38465</td>
<td>25000</td>
</tr>
</tbody>
</table>

* LEAVE BLANK TO RETAIN CURRENT VALUE

PRESS ENTER TO CONTINUE
PERMANENTLY MODIFY A USE

USE: E AND G

DO YOU WANT TO CHANGE THE LIST OF SOURCES THAT ARE ELIGIBLE TO PROVIDE FUNDS TO THIS USE?

ENTER Y/N y

PRESS ENTER TO CONTINUE
PERMANENTLY MODIFY A USE

USE: E AND G

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>ELIGIBLE?</th>
</tr>
</thead>
<tbody>
<tr>
<td>GENERAL FUND</td>
<td>Y</td>
</tr>
<tr>
<td>TUITION</td>
<td>Y</td>
</tr>
<tr>
<td>FEES</td>
<td>Y</td>
</tr>
<tr>
<td>LOCAL FUND</td>
<td>Y</td>
</tr>
<tr>
<td>SALES AND SERVICES</td>
<td>Y</td>
</tr>
<tr>
<td>PRIVATE MONEY</td>
<td>Y</td>
</tr>
<tr>
<td>FEDERAL MONEY</td>
<td>Y</td>
</tr>
<tr>
<td>STATE NON-GF</td>
<td>Y</td>
</tr>
<tr>
<td>RESERVES</td>
<td>N</td>
</tr>
<tr>
<td>OTHER</td>
<td>Y</td>
</tr>
<tr>
<td>OVERHEAD</td>
<td>Y</td>
</tr>
<tr>
<td>DEBT</td>
<td>Y</td>
</tr>
</tbody>
</table>

PRESS ENTER TO CONTINUE
PERMANENTLY DELETE A USE

1. E AND G  2. CAPITAL OUTLAY
3. SPONSORED PROGRAMS  4. OTHER
5. AUXILIARIES  6. STUDENT FINANCL ASSI

PF10 QUIT
PERMANENTLY DELETE A USE

USE: E AND G

ARE YOU SURE YOU WANT TO DELETE THIS USE?

ENTER Y/N  y

PRESS ENTER TO CONTINUE
PERMANENTLY DELETE A USE

NEW LIST OF USES AFTER DELETING USE: E AND G

1. CAPITAL OUTLAY
2. SPONSORED PROGRAMS
3. OTHER
4. AUXILIARIES
5. STUDENT FINANCL ASSI

PRESS ENTER TO CONTINUE
PERMANENTLY CREATE A NEW USE

USE NAME: NEW USE

PRESS ENTER TO CONTINUE
PERMANENTLY CREATE A NEW USE

USE: NEW USE

YEAR: 1985-86

LEAVE BLANK IF NO FUNDS AVAILABLE

FIRST QUARTER: 10000
SECOND QUARTER: 5000
THIRD QUARTER: 5000
FOURTH QUARTER: 5000

PRESS ENTER TO CONTINUE
PERMANENTLY CREATE A NEW USE

USE:  NEW USE

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>ELIGIBLE?</th>
</tr>
</thead>
<tbody>
<tr>
<td>GENERAL FUND</td>
<td>Y</td>
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<tr>
<td>TUITION</td>
<td>Y</td>
</tr>
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<td>FEES</td>
<td>N</td>
</tr>
<tr>
<td>LOCAL FUND</td>
<td>N</td>
</tr>
<tr>
<td>SALES AND SERVICES</td>
<td>N</td>
</tr>
<tr>
<td>PRIVATE MONEY</td>
<td>N</td>
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<td>FEDERAL MONEY</td>
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<tr>
<td>STATE NON-GF</td>
<td>N</td>
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<tr>
<td>RESERVES</td>
<td>N</td>
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<tr>
<td>OTHER</td>
<td>Y</td>
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<tr>
<td>OVERHEAD</td>
<td>Y</td>
</tr>
<tr>
<td>DEBT</td>
<td>Y</td>
</tr>
</tbody>
</table>

PRESS ENTER TO CONTINUE
PERMANENTLY CREATE A NEW USE

NEW LIST OF USES AFTER ADDING USE: NEW USE

1. CAPITAL OUTLAY
2. SPONSORED PROGRAMS
3. OTHER
4. AUXILIARIES
5. STUDENT FINANCL ASSI
6. NEW USE

PRESS ENTER TO CONTINUE
PERMANENTLY SORT SOURCES

SORTING SCHEME FOR SOURCES

PF1  DISPLAY CURRENT SORTING SCHEME
PF2  ALPHABETICALLY
PF3  DECREASING AMOUNT OF FUNDS
PF4  INCREASING AMOUNT OF FUNDS
PF5  USER SPECIFIED
PF10 QUIT

SELECT PF KEY
PERMANENTLY SORT SOURCES

SORTING OF SOURCES BY USER

<table>
<thead>
<tr>
<th>SOURCES</th>
<th>RANK</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. DEBT</td>
<td>4</td>
</tr>
<tr>
<td>2. OVERHEAD</td>
<td>5</td>
</tr>
<tr>
<td>3. OTHER</td>
<td>8</td>
</tr>
<tr>
<td>4. RESERVES</td>
<td>7</td>
</tr>
<tr>
<td>5. STATE NON-GF</td>
<td>9</td>
</tr>
<tr>
<td>6. FEDERAL MONEY</td>
<td>10</td>
</tr>
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<td>7. PRIVATE MONEY</td>
<td>6</td>
</tr>
<tr>
<td>8. SALES AND SERVICES</td>
<td>11</td>
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<td>9. LOCAL FUND</td>
<td>12</td>
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<tr>
<td>10. FEES</td>
<td>1</td>
</tr>
<tr>
<td>11. TUITION</td>
<td>2</td>
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<tr>
<td>12. GENERAL FUND</td>
<td>3</td>
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</table>

PRESS ENTER TO CONTINUE
PERMANENTLY SORT SOURCES

SORTED LIST OF SOURCES

SORTING SCHEME: USER SPECIFIED

<table>
<thead>
<tr>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>FEES</td>
<td>TUITION</td>
<td>DEBT</td>
<td>OTHER</td>
</tr>
<tr>
<td>GENERAL FUND</td>
<td>PRIVATE MONEY</td>
<td>RESERVES</td>
<td>STATE NON-GF</td>
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<tr>
<td>OVERHEAD</td>
<td>RESERVES</td>
<td>OTHER</td>
<td>FEDERAL MONEY</td>
</tr>
<tr>
<td>RESERVES</td>
<td>PRIVATE MONEY</td>
<td>RESERVES</td>
<td>LOCAL FUND</td>
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</tbody>
</table>

PRESS ENTER TO CONTINUE
PERMANENTLY SORT USES
SORTING SCHEME FOR USES
PF1 DISPLAY CURRENT SORTING SCHEME
PF2 ALPHABETICALLY
PF3 DECREASING AMOUNT OF FUNDS
PF4 INCREASING AMOUNT OF FUNDS
PF5 USER SPECIFIED
PF10 QUIT

SELECT PF KEY
PERMANENTLY SORT USES

SORTED LIST OF USES

SORTING SCHEME : ALPHABETICAL

1. AUXILIARIES
2. CAPITAL OUTLAY
3. E AND G
4. OTHER
5. SPONSORED PROGRAMS
6. STUDENT FINANCL ASSI

PRESS ENTER TO CONTINUE
C.88 MAKESURE

***********************************************************************
* *
* MAKE PERMANENT CHANGES LEVEL 2 *
* *
* *
* DO YOU WANT TO SAVE THESE CHANGES ? *
* *
* PF1 YES *
* *
* PF10 NO *
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Appendix C. LISTING OF DMS (DISPLAY MANAGEMENT SYSTEM) PANELS 411
GOAL PROGRAMMING MODEL

LEVEL 2

NOTICE: THE GOAL PROGRAMMING MODEL WILL USE THE TEMPORARY DATA CHANGES.

IF NO TEMPORARY DATA CHANGES WERE MADE, PERMANENT DATA WILL BE USED.

PRESS ENTER TO CONTINUE          PF10 QUIT
GOAL PROGRAMMING MODEL

NUMBER OF SOURCES : 12

NUMBER OF USES : 6

PLANNING PERIOD : 1 YEAR(S)

STARTING YEAR : 1985-86

PRESS ENTER TO CONTINUE    PF10 QUIT

Appendix C. LISTING OF DMS (DISPLAY MANAGEMENT SYSTEM) PANELS
GOAL PROGRAMMING MODEL

PF1  LOAD (RELOAD) ORIGINAL GP MODEL

PF2  FORM NEW GP MODEL

PF10  QUIT

SELECT PF KEY
Appendix C. LISTING OF DMS (DISPLAY MANAGEMENT SYSTEM) PANELS
GOAL PROGRAMMING MODEL

MAKE SPECIFIED ALLOCATIONS

SOURCES                      USES
1. GENERAL FUND             1. E AND G
2. TUITION                  2. CAPITAL OUTLAY
3. FEES                     3. SPONSORED PROGRAMS
4. LOCAL FUND               4. OTHER
5. SALES AND SERVICES       5. AUXILIARIES
6. PRIVATE MONEY            6. STUDENT FINANCl ASSIS
7. FEDERAL MONEY            
8. STATE NON-GF             
9. RESERVES                 
10. OTHER                   
11. OVERHEAD                
12. DEBT                    

SOURCE NUMBER: 3
USE NUMBER: 2

PRESS ENTER TO CONTINUE
GOAL PROGRAMMING MODEL

SOURCE NAME: FEES

USE NAME: CAPITAL OUTLAY

YEAR: 1985-86

<table>
<thead>
<tr>
<th>QTR1</th>
<th>QTR2</th>
<th>QTR3</th>
<th>QTR4</th>
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<tbody>
<tr>
<td>4307</td>
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<td>18931</td>
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<td>44667</td>
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<td>2884</td>
</tr>
<tr>
<td>1000</td>
<td>1000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PRESS ENTER TO CONTINUE

Appendix C. LISTING OF DHS (DISPLAY MANAGEMENT SYSTEM) PANELS
C.95 GOALMENU

******************************************************************************
* *
* GOAL PROGRAMMING MODEL LEVEL 4 *
* *
* TYPES OF GOAL *
* *
* PF1 ALLOCATE SPECIFIED AMOUNT FROM SOURCE TO USE *
* *
* PF2 ALLOCATE PERCENTAGE OF A SOURCE TO A USE *
* *
* PF3 ALLOCATE PERCENTAGE OF A USE FROM A SOURCE *
* *
* PF10 QUIT *
* *
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* *
* *
* SELECT PF KEY *
* *
* *
* *
******************************************************************************
GOAL PROGRAMMING MODEL

SPECIFIED ALLOCATION GOALS

SOURCES
1. GENERAL FUND
2. TUITION
3. FEES
4. LOCAL FUND
5. SALES AND SERVICES
6. PRIVATE MONEY
7. FEDERAL MONEY
8. STATE NON-GF
9. RESERVES
10. OTHER
11. OVERHEAD
12. DEBT

USES
1. E AND G
2. CAPITAL OUTLAY
3. SPONSORED PROGRAMS
4. OTHER
5. AUXILIARIES
6. STUDENT FINANCL ASSIS

SOURCE NUMBER: 1
USE NUMBER: 1

PRESS ENTER TO CONTINUE
GOAL PROGRAMMING MODEL  
PERCENTAGE ALLOCATION FROM SOURCE TO USE

<table>
<thead>
<tr>
<th>SOURCES</th>
<th>USES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. GENERAL FUND</td>
<td>1. E AND G</td>
</tr>
<tr>
<td>2. TUITION</td>
<td>2. CAPITAL OUTLAY</td>
</tr>
<tr>
<td>3. FEES</td>
<td>3. SPONSORED PROGRAMS</td>
</tr>
<tr>
<td>4. LOCAL FUND</td>
<td>4. OTHER</td>
</tr>
<tr>
<td>5. SALES AND SERVICES</td>
<td>5. AUXILIARIES</td>
</tr>
<tr>
<td>6. PRIVATE MONEY</td>
<td>6. STUDENT FINANCL ASSIS</td>
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<td>7. FEDERAL MONEY</td>
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<tr>
<td>8. STATE NON-GF</td>
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</tr>
<tr>
<td>9. RESERVES</td>
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<td>10. OTHER</td>
<td></td>
</tr>
<tr>
<td>11. OVERHEAD</td>
<td></td>
</tr>
<tr>
<td>12. DEBT</td>
<td></td>
</tr>
</tbody>
</table>

SOURCE NUMBER: 1          USE NUMBER: 1

PRESS ENTER TO CONTINUE
GOAL PROGRAMMING MODEL

PERCENTAGE ALLOCATION FOR USE FROM SOURCE

SOURCES
1. GENERAL FUND
2. TUITION
3. FEES
4. LOCAL FUND
5. SALES AND SERVICES
6. PRIVATE MONEY
7. FEDERAL MONEY
8. STATE NON-GF
9. RESERVES
10. OTHER
11. OVERHEAD
12. DEBT

USES
1. E AND G
2. CAPITAL OUTLAY
3. SPONSORED PROGRAMS
4. OTHER
5. AUXILIARIES
6. STUDENT FINANCIAL ASSIS

SOURCE NUMBER: 3
USE NUMBER: 1

PRESS ENTER TO CONTINUE

Appendix C. LISTING OF DMS (DISPLAY MANAGEMENT SYSTEM) PANELS
GOAL: ALLOCATE SPECIFIED AMOUNT FROM SOURCE TO USE

SOURCE : GENERAL FUND
USE : E AND G
YEAR : 1985-86

<table>
<thead>
<tr>
<th>QTR 1</th>
<th>QTR 2</th>
<th>QTR 3</th>
<th>QTR 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>84527</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>37176</td>
<td>26270</td>
<td>40174</td>
<td>38465</td>
</tr>
<tr>
<td>30000</td>
<td>20000</td>
<td>40000</td>
<td>30000</td>
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DEVIATIONAL TYPE (<,=,>)

<table>
<thead>
<tr>
<th>PRIORITY</th>
<th>WEIGHT</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
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<tr>
<td>4</td>
<td>1</td>
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</table>

DELETE ?

<table>
<thead>
<tr>
<th>AMOUNT TARGETED</th>
<th>AMOUNT ACHIEVED</th>
<th>ABSOLUTE DEVIATION</th>
<th>PERCENTAGE DEVIATION</th>
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<td>30000</td>
<td>20000</td>
<td>15473</td>
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<td>24527</td>
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PRESS ENTER TO CONTINUE
GOAL PROGRAMMING MODEL

GOAL: ALLOCATE PERCENTAGE OF A SOURCE TO A USE

SOURCE : GENERAL FUND
USE : E AND G
YEAR : 1985-86

Funds Available | Funds Required
---|---
04527 | 142085
CUMMULATIVE 04527 | 142085
TOTAL 04527 | 142085

Percentage to be Allocated : 50
Deviational Type (<=,>=) : >
Priority : 4
Weight : 1
Delete ? N

Percentage $ Amount

Target :
Achieved :
Absolute Deviation :
Percentage Deviation :

Press enter to continue

Appendix C. LISTING OF DMS (DISPLAY MANAGEMENT SYSTEM) PANELS 423
GOAL PROGRAMMING MODEL

GOAL: ALLOCATE PERCENTAGE OF A USE FROM A SOURCE

SOURCE : FEES
USE : E AND G
YEAR : 1985-86

Funds Available

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>THIS YEAR</td>
<td>20931</td>
</tr>
<tr>
<td>CUMULATIVE</td>
<td>20931</td>
</tr>
<tr>
<td>TOTAL</td>
<td>20931</td>
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</table>

Funds Required

<p>| | |</p>
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<tr>
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<td>142085</td>
</tr>
</tbody>
</table>

PERCENTAGE TO BE ALLOCATED : 20
DEVIATIONAL TYPE (<=,=,>) : >
PRIORITY : 5
WEIGHT : 1 DELETE ? N

PERCENTAGE $ AMOUNT

TARGET :
ACQUIRED :
ABSOLUTE DEVIATION :
PERCENTAGE DEVIATION :
PRESS ENTER TO CONTINUE
GOAL PROGRAMMING MODEL

VIEW CURRENT GOALS/RIGID ALLOCATIONS

PF1 RIGID ALLOCATIONS (SORTED BY SOURCE)
PF2 RIGID ALLOCATIONS (SORTED BY USE)
PF3 GOAL TYPE 1 : SPECIFIC ALLOCATIONS
PF4 GOAL TYPE 2 : PERCENTAGE OF SOURCE TO USE
PF5 GOAL TYPE 3 : PERCENTAGE OF USE FROM SOURCE
PF6 ALL GOALS : BY PRIORITY
PF7 PRINT ALL THESE REPORTS
PF10 QUIT

SELECT PF KEY
### VIEW GP MODEL'S GOALS/RIGID ALLOCATIONS

#### RIGID ALLOCATIONS (BY SOURCE)

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>USE</th>
<th>YR/QTR</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. FEES</td>
<td>CAPITAL OUTLAY</td>
<td>1/1</td>
<td>1000</td>
</tr>
<tr>
<td>2. FEES</td>
<td>CAPITAL OUTLAY</td>
<td>1/3</td>
<td>1000</td>
</tr>
<tr>
<td>3. OVERHEAD</td>
<td>E AND G</td>
<td>1/1</td>
<td>30000</td>
</tr>
<tr>
<td>4. OVERHEAD</td>
<td>E AND G</td>
<td>1/2</td>
<td>20000</td>
</tr>
<tr>
<td>5. OVERHEAD</td>
<td>E AND G</td>
<td>1/3</td>
<td>40000</td>
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<tr>
<td>6. OVERHEAD</td>
<td>E AND G</td>
<td>1/4</td>
<td>30000</td>
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</tbody>
</table>

Backward: PF7  Forward: PF8  Quit: PF10

---

Appendix C. LISTING OF DMS (DISPLAY MANAGEMENT SYSTEM) PANELS
<table>
<thead>
<tr>
<th>SOURCE</th>
<th>USE</th>
<th>YR/QTR</th>
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<tbody>
<tr>
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</tr>
<tr>
<td>2.</td>
<td>OVERHEAD</td>
<td>E AND G</td>
<td>1/2</td>
</tr>
<tr>
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<td>OVERHEAD</td>
<td>E AND G</td>
<td>1/3</td>
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<td>OVERHEAD</td>
<td>E AND G</td>
<td>1/4</td>
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<tr>
<td>5.</td>
<td>FEES</td>
<td>CAPITAL OUTLAY</td>
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<tr>
<td>6.</td>
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<td>CAPITAL OUTLAY</td>
<td>1/3</td>
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</tbody>
</table>

PF7 BACKWARD  PF8 FORWARD  PF10 QUIT
### VIEH GP MODEL'S GOALS/RIGID ALLOCATIONS

**GOAL 1: SPECIFIC ALLOCATION**

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>USE</th>
<th>YR/QTR</th>
<th>AMOUNT</th>
<th>TYPE</th>
<th>PR</th>
<th>WT</th>
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<td>E AND G</td>
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<td>&gt;</td>
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<tr>
<td>3. GENERAL FUND</td>
<td>E AND G</td>
<td>1/3</td>
<td>40000</td>
<td>&gt;</td>
<td>3</td>
<td>1</td>
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<tr>
<td>4. GENERAL FUND</td>
<td>E AND G</td>
<td>1/4</td>
<td>30000</td>
<td>&gt;</td>
<td>4</td>
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</tr>
</tbody>
</table>

PF7 BACKWARD    PF8 FORWARD    PF10 QUIT

---

**Appendix C. LISTING OF DMS (DISPLAY MANAGEMENT SYSTEM) PANELS**

**428**
C.106 VUGOAL2

| SOURCE        | USE            | YEAR | PERCENT | TYPE | PR  | WT  | *
|---------------|----------------|------|---------|------|-----|-----| *
| 1. GENERAL FUND | E AND G        | 1    | 50.00   | >    | 4   | 1   | *
| 2. LOCAL FUND  | SPONSORED PROGRAMS | 1    | 35.00   | =    | 4   | 1   | *

PF7 BACKWARD  PF8 FORWARD  PF10 QUIT
**VIEM GP MODEL'S GOALS/RIGID ALLOCATIONS**

**GOAL 3 : ALLOCATE PERCENTAGE OF USE FROM SOURCE**

<table>
<thead>
<tr>
<th>SOURCE USE</th>
<th>YEAR</th>
<th>PERCENT</th>
<th>TYPE</th>
<th>PR</th>
<th>WT</th>
</tr>
</thead>
<tbody>
<tr>
<td>FEES E AND G</td>
<td>1</td>
<td>20.00</td>
<td>&gt;</td>
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**PF7 BACKWARD**  **PF8 FORWARD**  **PF10 QUIT**
### C. Listing of DMS (Display Management System) Panels

<table>
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<tr>
<th>GT</th>
<th>Source</th>
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<th>Yr/Qtr</th>
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<th>Type</th>
<th>PR</th>
<th>WT</th>
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<td>E AND G</td>
<td>1/1</td>
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<td>&gt;</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2.1</td>
<td>GENERAL FUND</td>
<td>E AND G</td>
<td>1/2</td>
<td>0</td>
<td>&gt;</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3.1</td>
<td>GENERAL FUND</td>
<td>E AND G</td>
<td>1/3</td>
<td>0</td>
<td>&gt;</td>
<td>3</td>
<td>1</td>
</tr>
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<td>4.1</td>
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<td>1/4</td>
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<td>=</td>
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PF7 BACKWARD  PF8 FORWARD  PF10 QUIT
GOAL PROGRAMMING MODEL

LEVEL 4

VIEW GOAL ACHIEVEMENT REPORTS

PF1 GOAL TYPE 1: SPECIFIC ALLOCATIONS

PF2 GOAL TYPE 2: PERCENTAGE OF SOURCE TO USE

PF3 GOAL TYPE 3: PERCENTAGE OF USE FROM SOURCE

PF4 ALL GOALS: BY PRIORITY

PF5 PRINT ALL THESE REPORTS

PF10 QUIT

SELECT PF KEY

xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx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**GOAL ACHIEVEMENTS**

**GOAL 1: SPECIFIC ALLOCATION**

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<th>TY</th>
<th>PR</th>
<th>NT</th>
<th>TARGET</th>
<th>ACHVED</th>
<th>ABS-DEV</th>
<th>%-DEV</th>
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<td>30000</td>
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<td>E AND G</td>
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<td>E AND G</td>
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</tr>
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<td>E AND G</td>
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**PF7 BACKWARD**  **PF8 FORWARD**  **PF10 QUIT**
GOAL ACHIEVEMENTS
GOAL 2: ALLOCATE PERCENTAGE OF SOURCE TO USE

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<th>TY</th>
<th>PR</th>
<th>TARGET DOLLAR/PRENT</th>
<th>ACHIEVED DOLLAR/PRENT</th>
<th>ABS DEVTN</th>
<th>PRCNT</th>
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<tr>
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<td>0/0.0</td>
<td>5734/35.0</td>
<td>100.0</td>
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PF7 BACKWARD   PF8 FORWARD   PF10 QUIT
GOAL ACHIEVEMENTS
GOAL 3: ALLOCATE PERCENTAGE OF USE FROM SOURCE

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<tr>
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<th>YR</th>
<th>TY</th>
<th>PR</th>
<th>MT</th>
<th>DOLLAR/PRCNT</th>
<th>DOLLAR/PRCNT</th>
<th>DOLLAR/PRCNT</th>
<th>DEVTN</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. FEES</td>
<td>E AND G</td>
<td>1 &gt; 5</td>
<td>1</td>
<td>20417/20.0</td>
<td>18931/13.3</td>
<td>9486/6.7</td>
<td>33.4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PF7 BACKWARD  PF8 FORWARD  PF10 QUIT
<table>
<thead>
<tr>
<th>GT</th>
<th>SOURCE USE</th>
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<th>TY</th>
<th>PR</th>
<th>MT</th>
<th>DOLLAR/PRCNT</th>
<th>DOLLAR/PRCNT</th>
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<th>PRCNT</th>
<th>ABS DEVTN</th>
<th>DEVTN</th>
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<td>1</td>
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<td>0.0</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>1 GENERAL E AND G</td>
<td>1/2</td>
<td>&gt;</td>
<td>2</td>
<td>1</td>
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<td>0</td>
<td>0.0</td>
<td>*</td>
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<tr>
<td>3.</td>
<td>1 GENERAL E AND G</td>
<td>1/3</td>
<td>&gt;</td>
<td>3</td>
<td>1</td>
<td>40000</td>
<td>4527</td>
<td>35473</td>
<td>88.7</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>1 GENERAL E AND G</td>
<td>1/4</td>
<td>&gt;</td>
<td>4</td>
<td>1</td>
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<td>5.</td>
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<td>1</td>
<td>&gt;</td>
<td>4</td>
<td>1</td>
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<td>6.</td>
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<td>1</td>
<td>=</td>
<td>4</td>
<td>1</td>
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<td>0</td>
<td>0.0</td>
<td>5734/35.0</td>
<td>100.0</td>
<td>*</td>
</tr>
<tr>
<td>7.</td>
<td>3 FEES</td>
<td>E AND G</td>
<td>1</td>
<td>&gt;</td>
<td>5</td>
<td>1</td>
<td>28417/20.0</td>
<td>18931/13.3</td>
<td>9486/6.7</td>
<td>33.4</td>
<td>*</td>
</tr>
</tbody>
</table>

PF7 BACKWARD      PF8 FORWARD     PF10 QUIT
GOAL PROGRAMMING MODEL

DO YOU WISH TO STORE THE CURRENT MODEL AS THE ORIGINAL/PERMANENT MODEL? (ENTER Y/N)  N

PRESS ENTER TO CONTINUE
WARNING: YOU ARE ABOUT TO LEAVE THE SANDU MODEL.

PF1 RETURN TO SANDU MODEL
PF10 LEAVE MODEL

SELECT PF KEY

FUND SOURCES AND USES MODEL
The vita has been removed from the scanned document