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REGULATORY ANALYSIS FINANCIAL MODEL FOR TELECOMMUNICATIONS APPLICATIONS

RAMTEL

DESCRIPTIVE DOCUMENTATION

by

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TABLE OF CONTENTS

TABLE OF CONTENTS--continued

PART TWO
OPERATING INSTRUCTIONS

TABLE OF CONTENTS--continued

PART THREE
ELECTRONIC DATA PROCESSING DESIGN

LIST OF EXHIBITS

PART ONE

LIST OF EXHIBITS--continued

LIST OF EXHIBITS--continued

FOREWORD

Since obtaining a copy of the computer model, RAm, in 1978, NRRI has made several modifications toward making it more user-oriented, as have others. Most recently we completed a contract with the Public Utilities Commission of Ohio in which we adopted the RAm model from use solely with electric utility financial analysis to application in telecommunications. The result was RAMTEL, a new flexible model showing the relationships between important financial variables in telecommunications utilities. The PUCO has graciously allowed our publication of it and dissemination to all our clientele.

Douglas N. Jones, Director
Columbus, Ohio
February 26, 1988

PREFACE

This report documents the adaptation of the computer model Regulatory Analysis Model (RAm) for telecommunications applications. RAm was originally developed by Temple, Barker and Sloane, Inc. to analyze the impact of construction projects on electric utility revenue requirements. The resulting model has been named Regulatory Analysis Model for Telecommunications Applications (RAMTEL). The following is a brief account of the evolution of RAMTEL.

The original development by Temple, Barker, and Sloane, Inc. (TBS), was funded by the Experimental Technology Incentive Program (ETIP 76) of the National Bureau of Standards, U.S. Department of Commerce. The first major change to RAm was made by the Public Utilities Commission of Ohio (PUCO) which converted it from a CDC 3600 FORTRAN program to an IBM compatible form. At a later time, the Florida PSC converted the IBM version for use on a CDC 7600 computer.

In 1978, The National Regulatory Research Institute (NRRI) obtained a copy of the PUCO's version of RAm. The NRRI modified this version of RAm to make it more user-oriented. Later, further modifications were made to the model to comply with the American National Standard (ANS) FORTRAN. In 1980, Temple, Barker and Sloane (TBS) and M.S. Gerber and Associates (M.S.G.) enhanced the capabilities of RAm under a contract from PUCO. The enhancements were made to the calculation of taxes, dividend policy, financing policy, and investment tax credit. In 1982, the NRRI completed another set of enhancements to the 1979 version of RAm. The enhancements included improvements to the regression process and output content of the regression summary reports and modifications of tax depreciation calculations to incorporate recent tax acts.

The NRRI proposed adapting RAm to telecommunications to the PUCO as one of the tasks of the current project on telecommunications assistance. The task included collection of telecommunications utility data, making the necessary modifications to the programs in the model, performing demonstration runs using the collected data and preparation of documentation. In order to complete these tasks, the NRRI obtained the PUCO's 1980 version of RAm, collected 22 years of data from a telephone utility, modified the model (incorporating part of the 1982 NRRI version os

RAm), and made demonstration runs. Using these demonstration runs, financial calculations in the model were validated for the test period 1970 through 1975. The entire effort is documented in this report and may be followed entirely without referring to earlier versions of the model.

The history of developmental work demonstrates that the basic RAm financial model has been refined and improved over time in order to meet the changing needs of state regulatory commissions. The new RAMTEL model is flexible and may be modified to reflect changes in tax acts, state and federal legislation, and in regulatory rules. Because the present RAMTEL model was validated for the 1970 through 1975 period, the model necessarily reflects the tax, legislative, and regulatory conditions appropriate for that period. One of the strengths of RAMTEL lies in its ability to change input values and parameters to accommodate accelerated depreciation, investment tax credits, accounting depreciation, economic depreciation, and flow-through or normalization accounting concepts.

The time period chosen for validating the RAMTEL model covers the predivestiture years. The period was chosen because it was far enough removed from current contentious issues so as to allow a dispassionate analysis of the relationship between important financial variables. Further, it covers a period where there seems to be a reasonable consensus and knowledge among regulatory and utility experts about the financial variables examined. Because the RAMTEL model is constructed in modules and the equations that describe each variable and their inter-relationships are shown, it is a relatively straightforward task for any user to redefine or otherwise modify these variables. It is not the purpose or RAMTEL to prescribe a particular financial outcome, rather the intent is to provide a non-proprietary, modular computer model that may be used by all parties to a regulatory proceeding. One measure of the acceptance of the basic RAMTEL model will be the subsequent number of different versions in use before various state commissions.

The report is organized in three parts, each intended to serve a different purpose. They are numbered in increasing order of detail. Each part is described in the paragraphs below.

Part One contains the purpose, uses, and general logic of the model. It is written for regulatory commissioners, key commission staff, and company officials responsible for deciding whether RAMTEL could be used in addressing their needs for analysis. Because members of this group may have a range of interests, the most technical parts of the explanation of the logic are reserved for the appendices.

Part Two focuses on input data requirements and program operating procedures. The second part is intended for the staff personnel responsible for operating RAMTEL. It is recommended that key operating staff also become familiar with Part One, and, if technical skills permit, with the more detailed information in Part Three.

Part Three contains the computer system design. This material is needed only by those who must know how RAMTEL is implemented on a computer. Staff charged with installing, maintaining, and modifying the computer programs will require Part Three. Familiarity with Parts One and Two will add to the general understanding of staff responsible for computer implementation of RAMTEL.

Copies of the model are available from NRRI. Further information may be obtained from:

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REGULATORY ANALYSIS FINANCIAL MODEL
FOR TELECOMMUNICATIONS APPLICATIONS

RAMTEL

DESCRIPTIVE DOCUMENTATION

PART ONE

DESCRIPTION AND FUNCTIONS

CHAPTER 1
INTRODUCTION

The Regulatory Analysis model, RAm, is a well-known computer model for making financial projections for an electric utility. The Regulatory Analysis Model for Telecommunications Applications, RAMTEL, is an adaptation of RAm for making similar projections for a telecommunications utility. Like RAm, RAMTEL uses a set of assumptions or projections concerning demand, capital expenditures, operating costs, and financial and regulatory policies. These assumptions or projections may themselves be the output from other models that project telephone demand or plant additions.

This report describes the accounting, financial, and regulatory modeling embodied in RAMTEL, and the potential uses of RAMTEL. Part one of this report presents this description in the following four chapters.

1. Introduction
2. Uses of RAMTEL
3. Description of RAMTEL
4. How to use RAMTEL

These chapters describe to the reader, in increasing levels of detail, why RAMTEL may be useful in dealing with regulatory problems and what practical steps are required to use it. This part of the report also contains four appendices which provide even greater detail. The first appendix consists of a validation of RAMTEL's accuracy using sample data in an illustrative case. The second appendix contains the mathematical structure of the accounting identities used in RAMTEL. The third appendix cross-references the computed variables defined in the first appendix to the financial statements produced by RAMTEL. The fourth appendix explains the modifications made to the regression process and the tax depreciation calculations of original RAm. The latter three appendices allow the user to trace the flow of calculations from input to output reports.

Background

RAMTEL utilizes a combination of historical data, input assumptions concerning financial and reporting relationships and regulatory and tax accounting procedures in making financial projections. RAMTEL has been designed to accept alternative inputs such as different values for future capital expenditures for various types of plant and equipment. The data items required by RAMTEL may be developed by other, often complex models. For example, the capital budget required as an input to RAMTEL may be an output from a telephone plant expansion planning program. In this regard, RAMTEL may be utilized to make some subsidiary forecasts. For example, estimates of future operations and maintenance costs may be derived from historical trends through the use of the Performance Evaluation Module of RAMTEL. Exhibit 1 illustrates the flows of information utilized by RAMTEL. It shows the five modules in RAMTEL and the flow of input and output information required for each module. The modules and the information shown are described in detail in subsequent sections of the report. RAMTEL's design as a complement to other, often complex tools of the planning process both simplifies its structure and adds to its flexibility of use.

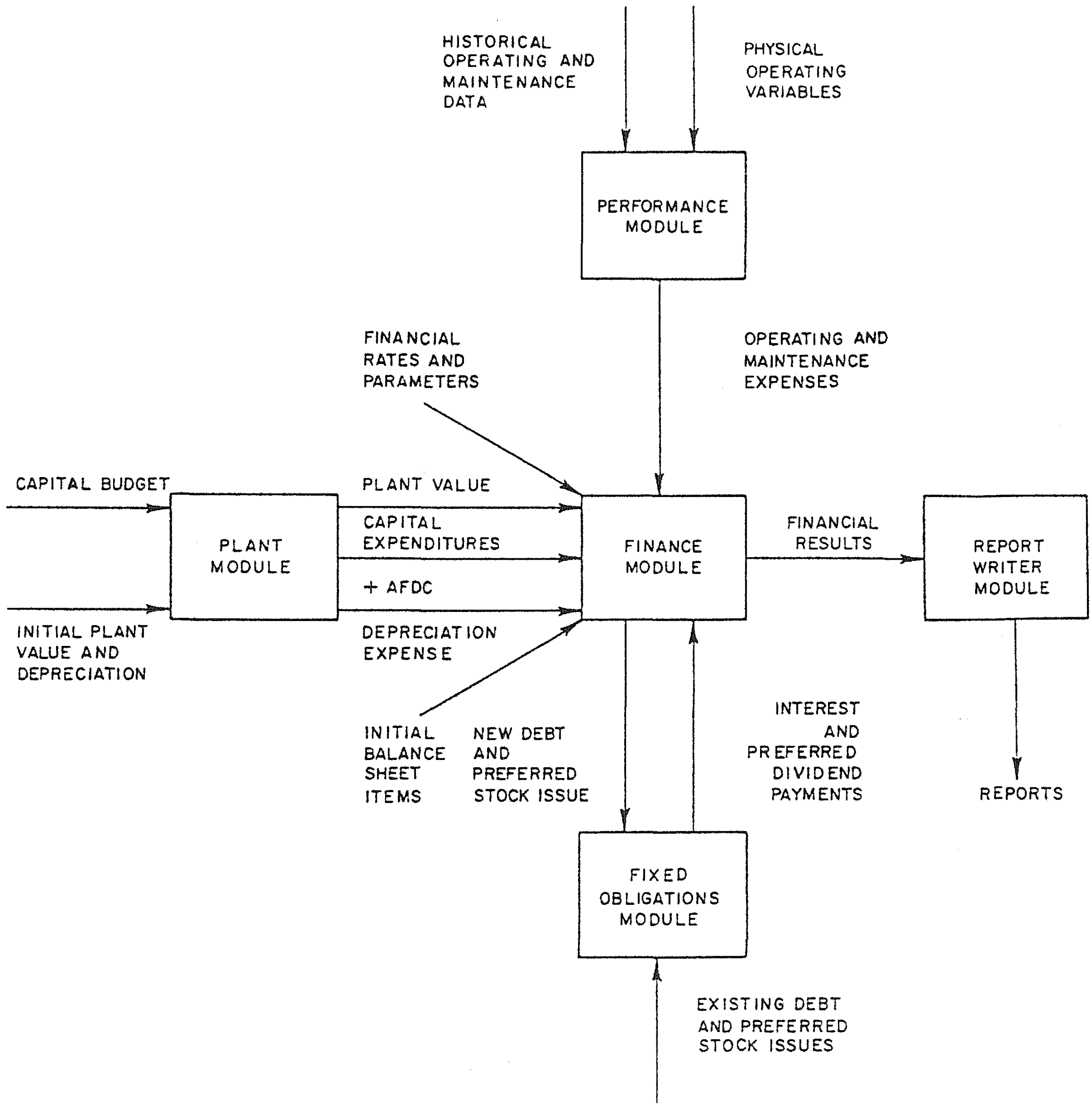
RAMTEL may also be used for industry or regional analysis as well as for individual telephone utility projections. This may be done in one of two ways. First, the industry or region may be modeled in its combined form, as a single firm. This method, however, does not allow for differences in accounting practices among the utilities. Second, the results of analyses of individual firms may be combined to include all firms in a region or in the industry.

Purpose of RAMTEL

The purpose of RAMTEL is to aid commissions in determining the implications of changes in corporate or regulatory policy, economic conditions, or cost estimates for a utility's external financing, revenue requirements, return on equity, and financial health. These changes are often interactive, and their effects are often complex to compute. RAMTEL's

EXHIBIT 1

RAMTEL BLOCK DIAGRAM



value lies in its ability to rapidly examine the implications of changing policies, conditions, and assumptions.

RAMTEL should prove to be especially valuable in assessing telephone utility investment decisions, particularly regarding modernization. In the next decade it has been variously predicted that (1) current switches will be replaced by digital switches, (2) glass fiber cable will replace copper cable, even on the local loop, (3) Integrated Services Digital Network (ISDN) will require that digital software in all switches be modified, and (4) even ISDN-based switches will have to be extensively modified to accommodate a switching system based on light rather than electricity. These four examples suggest that the next decade will be characterized by expensive and short-lived investments by telephone utilities. The threat of bypass and the promise of competition will produce a number of new accounting proposals designed to recover the cost of these investments and smooth the transition of telephone utilities into a more competitive environment. RAMTEL is a computer-based model that offers the regulatory analyst the opportunity to efficiently assess the financial implications of these proposals and to compare the financial outcomes of alternative proposals.

The usefulness of a model such as RAMTEL has increased in recent years as a result of several major trends affecting the telephone utility industry. Two such notable events are the restructuring of the American Telephone and Telegraph Company and the emerging competition in formerly monopolized markets. RAMTEL may inform legislators and regulators of the effects of different regulatory policies on utilities and on ratepayers. Moreover, RAMTEL may deal with the interaction between changing policies and costs and may present the effects in the familiar form of balance sheets, income statements, and related financial and operating statistics. Many commissions, without the use of a model, have been forced instead to consider the effects of changes in an isolated manner. Finally, utilities are increasingly relying on computer models in preparing financial exhibits for submissions to commissions. RAMTEL provides an independent check on the validity of company calculations of the effects of changing policies.

RAMTEL may facilitate the regulatory process and reduce regulatory lag. If regulatory lag is defined narrowly as the time between filing of a rate request and the final disposition of that request, RAMTEL helps reduce regulatory lag directly by facilitating the analysis of historical or future test years' costs and the consequent revenue requirements. RAMTEL is perhaps of particular value in providing a framework for rate cases employing future test years. If regulatory lag is defined more broadly to be the period beginning when rates become misaligned with costs and ending when rates and costs are realigned, RAMTEL may also be significant in reducing lag. RAMTEL helps indirectly reduce the staff time required for rate cases by facilitating analysis that may not be a part of a particular rate case, but that may compete with the rate case for the limited staff resources available for analysis.

It is worth noting that the analytical time and cost efficiencies available through the use of RAMTEL may manifest themselves in an increased scope and depth of analysis, rather than a faster and cheaper replication of tasks formerly done manually. Such is likely to be the case, particularly where a commission's staff resources have been limited relative to the amount of analysis that might have been desirable.

CHAPTER 2

USES OF RAMTEL

RAMTEL may assist regulators in making decisions in a variety of situations. Some possible uses are:

- Rate Cases
- Plant Construction Planning
- Policy Alternative Analysis
- External Financing Projection and Evaluation
- Financial Condition Projection and Surveillance
- Performance Evaluation
- Future Rate Projection

In each of the uses above, RAMTEL would be used to determine the financial effects of alternative policies. This is done by making a base case projection and then performing a scenario analysis for alternative policies. Each of these uses above is considered in detail below.

Rate Cases

RAMTEL may be used in rate cases to determine aggregate revenue requirements and test alternative policies.[1] It does not determine the effects of alternative rate structures nor does it perform a cost allocation. There are, of course, other limitations on the use of RAMTEL in rate cases. For example, many of the historical data most useful for projections are not available for a company's service territory. One way around this gap is to make projections for the holding company and prorate the results to each of the state's operations. Data may also be difficult

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[1] Determination of revenue requirements often requires computations which are unique to each service territory. Therefore, RAMTEL may require modification by each state to reflect such individual characteristics.

to obtain where the test year does not correspond to the normal fiscal year of the utility.

As mentioned, RAMTEL is more clearly useful for rate cases using a future test year, although it may also facilitate historical (or mixed future and historical) test year proceedings. Given a base case, scenarios regarding the effect on required revenues of alternative treatments of abnormal expenses or other policy issues may be run. These scenarios could be used with either a future or an historical test year. RAMTEL will accept any rate base definition such as net original cost or replacement costs.

In a future test-year rate case, RAMTEL combines cost projections (such as the cost of repairs of central office equipment) and forecasts of system operating parameters (such as miles of underground conduit, number of customers, new construction, etc.) to compute costs for the test year. Required revenues are then determined by incorporating the desired return on equity and the taxes and fixed obligations computed by RAMTEL.

In gathering data to generate a projection, care must be exercised by the analyst. The choice of input data is at the analyst's discretion and any potential pitfalls and problems with the data must be identified by the analyst. As an example, historical data may not be a good indicator of future costs if they include the effects of a major storm or the abnormal failure of switching equipment in a central office. Such cases may be identified for additional analysis and, if warranted, direct estimates of the affected accounts rather than the extrapolations should be used. The impacts of technological change should be likewise considered when projecting operating expenses.

Many utilities file rate requests which ask for policy changes such as flow-through to normalized treatment of taxes. Commissions thus require the ability to independently determine the effects of these changes. RAMTEL provides the commission with a financial projection capability comparable to that employed by many utilities.

Plant Construction Planning

An important consideration for telephone utilities in planning construction of a major plant facility is the effect on present and future consumers. A measure of this effect is the change in the resulting revenue requirement. RAMTEL may be used to determine the required revenues with and without the proposed facilities. The difference is, of course, the amount which consumers will save or pay. Costs for each alternative should take into account not only the additional capital related charges, but also the related operating cost. RAMTEL does not compute the construction costs, but uses a predetermined construction plan as input. It projects operating costs by using regression analysis of historical data for existing plant. The operating cost associated with a new plant must be integrated into the analysis by the analyst. Sophisticated engineering cost models may be used to estimate construction costs and the results directly used as input into RAMTEL. Such models may also be used to estimate operating costs as an alternative to the regression-based analyses used by RAMTEL and again the results directly used as input. A commission may use company analyses or publicly available models. These models may incorporate policy decisions regarding appropriate capacity margins or the availability of different types of services. The effect of these policies on the revenue requirements may also be tested by evaluating the resulting impact on the construction plan with RAMTEL.

Policy Alternative Analysis

Regulators and legislators are sometimes called upon to consider broad policy alternatives. In such cases, important considerations are the cost or benefit to the consumer and the effect on the utility. RAMTEL's ability to generate input for scenario analysis of alternative policies makes the model a valuable regulating tool.

RAMTEL may be used effectively to analyze the implications of such policy alternatives. As was explained above in connection with plant construction decisions, the cost or savings to the consumer from different policies may be determined by comparing required revenues determined by RAMTEL with and without implementation of the proposed policy. The effect of policy alternatives both in the financing needs of a utility and on the financial indicators used by investors to evaluate utility debt issues may be determined by the same scenario method.

External Financing Projection and Evaluation

RAMTEL is useful when a utility needs approval from a regulatory commission before issuing securities. This approval must consider both the quality and type of issue. Frequently, decisions on external financing must be made very quickly. A computer-based model such as RAMTEL enables commissions to evaluate the effect of the proposed financing and alternatives within a short time if data files for the utility already are available.

RAMTEL may be used to determine whether the requested amount of financing is required for the capital expenditure program by computing internal sources of funds. RAMTEL projects retained earnings, depreciation, tax deferrals, short-term debt, long-term debt refundings including sinking fund payments, proposed capital expenditure and external financing requirements--thus enabling commissions to estimate independently the amount of external funds required. The financial position of the firm may be projected over several years to determine whether the current need is short- or long-term in nature.

The effects of a proposed security issue on the utility's revenue requirement and financial ratios may be estimated. RAMTEL projections include measures of such effects as capitalization ratios, embedded interest rates, and interest coverage ratios. As described above, alternative plans may be evaluated to determine their effect on consumers and on the utility's financial health. For example, alternative financing plans might have different implications for bond ratings and, as a result, the cost of external funds.

In addition to analyzing traditional financing, commissions may need to consider non-standard financing methods such as the sale and lease back of physical assets. These two alternatives amount to the purchase of completed facilities at a price which includes the cost of financing by another firm during construction. RAMTEL may be used to determine the effects of such proposals.

Financial Condition Projection and Surveillance

The financial condition of a utility may be projected by RAMTEL based upon past trends in, and policy decisions regarding, key variables such as sales growth, telephone rates, and costs. Such projections may be useful in considering the adequacy of management planning and the probable need for future rate relief.

Performance Evaluation

Performance evaluation is a complex and controversial subject. Nonetheless, regulators are continually forced to make implicit or explicit judgments regarding past and future performance. Portions of RAMTEL are designed to assist regulators in analyzing trends in productivity and in making inter-company comparisons.

The Performance Module allows regulators to project future operations and maintenance by means of various statistical extrapolations of historical data. This module first facilitates the identification of anomalies that might be subjected to future review. Most important though, historical relationships between costs and possible causal factors may be investigated. As an example, the relationship between the inflation-adjusted costs of central office equipment maintenance and the number of customers served by the central office may be determined. Further, it may be determined whether this relationship suggests improving or deteriorating performance. If the latter, analysts may ask for further company data which will help determine the causes of such cost changes.

Future Rate Projection

Regulators and policy makers occasionally have need of forecasts of future telephone rates. RAMTEL may assist the analyst in this task. It may be used to project revenue requirements for a set of cost and policy assumptions. Rates may then be derived from these required revenues. This may simply be the average revenue requirement per customer or may have more detailed structures based on various cost-allocation schemes.

Some analyses focus more upon the effect on rates of different assumptions about economic conditions, costs, or regulatory policies. These differences may be incorporated in RAMTEL by altering the assumptions and forecasts used in determining future pro forma results.

CHAPTER 3
DESCRIPTION OF RAMTEL

RAMTEL is a complex, but flexible and user-oriented model. Its flexibility is evidenced not only by its ability to perform the functions described earlier in this part, but also by the fact that the data required by the model may be of various levels of detail. The complexity of RAMTEL is apparent only in the internal program structure of the model both conceptually and operationally. RAMTEL is relatively straightforward. The conceptual structure of RAMTEL, mentioned briefly in the introduction of this part, will be described in detail in the remainder of this section and in appendices B, C, and D. The reader should refer to the information flows depicted in exhibit 1. The operating instructions for RAMTEL are in Part II. A description of the internal program structure of the model is given in Part III of this documentation.

Each of the functional parts of the model is described below. Appendices B, C, and D contain much more detailed information concerning the calculations in RAMTEL. Appendix B identifies all of the variables used in RAMTEL and their sources. It also contains all of RAMTEL's equations. Appendix C identifies the elements in the Master File (one of RAMTEL's output files that contains all of the important financial values calculated by RAMTEL) and relates the elements both to the equations in appendix B and to the financial statements produced by RAMTEL. Appendix D explains the calculations related to the regression and productivity analysis, and tax depreciation which have been included in the current version of RAMTEL.

Plant Module: Plant Calculations

The Plant Module of RAMTEL performs three functions:

- It computes construction work in progress (CWIP) and allowance for funds during construction (AFDC).

- It computes the amount of depreciation, both tax and book, for each plant category.
- It determines net and gross plant value.

Among the above, CWIP and AFDC are relatively unimportant components of a telephone utility plant account. The reason is the relatively short construction periods (e.g., 1-3 years) for telephone plants compared to those (e.g., 5-10 years) for electric plants. The algorithms for calculating CWIP and AFDC have been retained in RAMTEL from the earlier electric utility version of the model (i.e., RAm) for completeness.

To perform these tasks, the Plant Module requires two types of information. The first type is historical, which consists of the latest available ending balances of CWIP, gross and net plant value, and accumulated tax and book depreciation. It also requires information to calculate depreciation rates, both book and tax, for all plant categories. These are used as a starting point for the projections. The other type of information consists of future projected data, and includes annual construction expenditures (excluding AFDC), retirements, and plant-in-service additions, for each plant category. These data may be obtained directly from the companies being studies or, in some cases, from public sources, such as annual reports or prospectuses.

Construction Work in Progress (CWIP)

CWIP is calculated by taking the previous year's CWIP figure, adding to it all actual cash construction expenditures, and subtracting all increases in plant-in-service (before retirements). The AFDC component of CWIP is kept separate. All cash construction expenditures should be accounted for in either CWIP or plant-in-service. Therefore, the increase (or decrease) in CWIP in equal to cash construction expenditures less the amount transferred to plant-in-service.

Allowance for Funds Used During Construction (AFDC)

The amount of AFDC shown as income in each year is calculated by multiplying the average year-end CWIP balance by the AFDC rate. AFDC is calculated on an annual basis and is not compounded. While the calculation of AFDC is simple, its accounting is more complex. The amount of AFDC in the CWIP account and the AFDC portion of each plant-in-service category must be kept separate because of the special nature of AFDC. When calculating the current year's AFDC amount, the AFDC portion of CWIP is not included. When depreciating the plant accounts for income tax purposes, only the non-AFDC portion of the plant is depreciated. For book purchases, however, the AFDC portion of plant is depreciated.

To properly account for AFDC, a second calculation is made. The second calculation determines how much AFDC is associated with plant going into service in a particular year. This amount is subtracted from the accumulated AFDC in the CWIP balance, and added to the accumulated AFDC in the plant-in-service balance. In effect, AFDC accounting parallels that of cash expenditures, with the CWIP account and each plant account having a corresponding AFDC account.

The second AFDC calculation is based on an estimate of the portion of expenditures which occurs in each year prior to completion for each type of construction project, the total cost of that project, and AFDC rate. From this information, the amount of AFDC which would be accrued during the construction of the project is calculated and transferred from accumulated AFDC in CWIP to accumulated AFDC in plant-in-service when the project is completed.

The user should be sure to verify that the method employed by the Finance Module to calculate AFDC is the same as that used by the utility under study. It is is not, the logic of the model may require alteration.

Depreciation

The annual depreciation charges are determined separately for plant existing at the beginning of the analysis and plant which is added over the period of the model run. In addition, several depreciation figures are calculated: book depreciation of plant, book depreciation of the AFDC component of plant, and tax (accelerated) depreciation of plant.

The main difference between the calculations for existing plant and new plant is the level of detail. Depreciation for existing plant may be computed by plant account while the new plant is subdivided between one to ten categories (or general accounts).

Book depreciation is calculated on a straight-line basis by multiplying the gross value of each plant account and category by a depreciation factor. For existing plant, these factors for each account are available from the FCC Form M, Schedule 14C, as are the net and gross value of each plant account. The depreciation factor is determined by the utility for each plant account based on studies of the average expected life of equipment in each account. For new plant, the factor is equivalent to the inverse of the number of years of expected life. The AFDC component of new plant is also depreciated on a straight-line basis for book purposes, using the same depreciation factor as for book depreciation of new plant.

Tax depreciation is calculated exclusive of AFDC. Since it is difficult to identify the gross and net plant value used for tax purposes, the net plant value (tax) of existing plant is estimated based on tax depreciation and an average asset life determined from book depreciation. To calculate tax depreciation, a number of options are available to the user. They include the straight line, the double declining balance, the sum-of-years digits, and a pre-specified depreciation rate schedule. (See appendix D for the exact equations.)

Gross and Net Plant Value

The gross plant value is determined by summing the gross value of each plant account (account numbers 201-277) for existing plant, adding the gross value of all new plant, and subtracting any retirements. The AFDC portion of gross plant value is kept separate. The net plant value is calculated by subtracting book depreciation from the gross plant value.

Performance Module: Calculation of Operations and Maintenance Expenses

Operations and maintenance expense (O&M) used by RAMTEL may be developed independently or by the Performance Module of RAMTEL. For example, company O&M projections might be used in RAMTEL for evaluation of different regulatory policies regarding rate of return or other elements.

Frequently, however, the commission may wish to independently determine O&M projections using the regression analysis in the Performance Module of RAMTEL.

All performance evaluation and projection analyses should be done with constant (inflation adjusted) dollars. This avoids excessive weighting of values during periods of high inflation. RAMTEL computes these constant dollar amounts from inflation indices provided by the user. Different indices may be used for different accounts. RAMTEL converts constant dollar projections to current dollars for future use in financial calculations.

Projections of O&M expenses with RAMTEL is a two step process. The Performance Module's primary function is to develop regression coefficients with which to predict or extrapolate O&M expenses into the future. It also calculates the correlation coefficient squared, r^2, the standard deviation of values in each account and standard errors of the regression coefficients. The regression coefficients may also be used for performance evaluation or one may use this module for performance evaluation independent of the desire to predict O&M expenses. For these reasons, use of the RAMTEL Performance Module to analyze performance is explained in the first section below. The second step is the projection of future values based upon relationships developed in the first step.

Performance Evaluation

The Performance Module needs historical data for dependent and independent variables to develop the statistical relationships. Both the dollar amount of expenses and measures of quantity of plant, physical activity, or service are needed. The first type of data are normally the USOA accounts for O&M expenses. However, more detailed accounting data, such as company functional accounts may be used or, conversely, data from the USOA accounts may be aggregated into groups such as traffic expenses. Cost data for any number of years may be analyzed with the Performance Module. The second type of data are measures of quantity of plant, physical activity, or service and are used as the independent of exogenous variables. Any measure which the analyst feels may be a causal factor in incurrence of costs may be used. Some examples are:

- average number of calls completed in an hour
- maximum number of calls completed in an hour
- average minutes of usage per local loop
- number of customers or loops
- transmission circuit miles

There are, of course, many others and the analyst's choice will significantly influence the quality of the analysis. These data must be available for the same number of years as the cost data for which the analyst wishes to develop the relationships.

Before analyzing relationships between the costs and physical measures described above, it is advisable to correct costs for inflation. Indices which reflect the inflation of the major items in each cost account must be identified and also used as input to the Performance Module. These indices are used to adjust each account in each year to constant dollars of a specified year. This removes the influence of inflation from measures of productivity and performance.

The steps above complete the data requirements for evaluation of performance.

The Performance Module of RAMTEL develops statistical relationships between costs and service activities. It does so by performing a regression over time with each constant dollar cost item and selected measures of service. The method of regression and selection of service measures are controlled by the analyst. Options available for each of these controls are described in the following paragraphs.

The analyst may select any method of regression. At present the Performance Module contains three methods:

- linear trend
- multivariate linear regression
- multivariate log-linear regression

Additional methods may be added to the module as desired by changing the computer code.

The user must specify the independent variables, up to five, for each cost item. The analyst may experience a high degree of collinearity when using more than one independent variable. Collinearity should not be a great concern to the analyst only interested in predicting future expenses unless RAMTEL will not invert the matrix. However, if the analyst is interested in performance evaluation using the individual coefficients, then further collinearity diagnostics should be run on the data outside of RAMTEL.

This module generates graphs depicting the estimated relationships and tables of the underlying predicted data. The tables of predicted data list either the constant dollar or unadjusted costs, the estimated coefficients, and statistical measures of the goodness of fit.

Analysis of this output should focus on two areas. First, do the relationships selected seem to reflect causal patterns? If they do not, other relationships should be explored. Second, the analyst should examine whether there are abnormal occurrences which affect the relationships and then seek out the underlying cause. For instance, he may find a tornado or fire hit a central office during some particular year. When this occurs, the analyst may throw out this observation or try to correct it. As a result of examining these two areas, it may be appropriate to repeat parts of the analysis above with revisions.

Correction for abnormal occurrences suggested above requires adjustments similar to those made to historical data to remove inflation effects. These adjustments may be multiplicative or additive. Thus a loss related to an abnormal event may be subtracted from a given year and prorated over several years to normalize its effect. A multiplicative adjustment might be used similarly.

Analysis of the output may yield more information than just a relationship between variables. The coefficients of the regression may be interpreted as the unit cost per measure of activity or services. For example, if telephone cable repair costs were regressed against the length of cables, the resulting relationship is as follows:

cable repair cost = A x (length of cables)

then the repair cost per unit length of cable would be A dollars.

The analyst could perform regressions for several companies and the resulting costs per unit of service compared to the "A dollars" in the commission jurisdiction or a multistate area. Also trends in costs may be compared. The same cost item for up to five companies may be displayed on the same graph against time.

O&M Expense Projections

The relationships developed as part of performance evaluation may be used to project future O&M expenses. These projections are, of course, at the same level of detail as the relationships previously developed, i.e., USOA account, group accounts, etc. Projection is accomplished by supplying forecasts of the independent variables specified in the causal relationships (e.g., busy-hour, busy-season calls and/or total minutes of use) and calculating the value for each expense item for each future year.

Projections of O&M expense also may be based upon different relationships than those developed in performance evaluation. It may be desirable to project future expenses at a different level of detail than was desirable for performance evaluation, e.g., USOA account or group of accounts. Also, forecasts of measures which are very useful for historical performance evaluation may not be available. In such cases, the process described under performance evaluation must be completed twice. It must be done once to analyze performance and once to develop the relationships which will be used to project O&M expenses. The analyst, however, should examine the availability of these data when choosing the independent variables for the regression.

The forecasts of independent system characteristics required for projecting O&M expenses as described above may be obtained from several sources. Company annual reports and prospectuses often contain such data. Also, the various reports required by regulatory commissions for rate setting frequently contain the needed information. Finally, some items may be obtained from the utility by direct inquiry.

An alternative procedure is available for projecting selected O&M items which do not lend themselves to the type of historical analysis described above. The user may independently determine the relationships to be used and simply input the desired coefficients and the form of the relationship. These relationships may have the same form as those developed from historical data.

Aggregation Module

The Aggregation Module is used to aggregate output data from the Performance Module and the Plant Module.

The Aggregation Module computes the following items from the output of the Performance Module (although other aggregations are possible):

- total operations expense, and
- total maintenance expense

It also aggregates the following across plant types or accounts from the output of the Plant Module:

- construction expenditures
- capital expenditures (annual additions to plant-in-service)
- gross plant value
- CWIP
- AFDC
- retirements, and
- tax and book depreciation, both annual and accumulated

Fixed Obligation Module: Interest Calculations

The Fixed Obligations Module of RAMTEL keeps track of and performs interest calculations of a utility's outstanding long-term debt and preferred stock issues (fixed obligations). In addition, it may measure the effect on interest and dividend payments and embedded interest rates resulting from any new issues. When used in conjunction with the Finance Module, the Fixed Obligations Module performs two functions:

- It allows the user to create a long-term debt file and a preferred stock file which contain information pertaining to each debt and stock issue outstanding as of the model base year.

- It calculates the annual interest charges and dividend payments on outstanding and preferred stock for each year of the forecast period.

The debt file and preferred stock file created by the user contain a description of each issue, the year and date of issue, the year of retirement (if any), the interest or dividend rate, the original amount of issue, the current amount outstanding, and the annual sinking fund payment (if any). The Finance Module uses this file to make preliminary estimates of interest payments and calculates the amount of new debt and stock issues and adds them to the debt and stock files. The Fixed Obligations Module then uses the file to calculate the exact amount of long-term debt interest payments and preferred stock dividends. The information is then passed on to the Finance Module for use in the financial calculations. The amount of interest or dividends to be paid each year on each issue is assumed to be paid on the date of original issue and is prorated if the issue has not been outstanding for a full year.

Finance Module: Financial Calculations

The Finance Module is the heart of RAMTEL. It performs the task of calculating required revenues and all the relevant financial parameters necessary to develop a pro forma income statement, balance sheet, and sources and uses of funds statement. In particular, the Financial Module calculates for each year of the forecast period:

- Ratebase
- Required revenues
- Net income and return on equity for a given rate of return on the ratebase
- Earnings available for common equity
- Common dividends paid
- Retained earnings
- Common stock issued
- Preferred stock issued
- Long-term debt issued
- Short-term debt issued
- Short-term debt interest payments
- Increase (or decrease) in net working capital
- Federal and state income taxes paid

- Gross revenue taxes paid
- Property taxes paid
- Investment tax credit (ITC) earned on investments
- Portion of the ITC which was deferred (under normalized accounting)
- Portion of the ITC which was used to reduce taxes on the books (normalized accounting)
- The tax deferral resulting from accelerated depreciation (normalized accounting)

Selection of Income Calculation Method

When using the Finance Module, the user must specify whether the financial projections will be based on the attainment of a user-specified return on equity, return on ratebase, or operating revenue.

If the return on common equity is chosen, the user must specify the percent return on average equity for each year of the forecast period. Net income is calculated such that, when preferred dividends are subtracted, earnings available for common stock yield the specified return on equity.

If the return on ratebase option is chosen, the user must specify the percent return on the ratebase and the components which make up the ratebase. Net income is calculated such that the after-tax operating income yields the specified return on the ratebase. The rate-base is calculated by adding to net plant value a user-specified dollar figure representing any other items to be included in the ratebase and by subtracting a user-specified portion (0 percent to 100 percent) of cumulative deferred income taxes.

Finally, if the operating revenue option is chosen, the user must specify the target operating revenue for each year of the forecast period and the actual operating revenue of the years past. The net income is then computed as the operating revenue less all operations and maintenance expenses, depreciation, taxes, and interest charges.

Selection of Accounting Method

In addition to selecting the method of income calculation, the user must specify the method of accounting to be used in making the financial projections. When flow-through accounting has been specified, any tax deferrals resulting from differences in tax and book depreciation are passed on to customers. Under normalized accounting, these tax deferrals are retained by the utility and not immediately passed on to customers. Instead, the saving realized by the utility is amortized, or normalized, over a period of years which is specified by the user, and is usually equal to the life of the asset which generates the tax deferral.

As stated above, the difference between flow-through and normalized accounting in RAMTEL only affects the income tax deferrals from accelerated depreciation. The user should be sure to check the accounting practices of the company being modeled and modify the model if accounting practices differ.

Calculation of Financial Items

The basis for the financial calculations in the Finance Module is the attainment of an income figure derived from the user-specified rate of return on ratebase or on common equity. The Finance Module calculates the information necessary to develop an income statement from the bottom up. That is, net income is calculated first, then income taxes, interest, other income, operating income, operating expenses, and finally the desired operating revenues are calculated.

The calculations are, for the most part, straightforward and simple. After subtracting preferred dividends (calculated by the Fixed Obligations Module) from net income, the remaining income is allocated between retained earnings and common dividends, using a user-specified ratio. Working up the income statement, income taxes are calculated using the prevailing federal and state income tax rate and the after tax net income (less any non-taxable income, such as AFDC). This calculation is somewhat complicated because the adjustments must be made for various non-taxable items such as tax deferral items and ITCs. The amount of investment tax credit is calculated as a percent of the cash construction expenditures for the year, less a portion assumed to be ineligible for ITC (e.g., buildings, land, etc.). By adding net income and taxes paid and subtracting ITC, earnings before taxes (EBT) are determined. (Note that the entire ITC is taken for tax reporting in the year it is earned.) Adding in the long-term debt interest calculated by the Fixed Obligations Module and the interest on short-term debt calculated by the Finance Module (a given interest rate times the average short-term debt for the year) to EBT gives earnings before interest and taxes (EBIT). Subtracting other income calculated by the Plant Module and any user-specified equity earnings in subsidiary companies from EBIT yields operating income.

To determine operating revenues, the various expenses must be added to the operating income. The O&M expenses are provided by the Performance Module. Depreciation charges are calculated by the Plant Module. The remaining expense item, other taxes, is calculated by the Finance Module as a percent of average gross plant, excluding AFDC, and of operating revenues (franchise, payroll, and miscellaneous taxes).

As the Finance Module calculates the items on the income statement, the calculations necessary to develop the other two basic financial statements, the balance sheet, and sources and uses of funds, are performed. The capital expenditures and AFDC computed in the Plant Module require financing from internal sources (retaining earnings, tax deferrals) and external sources (long- and short-term debt, preferred and common stock). Funds required in excess of internally generated funds are financed first through the issuance of short-term debt to a user-specified limit, then through the issuance of a user-specified mix of long-term debt, common stock, and preferred stock. If there exists internally generated funds in excess of expenditures, short-term debt will be reduced to a user-specified minimum, and any remaining funds will be put into the net working capital account.

Report Module: Generation of Financial Statements and Other Reports

The last part of the RAMTEL is the Report Module. The Report Module receives all the information calculated by the Finance, Fixed Obligations, and Performance Modules and displays these data in various user-specified reports. At present, the user has the option of printing income statements, balance sheets, sources and uses of funds statements, O&M expense projections, regression summaries, productivity analysis reports, and supplementary variables reports. The Report Module allows the user to print these reports for any year or years over the forecast period in either constant or current dollars. The user also has the option of specifying which lines of certain reports are to be printed.

The Report Module is designed to allow the user to add additional reports as the need arises. The user need only specify the data elements to be in the report and the column and row heading. The details of this procedure may be found in Part III.

The reports now available to the user are those which will be of the most use to regulatory commissions and utilities. The income statement (exhibit 2) is similar in format to the FCC Form M, and most utilities' annual reports. The income statement shows the various operating expenses, capital expenses and taxes, and the revenues which are required to meet those expenses and still yield a given net income or return on common equity.

The sources and uses of funds statement (exhibit 3) is useful in determining the cash flow of a utility. The various sources of cash (e.g., retained earnings, external financing, depreciation, etc.) are shown along with the uses of funds (capital expenditures, etc.), allowing the user to see explicitly how a utility may be expected to meet its future financial obligations.

The balance sheet (exhibit 4) is a summary of all the financial transactions shown on the sources and uses of funds statement. From it the user may track the changes in capitalization and asset value of a utility.

The O&M expense report (exhibit 5) shows the future values of each O&M account and the method and coefficients used to calculate the O&M values. It also shows the correlation coefficient squared, r^2, and the standard deviation of values for individual accounts. Both the projected values and the historical values on which the projection was based are shown. In addition to the O&M expense report, the user may have the historical and projected O&M values graphed in current or constant (uninflated) dollars (exhibit 6). Up to five O&M expense accounts may be plotted on the same graph for comparison purposes. This allows a visual comparison of O&M accounts within a utility or between utilities.

EXHIBIT 2

INCOME STATEMENT

COMPANY ABC
FILE NO. 1
DATE 6/24/87

ABC TELEPHONE COMPANY
INCOME STATEMENT

MILLIONS OF CURRENT DOLLARS

DECEMBER 31.	1970	1971	1972	1973	1974	1975
OPERATING REVENUES	561.08	605.37	634.27	710.06	820.16	857.68
-OPERATION	175.97	194.03	211.22	230.66	253.06	291.20
-MAINTENANCE	124.01	141.11	156.46	170.94	191.08	208.31
-DEPRECIATION	81.32	89.55	98.61	108.36	118.59	128.27
TOTAL OPERATING EXPENSES	381.30	424.69	466.29	509.96	562.73	627.78
-OP REVENUE TAX	13.75	17.01	18.39	18.96	22.06	25.04
-PROPERTY TAX	35.00	40.26	43.07	47.98	52.09	52.24
-INCOME TAX PAID	47.04	36.96	15.10	18.37	35.35	2.95
-DEFERRED INCOME TAX	6.98	12.42	17.08	22.50	27.10	30.27
-DEF INVEST TAX CREDIT	0.51	1.14	6.34	6.76	7.95	19.16
TOTAL EXPENSES	484.58	532.48	566.28	624.51	707.30	757.44
OPERATING INCOME	76.50	72.89	67.99	85.55	112.86	100.24
+OTHER INCOME	4.36	6.24	6.24	7.38	7.15	6.14
+AFDC	0.00	0.00	0.00	0.00	0.00	0.00
INCOME BEFORE INTEREST	80.86	79.12	74.23	92.93	120.01	106.38
-INTEREST ON LTD	14.46	21.47	25.64	31.47	37.70	40.41
-INTEREST ON STD	4.49	0.57	3.79	6.52	1.19	2.25
NET INCOME	61.92	57.08	44.80	54.94	81.12	63.73
-PREFERRED DIVIDENDS	0.00	0.00	0.00	0.00	0.00	0.00
EARNINGS AVAIL COMM	61.92	57.08	44.80	54.94	81.12	63.73
-COMMON DIVIDENDS	57.12	66.56	65.29	67.09	79.74	85.84
RETAINED EARNINGS	4.80	-9.48	-20.49	-12.16	1.39	-22.11

EXHIBIT 3

SOURCES AND USES OF FUNDS REPORT

COMPANY ABC
FILE NO. 1
DATE 6/24/87

ABC TELEPHONE COMPANY
SOURCES AND USES OF FUNDS

MILLIONS OF CURRENT DOLLARS

DECEMBER 31,	1970	1971	1972	1973	1974	1975
SOURCES						
INTERNAL						
NET INCOME	61.92	57.08	44.80	54.94	81.12	63.73
DEPRECIATION	81.32	89.55	98.61	108.36	118.59	128.27
DEFERRED INCOME TAXES	6.98	12.42	17.08	22.50	27.10	30.27
DEF INVEST TAX CREDIT	0.51	1.14	6.34	6.76	7.95	19.16
TOTAL INTERNAL	150.73	160.19	166.84	192.55	234.76	241.42
EXTERNAL						
COMMON STOCK	110.04	17.23	14.24	89.07	137.62	20.27
PREFERRED STOCK	0.00	0.00	0.00	0.00	0.00	0.00
LONG TERM DEBT	114.19	128.27	28.48	164.71	36.04	40.55
SHORT TERM DEBT	-102.88	1.41	105.90	-102.54	-8.38	59.03
TOTAL EXTERNAL	121.35	146.91	148.61	151.24	165.28	119.85
TOTAL SOURCES	272.08	307.10	315.45	343.80	400.04	361.27
USES						
GR PLANT ADDITIONS +AFDC	191.50	234.52	246.66	287.08	302.78	290.76
CWIP INCREMENT	17.56	8.23	15.11	-9.03	-2.04	-18.08
TOTAL CONST EXPENDITURES	209.06	242.75	261.77	278.04	300.74	272.68
PREFERRED DIVIDENDS	0.00	0.00	0.00	0.00	0.00	0.00
COMMON DIVIDENDS	57.12	66.56	65.29	67.09	79.74	85.84
DEBT RETIREMENT	0.00	0.00	0.00	0.00	0.00	0.00
PREF RETIREMENT	0.00	0.00	0.00	0.00	0.00	0.00
NET INCR WORKING CAPITAL	5.90	-2.21	-11.61	-1.34	19.56	2.75
TOTAL USES	272.08	307.10	315.45	343.80	400.04	361.27

EXHIBIT 4

BALANCE SHEET

COMPANY ABC
FILE NO. 1
DATE 6/24/87

ABC TELEPHONE COMPANY
BALANCE SHEET

MILLIONS OF CURRENT DOLLARS

DECEMBER 31,	1970	1971	1972	1973	1974	1975
ASSETS						
GR PLANT INS (INCL AFDC)	1606.28	1777.23	1951.62	2148.83	2341.53	2518.47
-ACCUM DEPREC	413.59	439.58	465.92	484.42	492.92	507.38
NET PLANT VALUE	1192.69	1337.66	1485.70	1664.41	1848.60	2011.09
+CWIP	72.32	80.55	95.66	86.63	84.59	66.51
NET UTILITY PLANT	1265.01	1418.21	1581.36	1751.04	1933.20	2077.60
+ASSETS N.E.C.	110.61	118.45	125.10	140.50	154.61	160.20
TOTAL ASSETS	1375.62	1536.66	1706.46	1891.55	2087.80	2237.80
LIABILITIES						
COMMON STOCK	720.04	737.28	751.51	840.58	978.20	998.47
+RETAINED EARNINGS	143.57	134.09	113.61	101.45	102.84	80.72
TOTAL COMMON EQUITY	863.61	871.37	865.12	942.03	1081.04	1079.20
+PREFERRED STOCK	0.00	0.00	0.00	0.00	0.00	0.00
+LONG TERM DEBT	339.69	467.96	496.44	661.15	697.19	737.74
TOTAL CAPITAL	1203.31	1339.33	1361.56	1603.18	1778.23	1816.93
+SHORT TERM DEBT	11.25	12.66	118.55	16.02	7.63	66.66
+ACCUM DEF INCOME TAXES	6.98	19.39	36.48	58.98	86.08	116.35
+ACCUM DEF INV TAX CR	15.00	16.14	22.49	29.24	37.19	56.35
+LIABILITIES N.E.C.	139.09	149.13	167.38	184.13	178.67	181.50
TOTAL LIABILITIES	1375.62	1536.66	1706.46	1891.54	2087.80	2237.79

EXHIBIT 5

O&M PROJECTION TABLE

LEGEND:

```
* =     ACCOUNT-  6Ø2          FILE- LABC 2
        COMPANY- ABC           DATE-  6/2Ø/87

   REPAIRS OF OUTSIDE PLANT

        MULTIVARIATE LINEAR REGRESSION
        N = -7312.72      + Ø.137237E-Ø2*<1ØØ4>
        R-SQUARED OF Ø.932Ø BASED ON 1Ø POINTS, WITH STD DEV OF   972.ØØ22

+ =     ACCOUNT-  6Ø3          FILE- LABC 2
        COMPANY- ABC           DATE-  6/2Ø/87

   TEST DESK WORK

        MULTIVARIATE LINEAR REGRESSION
        N = -9235.79      + -.724463E-Ø2*<1ØØ1>
                          +  48.Ø97Ø     *<1ØØ3>
                          + Ø.124532E-Ø2*<1ØØ4>

        R-SQUARED OF Ø.9872 BASED ON 1Ø POINTS, WITH STD DEV OF   284.8274

   NOTE: SYMBOLS MAY MASK EACH OTHER IN DESCENDING ORDER
```

ANNUAL ACCOUNT DATA:

DEC 31, ACCOUNT	196Ø	1961	1962	1963	1964	1965	1966	1967	1968	1969	197Ø
6Ø2	98Ø9.43	1ØØ93.4Ø	9947.91	9839.44	11383.37	13226.65	13826.Ø9	14477.ØØ	16517.89	2Ø437.26	21Ø54.94
6Ø3	3829.76	4141.45	4319.72	4392.79	5225.82	5931.66	6792.59	7754.34	8521.12	9712.35	9291.41

DEC 31, ACCOUNT	1971	1972	1973	1974	1975	1976	1977	1978	1979	198Ø	1981
6Ø2	23Ø37.23	25Ø13.12	27531.86	29649.66	3Ø696.72	31736.93	33617.Ø5	35114.38	36479.55	37546.46	38595.41
6Ø3	12845.26	137Ø8.62	15413.5Ø	17Ø43.12	1758Ø.32	18572.34	19728.41	2Ø8Ø1.12	21943.18	23Ø71.Ø7	24814.83

EXHIBIT 6

O&M PROJECTION GRAPH

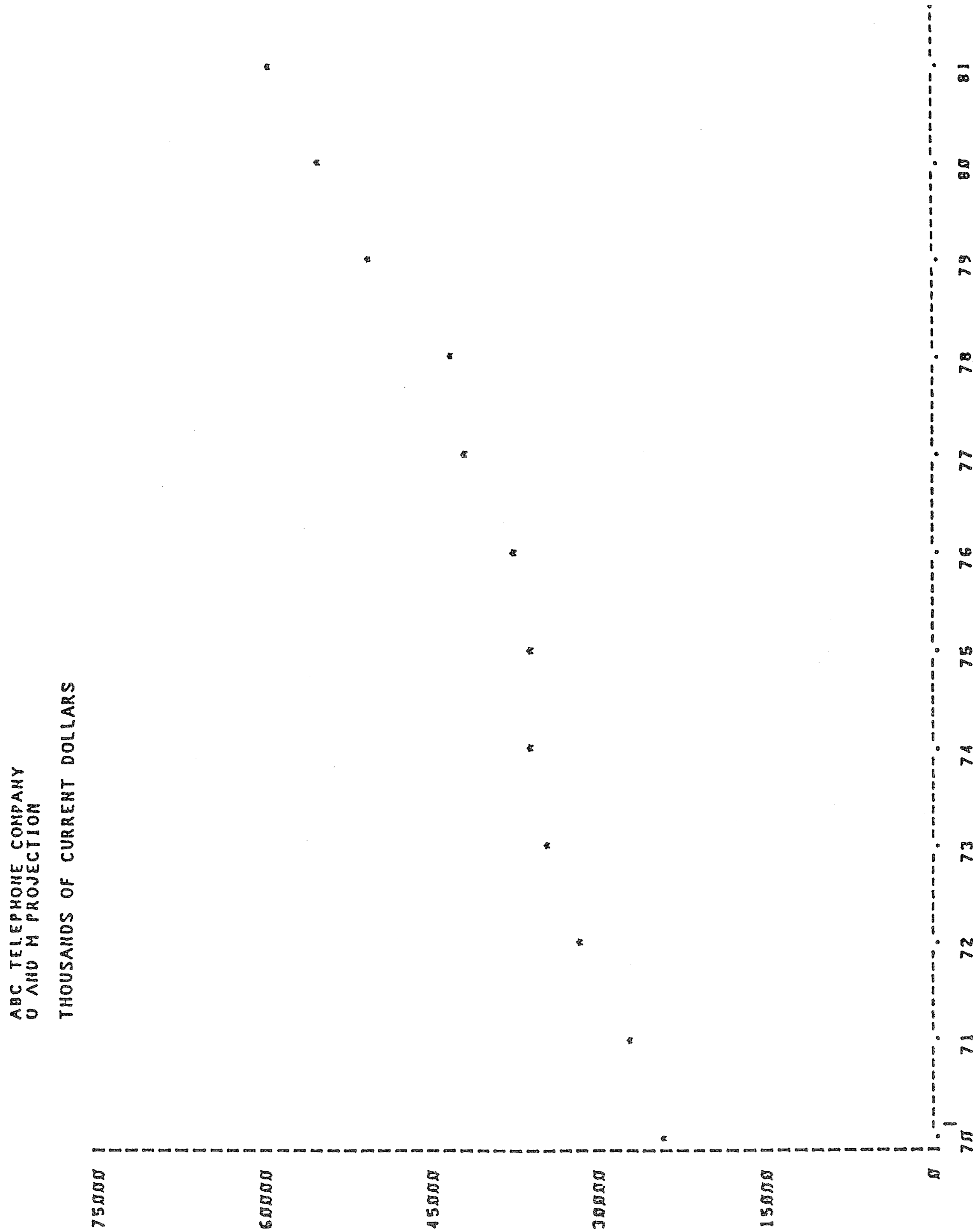


Exhibit 7 shows a report not mentioned so far, the Master Data File report. This report is intended only as an aid to the user in tracking down input errors. The report displays all the items contained in the main output data file of the Finance Module, including all the items which make up the other reports shown in the preceding exhibits. In addition, the top line describes the accounting method used in generating the data. In this report, as with the others, the user may specify whether the whole report is to be printed, or just certain lines and/or years. Appendix C lists all of the elements in the Master Data file and relates them both to the model equations in appendix B and to the values presented in the three financial statements.

The regression summary report (exhibit 8) summarizes that information found in the O&M expense report. The coefficients listed for each specified account may be used as comparative indicators of production performance. This report also relates the regression method used, the number of points plotted and the R-squared, standard deviation of values for each account and standard error of each regression coefficient. By specifying several different five-year periods, the regression summary report may be examined for accurate processing by comparing the account values against those recorded in the historical data file. A five-year period must be specified if the default years are not used.

The productivity analysis report (exhibit 9) shows the actual versus the projected productivity performance for a chosen account. The change in projected productivity is separated into that portion attributable to changes in output as well as an inflationary-caused portion.

The supplementary variables report (exhibit 10) lists financial items which would be of interest to analysts for evaluating the financial health of the utility. These items include interest coverage ratios, capitalization ratios, and internal funds as a fraction of total financial capital.

The Report Module is not limited to just printing reports of data calculated by the Finance Module. The Report Module may access the output file of any of the RAMTEL components and use it as the basis for a report.

EXHIBIT 7

MASTER DATA FILE

ABC TELEPHONE COMPANY
MASTER DATA FILE

MILLIONS OF CURRENT DOLLARS

DECEMBER 31.	1970	1971	1972	1973	1974	1975
FILE. SUFFIX. DATE. ETC.	MABC	1	62487	TELE	PHON	E CO
INBASE ACMETH DCMETH BSYR	ROE	NORM	DPR	1969.	1	LABC
GNP DEFLATOR	1.00	1.00	1.00	1.00	1.00	1.00
GROSS PLANT IN SERVICE	1606.28	1777.23	1951.62	2148.83	2341.53	2518.47
CONST WORK IN PROGRESS	72.32	80.55	95.66	86.63	84.59	66.51
ACCUM DEPRECIATION	413.59	439.58	465.92	484.42	492.92	507.38
DEPREC THIS PER (ACCEL)	95.86	115.41	134.20	155.23	175.05	191.33
NET WORKING CAPITAL CUM	-28.47	-30.68	-42.29	-43.62	-24.06	-21.31
CUM COMMON STK ISSUED	720.04	737.28	751.51	840.58	978.20	998.47
COM STK ISSUED THIS PER	110.04	17.23	14.24	89.07	137.62	20.27
CUM RET EARNINGS GENER	143.57	134.09	113.61	101.45	102.84	80.72
RET EARNINGS GEN THIS PER	4.80	-9.48	-20.49	-12.16	1.39	-22.11
CUM PREF STK ISSUED	0.00	0.00	0.00	0.00	0.00	0.00
PREF STK ISSUED THIS PER	0.00	0.00	0.00	0.00	0.00	0.00
CUM LONG TERM DEBT	339.69	467.96	496.44	661.15	697.19	737.74
LNG TRM DBT ISS THIS PER	114.19	128.27	28.48	164.71	36.04	40.55
LNG TRM DBT REF THIS PER	0.00	0.00	0.00	0.00	0.00	0.00
CUM SHORT TERM DEBT	11.25	12.66	118.55	16.02	7.53	66.56
SHT TRM DBT ISS THIS PER	-102.88	1.41	105.90	-102.54	-8.38	59.03
CUM INC TAX DEFERRALS	6.98	19.39	36.48	58.98	86.08	116.35
INC TAX DEF THIS PER	6.98	12.42	17.08	22.50	27.10	30.27
CUM AFDC CAPITALIZED	0.00	0.00	0.00	0.00	0.00	0.00
AFDC CAPITALIZED THIS PER	0.00	0.00	0.00	0.00	0.00	0.00
OPERATING REVENUES	561.08	605.37	634.27	710.06	820.16	857.68
OPERATION EXPENSE	175.97	194.03	211.22	230.66	253.06	291.20
MAINTENANCE EXPENSE	124.01	141.11	156.46	170.94	191.08	208.31
DEPREC EXPENSE (STR LIN)	81.32	89.55	98.61	108.36	118.59	128.27
STATE INCOME TAXES	0.00	0.00	0.00	0.00	0.00	0.00
FEDERAL INCOME TAXES	47.04	36.96	15.10	18.37	35.36	2.95
OPERATING-REVENUE TAXES	13.75	17.01	18.39	18.96	22.06	25.04

EXHIBIT 7--continued

MASTER DATA FILE

OTHER INCOME	4.36	6.24	6.24	7.38	7.13	6.14
ALLOW FUNDS DURING CONST	0.00	0.00	0.00	0.00	0.00	0.00
INT EXP LONG TERM DEBT	14.46	21.47	25.64	31.47	37.70	40.41
INT RATE LTD AVERAGE	5.35	5.83	5.74	5.79	5.86	5.92
INT RATE LTD END OF PER	5.97	5.73	5.75	5.82	5.89	5.96
DIVIDEND EXP PREF STOCK	0.00	0.00	0.00	0.00	0.00	0.00
INT RATE PREF STK AVERAGE	0.00	0.00	0.00	0.00	0.00	0.00
INT RATE PREF STK END PER	0.00	0.00	0.00	0.00	0.00	0.00
INT EXP SHORT TERM DEBT	4.49	0.57	3.79	6.52	1.19	2.25
FRACTION ITC NOT IN RATE BASE	0.0000	0.0000	0.0000	0.0000	0.0000	0.00
COMMON DIVIDENDS	57.12	66.56	65.29	67.09	79.74	85.84
RETIREMENTS	49.06	63.56	72.27	89.86	110.08	113.82
FRACTION CWIP IN RATE BASE	0.0000	0.0000	0.0000	0.0000	0.0000	0.00
FR DEFERRAL NOT IN RATE BASE	0.0000	0.0000	0.0000	0.0000	0.0000	0.00
NET INCOME	61.92	57.08	44.80	54.94	81.12	63.73
INVESTMENT TAX CREDIT	1.87	2.27	7.81	8.36	10.27	22.51
INVEST TAX CREDIT AMORT	1.36	1.13	1.47	1.61	2.32	3.35
CAPITAL EXPENDITURE PLANT	191.50	234.52	246.66	287.08	302.78	290.76
SINKG FUND PAY THIS PER	0.00	0.00	0.00	0.00	0.00	0.00
CONSTRUCT EXPEND PLANT	209.06	242.75	261.77	278.04	300.74	272.68
NET WORK CAPITAL THIS PER	5.90	-2.21	-11.61	-1.34	19.56	2.75
DEPRECIATION AFDC - CUM	0.00	0.00	0.00	0.00	0.00	0.00
INVEST TAX CREDIT CUMUL	15.00	16.14	22.49	29.24	37.19	56.35
INVEST TAX CREDIT DEFERRED	0.51	1.14	6.34	6.76	7.95	19.16
AFDC - CUM IN CWIP	0.00	0.00	0.00	0.00	0.00	0.00
DEPREC AFDC - THIS PER	0.00	0.00	0.00	0.00	0.00	0.00
RATE BASE	1137.60	1265.17	1411.68	1575.06	1756.51	1929.85
NET WKG CAP IN RATE BASE	0.00	0.00	0.00	0.00	0.00	0.00
PROPERTY TAXES	35.00	40.26	43.07	47.96	52.09	52.24
MAXIMUM SHORT-TERM DEBT	112.50	126.56	142.38	160.18	180.20	202.73
BOOK VALUE PER SHARE	0.00	0.00	0.00	0.00	0.00	0.00
NUMBER OF COMMON SHARES	6996485.	7136095.	7252697.	7999385.	9167994.	9339921.
DIVIDEND PAYOUT RATIO	0.92	1.17	1.46	1.22	0.98	1.35
MARKET-TO-BOOK RATIO	1.00	1.00	1.00	1.00	1.00	1.00
CURRENT LIABILITIES N.E.C.	139.09	149.13	167.38	184.13	178.67	181.50
TAXABLE INCOME - FEDERAL	101.91	81.73	47.74	55.69	95.07	53.05
TAXABLE INCOME - STATE	0.00	0.00	0.00	0.00	0.00	0.00

EXHIBIT 8

REGRESSION SUMMARY REPORT

ABC TELEPHONE COMPANY DATE: 62087

COEFFICIENTS OF REGRESSION, LINE-BY-LINE SUMMARY

CURRENT DOLLARS

ACCOUNT	1960	1961	1962	1963	1964	M/PT	EXOGEN	COEFFICIENT	SCALE	RSQUARED	STD DEV	STD ERR
602	9809.43	10093.40	9947.91	9839.44	11383.37	2 10		-7312.72	10**3	0.93199	972.00	1960.1
							<1004>	0.137237E-02	10**3			0.13107E-03
603	3829.76	4141.45	4319.72	4392.79	5225.82	2 10		-9235.79	10**3	0.98718	284.83	3395.9
							<1001>	-.724463E-02	10**3			0.65893E-02
							<1003>	48.0970	10**3			40.270
							<1004>	0.124532E-02	10**3			0.55828E-03
604	13408.89	14174.31	15335.80	16282.93	18279.76	2 10		-43512.9	10**3	0.96424	1257.3	4378.5
							<1003>	149.308	10**3			10.166
605	19131.61	19779.98	20620.59	21387.64	23603.60	2 10		-25597.5	10**3	0.97694	1077.1	2847.1
							<1001>	0.158897E-01	10**3			0.86322E-03
606	1117.79	1201.78	1208.99	1313.76	1432.25	2 10		-4392.88	10**3	0.86010	251.90	877.22
							<1003>	14.2828	10**3			2.0368
610	812.44	925.11	983.15	1055.04	1102.10	2 10		-160.393	10**3	0.98160	32.056	64.641
							<1004>	0.893026E-04	10**3			0.43227E-05
612	424.45	531.46	593.78	800.92	159.52	2 10		6197.65	10**3	0.81428	114.84	1197.4
							<1003>	-27.3435	10**3			6.3419
							<1004>	0.397590E-03	10**3			0.10577E-03
621	4450.69	4519.60	4442.97	4420.60	4618.52	2 10		5907.57	10**3	0.93350	213.31	2954.8
							<1002>	0.191593E-04	10**3			0.69202E-05
							<1003>	-10.4827	10**3			9.8670
622	1123.31	1284.22	1388.77	1522.34	1783.93	2 10		-1081.08	10**3	0.95333	82.994	219.37
							<1001>	0.850270E-03	10**3			0.66512E-04
624	22829.01	22242.57	22955.01	23311.80	24037.37	2 10		11444.4	10**3	0.98022	732.61	818.13
							<1002>	0.827229E-04	10**3			0.41546E-05
626	346.28	303.99	320.14	272.37	257.85	2 10		496.000	10**3	0.19952	44.854	156.20
							<1003>	-.511766	10**3			0.36268
627	1023.06	822.30	782.11	856.32	1009.07	2 10		142.579	10**3	0.85302	125.00	1731.5
							<1002>	0.421572E-05	10**3			0.40552E-05
							<1003>	0.437562	10**3			5.7820
629	682.78	666.44	653.96	652.93	765.57	2 10		-387.598	10**3	0.70761	75.877	264.23
							<1003>	2.69934	10**3			0.61353
630	245.77	222.64	200.74	191.71	200.56	2 10		28.5302	10**3	0.36801	26.538	92.416
							<1003>	0.463076	10**3			0.21458
631	391.19	441.42	442.43	488.49	628.87	2 10		-2615.59	10**3	0.97645	53.274	185.52
							<1003>	7.84471	10**3			0.43077

EXHIBIT 8--continued

REGRESSION SUMMARY REPORT

632	214.46	221.58	67.91	58.89	59.25	2	1Ø		395.371	1Ø**3	Ø.43124	54.442	125.Ø8
								<1ØØ5>	-.696182E-Ø2	1Ø**3			Ø.28269E-Ø2
633	27454.ØØ	24632.ØØ	14171.ØØ	13639.ØØ	13565.ØØ	2	1Ø		179283.	1Ø**Ø	Ø.52682	6799.6	94186.
								<1ØØ2>	Ø.48ØØ86E-Ø3	1Ø**Ø			Ø.22Ø59E-Ø3
								<1ØØ3>	-578.3Ø4	1Ø**Ø			314.52
634	4Ø1.85	398.Ø2	4Ø9.62	46Ø.5Ø	456.21	2	1Ø		-8Ø5.121	1Ø**3	Ø.67182	61.114	846.54
								<1ØØ2>	-.443789E-Ø5	1Ø**3			Ø.19826E-Ø5
								<1ØØ3>	4.72273	1Ø**3			2.8269
64Ø	3569.28	4126.8Ø	44Ø4.45	4445.95	47ØØ.49	2	1Ø		5587.61	1Ø**3	Ø.95549	226.65	3188.8
								<1ØØ1>	Ø.516333E-Ø2	1Ø**3			Ø.35561E-Ø2
								<1ØØ2>	Ø.942528E-Ø5	1Ø**3			Ø.1Ø614E-Ø4
								<1ØØ3>	-45.215Ø	1Ø**3			27.144
								<1ØØ5>	Ø.49Ø969E-Ø1	1Ø**3			Ø.6Ø6Ø3E-Ø2
649	9Ø69.36	9133.46	9637.87	1Ø361.95	1Ø353.98	2	1Ø		-1164.17	1Ø**3	Ø.98491	2Ø2.99	536.54
								<1ØØ1>	Ø.371662E-Ø2	1Ø**3			Ø.16267E-Ø3
65Ø	7613.ØØ	1Ø133.ØØ	12178.ØØ	1ØØ85.ØØ	4512.ØØ	2	1Ø		-8796.8Ø	1Ø**Ø	Ø.2415Ø	4587.6	12126.
								<1ØØ1>	Ø.586747E-Ø2	1Ø**Ø			Ø.36765E-Ø2
666	15446.43	15865.4Ø	16813.31	17963.28	192Ø5.13	2	1Ø		2ØØ1Ø.6	1Ø**3	Ø.98672	635.Ø7	8935.Ø
								<1ØØ1>	Ø.462866E-Ø2	1Ø**3			.Ø.99643E-Ø2
								<1ØØ2>	Ø.963736E-Ø4	1Ø**3			Ø.29739E-Ø4
								<1ØØ3>	-76.784Ø	1Ø**3			76.Ø56
68Ø	13523.38	14419.69	14742.22	15292.58	18883.89	2	1Ø		-166Ø3.4	1Ø**3	Ø.99Ø62	734.3Ø	1Ø331.
								<1ØØ1>	-.1628Ø5E-Ø1	1Ø**3			Ø.11521E-Ø1
								<1ØØ2>	Ø.1Ø5Ø82E-Ø3	1Ø**3			Ø.34386E-Ø4
								<1ØØ3>	164.48Ø	1Ø**3			87.941
642	1846.48	1837.54	1882.84	1957.Ø6	2Ø63.89	2	1Ø		-1Ø81.Ø9	1Ø**3	Ø.84512	19Ø.77	5Ø4.25
								<1ØØ1>	Ø.1Ø1ØØ7E-Ø2	1Ø**3			Ø.15288E-Ø3
643	3663.14	355Ø.26	3952.63	38Ø2.24	3452.79	2	1Ø		3786.98	1Ø**3	Ø.ØØ761	311.2Ø	822.58
								<1ØØ1>	-.599416E-Ø4	1Ø**3			Ø.2494ØE-Ø3
644	273.86	281.37	295.Ø3	312.Ø4	323.75	2	1Ø		-1Ø9.948	1Ø**3	Ø.9756Ø	9.6547	25.519
								<1ØØ1>	Ø.138385E-Ø3	1Ø**3			Ø.77373E-Ø5
645	7738.94	7931.27	7871.55	8581.5Ø	9138.84	2	1Ø		-7634.69	1Ø**3	Ø.9698Ø	421.48	1114.1
								<1ØØ1>	Ø.5414Ø7E-Ø2	1Ø**3			Ø.33778E-Ø3
648	18Ø1.63	1855.95	1879.91	2ØØ1.38	2122.87	2	1Ø		66.397Ø	1Ø**3	Ø.89135	116.71	268.15

EXHIBIT 9

PRODUCTIVITY ANALYSIS REPORT

ABC TELEPHONE COMPANY   DATE: 62087

PRODUCTIVITY ANALYSIS

CURRENT DOLLARS

YEAR	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
DEFLATOR	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
INFLATOR	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
OUTPUT 1004	11607050.	12106653.	12740355.	13368713.	14069202.	14787262.	15639947.	16580654.	17689856.	19101008.	20670624.
NORMALIZED	1.0000	1.0430	1.0976	1.1518	1.2121	1.2740	1.3475	1.4285	1.5241	1.6456	1.7809
ACCOUNT 602	9809.43	10093.40	9947.91	9839.44	11383.37	13226.65	13826.09	14477.00	16517.89	20437.26	21054.94
PROJECTION	9809.43	10231.65	10767.21	11298.25	11890.25	12497.11	13217.73	14012.75	14950.17	16142.77	17469.29
OUTPUT CHANGE	0.00	422.22	528.32	490.62	515.56	580.98	762.69	831.60	968.47	1317.65	1679.40
INFLTN CHANGE	0.00	0.00	145.49	859.72	1535.25	532.76	-771.61	-644.94	-495.31	-1692.77	-4647.36
PRDTVY CHANGE	0.00	138.25	819.30	1458.81	506.88	-729.54	-608.36	-464.25	-1567.72	-4294.49	-3585.65
PCT CHG PRDVY	0.00	1.37	8.24	14.83	4.45	-5.52	-4.40	-3.21	-9.49	-21.01	-17.03

EXHIBIT 10

SUPPLEMENTARY VARIABLES REPORT

COMPANY ABC
FILE NO. 1
DATE 6/24/87

ABC TELEPHONE COMPANY
SUPPLEMENTARY FINANCIAL VARIABLES

DECEMBER 31,	1970	1971	1972	1973	1974	1975
RETURN ON RATEBASE (PCT)	6.73	5.76	4.82	5.43	6.43	5.19
RETURN ON COMMON EQUITY (PCT)	7.68	6.58	5.16	6.08	8.02	5.90
EARNINGS PER SHARE COMMON	0.00	0.00	0.00	0.00	0.00	0.00
COMMON DIVIDENDS PER SHARE	0.00	0.00	0.00	0.00	0.00	0.00
COMMON DIV PAYOUT RATIO (PCT)	92.25	116.60	145.73	122.13	98.29	134.70
DIVIDEND YIELD (PCT)	7.07	7.71	7.61	7.47	7.88	8.03
NUMBER OF COMMON SHARES	6996485.	7136095.	7252697.	7999385.	9167994.	9339921.
BOOK VALUE PER SHARE COMMON	0.00	0.00	0.00	0.00	0.00	0.00
MARKET PRICE PER SHARE	0.00	0.00	0.00	0.00	0.00	0.00
MARKET-TO-BOOK RATIO	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
INTEREST COVERAGE RATIO						
INCLUDING AFDC	6.92	5.60	3.62	3.51	4.71	3.58
EXCLUDING AFDC	6.92	5.60	3.62	3.51	4.71	3.58
INCLUDING AFDC W/LIMIT	6.92	5.60	3.62	3.51	4.71	3.58
INT+PREF DIV COVER(EXCL AFDC)	6.92	5.60	3.62	3.51	4.71	3.58
CASH FLOW DIVIDEND COVERAGE	2.64	2.41	2.56	2.87	2.94	2.81
CAPITALIZATION RATIOS						
LONG-TERM DEBT/CAPITAL	0.2823	0.3494	0.3646	0.4124	0.3921	0.4060
COMMON EQUITY/CAPITAL	0.7177	0.6506	0.6354	0.5876	0.6079	0.5940
PREFERRED STOCK/CAPITAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
AFDC FRAC EARN AVAIL COMMON	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
INTERN FUNDS/TOTAL FINANCING	0.0804	0.0714	0.0692	0.0764	0.0843	0.0794
INTERN FUNDS/CONSTR EXP(3YR)	0.4047	0.4097	0.4545	0.5121	0.6255	0.7858
CONSTRUCT EXP(3YR)/GPV(1YR)	0.4875	0.4872	0.4730	0.4363	0.3841	0.3361

Difference Module

As has been discussed earlier, RAMTEL can be used to compare the effect of various regulatory alternatives and financial parameters. For example, the user could compare the effect of alternative regulatory treatments (normalized or flow-through) of deferred taxes on after-tax income. One could also test the effect of varying interest rates on net income. The pro forma financial statements and the Master File can be used to carry out any desired sensitivity analysis. To help the user in this task further, RAMTEL has an additional module, namely the Difference Module (DIFFER), which can be used to compare the entries in the Master File. DIFFER can be used to construct a master file whose entries are the differences between corresponding entries of two master files. In addition to comparing the effect of alternative regulatory or accounting treatments on a single utility, one can use DIFFER to make financial comparisons of two different utilities.

CHAPTER 4
HOW TO USE RAMTEL

To use RAMTEL, the user must perform a number of tasks in the proper order. The user must:

- collect the data necessary for input
- put the data in the proper form
- load the data into the model input files
- run the model
- print reports, and
- analyze the results

A brief description of each step follows.

Collect Input Data

The majority of the data required to run RAMTEL are available from public sources. The most useful sources are the FCC Form M, annual reports to stockholders, and a utility's most recent stock or bond prospectus. The data obtained from these sources include:

- historic operations and maintenance account data
- interest rates
- assets and liabilities
- depreciation rates
- capacity additions
- effective tax rates and
- dividend payout ratio

In addition to the publicly available data, the model requires some data which in most cases must be obtained from the utility. These data include:

- proposed capital budget for the forecast period
- plant retirement, and
- expected capital structure

Format Input Data

Unfortunately, both the publicly-available data and the data provided by the utilities will vary in form, content, and scope for each utility. As a result, all input data must first be checked by the user to insure that it conforms to the input requirements of RAMTEL. For example, if a utility has an operating subsidiary, the input data must be checked to determine if it is consistent, either including or excluding the subsidiary. Many utilities publish financial reports on both a consolidated basis (including subsidiaries) and a corporate basis (excluding subsidiaries). The user must make sure all the input data cover the same scope of a utility's operations.

The model assumes that the input data will be properly scaled (e.g., in millions of dollars or thousands of dollars, as is appropriate for each data item), so the user must check each item and, if necessary, perform the calculations to properly scale each item.

Finally, the user may need to calculate a few rates and parameters from the various data sources. These include the tax depreciation schedules, return on average common equity, etc. (The source, scaling, and explanation of each data element may be found in Part II.)

Load the Data Into Model Input Files

This step consists of keypunching (and verifying, if desired) all the input data into input terminals and storing them in computer files. Printed copies of each file should be kept for each model run so the results may be reproduced, if necessary.

Run the Model

After the input data have been entered, the model is executed, module by module. Certain command and allocation procedures have to be run before running the modules. Every module need not be run every time. For example, if the user decides to change the tax rate or an interest rate, the Performance Module and the Plant Module do not have to be re-run. The steps necessary are covered in detail in Part II.

Print Reports

After one or more model runs have been completed, the Report Module is used to print the desired reports.

Analyze the Results

The final and most important step is the analysis of results and consists of two tasks. The first consists of checking the model output with regard to the accuracy of the results. Any input data errors will be reflected in the results of the model run. The user must satisfy himself that the output results are correct prior to using the results for any further analysis. The results should be checked for negative numbers, numbers which appear to be too large or too small, and missing information. If any errors are found, the source must be determined, the error corrected, and the model re-run.

When the user is confident the results are correct, the results may be analyzed with regard to what they imply. This is the main purpose of RAMTEL--to provide the user with the information necessary to determine the effects and implications of various policies and regulatory strategies. Proper utilization of RAMTEL requires the user not only to run the model, but to think about and analyze the results. A wealth of information may be obtained by comparing the financial statements of a utility under two alternative sets of assumptions. As the user becomes more familiar with the model, additional reports may be added to provide bases for specific financial and operational comparisons of a single utility or group of utilities. The particular form of the analysis is, of course, up to the user.

APPENDIX A
RAMTEL VALIDATION

This appendix establishes the validity of RAMTEL for making future financial projections. Although it is never possible to model the future perfectly, the following sections should clearly indicate to potential users the accuracy of RAMTEL for making financial projections.

The main objective of this appendix is to demonstrate, through empirical analysis, RAMTEL's ability to accurately project financial results for a single utility using only publicly available information for input. In the validation period, the tax rates and procedures, of course, differ from their current versions. RAMTEL is flexible enough to accommodate the differences by either manipulating data or minor modifications to the computer programs. In this appendix, the Ohio Bell Company has been used as an illustrative example. The procedure is simple: First, 1969 is established as the base year. Then RAMTEL "projects" financial values for 1970 through 1975. Finally, RAMTEL's output is compared with the actual values for the same years.

The validation is described in these four sections:

- Selection of Actual Values
- Selection of RAMTEL Input Values and Parameters
- Analysis of Results
- Conclusions

The source of each actual value selected for this validation is identified in the first part. In the second part, the source and derivation of each input value used in the test are described. The next section, analysis of results, presents a comparison of RAMTEL output for Ohio Bell versus the actual values. This comparison includes possible reasons for discrepancies between the actual values and the RAMTEL "projections." The final section presents conclusions on RAMTEL effectiveness based on the results of this validation.

Selection of Actual Values

This section describes the actual values selected for comparison with the RAMTEL projections. These values were selected from Ohio Bell Telephone Company's Balance Sheet and Income Statement as reported in the Federal Communications Commission (FCC) Form M.

Sources of Data

The source of each actual data item used in this validation is described below under two headings: Balance Sheet and Income Statement. Numbers in parentheses indicate first the row and then the column of a schedule in which the particular entry may be found.

Balance Sheet

1. Gross Plant in Service (including AFDC)--FCC Form M, sch. 10 (1,c) Telephone Plant in Service

2. Accumulated Depreciation--FCC Form M, sch. 10 (6,c) Depreciation Reserve

3. Net Plant Value--Calculated; Gross Plant in Service (1) minus Accumulated Depreciation (2)

4. Construction Work in Progress (CWIP)--FCC Form M, sch. 10 (2,c) Telephone Plant under Construction

5. Net Utility Plant--Calculated; Net Plant Value (3) plus Construction Work in Progress (4)

6. Total Assets--FCC Form M, sch. 10 (44,c) Total Assets and Other Debits

7. Common Stock--FCC Form M, sch. 10 (45+46+47+48+49+50-54-55,c) Capital Stock (actually outstanding) plus Stock Liability for Conversion plus Capital Stock Subscribed plus Installments paid on Capital Stock plus Premium on Capital Stock plus Other Capital minus Discount on Capital Stock minus Capital Stock Expense

8. Retained Earnings--FCC Form M, sch. 10 (51+52,c) Retained Earnings Reserved plus Unappropriated Retained Earnings

9. Total Common Equity--Calculated; Common Stock (6) plus Retained Earnings (7)

10. Preferred Stock--Not Used

11. Long Term Debt--FCC Form M, sch. 10 (57+58+59+60+61, c) Funded Debt (actually outstanding) plus Funded Debt Subscribed plus Receiver's Certificates plus Advances from Affiliated Companies

12. Total Capitalization--Calculated; Total Common Equity (8) plus Long Term Debt (10)

13. Short Term Debt--FCC Form M, sch. 10 (63+64,c) Notes Payable to Affiliated Companies plus Other Notes Payable

14. Accumulated Deferred Income Taxes--FCC Form M, sch. 10 (80,c) Accumulated Deferred Income Taxes--Accelerated Tax Depreciation

15. Accumulated Deferred Investment Tax Credits--FCC Form M, sch. 30 (5,b) Investment Credits Unamortized at the end of the year

16. Total Liabilities--FCC Form M, sch. 10 (82,c) Total Liabilities and Other Credits

Income Statement

17. Operating Revenues--FCC Form M, sch. 11 (1,b) Operating Revenues

18. Operation--FCC Form M, sch. 35 (62-18-23,b) Total Operating Expenses minus Maintenance Expenses minus Depreciation and Amortization Expenses

19. Maintenance--FCC Form M, sch. 35 (18,b) Maintenance Expenses

20. Depreciation--FCC Form M, sch. 35 (19,b) Depreciation

21. Total Operating Expenses--FCC Form M, sch. 35 (62,b) Total Operating Expenses

22. Operating Revenue Tax--FCC Form M, sch. 36A (2,d) Gross Receipts Taxes

23. Property Tax--FCC Form M, sch. 36A (2,a) Property Taxes

24. Income Tax Paid--FCC Form M, sch. 11 (6,b) Federal Income Taxes-Operating

25. Deferred Income Tax--FCC Form M, sch. 11 (8,b) Operating Federal Income Taxes Deferred-Accelerated Tax Depreciation

26. Deferred Investment Tax Credit--FCC Form M, sch. 30A (2-3,b) Investment Credits Unamortized at the Beginning of Year minus Investment Credits Amortized during the Year

27. Total Expenses--Calculated; Total Operating Expenses (21) plus Operating Revenue Tax (22) plus Property Tax (22) plus Income Tax Paid (24) plus Deferred Income Tax (25) plus Deferred Investment Tax Credit

28. Operating Income--FCC Form M, sch. 11 (11,b)
Operating Income

29. Other Income--FCC Form, sch 11. (17-21,b-13,a)
Total Other Income minus Total Miscellaneous Deductions minus Interest charged to Construction

30. Allowance for Funds Used During Construction (AFDC)--FCC Form M, sch. 11(13,c)
Interest charged to Construction

31. Income Before Interest--FCC Form M, sch. 11 (22,b)
Income available for Fixed Charges

32. Interest on Long Term Debt--FCC Form M, sch. 11 (23,b)
Interest on Funded Debt

33. Interest on Short Term Debt--Calculated; Short Term Debt (13) times Interest Rate (from parameter file)

34. Net Income--Calculated; Income Before Interest (31) minus Interest on Long Term Debt (32) minus Interest on Short Term Debt

35. Preferred Dividends--Not used

36. Earnings Available to Common--Calculated; Net Income (34)

37. Common Dividends--FCC Form M, sch. 11 (44,b)
Dividends Declared

38. Retained Earnings--Calculated; Earnings Available Common (36) minus Common Dividends (37)

Selection of RAMTEL Input Values and Parameters

This section describes the input values and parameters selected for use in validating RAMTEL. The advantage of hindsight over the years to be "projected" was employed in the calculation and estimation of many of the parameters and "future" budgets. Although this advantage would not be available to a person attempting to make future projections, the technique was used in this effort to minimize variance in output due to input rather than RAMTEL's calculations. Thus this validation tests the computations and relationships embodied in RAMTEL, not the clarity of one or another forecaster's crystal ball.

Input Values Selected

Each file used as input by RAMTEL is described below. Please note that this validation section was included in the original documentation prepared by Temple, Barker & Sloane, Inc. Since the original RAm model was distributed, format changes have been made to the input files. The row and column numbers used for the current model are described in detail in Part II of the RAMTEL documentation. Also note that RAMTEL allows a part of the input data to be used for projections. For this reason, data for the years 1960-1981 was stored in the input files while only data for the years 1960-1969 were treated as "historical" in the current validation run. The input files used in the validation run are shown in exhibits A-1 through A-10. The formatting instructions for these files are given in Part II of this report.

<u>History File</u>

Row 1	Base year: 1969. No. of Historical Years: 10
Row 2	Repairs of Outside Plant: FCC Form M, sch. 35 (10,b) for years 1960-1981
Row 3	Test Desk Work: FCC Form M, sch. 35 (11,b) for years 1960-1981
Row 4	Repairs of Central Office Equipment: FCC Form M, sch. 35 (12,b) for years 1960-1981
Row 5	Station Equipment: FCC Form M, sch. 35 (13,b) for years 1960-1981
Row 6	Repairs of Buildings and Grounds: FCC Form M, Sch. 35 (14,b) for years 1960-1981
Row 7	Maintaining Transmission Power: FCC Form M, sch. 35 (15,b) for years 1960-1981
Row 8	Other Maintenance Expenses: FCC Form M, sch. 35 (17,b) for years 1960-1981
Row 9	General Traffic Supervision: FCC Form M, sch. 35 (24,b) for years 1960-1981

Row 10	Service Inspection and Customer Instruction: FCC Form M, sch. 35 (25,b) for years 1960-1981
Row 11	Operators' Wages: FCC Form M, sch. (26,b) for years 1960-1981
Row 12	Rest and Lunchrooms: FCC Form M, sch. 35 (27,b) for years 1960-1981
Row 13	Operators' Employment and Training: FCC Form M, sch. 35 (28,b) for years 1960-1981
Row 14	Central Office Stationary and Printing: FCC Form M, sch. 35 (29,b) for years 1960-1981
Row 15	Central Office House Service: FCC Form M, sch. 35 (30,b) for years 1960-1981
Row 16	Miscellaneous Central Office Expenses: FCC Form M, sch. 35 (31,b) for years 1960-1981
Row 17	Public Telephone Expenses: FCC Form M, sch. 35 (32,b) for years 1960-1981
Row 18	Other Traffic Expenses: FCC Form M, sch. 35 (33,b) for years 1960-1981
Row 19	Joint Traffic Expenses FCC Form M, sch. 35 (34-35,b) for years 1960-1981
Row 20	General Commercial Administration: FCC Form M, sch. 35, (37,b) for years 1960-1981
Row 21	Advertising: FCC Form M, sch. 35 (38,b) for years 1960-1981
Row 22	Sales Expense: FCC Form M, sch. 35 (39,b) for years 1960-1981
Row 23	Connecting Company Relations: FCC Form M, sch. 35 (40,b) for years 1960-1981
Row 24	Local Commercial Operations: FCC Form M, sch. 35 (41,b) for years 1960-1981
Row 25	Public Telephone Commissions: FCC Form M, sch. 35 (42,b) for years 1960-1981
Row 26	Directory Expenses: FCC Form M, sch. 35 (43,b) for years 1960-1981
Row 27	Other Commercial Expenses: FCC Form M, sch. 35 (44,b)
Row 28	Office Salaries and Expenses: FCC Form M, sch. 35 (51,b) for years 1960-1981

Row 29 Other Operating Expenses: FCC Form M, sch. 35 (61,b) for years 1960-1981

Note: Although historical O & M data for years 1960-1981 were entered, only a part of the data (those for years 1960-1969) was used in this validation run. RAMTEL allows the user to use all, part or none of the historical O & M data to make projections. The data were entered in the file for potential future use and are reported here to familiarize users with the input procedure.

Regression Methods File

Regression Method: Code 5--Additive Linear Equation.

Rows 1-4 Equation was of the form 0 + 1. x, where x represents values stored under the Exogenous Variable Account.

Note: In this validation run, actual values of all O & M accounts were stored under Exogeneous Variable Accounts 1602-1680 for the projected years 1970-1981. The purpose was to set O & M expense values to their true values for the projected years. Normally these expenses would be projected from historical data via various regression techniques as specified in this file. The main concern in the validation was to evaluate RAMTEL financial calculations. An assumption of perfect projection was therefore implied.

Adjustment File

Adjustment parameter was set to 1 for all years.

Exogeneous Variables File

This file was made identical in content to the history file. The years 1970-1981 were treated as the "future" years used in the O & M projection. See note above under Regression Methods File.

Initialization File

Row 1 Other Income: FCC Form M, sch. 11 (12,b) for years 1969-1981

Row 2 Current Assets: FCC Form M, sch. 10 (82-1-2+6,c) Total Liabilities minus Telephone Plant under Construction plus Depreciation Reserve. This is a plug-in number to balance the Balance Sheet in the base year (1969)

Row 3 Common Stock and Other Paid in Capital: FCC Form M, sch. 10 (56-51,c) Total Stockholder's Equity minus Retained Earnings Reserved for 1969

Row 4 Retained Earnings: FCC Form M, sch. 10 (52) Retained Earnings for 1969

Row 5 Preferred Stock: Not used; set equal to zero

Row 6 Long Term Debt: FCC Form M, sch. 10 (62,c) Long Term Debt for 1969

Row 7 Short Term Debt: FCC Form M, sch. 10 (6364,c) Notes Payable to Affiliated Companies <u>plus</u> Other Notes Payable for 1969

Row 8 Cumulative Deferred Income Taxes: FCC Form M, sch. 10 (80,c) Accumulated Deferred Income Taxes--Accelerated Tax Depreciation for 1969 (actual value=0)

Row 9 Operating Revenues: FCC Form M, sch. 11 (1,c) Operating Revenues for 1969

Row 10 Dividend Expense for Preferred Stock: Not used

Row 11 Cumulative Deferred Investment Tax Credit: FCC Form M, sch. 30 (5,b) Investment Credits Unamortized at the end of 1969

Row 12 Current Liabilities: Total Liabilities <u>minus</u> Preferred Stock <u>minus</u> Long Term Debt <u>minus</u> Short Term Debt <u>minus</u> Deferred Income Taxes <u>minus</u> Deferred Investment Tax Credits for 1969

<u>Budget File</u>

Row 131 CWIP (Initial): FCC Form M, sch. 10 (2,c) Telephone Plant Under Construction for 1969

Row 133 AFDC (Initial): Set to zero

New Plant

Row 1 Account Number set to 200. Book Life and Tax Life set to 19 and 15 years respectively.

Row 2 Capital Expenditures: FCC Form M, sch. 10 (1,d) Increase in Telephone Plant in Service over previous year
Construction Expenditures: Calculated as follows.

Let $CWIP_1$: Plant under construction for current year from FCC Form M, sch. 10 (2,c)

$CWIP_0$: Plant under construction for previous year from FCC Form M, sch. 10 (2,b)

CAP_1: Telephone plant added (capital expenditures) for current year from FCC Form M, sch. 10 (1,d)

CE_1: Construction expenditures for current year to be

Then $CE_1 = CWIP_1 + CAP_1 - CWIP_1$.

Existing Plant

Row 134 Tax Life, Tax Depreciation Rate, Tax Depreciation, Tax Net Plant Value: Not used. 15 was entered for the first element and zeros for others.

Row 71 Plant Value: User estimates
Account Number: Set to zero
Gross Plant Value: FCC Form M, sch. 10 (1,c) for 1969
Net Plant Value: FCC Form M, sch. 10 (1-6,c)

Row 72 Retirements: FCC Form M, sch. 12A (23, e & f)

Parameter File

Row 1 Fraction of Plant Eligible for Investment Tax Credit: User estimate or utility data

Row 2 Investment Tax Credit Rate: Internal Revenue Service

Row 3 Straight Line Depreciable Life of Investment Tax Credit: Set equal to book life of plant

Row 4 Federal Income Tax Rate: Internal Revenue Service or utility estimate

Row 5 State and Local Income Tax Rate: Appropriate state and local authorities

Row 6 Ratio of Current Assets and Previous Year Operating Revenues: Calculated

$$\text{Ratio} = \frac{\text{Current Assets (row 2, Initialization File)}}{\text{Prev. Year Op. Rev. [see FCC Form M, Sch. 11 (1,b)]}}$$

Row 7 Maximum Allowable Short Term Debt: User estimate

Row 8 Minimum Short Term Debt: User estimate

Row 9 Dividend Payout Ratio: Calculated

$$\text{Ratio} = \frac{\text{Dividends Declared (FCC Form M, sch. 11 (43,b)}}{\text{Common Stock (row 3, Initialization File)}}$$

Row 10 Ratio of Common Equity to Total Capitalization: Calculated

$$\text{Ratio} = \frac{\text{Common Equity (FCC Form M, sch. 10 (56,c)}}{\text{Total Capital (item 12, Balance Sheet)}}$$

Row 11 Ratio of Total Equity to Total Capitalization: Set equal to the value in row 10

Row 12 Preferred Stock Interest Rate: Set to zero

Row 13 Return on Average Common Equity: Calculated

$$\text{Return} = \frac{\text{Net Income (FCC Form, sch. 11 (36,b)}}{\text{Common Equity (FCC Form M, Sch. 10 (56,b)}}$$

Row 14 Long Term Debt Interest Rate: Calculated
Average of all interest rates weighted with respect to long term debt issues (FCC Form M, sch. 24)

$$\text{Interest Rate} = \frac{\text{Interest accrued (col 1)}}{\text{Debt Outstanding (col h)}}$$

Row 15 Long Term Debt Maturity Time: Set to 40 years (FCC Form M, sch. 24 (columns b and c)

Row 16 Return on Rate Base: User estimate

Row 17 Interest on New Short Term Debt: Calculated
Average of all interest rates weighted with respect to short term debt issues (FCC Form M, sch. 28)

$$\text{Interest Rate} = \frac{\Sigma\text{(Amount of Debt)(Interest Rate)[col e * col f]}}{\Sigma\text{Amount of Debt (col e)}}$$

Row 18 Miscellaneous Federal Tax Deductions: Set to zero

Row 19 Share of Telecommunications Operations: Set to one

Row 20 AFDC Factors: Set to one

Row 30 Dividends Per Share: Not used; set to zero

Row 31 Market to Book Ratio for Common Stock: Set to one

Row 32 Property Tax Rate: Calculated

$$\text{Tax Rate} = \frac{\text{Property Tax (FCC Form M, sch. 36A (2,b)}}{\text{Telephone Plant in Service (FCC Form M, sch. 10 (1,c)}}$$

Row 33 Operating Revenue Tax Rate: Calculated

$$\text{Tax Rate} = \frac{\text{Gross Receipts Taxes (FCC Form M, sch. 36A (2,d)}}{\text{Operating Revenues (FCC Form M, sch. 11 (1,b)}}$$

Row 34 Rate of AFDC of CWIP: Set to zero

Row 35 Fraction of Investment Tax Credit Excluded From Rate Base: Set to zero

Row 36 Target Operating Revenues: FCC Form M, sch. 11 (1,b)

Row 37 Miscellaneous State Tax Deductions: Set to zero

Row 38 Fraction of CWIP Included in Rate Base: Set to zero

Row 39 Fraction of Deferred Taxes Excluded From Rate Base: Set to zero

Row 40 Working Capital Included in Rate Base: Set to zero

Row 41 Unit of Common Stock Issue: Set to 100 dollars

Row 42 Minimum Common Stock Issue: Set to ten million dollars during first future year. Incremented by 12.5% each succeeding year.

Row 43 Maximum Common Stock Issue: Set to 200 million dollars during first future year. Incremented by 12.5% each succeeding year.

Row 44 Unit of Preferred Stock Issue: Not used

Row 45 Minimum Preferred Stock Issue: Not used

Row 46 Maximum Preferred Stock Issue: Not used

Row 47 Unit of Long Term Debt Issue: Set to 100 dollars

Row 48 Minimum Long Term Debt Issue: Set to 20 million dollars during first future year. Incremented by 12.5% each succeeding year.

Row 49 Maximum Long Term Debt Issue: Set to one billion dollars

Row 50 Ratio of Current Assets and Net Utility Plant: Calculated

$$\text{Ratio} = \frac{\text{Current Assets (row 2, Initialization File)}}{\text{Net Utility Plant (item 2, Balance Sheet)}}$$

Row 51 Additional Current Liabilities: Set to zero

Row 52 Ratio of Current Liabilities and Previous Year Operating Revenues: Calculated

$$\text{Ratio} = \frac{\text{Current Liabilities (row 12, Initialization File)}}{\text{Prev. Year Oper. Revenue (row 9, Initialization File)}}$$

Row 53 Ratio of Current Liabilities and Net Utility Plant: Calculated

$$\text{Ratio} = \frac{\text{Current Liabilities (row 12, Initialization File)}}{\text{Net Utility Plant (item 2, Balance Sheet)}}$$

Row 54 Additional Current Assets: Set to zero

Debt File

Data entered in the debt file was taken from schedule 24 of FCC Form M.

Account Names File

This file simply lists the number and names of accounts without any other data. The accounts are the same as that of the History File. This file is used by the Aggregation Module for combining accounts.

Depreciation File

This file is used by the Plant Module for tax depreciation calculations. Further explanation on data items and file format is provided in Appendix D.

EXHIBIT A-1

HISTORY FILE

```
HISABC
C
C              OHIO BELL
C              HISTORY FILE
C              O & M EXPENSES
C              196Ø - 1981
C
C
C       HEADER ROW
C       ROW NO, BASE YEAR, NO OF HIST YRS, SCALE, UNUSED ZEROES
C
         1; 1969 1Ø 1 42*Ø
C
C       REPAIRS OF OUTSIDE PLANT
C
         2; 6Ø2 1 Ø 1 Ø 98Ø9432 1ØØ934Ø5 9947912 9839439 >
        11383371 13226653 138226Ø91 144770Ø3 16517891 2Ø437273 >
        24436139 2726ØØ46 3Ø981282 341Ø6378 36527827 36695669 >
        38Ø56564 41620715 43ØØ7249 51212286 55748498 6Ø173411 >
        18*Ø
C
C       TEST DESK WORK
C
         3; 6Ø3 1 Ø 1 Ø 3829762 4141457 4319719 4392796 5225821 >
        5931659 6792591 7754345 8521126 9712351 1Ø867876 12774581 >
        14491711 17514799 2Ø437444 235Ø5153 26452477 3Ø245531 3Ø89Ø326 >
        39ØØ8Ø77 445Ø1475 49966756 18*Ø
C
C       REPAIRS OF CENTRAL OFFICE EQUIPMENT
C
         4; 6Ø4 1 Ø 1 Ø 134Ø8891 14174311 15335798 16282932 >
        1827976Ø 2Ø384737 22715759 243897Ø5 2813Ø471 3215Ø522 >
        3749Ø35Ø 435Ø1587 46569155 48847148 55261753 59827225 >
        62533692 77Ø211ØØ 8149Ø213 88769879 91151684 1Ø5629689 >
        18*Ø
C
C       REPAIRS OF STATION EQUIPMENT
C
         5; 6Ø5 1 Ø 1 Ø 19131628 19779998 2Ø62Ø6Ø9 21387663 >
        236Ø36Ø2 26884118 29240258 31Ø98988 3373254Ø 38862Ø61 >
        45391468 5Ø58Ø16Ø 56658Ø55 61Ø8Ø143 66687588 74391717 >
        81375581 9286199Ø 1Ø2734222 1Ø7ØØ2385 113Ø166Ø3 147223456 >
        18*Ø
C
C       REPAIRS OF BUILDINGS AND GROUNDS
C
         6; 6Ø6 1 Ø 1 Ø 1117791 12Ø178Ø 12Ø8987 1313762 1432251 >
        183163Ø 1811217 1862742 2441198 31Ø8824 344128Ø 3873107 >
        4439254 4542948 561Ø918 54Ø2Ø51 4667171 6838658 78Ø6685 >
        7936372 8533533 99177Ø1 18*Ø
C
C       MAINTAINING TRANSMISSION POWER
C
         7; 61Ø 1 Ø 1 Ø 812443 925114 983149 1Ø55Ø39 11Ø2Ø98 >
        1196947 1257724 13296ØØ 1419Ø76 15Ø4Ø53 2Ø42653 2427137 >
        2525849 2765174 3512252 4266457 43Ø7695 5Ø6Ø117 5749794 >
        6322465 682875Ø 78164Ø8 18*Ø
C
C       OTHER MAINTENANCE EXPENSES
C
         8; 612 1 Ø 1 Ø 424454-531465 59378Ø 8ØØ916 159525 118ØØ9 >
        11Ø61Ø 2Ø697Ø 197Ø44 277875 343143 695128 796Ø19 2Ø83717 >
        3Ø46361 422314Ø 5289632 4Ø91564 48344Ø6 5436566 4645662 >
        499758Ø 18*Ø
```

EXHIBIT A-1--continued

HISTORY FILE

```
C
C       GENERAL TRAFFIC SUPERVISION
C
         9; 621 1 Ø 1 Ø 445Ø694 45196Ø1 4442971 442Ø598 4618516 >
        47Ø9144 5Ø73561 5716262 5936218 6412142 7151361 8ØØ745Ø >
        8Ø6Ø155 8719881 9876868 112757Ø2 12Ø58247 13919828 13Ø77Ø15 >
        12278234 942563Ø 9936Ø24 18*Ø
C
C       SERVICE INSPECTION AND CUSTOMER INSTRUCTION
C
        1Ø; 622 1 Ø 1 Ø 11233Ø9 1284216 1388772 1522336 1783932 >
        1781756 1853957 198581Ø 2Ø65Ø6Ø 22427Ø2 2417327 2581629 >
        2855Ø96 326527Ø 355Ø727 331Ø426 3372ØØ5 3615764 3636318 >
        396178Ø 416335Ø 4841956 18*Ø
C
C       OPERATORS' WAGES
C
        11; 624 1 Ø 1 Ø 22829Ø23 22242591 22955Ø24 23311812 >
        24Ø37399 26Ø87638 29247679 3Ø81729Ø 33317395 35829636 >
        38374899 4Ø49462Ø 4Ø944Ø92 43449744 44Ø48Ø98 4528483Ø >
        46Ø758Ø3 41513626 4345Ø658 45Ø29739 484Ø5547 52473Ø5Ø >
        18*Ø
C
C       REST AND LUNCHROOMS
C
        12; 626 1 Ø 1 Ø 346282 3Ø3994 32Ø141 272369 25785Ø 237681 >
        2Ø1857 225271 326457 273138 296112 348973 39Ø158 361676 >
        448Ø57 388288 429593 264968 16585Ø 1747Ø8 145ØØØ 92911 18*Ø
C
C       OPERATORS' EMPLOYMENT AND TRAINING
C
        13; 627 1 Ø 1 Ø 1Ø23Ø57 822296 782111 856316 1ØØ9Ø68 1183755 >
        1222331 137Ø729 1287152 17Ø75Ø7 1871ØØ3 1425382 1177413 >
        13729Ø1 1Ø31945 363366 363185 268414 667196 599327 794526 >
        8ØØ528 18*Ø
C
C       CENTRAL OFFICE STATIONERY AND PRINTING
C
        14; 629 1 Ø 1 Ø 68278Ø 666444 653958 652934 765566 8Ø4461 >
        77Ø873 749576 86715Ø 1Ø87734 12543Ø7 1299199 1169569 1Ø451Ø8 >
        11Ø5923 11Ø3ØØ4 1186573 1146253 1134952 1175223 1998213 >
        1593Ø64 18*Ø
C
C       CENTRAL OFFICE HOUSE SERVICE
C
        15; 63Ø 1 Ø 1 Ø 245771 222636 2ØØ743 1917Ø6 2ØØ556 2Ø35Ø8 >
        212629 251616 253134 289137 378967 466667 514396 583398 >
        742823 841375 864Ø75 876552 822279 978777 854641 84Ø746 >
        18*Ø
C
C       MISCELLANEOUS CENTRAL OFFICE EXPENSES
C
        16; 631 1 Ø 1 Ø 391194 441421 442433 488493 628873 731388 >
        859626 1Ø53129 1182996 127Ø463 1526744 17ØØ345 1594839 >
        24ØØ226 2769451 2827857 33753Ø5 4Ø228Ø8 5288328 5631294 >
        6237354 81Ø8163 18*Ø
C
C       PUBLIC TELEPHONE EXPENSES
C
        17; 632 1 Ø 1 Ø 214459 221578 679Ø8 58892 59255 65968 62918 >
        68586 44161 38851 39123 51822 23242 2Ø11 7651 13788 4Ø213 >
        27ØØ5 24149 1562 95Ø 5Ø49 18*Ø
```

EXHIBIT A-1--continued

HISTORY FILE

```
C
C       OTHER TRAFFIC EXPENSES
C
        18; 633 1 Ø 1 Ø 27454 24632 14171 13639 13565 19612 16648 >
        17529 36513 35418 35332 32934 26536 11665 65Ø8 147 165 23*Ø
C
C       JOINT TRAFFIC EXPENSES (NET OF DR AND CR)
C
        19; 634 1 Ø 1 Ø 4Ø1855 398Ø16 4Ø9616 46Ø496 456214 498471 >
        417383 327535 2Ø9281 244277 253851 318781 36Ø6Ø8 455761 >
        449Ø18 654882 758591 4Ø4Ø17 272731 41Ø79Ø 259558 25Ø488 18*Ø
C
C       GENERAL COMMERCIAL ADMINISTRATION
C
        2Ø; 64Ø 1 Ø 1 Ø 3569276 41268Ø3 44Ø4452 4445953 47ØØ491 >
        4859811 5Ø27823 532234Ø 565Ø57Ø 6718721 78Ø7Ø89 8945139 >
        9113152 1Ø1423Ø5 11934872 13397561 14Ø85484 15399839 >
        194Ø2955 22622919 2918773Ø 35941979 18*Ø
C
C       ADVERTISING
C
        21; 642 1 Ø 1 Ø 1846482 1837537 1882837 1957Ø56 2Ø63893 >
        2114652 217Ø594 236Ø186 28Ø6145 3225169 3112165 3287337 >
        3443Ø55 3378Ø18 38Ø8178 43Ø2ØØ7 4389326 5428612 7Ø84177 >
        8325Ø14 9674619 1Ø367Ø54 18*Ø
C
C       SALES EXPENSE
C
        22; 643 1 Ø 1 Ø 3663143 355Ø261 3952626 38Ø2241 3452794 >
        3374887 3275658 329Ø512 34ØØ424 4144443 5423982 6263279 >
        717367Ø 85252ØØ 9692839 112ØØØ69 13123638 15318184 >
        18662756 22119942 27393429 33164867 18*Ø


C
C       CONNECTING COMPANY RELATIONS
C
        23; 644 1 Ø 1 Ø 273861 281373 295Ø31 312Ø41 323752 341Ø68 >
        36Ø352 3853Ø7 4Ø4583 454661 535184 5158Ø5 584477 644264 >
        675493 717435 729612 637Ø3Ø 691726 648624 6ØØ413 732595 >
        18*Ø
C
C       LOCAL COMMERCIAL OPERATIONS
C
        24; 645 1 Ø 1 Ø 7738945 7931272 7871554 85815Ø5 9138843 >
        9946822 1Ø847747 11685Ø67 12889321 143Ø8981 15742893 >
        16918439 17732442 217Ø3747 25331788 28287698 31654976 >
        33Ø97948 38346552 43146751 47256Ø55 63Ø476Ø8 18*Ø
C
C       PUBLIC TELEPHONE COMMISSIONS
C
        25; 648 1 Ø 1 Ø 18Ø1635 1855952 18799Ø9 2ØØ1385 2122873 >
        22644Ø7 2451938 2463897 2634253 27Ø5348 2682551 2775987 >
        2842828 3Ø9Ø75Ø 3531763 3554176 3928Ø89 3776315 4226379 >
        4513871 4625561 5Ø871Ø3 18*Ø
C
C       DIRECTORY EXPENSES
C
        26; 649 1 Ø 1 Ø 9Ø69356 9133466 9637875 1Ø361953 1Ø353984 >
        11176459 115272Ø25 12593544 12753189 13454273 145Ø7664 >
        15854815 172330Ø11 19Ø2563Ø 2Ø746864 22923584 2527851Ø >
        27521Ø25 3123810Ø8 35379286 35726824 38937716 18*Ø
```

EXHIBIT A-1--continued

HISTORY FILE

```
C
C       OTHER COMMERCIAL EXPENSES
C
        27; 65Ø 1 Ø 1 Ø 7613 1Ø133 12178 1ØØ85 4512 2262 121Ø1     >
        11483 2Ø173 13626 8118 895Ø 1537 1654 998 2565 1496 6717 >
        77Ø 3112 48724 417278 18*Ø
C
C       OFFICE SALARIES AND EXPENSES
C       ACCOUNTS (661 THROUGH 665)
C
        28; 666 1 Ø 1 Ø 15446435 158654Ø4 16813324 17963297 192Ø5154 >
        1983584Ø 21223316 22668318 26Ø7659Ø 29261669 33153916 >
        36527Ø55 41Ø66445 42556864 45873556 5228Ø513 614Ø472Ø >
        65947129 7518215Ø 82262Ø14 94ØØ9685 1Ø22Ø1911 18*Ø
C
C       OTHER OPERATING EXPENSES
C       ACCOUNTS (668 THROUGH 677)
C
        29; 68Ø 1 Ø 1 Ø 1352338Ø 1441969Ø 14742223 15292585 18883898 >
        2141ØØ7Ø 22821624 2475Ø647 27Ø41Ø91 31879132 39394715 >
        462ØØ91Ø 5491282Ø 59921Ø53 67429776 88468164 1Ø4857637 >
        116827Ø47 126648744 14465Ø158 157336368 167394868 18*Ø
END OF FILE
```

EXHIBIT A-2

REGRESSION METHOD FILE

```
REGABC.DATA
C
C               OHIO BELL
C               REGRESSION METHODS FILE
C
    1; 6Ø2 5 Ø 16Ø2 1.Ø 8*Ø
    2; 6Ø3 5 Ø 16Ø3 1.Ø 8*Ø
    3; 6Ø4 5 Ø 16Ø4 1.Ø 8*Ø
    4; 6Ø5 5 Ø 16Ø5 1.Ø 8*Ø
    5; 6Ø6 5 Ø 16Ø6 1.Ø 8*Ø
    6; 61Ø 5 Ø 161Ø 1.Ø 8*Ø
    7; 612 5 Ø 1612 1.Ø 8*Ø
    8; 621 5 Ø 1621 1.Ø 8*Ø
    9; 622 5 Ø 1622 1.Ø 8*Ø
   1Ø; 624 5 Ø 1624 1.Ø 8*Ø
   11; 626 5 Ø 1626 1.Ø 8*Ø
   12; 627 5 Ø 1627 1.Ø 8*Ø
   13; 629 5 Ø 1629 1.Ø 8*Ø
   14; 63Ø 5 Ø 163Ø 1.Ø 8*Ø
   15; 631 5 Ø 1631 1.Ø 8*Ø
   16; 632 5 Ø 1632 1.Ø 8*Ø
   17; 633 5 Ø 1633 1.Ø 8*Ø
   18; 634 5 Ø 1634 1.Ø 8*Ø
   19; 64Ø 5 Ø 164Ø 1.Ø 8*Ø
   2Ø; 642 5 Ø 1642 1.Ø 8*Ø
   21; 643 5 Ø 1643 1.Ø 8*Ø
   22; 644 5 Ø 1644 1.Ø 8*Ø
   23; 645 5 Ø 1645 1.Ø 8*Ø
   24; 648 5 Ø 1648 1.Ø 8*Ø
   25; 649 5 Ø 1649 1.Ø 8*Ø
   26; 65Ø 5 Ø 165Ø 1.Ø 8*Ø
   27; 666 5 Ø 1666 1.Ø 8*Ø
   28; 68Ø 5 Ø 168Ø 1.Ø 8*Ø
END OF FILE
```

EXHIBIT A-3

ADJUSTMENT FILE

```
ADJABC.DATA
C
C               OHIO BELL
C               ADJUSTMENT FILE
C               196Ø-1981
C
C
      1; 4Ø*1.Ø
C
END OF FILE
```

EXHIBIT A-4

EXOGENEOUS VARIABLES FILE

```
EXOABC
C
C               OHIO BELL
C               EXOGENOUS VARIABLES FILE FOR VALIDATION
C               196Ø - 1981
C
C       REPAIRS OF OUTSIDE PLANT
C
         1; 16Ø2  98Ø9432 1ØØ934Ø5 9947912 9839439 >
        11383371 13226653 138260Ø91 144770Ø3 16517891 2Ø437273 >
        24436139 272600Ø46 3Ø981282 341Ø6378 36527827 36695669 >
        38Ø56564 41620Ø715 43ØØ7249 51212286 55748498 6Ø173411 >
        18*Ø
C
C       TEST DESK WORK
C
         2; 16Ø3  3829762 4141457 4319719 4392796 5225821 >
        5931659 6792591 7754345 8521126 9712351 1Ø867876 12774581 >
        14491711 17514799 2Ø437444 235Ø5153 26452477 3Ø245531 3Ø89Ø326 >
        39ØØ8Ø77 445Ø1475 49966756 18*Ø
C
C       REPAIRS OF CENTRAL OFFICE EQUIPMENT
C
         3; 16Ø4  134Ø8891 14174311 15335798 16282932 >
        1827976Ø 2Ø384737 22715759 243897Ø5 2813Ø471 3215Ø522 >
        3749Ø35Ø 435Ø1587 46569155 48847148 55261753 59827225 >
        62533692 77Ø211ØØ 8149Ø213 88769879 91151684 1Ø5629689 >
        18*Ø
C
C       REPAIRS OF STATION EQUIPMENT
C
         4; 16Ø5  19131628 19779998 2Ø62Ø6Ø9 21387663 >
        236Ø36Ø2 26884118 2924Ø258 31Ø98988 3373254Ø 38862Ø61 >
        45391468 5Ø58Ø16Ø 56658Ø55 61Ø8Ø143 66687588 74391717 >
        81375581 9286199Ø 1Ø2734222 1Ø7ØØ2385 113Ø166Ø3 147223456 >
        18*Ø
C
C       REPAIRS OF BUILDINGS AND GROUNDS
C
         5; 16Ø6  1117791 12Ø178Ø 12Ø8987 1313762 1432251 >
        183163Ø 1811217 1862742 2441198 31Ø8824 344128Ø 3873167 >
        4439254 4542948 561Ø918 54Ø2Ø51 4667171 6838658 78Ø6685 >
        7936372 8533533 991770Ø1 18*Ø
C
C       MAINTAINING TRANSMISSION POWER
C
         6; 161Ø  812443 925114 983149 1Ø55Ø39 11Ø2Ø98 >
        1196947 1257724 13296ØØ 1419Ø76 15Ø4Ø53 2Ø42653 2427137 >
        2525849 2765174 3512252 4266457 43Ø7695 5Ø6Ø117 5749794 >
        6322465 682875Ø 78164Ø8 18*Ø
C
C       OTHER MAINTENANCE EXPENSES
C
         7; 1612  424454 531465 59378Ø 8ØØ916 159525 118ØØ9 >
        11Ø61Ø 2Ø697Ø 197Ø44 277875 343143 695128 796Ø19 2Ø83717 >
        3Ø46361 422314Ø 5289632 4Ø91564 48344Ø6 5436566 4645662 >
        499758Ø 18*Ø
```

EXHIBIT A-4--continued

EXOGENEOUS VARIABLES FILE

```
C
C       GENERAL TRAFFIC SUPERVISION
C
         8; 1621  445Ø694 45196Ø1 4442971 442Ø598 4618516 >
        47Ø9144 5Ø73561 5716262 5936218 6412142 7151361 8ØØ745Ø >
        8Ø6Ø155 8719881 9876868 112757Ø2 12Ø58247 13919828 13Ø77Ø15 >
        12278234 942563Ø 9936Ø24 18*Ø
C
C       SERVICE INSPECTION AND CUSTOMER INSTRUCTION
C
         9; 1622  112330Ø9 1284216 1388772 1522336 1783932 >
        1781756 1853957 198581Ø 2Ø65Ø6Ø 22427Ø2 2417327 2581629 >
        2855Ø96 326527Ø 355Ø727 331Ø426 33720Ø5 3615764 3636318 >
        396178Ø 416335Ø 4841956 18*Ø
C
C       OPERATORS' WAGES
C
        1Ø; 1624  22829Ø23 22242591 22955Ø24 23311812 >
        24Ø37399 26Ø87638 29247679 3Ø81729Ø 33317395 35829636 >
        38374899 4Ø49462Ø 4Ø944Ø92 43449744 44Ø48Ø98 4528483Ø >
        46Ø758Ø3 41513626 4345Ø658 45Ø29739 484Ø5547 5247305Ø >
        18*Ø
C
C       REST AND LUNCHROOMS
C
        11; 1626  346282 3Ø3994 32Ø141 272369 25785Ø 237681 >
        2Ø1857 225271 326457 273138 296112 348973 39Ø158 361676 >
        448Ø57 388288 429593 264968 16585Ø 1747Ø8 145ØØØ 92911 18*Ø
C
C       OPERATORS' EMPLOYMENT AND TRAINING
C
        12; 1627  1Ø23Ø57 822296 782111 856316 1ØØ9Ø68 1183755 >
        1222331 137Ø729 1287152 17Ø75Ø7 1871ØØ3 1425382 1177413 >
        13729Ø1 1Ø31945 363366 363185 268414 667196 599327 794526 >
        8ØØ528 18*Ø
C
C       CENTRAL OFFICE STATIONERY AND PRINTING
C
        13; 1629  68278Ø 666444 653958 652934 765566 8Ø4461 >
        77Ø873 749576 867150 1Ø87734 12543Ø7 1299199 1169569 1Ø451Ø8 >
        11Ø5923 11Ø3ØØ4 1186573 1146253 1134952 1175223 1998213 >
        1593Ø64 18*Ø
C
C       CENTRAL OFFICE HOUSE SERVICE
C
        14; 163Ø  245771 222636 2ØØ743 1917Ø6 2ØØ556 2Ø35Ø8 >
        212629 251616 253134 289137 378967 466667 514396 583398 >
        742823 841375 864Ø75 876552 822279 978777 854641 84Ø746 >
        18*Ø
C
C       MISCELLANEOUS CENTRAL OFFICE EXPENSES
C
        15; 1631  391194 441421 442433 488493 628873 731388 >
        859626 1Ø53129 1182996 127Ø463 1526744 17ØØ345 1594839 >
        24ØØ226 2769451 2827857 33753Ø5 4Ø228Ø8 5288328 5631294 >
        6237354 81Ø8163 18*Ø
C
C       PUBLIC TELEPHONE EXPENSES
C
        16; 1632  214459 221578 679Ø8 58892 59255 65968 62918 >
        68586 44161 38851 39123 51822 23242 2Ø11 7651 13788 4Ø213 >
        27ØØ5 24149 1562 95Ø 5Ø49 18*Ø
```

EXHIBIT A-4--continued

EXOGENEOUS VARIABLES FILE

```
C
C       OTHER TRAFFIC EXPENSES
C
        17; 1633  27454 24632 14171 13639 13565 19612 16648 >
        17529 36513 35418 35332 32934 26536 11665 65Ø8 147 165 23*Ø
C
C       JOINT TRAFFIC EXPENSES (NET OF DR AND CR)
C
        18; 1634  4Ø1855 398Ø16 4Ø9616 46Ø496 456214 498471 >
        417383 327535 2Ø9281 244277 253851 318781 36Ø6Ø8 455761 >
        449Ø18 654882 758591 4Ø4Ø17 272731 41Ø79Ø 259558 25Ø488 18*Ø
C
C       GENERAL COMMERCIAL ADMINISTRATION
C
        19; 164Ø  3569276 41268Ø3 44Ø4452 4445953 47ØØ491 >
        4859811 5Ø27823 532234Ø 565Ø57Ø 6718721 78Ø7Ø89 8945139 >
        9113152 1Ø1423Ø5 11934872 13397561 14Ø85484 15399839 >
        194Ø2955 22622919 2918773Ø 35941979 18*Ø
C
C       ADVERTISING
C
        2Ø; 1642  1846482 1837537 1882837 1957Ø56 2Ø63893 >
        2114652 217Ø594 236Ø186 28Ø6145 3225169 3112165 3237337 >
        3443Ø55 3378Ø18 38Ø8178 43Ø2ØØ7 4389326 5428612 7Ø84177 >
        8325Ø14 9674619 1Ø367Ø54 18*Ø
C
C       SALES EXPENSE
C
        21; 1643  3663143 355Ø261 3952626 38Ø2241 3452794 >
        3374887 3275658 329Ø512 34ØØ424 4144443 5423982 6263279 >
        717367Ø 85252ØØ 9692839 112ØØØ69 13123638 15318184 >
        18662756 22119942 27393429 33164867 18*Ø
C
C       CONNECTING COMPANY RELATIONS
C
        22; 1644  273861 281373 295Ø31 312Ø41 323752 341Ø68 >
        36Ø352 3853Ø7 4Ø4583 454661 535184 5158Ø5 584477 644264 >
        675493 717435 729612 637Ø3Ø 691726 648624 6ØØ413 732595 >
        18*Ø
C
C       LOCAL COMMERCIAL OPERATIONS
C
        23; 1645  7738945 7931272 7871554 85815Ø5 9138843 >
        9946822 1Ø847747 11685Ø67 12889321 143Ø8981 15742893 >
        16918439 17732442 217Ø3747 25331788 28287698 31654976 >
        33Ø97948 38346552 43146751 47256Ø55 63Ø476Ø8 18*Ø
C
C       PUBLIC TELEPHONE COMMISSIONS
C
        24; 1648  18Ø1635 1855952 18799Ø9 2ØØ1385 2122873 >
        22644Ø7 2451938 2463897 2634253 27Ø5348 2682551 2775987 >
        2842828 3Ø9Ø75Ø 3531763 3554176 3928Ø89 3776315 4226379 >
        4513871 4625561 5Ø871Ø3 18*Ø
C
C       DIRECTORY EXPENSES
C
        25; 1649  9Ø69356 9133466 9637875 1Ø361953 1Ø353984 >
        11176459 11527Ø25 12593544 12753189 13454273 145Ø7664 >
        15854815 17233Ø11 19Ø2563Ø 2Ø746864 22923584 2527851Ø >
        27521Ø25 312381Ø8 35379286 35726824 38937716 18*Ø
```

EXHIBIT A-4--continued

EXOGENEOUS VARIABLES FILE

```
C
C       OTHER COMMERCIAL EXPENSES
C
        26; 165Ø  7613 1Ø133 12178 1ØØ85 4512 2262 121Ø1     >
        11483 2Ø173 13626 8118 895Ø 1537 1654 998 2565 1496 6717 >
        77Ø 3112 48724 417278 18*Ø
C
C       OFFICE SALARIES AND EXPENSES
C       ACCOUNTS (661 THROUGH 665)
C
        27; 1666  15446435 158654Ø4 16813324 17963297 192Ø5154 >
        1983584Ø 21223316 22668318 26Ø7659Ø 29261669 33153916 >
        36527Ø55 41Ø66445 42556864 45873556 5228Ø513 614Ø472Ø >
        65947129 7518215Ø 82262Ø14 94ØØ9685 1Ø22Ø1911 18*Ø
C
C       OTHER OPERATING EXPENSES
C       ACCOUNTS (668 THROUGH 677)
C
        28; 168Ø  1352338Ø 1441969Ø 14742223 15292585 18883898 >
        21410Ø7Ø 22821624 2475Ø647 27Ø41Ø91 3187913[illegible] 39394715 >
        462ØØ91Ø 5491282Ø 59921Ø53 67429776 88468164 1Ø4857637 >
        116827Ø47 126648744 14465Ø158 157336368 167394868 18*Ø
END OF FILE
```

EXHIBIT A-5

INITIALIZATION FILE

```
INIABC.DATA
C
C                 OHIO BELL
C                 INITIALIZATION FILE
C                 BASE YEAR: 1969
C
C       OTHER INCOME
C
        1: 2.9Ø85Ø4 4.359893 6.235224 6.241716 7.382Ø34 >
        7.147278 6.142611 4.632229 6.Ø37823 6.973918    >
        2.285197 3.Ø13463 3.9Ø1Ø56 16*Ø
C
C       CURRENT ASSETS
C
        2; 98.681ØØ1
C
C       COMMON STOCK AND OTHER PAID IN CAPITAL
C
        3; 61Ø.Ø
C
C       RETAINED EARNINGS
C
        4; 138.771199
C
C       PREFERRED STOCK
C
        5: Ø.Ø
C
C       LONG TERM DEBT
C
        6; 225.5Ø
C
C       SHORT TERM DEBT
C
        7; 114.134Ø
C
C       CUMULATIVE DEFERRED INCOME TAXES
C
        8: Ø
C
C       OPERATING REVENUES
C
        9; 5ØØ.744118
C
C       DIVIDEND EXPENSE
C
        1Ø; 53.375Ø
C
C       CUMULATIVE DEFERRED INVESTMENT TAX CREDIT
C
        11: 14.49241Ø
C
C       CURRENT LIABILITIES
C
        12: 133.Ø5Ø32Ø
C
C       NO OF COMMON SHARES
C
        13: 61ØØØØØ
END OF FILE
```

EXHIBIT A-6

BUDGET FILE

```
BUDABC
C
C                      OHIO BELL
C                      BUDGET FILE
C                      PLANT ACCOUNTS
C                      1969 - 1981
C
C       CWIP (INITIAL)
C
        131; 54.7564 28*Ø
C
C       AFDC (INITIAL)
C
        133; Ø 28*Ø
C
C*************** NEW PLANT ***************
C
C       ACCOUNT NO,BOOK LIFE,TAX LIFE
C
        1; 2ØØ 19.Ø 19.Ø 26*Ø
C
C       CAPITAL EXPENDITURES
C
        2; Ø.Ø 191.5Ø222Ø 234.51647Ø 246.656Ø2Ø >
        287.Ø7626Ø 3Ø2.77564Ø 29Ø.76177Ø 266.294Ø6Ø >  >
        311.58361Ø 4Ø6.45794Ø 4Ø9.68819Ø 424.22797Ø >  >
        411.Ø5692Ø 16*12.5P
C
C       CONSTRUCTION EXPENDITURES
C
        3; Ø.Ø 2Ø9.Ø633ØØ 242.75Ø67Ø  261.76754Ø >
        278.Ø4237 3ØØ.73762 272.677738 251.92261Ø 262.4616ØØ >
        39Ø.841Ø7Ø 4Ø8.191Ø9Ø 415.56637Ø 384.27935Ø 16*13.25P
C
C*************** EXISTING PLANT ***************
C
C       TAX LIFE (GPV WEIGHTED), TAX DEPR RATE,
C       TAX DEPR, TAX NPV
C
        134; 19.Ø Ø Ø Ø 25*Ø
C
C       ACCOUNT NO,GPV,BOOK NPV,BOOK DEPR RATE,
C       GR AFDC, NET AFDC
C
        71; 3ØØ 1463.839966 1Ø82.51ØØØØ Ø.Ø53 >
        Ø Ø 23*Ø
C
C       RETIREMENTS
C
        72; 1 49.Ø6Ø929 63.562253 72.267267 >
        89.86469Ø 11Ø.Ø83ØØØ 113.8159ØØ 115.58987Ø 118.39865Ø >
        14Ø.8Ø728Ø 146.28424Ø 18Ø.9Ø755Ø 132.388368 6*21.8Ø 1Ø*Ø
END OF FILE
```

EXHIBIT A-7

PARAMETERS FILE

```
PARABC.DATA
C
C             OHIO BELL
C             PARAMETERS FILE
C             1969-1981
C
C       FRACTION OF PLANT ELIGIBLE FOR
C       INVESTMENT TAX CREDIT
C
        1: 29*Ø.8
C
C       INVESTMENT TAX CREDIT RATE
C
        2: Ø.Ø261 Ø.Ø112 Ø.Ø117 Ø.Ø373 Ø.Ø376 Ø.Ø427 >
        Ø.1Ø32 Ø.1184 Ø.1162 Ø.Ø976 Ø.Ø994 Ø.Ø972 >
        Ø.Ø174 16*Ø.1Ø
C
C       ST LINE DEPR LIFE OF INV TAX CREDIT
C
        3: 16.8 12.Ø 15.3 16.3 19.2 17.Ø 17.8 2Ø.3 15.4 15.2 14.9 >
        13.4 11.1 16*13.Ø
C
C       FEDERAL INCOME TAX RATE
C
        4: 9*Ø.48 2Ø*Ø.46
C
C       STATE AND LOCAL INCOME TAX RATE
C
        5: 29*Ø
C
C       FRACTION OF OPERATING REVENUES ATTRIBUTED TO
C       CURRENT ASSETS
C
        6: Ø.Ø985 Ø.Ø785 Ø.Ø747 Ø.Ø755 Ø.Ø765 Ø.Ø733 Ø.Ø7Ø3 Ø.Ø76Ø >
        Ø.Ø712 Ø.Ø723 Ø.Ø717 Ø.Ø753 Ø.Ø755 16*Ø.Ø75
C
C       MAX ALLOWABLE SHORT TERM DEBT
C
        7: 1ØØ 28*12.5P
C
C       MIN SHORT TERM DEBT
C
        8: 1Ø.Ø 28*12.5P
C
C       DIVIDEND PAYOUT RATIO
C
        9: 1.Ø486 Ø.9225 1.166Ø 1.4573 1.2213 Ø.9829 1.347Ø >
        Ø.8256 Ø.6221 Ø.6579 Ø.7211 Ø.8771 Ø.7835 16*Ø.8
C
C       RATIO OF COMMON EQUITY TO TOTAL CAPITALIZATION
C
        1Ø: Ø.7685 Ø.7177 Ø.65Ø6 Ø.627Ø Ø.5876 Ø.6115 Ø.6Ø47 >
        Ø.6489 Ø.6678 Ø.6392 Ø.6368 Ø.6241 Ø.6381 16*Ø.63
C
C       RATIO OF TOTAL EQUITY TO TOTAL CAPITALIZATION
C
        11: Ø.7685 Ø.7177 Ø.65Ø6 Ø.627Ø Ø.5876 Ø.6115 Ø.6Ø47 >
        Ø.6489 Ø.6678 Ø.6392 Ø.6368 Ø.6241 Ø.6381 16*Ø.63
C
C       PREFERRED STOCK INTEREST RATE
C
        12: 29*Ø.Ø
C
C       RETURN ON AVERAGE COMMON EQUITY
C
        13: Ø.Ø68Ø Ø.Ø763 Ø.Ø658 Ø.Ø516 Ø.Ø6Ø8 Ø.Ø8Ø2 Ø.Ø59Ø >
```

PARAMETERS FILE

```
          Ø.Ø88Ø Ø.1332 Ø.1327 Ø.1218 Ø.Ø95Ø Ø.1159 16*Ø.12ØØ
C
C         LONG TERM DEBT INTEREST RATE
C
          14: Ø.Ø63Ø Ø.Ø649 Ø.Ø516 Ø.Ø612 Ø.Ø6ØØ Ø.Ø718 Ø.Ø699 >
          Ø.Ø722 Ø.Ø718 Ø.Ø622 Ø.Ø75Ø Ø.Ø874 Ø.Ø888 16*Ø.08ØØ
C
C         LONG TERM DEBT MATURITY TIME
C
          15; 29*4Ø.Ø
C
C         RETURN ON RATE BASE
C
          16; 29*Ø.1Ø
C
C         INTEREST RATE ON NEW SHORT TERM DEBT
C
          17; Ø.Ø866 Ø.Ø716 Ø.Ø476 Ø.Ø577 Ø.Ø969 Ø.1ØØ3 Ø.Ø6Ø5 >
          Ø.Ø465 Ø.Ø626 Ø.1Ø28 Ø.1323 Ø.1827 Ø.1287 16*Ø.12ØØ
C
C         MISC FEDERAL TAX DEDUCTIONS (MILLION DOLLARS)
C
          18; 29*Ø
C
C         SHARE OF TELECOMMUNICATIONS OPERATIONS
C
          19; 29*1.Ø
C
C         AFDC FACTORS (PLANT ACCOUNT 2ØØ)
C
          2Ø; 29*1.Ø
C
C         DIVIDENDS PER SHARE (DOLLARS)
C
          3Ø; 29*2.Ø
C
C         MARKET TO BOOK RATIO FOR COMMON STOCK
C
          31; 29*1.Ø
C
C         PROPERTY TAX RATE
C
          32; Ø.Ø232 Ø.Ø228 Ø.Ø238 Ø.Ø231 Ø.Ø234 Ø.Ø232 Ø.Ø215 >
          Ø.Ø2Ø9 Ø.Ø21Ø Ø.Ø21Ø Ø.Ø2Ø9 Ø.Ø2Ø9 Ø.Ø217 16*Ø.Ø21Ø
C
C         OPERATING REVENUE TAX RATE
C
          33: Ø.Ø219 Ø.Ø245 Ø.Ø281 Ø.Ø29Ø Ø.Ø267 Ø.Ø269 Ø.Ø292 >
          Ø.Ø261 Ø.Ø263 Ø.Ø29Ø Ø.Ø292 Ø.Ø287 Ø.Ø3Ø6 16*Ø.Ø3ØØ
C
C         RATE OF AFDC ON CWIP
C
          34; 29*Ø
C
C         FR OF INV TAX CR EXCL FROM RATE BASE
C
          35; 29*Ø.Ø
C
C         TARGET OPERATING REVENUES (MILLION DOLLARS)
C
          36; 5ØØ.744118 569.774512 6Ø3.Ø5639Ø 637.85Ø688 >
          726.763367 83Ø.387Ø16 87Ø.179426 1Ø17.881962 1218.25Ø392 >
          1312.399353 14Ø2.324919 1495.1766Ø9 171Ø.242295 16*18P
C
C         MISC STATE TAX DEDUCTIONS
C
          37: 29*Ø.Ø
C
```

EXHIBIT A-7--continued

PARAMETERS FILE

```
C       FR OF CWIP INCL IN RATE BASE
C
        38; 29*Ø.Ø
C
C       FR OF DEFERRED TAXES EXCLUDED FROM RATE BASE
C
        39; 29*Ø.Ø
C
C       WORKING CAPITAL INCL IN RATE BASE (MILLION DOLLARS)
C
        4Ø; 29*Ø.Ø
C
C       UNIT OF COMMON STOCK ISSUE (MILLION DOLLARS)
C
        41; 29*1ØØ.ØE-6
C
C       MIN COMMON STOCK ISSUE (MILLION DOLLARS)
C
        42; 1Ø.Ø 28*12.5P
C
C       MAX COMMON STOCK ISSUE (MILLION DOLLARS)
C
        43; 2ØØ.Ø 28*12.5P
C
C       UNIT OF PREFERRED STOCK ISSUE (MILLION DOLLARS)
C
        44; 29*2Ø.ØE-6
C
C       MIN PREF STOCK ISSUE (MILLION DOLLARS)
C
        45; 29*Ø.Ø
C
C       MAX PREFERRED STOCK ISSUE (MILLION DOLLARS)
C
        46; 29*1Ø.Ø
C
C       UNIT OF LONG TERM DEBT ISSUE (MILLION DOLLARS)
C
        47; 29*1ØØ.ØE-6
C
C       MIN LONG TERM DEBT ISSUE (MILLION DOLLARS)
C
        48; 2Ø.Ø 28*12.5P
C
C       MAX LONG TERM DEBT ISSUE (MILLION DOLLARS)
C
        49; 5ØØ.Ø 28*12.5P
C
C       FRACTION OF NET UTILITY PLANT ATTRIBUTED TO CURRENT ASSETS
C
        5Ø;  Ø.Ø434 Ø.Ø354 Ø.Ø318 Ø.Ø3Ø4 Ø.Ø315 Ø.Ø313 Ø.Ø293 >
        Ø.Ø35Ø Ø.Ø358 Ø.Ø358 Ø.Ø351 Ø.Ø368 Ø.Ø395 16*Ø.Ø35
C
C       ADDITIONAL CURRENT ASSETS
C
        51; Ø.Ø 26.525233 31.44Ø567 31.317542 36.822973 >
        42.Ø49812 41.664852 49.174452 58.Ø43925 61.773712 >
        65.735878 73.411646 88.4Ø2752 16*21P
C
C       FRACTION OF OPERATING REVENUES ATTRIBUTED TO
C       CURRENT LIABILITIES
C
        52; Ø.13Ø2 Ø.11ØØ Ø.1Ø66 Ø.1153 Ø.1157 Ø.Ø974 Ø.Ø872 >
        Ø.Ø957 Ø.1Ø25 Ø.Ø832 Ø.Ø777 Ø.Ø845 Ø.Ø851 16*Ø.Ø85
C
C       FRACTION OF NET UTILITY PLANT ATTRIBUTED TO
C       CURRENT LIABILITIES
        53; Ø.Ø485 Ø.Ø496 Ø.Ø463 Ø.Ø464 Ø.Ø477 Ø.Ø416 Ø.Ø363 >
```

EXHIBIT A-7--continued

PARAMETERS FILE

```
        Ø.Ø441 Ø,Ø516 Ø.Ø412 Ø.Ø38Ø Ø.Ø413 Ø.Ø445.16*Ø.Ø45
C
C       ADDITIONAL CURRENT LIABILITIES
C
        54; Ø.Ø 21.2596Ø3 22.535447 24.2Ø7937 27.215617 >
        29.Ø846Ø7 34.567Ø17 38.55325Ø 37.61423Ø 44.97674Ø >
        49.981Ø1Ø 55.57153Ø 57.13342Ø 16*15P
END OF FILE
```

EXHIBIT A-8

DEBT FILE

```
DABC 1
1  1 FORTY YR DEBENTURES   2  1 1966 2ØØ6 6ØØØØ.Ø 6ØØØØ.Ø     Ø.Ø  5.ØØØ
1  2 FORTY YR DEBENTURES   3  1 1967 2ØØ7 75ØØØ.Ø 75ØØØ.Ø     Ø.Ø  5.375
1  3 FORTY YR DEBENTURES   7  1 1968 2ØØ8 55ØØØ.Ø 55ØØØ.Ø     Ø.Ø  6.75Ø
Ø
```

EXHIBIT A-9

ACCOUNT NAMES FILE

```
 29                                                                   ØØØØØØ1Ø
6Ø2  2 REPAIRS OF OUTSIDE PLANT                                       ØØØØØØ2Ø
6Ø3  2 TEST DESK WORK                                                 ØØØØØØ3Ø
6Ø4  2 REPAIRS OF CENTRAL OFFICE EQUIPMENT                            ØØØØØØ4Ø
6Ø5  2 REPAIRS OF STATION EQUIPMENT                                   ØØØØØØ5Ø
6Ø6  2 REPAIRS OF BUILDINGS AND GROUND                                ØØØØØØ6Ø
61Ø  2 MAINTAINING TRANSMISSION POWER                                 ØØØØØØ7Ø
612  2 OTHER MAINTENANCE EXPENSES                                     ØØØØØØ8Ø
621  1 GENERAL TRAFFIC SUPERVISION                                    ØØØØØØ9Ø
622  1 SERVICE INSPECTION AND CUSTOMER INSTRUCTION                    ØØØØØ1ØØ
624  1 OPERATORS' WAGES                                               ØØØØØ11Ø
626  1 REST AND LUNCHROOMS                                            ØØØØØ12Ø
627  1 OPERATORS' EMPLOYMENT AND TRAINING                             ØØØØØ13Ø
629  1 CENTRAL OFFICE STATIONERY PRINTING                             ØØØØØ14Ø
63Ø  1 CENTRAL OFFICE HOUSE SERVICE                                   ØØØØØ15Ø
631  1 MISCELLANEOUS CENTRAL OFFICE EXPENSES                          ØØØØØ16Ø
632  1 PUBLIC TELEPHONE EXPENSES                                      ØØØØØ17Ø
633  1 OTHER TRAFFIC EXPENSES                                         ØØØØØ18Ø
634  1 JOINT TRAFFIC EXPENSES (NET OF DR. AND CR.)                    ØØØØØ19Ø
64Ø  1 GENERAL COMMERCIAL ADMINISTRATION                              ØØØØØ2ØØ
642  1 ADVERTISING                                                    ØØØØØ21Ø
643  1 SALES EXPENSE                                                  ØØØØØ22Ø
644  1 CONNECTING COMPANY RELATIONS                                    ØØØØØ23Ø
645  1 LOCAL COMMERCIAL OPERATIONS                                    ØØØØØ24Ø
648  1 PUBLIC TELEPHONE COMMISSIONS                                   ØØØØØ25Ø
649  1 DIRECTORY EXPENSES                                             ØØØØØ26Ø
65Ø  1 OTHER COMMERCIAL EXPENSES                                      ØØØØØ27Ø
666  1 OFFICE SALARIES AND EXPENSES                                   ØØØØØ28Ø
68Ø  1 OTHER OPERATING EXPENSES                                       ØØØØØ29Ø
```

EXHIBIT A-10

DEPRECIATION FILE

```
2ØØ DATA
197Ø 1998 4
1Ø.5  9.4  8.9  8.4  7.8  7.3  6.8  6.3
 5.7  5.2  4.7  4.2  3.7  3.2  2.6  2.1
 1.6  1.Ø  Ø.5
3ØØ  1
  1ØØ.Ø       18.Ø  1
```

Analysis of Results

This section compares RAMTEL output to actual values. Exhibits A-11 and A-12 contains actual and RAMTEL values for the Balance Sheet and the Income Statement, respectively. Instead of discussing items for which RAMTEL output values were close to the actual values, this discussion focuses on instances where there were significant differences between the two sets of values. It is clear from exhibits A-11 and A-12 that for most of the financial items, RAMTEL output closely predicted the actual values. The largest percentage differences occurred in two types of accounts. The first type consists of those accounts which had relatively small values and a small difference becomes large when translated into a percentage. The second type comprises those where any financial modeling approach (such as that used in RAMTEL) is not adequate to capture the variability inherent in such accounts. The variability is often the result of the lack of a well-understood and structured decision-making process in allocating these accounts. Examples of such accounts will be discussed in the following part of this analysis. Aggregate values, such as Total Assets, Total Liabilities, and Total Operating Revenues computed by RAMTEL did not differ from actual values by more than 5 percent.

The following discussion attempts to explain the causes of those instances where RAMTEL values differed from actual values by more than 5 percent.

Balance Sheet

Assets Not Elsewhere Classified. This account shows a difference of more than 5% in 1973 and 1974. It is the result of small differences (all less than 3%) in other asset accounts and the fact that it itself is a small account used to lump together items not considered by RAMTEL.

EXHIBIT A-11

COMPARISON OF ACTUAL AND RAMTEL OUTPUT VALUES
IN THE BALANCE SHEET
(in millions of current dollars)

	1970			1971			1972		
	Actual	RAMTEL	Percent Difference	Actual	RAMTEL	Percent Difference	Actual	RAMTEL	Percent Difference
Gross Plant in Service	1605.28	1606.28	-0.06	1776.24	1777.23	-0.06	1950.62	1951.62	-0.05
Accumulated Depreciation	413.15	4.1359	-0.1	441.85	439.58	0.5	460.94	465.92	-1.0
Net Plant Value	1192.13	1192.69	-0.04	1334.39	1337.66	-0.25	1489.68	1485.70	0.27
Construction Work In Progress	72.32	72.32	0	80.55	80.55	0	95.66	95.66	0
Net Utility Plant	1264.45	1265.01	-0.04	1414.94	1418.21	-0.23	1585.34	1581.36	0.25
Assets N.E.C.	116.03	110.61	4.7	121.56	118.45	2.6	127.66	125.10	0.02
Total Assets	1380.48	1375.62	0.35	1536.50	1536.66	0	1713.00	1706.46	0.39
Common Stock	670.00	720.04	-7.5	710.00	737.28	-3.8	760.00	751.51	1.1
Retained Earnings	143.62	143.57	0.03	134.40	134.09	0.23	113.79	113.61	0.16
Total Common Equity	813.62	863.61	-6.1	844.40	871.37	-3.2	873.79	865.12	0.99
Preferred Stock	0	0	0	0	0	0	0	0	0
Long Term Debt	320.00	339.69	-6.2	453.50	467.96	-3.2	520.00	496.44	4.5
Total Capital	1133.62	1203.31	-6.1	1297.90	1339.33	-3.2	1393.79	1465.88	-5.2
Short Term Debt	80.60	11.25	86.0	55.15	12.66	77.0	99.70	118.55	-18.8
Deferred Income Taxes	2.16	6.98	-223.1	10.46	19.39	-85.4	22.48	36.48	-62.3
Deferred Investment Tax Credit	17.44	15.00	13.9	19.47	16.14	17.1	25.59	22.49	13.8
Liabilities NEC	146.66	139.09	5.2	153.52	149.13	2.9	171.44	167.38	2.4
Total Liabilities	1380.48	1375.62	0.35	1536.50	1536.66	-0.01	1713.00	1706.46	0.38

EXHIBIT A-11--continued

COMPARISON OF ACTUAL AND RAMTEL OUTPUT VALUES
IN THE BALANCE SHEET
(in millions of current dollars)

	1973			1974			1975		
	Actual	RAMTEL	Percent Difference	Actual	RAMTEL	Percent Difference	Actual	RAMTEL	Percent Difference
Gross Plant in Service	2147.84	2148.83	-0.05	2340.53	2341.53	0	2516.00	2518.47	-0.1
Accumulated Depreciation	470.81	484.42	-2.9	481.04	492.92	-2.5	493.96	507.38	-2.7
Net Plant Value	1677.03	1664.41	0.75	1859.49	1848.60	0.59	2022.04	2011.09	0.5
Construction Work In Progress	86.63	86.63	0	84.59	84.59	0	66.51	66.51	0
Net Utility Plant	1763.66	1751.04	0.72	1944.08	1933.20	0.56	2088.55	2077.60	0.5
Assets N.E.C.	148.06	140.50	5.1	163.71	154.61	5.6	163.93	160.20	2.3
Total Assets	1911.72	1891.55	1.1	2107.79	2087.80	0.95	2252.48	2237.80	0.6
Common Stock	845.00	840.58	0.52	905.00	978.20	-8.2	970.00	998.47	-2.9
Retained Earnings	101.05	101.45	0.40	102.43	102.84	-0.40	80.91	80.72	0.23
Total Common Equity	946.05	917.25	3.0	1007.43	1041.75	-3.4	1050.91	1040.71	0.9
Preferred Stock	0	0	-	0	0	-	0	0	-
Long Term Debt	664.10	661.15	0.44	640.00	697.19	-8.9	687.00	737.74	-7.4
Total Capital	1610.15	1603.18	0.44	1647.43	1778.23	-7.9	1737.91	1816.93	-4.1
Short Term Debt	7.55	16.02	-112.2	119.82	7.63	93.6	121.40	66.66	45.1
Deferred Income Taxes	66.47	58.98	11.3	109.66	86.08	21.5	147.86	116.35	21.3
Deferred Investment Tax Credit	32.19	29.24	9.2	39.97	37.19	7.0	58.99	56.35	4.5
Liabilities NEC	195.36	184.13	5.7	190.91	178.67	6.4	186.32	181.50	2.6
Total Liabilities	1911.72	1891.54	1.1	2107.79	2087.80	0.95	2252.48	2237.79	0.65

- means undefined

EXHIBIT A-12

COMPARISON OF ACTUAL AND RAMTEL OUTPUT VALUES
IN THE INCOME STATEMENT
(in millions of current dollars)

	1970			1971			1972		
	Actual	RAMTEL	Percent Difference	Actual	RAMTEL	Percent Difference	Actual	RAMTEL	Percent Difference
Operating Revenues	569.77	561.08	1.5	603.06	605.37	0.38	637.85	635.52	0.37
Operation	176.02	175.97	1.5	603.06	605.37	0.38	637.85	635.52	0.37
Maintenance	124.01	124.01	0	141.11	141.11	0	156.46	156.46	0
Depreciation	79.71	81.32	-2.0	84.83	89.55	-5.6	92.54	98.61	6.6
Total Operating Expenses	379.74	381.30	-0.41	420.15	424.69	-1.1	460.22	466.29	-1.3
Operating Revenue Tax	13.97	13.75	1.5	16.96	17.01	-0.29	18.48	18.43	0.27
Property Tax	36.07	35.00	3.0	39.80	40.26	-1.2	42.56	43.07	-1.2
Income Tax Paid	44.60	47.04	-5.5	27.85	36.96	-32.7	8.12	16.39	-101.8
Deferred Income Tax	2.16	6.98	223.1	8.31	12.42	-49.5	12.62	17.08	-35.3
Deferred Investment Tax Credit	0.27	0.51	-0.89	2.01	1.14	43.2	6.12	6.34	-3.6
Total Expenses	476.81	484.58	-1.6	515.08	532.48	-3.3	548.12	567.60	-3.6
Operating Income	85.10	76.50	10.1	79.02	72.89	7.8	78.94	67.91	14.0
Other Income	4.36	4.36	0	6.24	6.24	0	6.24	6.24	0
AFDC	0	0	-	0	0	-	0	0	-
Income before Interest	87.93	80.86	8.0	83.88	79.12	5.7	82.63	74.16	10.3
Interest on LTD	19.18	14.46	24.6	21.78	21.47	1.4	30.18	27.19	9.9
Interest on STD	6.2	4.49	27.6	6.56	0.57	91.3	7.29	0.78	89.3
Net Income	62.52	61.92	0.96	55.53	57.08	-1.6	45.06	46.19	-1.1
Preferred Dividends	0	0	0	0	0	0	0	0	0
Earnings Available Common	62.52	61.92	0.96	55.53	57.08	-1.6	45.06	46.19	-1.1

- means undefined

EXHIBIT A-12--continued

COMPARISON OF ACTUAL AND RAMTEL OUTPUT VALUES
IN THE INCOME STATEMENT
(in millions of current dollars)

	1970			1971			1972		
	Actual	RAMTEL	Percent Difference	Actual	RAMTEL	Percent Difference	Actual	RAMTEL	Percent Difference
Common Dividends	70.30	69.10	1.7	79.39	79.74	-0.44	83.56	85.84	-2.7
Retained Earnings	-12.74	-12.52	1.7	1.38	1.39	-0.72	-21.53	-22.11	-2.7

EXHIBIT A-12--continued

COMPARISON OF ACTUAL AND RAMTEL OUTPUT VALUES
IN THE INCOME STATEMENT
(in millions of current dollars)

	1973			1974			1975		
	Actual	RAMTEL	Percent Difference	Actual	RAMTEL	Percent Difference	Actual	RAMTEL	Percent Difference
Operating Revenues	726.76	709.72	2.3	830.39	820.22	1.2	870.18	857.74	1.4
Operation	230.66	230.66	0	253.07	253.06	0	291.21	291.20	0
Maintenance	170.94	170.94	0	191.08	191.08	0	208.31	208.31	0
Depreciation	99.25	108.36	-9.2	113.82	118.59	-4.1	121.08	128.27	-5.9
Total Operating Expenses	500.85	509.96	-1.8	557.97	562.73	-0.85	620.60	627.78	-1.6
Operating Revenue Tax	19.43	18.95	2.5	22.30	22.06	1.0	25.40	25.05	1.4
Property Tax	48.29	47.98		51.08	52.09	1.9	50.98	52.24	-2.5
Income Tax Paid	-11.06	19.88	297.7	0.91	35.36	-378.6	-22.28	2.95	113.2
Deferred Income Tax	43.38	22.50	48.1	46.75	27.10	42	41.76	30.27	27.5
Deferred Investment Tax Credit	6.60	6.76	-2.4	7.77	7.95	-2.3	21.10	19.10	9.5
Total Expenses	607.49	626.02	-3.1	686.78	707.30	-3.0	737.56	757.44	-2.7
Operating Income	105.04	83.70	20.3	127.71	112.92	11.6	116.39	100.30	13.8
Other Income	7.38	7.38	0	7.15	7.15	0	6.14	6.14	0
AFDC	0	0	-	0	0	-	0	0	-
Income before Interest	109.58	91.08	16.9	132.54	120.07	9.4	120.46	106.44	11.6
Interest on LTD	32.81	33.04	-0.71	45.93	37.76	8.2	45.93	40.47	11.9
Interest on STD	17.52	1.47	91.6	6.94	1.19	82.3	10.89	2.25	79.3
Net Income	57.56	56.58	1.7	80.77	81.12	-0.43	62.04	63.73	0.50
Preferred Dividends	0	0	-	0	0	-	0	0	-
Earnings Available Common	57.56	56.58	1.7	80.77	81.12	-0.43	62.04	63.73	-2.7

- means undefined

EXHIBIT A-12--continued

COMPARISON OF ACTUAL AND RAMTEL OUTPUT VALUES
IN THE INCOME STATEMENT
(in millions of current dollars)

	1973			1974			1975		
	Actual	RAMTEL	Percent Difference	Actual	RAMTEL	Percent Difference	Actual	RAMTEL	Percent Difference
Common Dividends	57.68	57.12	0.97	64.75	66.56	-2.8	65.68	67.32	-2.5
Retained Earnings	4.85	4.80	1.0	-9.22	-9.48	-2.8	-20.61	-21.12	-2.5

Common Stock. This account shows differences over 5% between RAMTEL and actual values in years 1970 and 1974. The differences are caused by corresponding differences between how RAMTEL models the process of raising capital and how it happens in a corporation. While RAMTEL uses an algorithm which has a sound basis in well-known financial principles (such as trying to approximate a target capital structure), it does not (and possibly no other financial model can) capture the total variability involved in allocating funds in different capital accounts. Such variability is often caused by, among other factors, the subjective element involved in financial decision-making. For example, the board of directors of a corporation may decide to finance a large part of its capital projects through short terms notes in a given year and none in another year. The decisions may be based on both the condition of the financial markets (reflected by availability and interest rates) and the subjective judgement of its members. RAMTEL does not model the first factor (it would be difficult to predict) and cannot possibly simulate the second. The difference between RAMTEL and actual values were all less than 10%.

Total Common Equity. This account is the sum of common stock and retained earnings. For reasons explained under Common Stock, it shows a similar difference in the year 1970.

Long Term Debt. This account exhibits differences larger than 5% in 1970, 1974 and 1975. The explanation is the same as that provided for Common Stock. All the differences are, however, under 10%.

Short Term Debt. This is the account where most of the differences occurred. Looking at the actual values, one observes rather wide variation over the years with no apparent correlation with other accounts. RAMTEL, however, predicts relatively slow variations in this account based on its own financial logic, thus causing the differences (which reaches -112.2% in 1973) with actual values. These differences presumably affect other capital accounts (since total capital requirements should about by the same in both the actual case and RAMTEL) and cause differences in those accounts.

Deferred Income Taxes. Deferring income taxes due to accelerated depreciation was allowed as an accounting practice beginning in 1970. Initially, relatively small portions of these deferrals were realized by Ohio Bell. In later years (beginning in 1973), the balance accrued from past years was charged against this account. This explains the part of the differences between RAMTEL and actual values. The rest of the differences may be due to inclusion of items under this account which RAMTEL does not model.

Deferred Investment Tax Credit. The difference in these values are larger than 5% in all years except 1975. RAMTEL uses an amortization life for calculating this account. In the actual case, instead of a uniform deferral based on an amortization life of the investments, the utility may opt for deferring relatively larger or smaller dollar amounts in different years. Also, RAMTEL uses one aggregated value of amortization life for the total of all investments in a single account, while in the actual case, deferrals may be calculated separately for individual investment accounts, and the aggregated. The above two factors may contribute to the observed differences.

Liabilities Not Elsewhere Classified. The differences between actual values in these accounts and RAMTEL output may be a reflection of differences in other liability accounts, particularly short term debt, and the fact that it is a relatively small account. The differences ranged between 2.4% and 6.4% in 1970 through 1975.

Income Statement

Depreciation. This account shows a difference of more than 5% between RAMTEL output and actual values in all years except 1970 and 1974. This is caused by the way Ohio Bell allocates retirement-related charges to the depreciation accounts. For example, Ohio Bell charges the cost of removal of retired plant and equipment to depreciation but RAMTEL does not.

Income Tax Paid, Deferred Income Tax and Deferred Investment Tax Credit. The causes of differences in the cumulative values of these accounts have been already discussed under Balance Sheet. In fact, the differences in the cumulative values (in the Balance Sheet) are a reflection of differences in the annual values (which are reported in the Income Statement) of these accounts.

Operating Income and Income Before Interest. The differences in these accounts are caused by differences in the depreciation and tax-related accounts which have been already discussed.

Interest on Long Term Debt and Interest on Short Term Debt. As already discussed under balance sheet, all capital related accounts cannot be accurately simulated by RAMTEL (or any other conceivable model). This caused rather large variations in RAMTEL output and actual values in the Long Term Debt and Short Term Debt accounts. Quite logically, the interest charges accruing to these accounts also show corresponding differences.

Conclusions

From this brief analysis we conclude that the RAMTEL model can predict, with reasonable accuracy, the future values of selected financial variables. Changes can be made in RAMTEL to accommodate known changes in tax laws or accounting procedures. As with all complex computer-based models, the analyst has the primary responsibility for assessing the validity of the RAMTEL output values against industry standards, regulatory criteria, and the peculiar economic circumstances of the telephone utility being examined. The authors of the RAMTEL model (and its previous versions) on their part have built an analytical tool which uses accurate representations of actual financial variables and simulates the flows and interactions among those variables.

APPENDIX B
MATHEMATICAL ILLUSTRATIONS

This section illustrates the accounting relationships and flow of calculations for RAMTEL. It is divided into two major sections.

- Definition of variables
- Model equations

The first section lists mathematical symbols that are used to represent financial variables. The second section sets out equations and algorithms that are used to carry out various financial calculations. The second section is further divided into subsections, each of which deal with a specific set of financial calculations. They are the following.

- Capital expenditures
- Allowance for funds during construction
- Depreciation
- Operations and maintenance expenses
- Deferred items and tax credits
- Fixed obligations
- Income
- Sources of funds
- Taxes
- Operating revenue

Definition of Variables

Exhibit B-1 contains an alphabetical list and definitions of the parameters and variables used in the model equations which follow this section. In general, variables are monetary quantities whereas parameters are not.

The reader should be cautioned in attempting to make a direct correspondence between the equations which follow and the RAMTEL computer programs. The equations represent the accounting relationship and identifies used in the RAMTEL calculations. In some instances, the reader will find simultaneous equations which are solved literatively in the programs. The equations are grouped into ten functional classifications and are not presented in the order of calculation. Likewise, the variable name abbreviations are hoped to be useful mnemonics and are not identical to variables used by the computer programs.

The source of all parameters and variables is identified in the last column of Table B-1. If the source is an input file (i.e., user-supplied), then the name of the file is given. Where no source is given, the variable or parameter is calculated by the model. In addition, the following three special characteristics are used to identify variables whose value is calculated by the model for all years after the initial year:

- * Initial value taken from Budget File; calculated by model thereafter.
- + Initial value taken from Initialization File; calculated by model thereafter.
- ** Values taken from input Debt File for issues existing at the beginning of the model simulation; calculated by model thereafter.

The following subscripts are also used:

Subscript t refers to year t.

Subscript j refers to account j in the capital budget.

Subscript n refers to long-term debt issue n.

Subscript m refers to preferred stock issue m.

The integer function used in Section VIII is defined as that which simply truncates any fractional part of its argument, thus always rounding downward.

EXHIBIT B-1
LIST OF VARIABLES

Variable Name	Definition	Source
$AFDC1_t$	AFDC associated with CWIP	*
$AFDC1C_t$	Total AFDC in CWIP account	
$AFDC2_t$	AFDC portional plant going into service in year t	
$AFDC2C_t$	Cumulative AFDC2	
$AFDCEG_j$	Amount of AFDC in starting value of gross plant in service	Budget File
$AFDCEN_j$	Amount of AFDC in starting value of net plant in service	Budget File
AFDCP	Sum of AFDC2 over all years modeled	
AFDCT	Sum of AFDC1 over all years modeled	
$BVCOM_t$	Book value per share of common stock	
$CAPT_t$	Total capitalization	
CE_t	Annual cash construction expenditures (excluding AFDC)	
CEJ_{tj}	Annual cash expenditures for plant account j (excluding AFDC)	Budget File

EXHIBIT B-1--continued
LIST OF VARIABLES

Variable Name	Definition	Source
CEP_t	Value of plant going into service in year t (excluding AFDC)	
$CEPJ_{tj}$	Value of plant going into service, plant account j (excluding AFDC)	Budget File
$CURAS_t$	Current assets	+
$CURL1_t$	Current liabilities	+
CS_t	Common stock outstanding	+
$CWIP_t$	Construction work in progress (excluding AFDC)	*
$DEBT_t$	Long-term debt outstanding	+
$DEBTER_t$	Long-term debt issued in year t	
$DEBTIN_m$	Initial amount--long-term debt issue m	**
$DEBTJ_{mt}$	Amount of outstanding long-term debt issue m	
DEF_t	Income tax deferrals	
$DEFC_t$	Cumulative income tax deferrals	+
DEP_t	Annual book depreciation	

EXHIBIT B-1--continued
LIST OF VARIABLES

Variable Name	Definition	Source
$DEPA_t$	Annual tax depreciation	
$DEPAFC_t$	Cumulative $DEPAFD_t$	
$DEPAFD_t$	Annual depreciation on AFDC component of total plant	
$DEPC_t$	Cumulative DEP_t	
$DEPEA_{tj}$	Annual depreciation of AFDC component of exiting plant	
$DEPEB_{tj}$	Annual book depreciation of existing plant	
$DEPET_t$	Annual tax depreciation of existing plant	
$DEPFA_{tj}$	Annual depreciation of AFDC component of future plant	
$DEPFB_{tj}$	Annual book depreciation of future plant	
$DEPFT_{tj}$	Annual tax depreciation of future plant	
$DIVC_t$	Common stock dividends	
$DIVP_t$	Preferred stock dividends	+

EXHIBIT B-1--continued
LIST OF VARIABLES

Variable Name	Definition	Source
$DIVPJ_{mt}$	Preferred stock dividends--issue m	
EQ_{t}	Total common equity outstanding (common stock and retained earnings)	
$EQER_{t}$	Common stock issue in year t	
$FACTOR_{tj}$	AFDC accompanying plant in service	
$FUEL_{t}$	Fuel expense (O&M)	
GPV_{t}	Gross plant value	
$GPVE_{j}$	Initial gross plant value --existing plant	Budget File
$GRREQ_{t}$	Gross requirements for funds	
$INTLTD_{t}$	Interest expense--long-term debt	
$INTLTDJ_{nt}$	Long-term debt interest--issue n	
$INTSTD_{t}$	Interest expense--short-term debt	
ITC_{t}	Investment tax credit	
$ITCAM_{t}$	Investment tax credit amortized	

EXHIBIT B-1--continued
LIST OF VARIABLES

Variable Name	Definition	Source
$ITCC_t$	Cumulative investment tax credit (deferred)	+
$MAINT_t$	Maintenance expense (O&M)	
NI_t	Net income	
$NPVEB_j$	Initial net plant value (book) of existing plant	Budget File
NPVET	Initial net plant value (tax) of existing plant	Budget File
NWC_t	Annual change in net working capital	
$NWCC_t$	Cumulative net working capital	+
$OINCOM_t$	Other income	Initialization File
$OPER_t$	Operating expense (O&M)	
$OPINC_t$	Operating income	
$OPREV_t$	Operating revenue	+
$OTAX_t$	Other taxes--property plus revenue taxes	
PF_t	Preferred stock outstanding	+
$PFER_t$	Preferred stock issue in year t	

EXHIBIT B-1--continued
LIST OF VARIABLES

Variable Name	Definition	Source
PFJ_{mt}	Outstanding amount of preferred issue m	**
$PFJIN_{m}$	Initial amount of preferred issue m	**
$PURPOW_{t}$	Purchased power expense (O&M)	
$RATEBASE_{t}$	Ratebase (for return on net plant value)	
RATIO	Adjustment factor for AFDC2	
$RBNWC_{t}$	Working capital or other dollar figure to include in ratebase	
REA_{t}	Retained earnings generated in year t	
$REAC_{t}$	Cumulative retained earnings	+
RET_{t}	Gross value of all retirements	
$RETJ_{tj}$	Gross value of retirements for account j	Budget File
RFD_{t}	Long-term debt refundings	
$SFDJ_{n}$	Long-term debt sinking fund payment--issue n	**
SFP_{t}	Preferred stock sinking fund payment	

EXHIBIT B-1--continued
LIST OF VARIABLES

Variable Name	Definition	Source
$SFPINT_t$	Interest on preferred sinking fund payment	
$SFPJ_m$	Preferred stock sinking fund payment issue m	**
STD_t	Short-term debt issued in year t	
$STDC_t$	Cumulative short-term debt	+
T	Average age of plant in base year	
$TAXESP_t$	Income taxes paid	
$TAXESR_t$	Income taxes reported	
TOPREV	Tax rate operating revenues	Parameter File
$TXCR_t$	Tax credit	
$TXOREV_t$	Operating revenues taxes paid	
$TXPF_t$	Federal taxes paid	
$TXPR_t$	Property taxes paid	
$TXPS_t$	State and local taxes paid	
$addcas_t$	Additional current assets	Parameter File
$addcli_t$	Additional current liabilities	Parameter File

EXHIBIT B-1--continued
LIST OF VARIABLES

Variable Name	Definition	Source
$afdrat_t$	Rate of AFDC on CWIP	Parameter File
$cwiprb_t$	Fraction of CWIP in rate base	Parameter File
$ddate_n$	Month and day of original issue--long-term debt issue n	**
$depn_t$	Straight line depreciable life of investment tax credit (years)	Parameter File
$dexp_n$	Year of maturity--long-term debt issue n	**
$diss_n$	Year of original issue--long-term debt issue n	**
$dpct_n$	Fraction of year elapsed up to date n	
dpr_t	Dividend payout ratio	Parameter File
$istd_t$	Interest rate on short-term debt	Parameter File
$lifeb_j$	Expected life of future plant (years)--for book depreciation	Budget File
$life_{tj}$	Expected life of future plant (years)--for tax depreciation	Budget File

EXHIBIT B-1--continued
LIST OF VARIABLES

Variable Name	Definition	Source
m_t	Number of preferred stock issues outstanding in year t	
mat_t	Number of years to maturity --future debt issues	Parameter File
$mnstd_t$	Value to which short-term debt is reduced upon stock or debt issue	Parameter File
$mxstd_t$	Maximum allowable short-term debt	Parameter File
n_t	Number of long-term debt issues outstanding in year t	
$oprevc_t$	Operating revenue	
$pdate_m$	Month and day of original issue--preferred issue m	**
pe_t	Percent of plant eligible for investment tax credit	Parameter File
$pexp_m$	Year of maturity--preferred issue m	**
$piss_m$	Year of original issue--preferred issue m	**
$ppct_m$	Fraction of year elapsed up to pdatem	
$rateb_j$	Average depreciation rate (book)--existing plant	Budget File

EXHIBIT B-1--continued
LIST OF VARIABLES

Variable Name	Definition	Source
$rate_t$	Average depreciation rate (tax)--existing plant	Budget File
$rcwip_t$	Fraction of CWIP to be included in ratebase	Parameter File
$rdefc_t$	Fraction of income tax deferrals to be excluded from ratebase	Parameter File
rec_t	Ratio of common equity to total capital	Parameter File
ret_t	Ratio of common equity and preferred stock to total capital	Parameter File
$rint_t$	Long-term debt interest rate--future issue	Parameter File
$rintj_n$	Interest rate--long-term debt issue n	**
$ritc_t$	Investment tax credit rate	Parameter File
$ritcrb_t$	Fraction ITC excluded from ratebase	Parameter File
$rnpv_t$	Return on net plant value	Parameter File
roe_t	Return on equity	Parameter File
$rpct_{tj}$	Percent of previous year's plant value (see equation for definition) to be retired	Budget File

EXHIBIT B-1--continued
LIST OF VARIABLES

Variable Name	Definition	Source
rpf_t	Preferred dividend rate--future issues	**
$rpfj_m$	Dividend rate--preferred issue m	
$tfed_t$	Federal income tax rate	Parameter File
tlife	Expected life of existing plant (years)--for tax depreciation	Budget File
$toprev_t$	Operating revenues tax rate	Parameter File
$tprop_t$	Property tax rate	Parameter File
tsl_t	State and local income tax rate	Parameter File
tv_{j1}	Percent Completion 1 year before final completion of a project in plant category j	Parameter File
$uncst_t$	Unit of common-stock issue	Parameter File
$unpst_t$	Unit of preferred-stock issue	Parameter File

Model Equations

The following sections present the equations used in the RAMTEL model. Definitions of variables and parameters can be found in the previous section.

The following subscripts are used:

Subscript t refers to year t. (Subscript o refers to initial value.)

Subscript j refers to account j in the capital budget.

Subscript n refers to long-term debt issue n.

Subscript m refers to preferred stock issue m.

A summation sign whose index variable has no bounds is defined as summation over all possible values. For example, $\sum_j CEJ_{tj}$ means a summation of CEJ over all capital accounts j.

Capital Expenditures

$$CE_t = \sum_j CEJ_{tj} \qquad \text{(B-1)}$$

$$CEP_t = \sum_j CEPJ_{tj} \qquad \text{(B-2)}$$

$$RET_t = \sum_j RETJ_{tj} \qquad \text{(B-3)}$$

$$RETJ_{tj} = GPVE_j - \sum_{i=1}^{t-1} (CEP_i - RET_i) \qquad \text{(B-4)}$$

Note: This calculation is optional. Either percentage data (prct) or dollar data (RETJ) may be supplied for retirements.

$$GPV_t = \sum_j GPVE_j + \sum_{i=1}^{t} (CEP_i - RET_i) \qquad \text{(B-5)}$$

$$CWIP_t = CWIP_0 + \sum_{i=1}^{t} (CE_i - CEP_i) \qquad \text{(B-6)}$$

Allowance for Funds Used During Construction

$$AFDC1_t = 0.5*afdrat_t * (CWIP_t + CWIP_{t-1}) * (1-rcwip_t) \tag{B-7}$$

$$AFDC1C_t = \sum_{i=0}^{t} AFDC1_i - \sum_{i=1}^{t} AFDC2_i \tag{B-8}$$

$$AFDCT = \sum_{t=0}^{end} AFDC1_t \tag{B-9}$$

$$FACTOR_{tj} = \sum_{l=1}^{10} tv_{jl} * afdrat_{t+l-1} \tag{B-10}$$

$$AFDCP = \sum_{t=0}^{end} \sum_{j} CEPJ_{tj} * FACTOR_{tj} \tag{B-11}$$

$$RATIO = AFDCT/AFDCP \tag{B-12}$$

$$AFDC2J_{tj} = RATIO * CEPJ_{tj} * FACTOR_{tj} \tag{B-13}$$

$$AFDC2C_t = \sum_{j} AFDCEG_j + \sum_{i=1}^{t} AFDC2_i \tag{B-14}$$

$$AFDC2_t = \sum_{j} AFDC2J_{tj} \tag{B-15}$$

Note: All variables with non-positive time subscripts have a value of zero.

Depreciation

If NPVET is not entered in the Budget File, then (B-16)

$$T = 1 - \frac{\sum_j NPVEB_j}{\sum_j GPVE_j} \quad \frac{\sum_j GPVE_j}{\sum_j (rateb_j * GPVE_j)}$$

$$NPVET = \sum_j GPVE_j * \left(1 - \frac{2}{tlife}\right)^T \quad \text{(B-18)}$$

If ratet is not entered in the Budget File, then

$$ratet = DEPET_0 \;/\; (NPVET + DEPET_0) \quad \text{(B-19)}$$

Book depreciation of telephone plant in service:

$$DEPEB_{tj} = (GPVE_j - \sum_{i=1}^{t-1} RETJ_{ij} - 0.5*RETJ_{tj}) * rateb_j \quad \text{(B-20)}$$

$$\text{If } DEPEB_{tj} > NPVEB_j - \sum_{i=1}^{t-1} DEPEB_{ij}) \text{ then} \quad \text{(B-21)}$$

$$DEPEB_{tj} = NPVEB_j - \sum_{i=1}^{t-1} DEPEB_{ij}$$

$$DEPEB_{tj} = \frac{1}{lifeb_j} \quad 0.5*CEPT_{t-lifeb_j\, j} + \sum_{i=t-lifeb_j+1}^{t-1} CEPJ_{ij} \quad \text{(B-22)}$$

$$+0.5*CEP_{tj} \quad \text{(See note below)}$$

Note: All variable with non-positive time subscripts have a value of zero.

$$DEP_t = \sum_j (DEPEB_{tj} + DEPFB_{tj}) \tag{B-23}$$

$$DEPC_t = \sum_j (GPVEj - NPVEBj) - \sum_{i=1}^{t-1} RET_1 + \sum_{i=1}^{t-1} DEP_i \tag{B-24}$$

Book depreciation of AFDC component of plant in service:

$$DEPEA_{tj} = AFDCEG_j * rateb_j \tag{B-25}$$

If $(DEPEA_{tj} > AFDCEN_j - \sum_{i=1}^{t-1} DEPEA_{ij})$ then

$$DEPEAtj = AFDCENj - \sum_{i=1}^{t-1} DEPEA_{ij} \tag{B-26}$$

$$DEPFA_{tj} = \frac{1}{lifeb_j} 0.5\ AFDC2J_{t - lifeb_j\ j} + \sum_{i=t-lifeb_j+1}^{t-1} AFDC2J_{ij} + 0.5*AFDC2J_{tj} \tag{B-27}$$

$$DEPAFD_t = \sum_j (DEPEA_{tj} + DEPFA_{tj}) \tag{B-28}$$

$$DEPAFC_t = \sum_j (AFDCEG_j - AFDGEN_j) + \sum_{i=t}^{t-1} DEPAFD_i \tag{B-29}$$

For equations on tax depreciation, see Appendix D.

Operations and Maintenance Expenses

Operations and maintenance (O&M) expenses are calculated in the Performance Module for each FCC or user-specified account. These accounts are aggregated into a small number of categories for inclusion in financial statements.

There are no fixed equations for calculating O&M expenses. The extreme flexibility in forecasting O&M expenses is intended to allow the user to explore many alternatives and to choose the method of calculation deemed most accurate.

There are six steps in calculating future O&M expenses:

- Pre-adjustment of historical data
- Account aggregation
- Regression
- Extrapolation
- Post-adjustment
- Gross aggregation

Pre-Adjustment

A number of historical years of O&M data (between three and forty) are provided for each FCC account or subaccount in current dollars. The first step in preparing the data is to make any desired adjustments before regression. Both additive and multiplicative adjustments are possible. Multiplicative adjustments are useful for transforming current to constant dollars; the price series need not be a GNP series. Additive adjustments are useful for adjusting specific years' data to correct for extraordinary occurrences such as a natural disaster or labor strike.

Account Aggregation

Historical data can be provided at a more detailed level than FCC account. After pre-adjustments have been made, these subaccounts (in adjusted dollars) are aggregated into main accounts for regression.

Regression

Forecasts of O&M expenses can be made using one of six methods: regression analysis (using one of three equations) or user-specified equation (in one of three forms). The three equation forms are trend, linear, and multiplicative. The methods have been numbered 1 to 6 and are shown in the table below.

METHODS OF FORECASTING O&M EXPENSES

Method Number	Regression Analysis	Type of Equation
1	Yes	Trend
2	Yes	Linear
3	Yes	Multiplicative
4	No	Trend
5	No	Linear
6	No	Multiplicative

An example of each type of equation is shown below.

Trend: $Expense_t = a*t + b$

Linear: $Expense_t = a + bX_{1t} + cX_{2t} + dX_{3t} + eX_{4t} + fX_{5t}$

Multiplicative: $Expense_t = a * X_{1t}^{b} + X_{2t}^{c} + X_{3t}^{d} + X_{4t}^{e} + X_{5t}^{f}$

The coefficients a, b, c, d, e, and f are determined through least squares regression unless the user specifies the values of the coefficients. X_{1t}, X_{2t}, X_{3t}, X_{4t}, and S_{5t} are exogenous variables selected by the user.

If Methods 1, 2, or 3 are used, last squares linear regression is performed using the adjusted, account-aggregated data as an independent variable. Method 1 uses time as the dependent variable. Methods 2 and 3 use up to five user-specified exogenous variables. Multiplicative regression (Method 3) is accomplished by performing linear least-squares regression on the logarithms of the data. Thus, neither the dependent nor independent variables should contain zero or negative values if Method 3 is used.

If Methods 4, 5, or 6 are used, the user substitutes coefficients for the regression equations corresponding to Methods 1, 2, and 3, respectively. Because regression is not used, no historical data need be supplied. As in the cases of Methods 2 and 3, up to five independent variables may be used in direct calculation Methods 5 and 6. Because Method 6 uses logarithms, positive values must be specified for exogenous variables.

Extrapolation

Using either an equation derived from regression or one specified by the user, extrapolations of O&M expenses are made for each O&M account. Future values of all exogenous variables must be supplied.

Post-Adjustment

Regression and extrapolation will normally be done in constant dollars. To transform the adjusted dollars back to current dollars, division and subtraction adjustments are made both to historical and future data. In the usual case, the reverse adjustments will be made post-regression as pre-regression, but this need not be the case.

Gross Aggregation

Future values for O&M expenses are further aggregated into a small number of categories for inclusion in financial statements. The number and contents of the aggregation accounts are easily changed, and split allocations are possible.

This section provides one example of an aggregation scheme which is currently used by the RAMTEL model.

Operation and maintenance expenses are aggregated into two expense accounts:

- Operations expense
- Maintenance expense

Exhibit B-2 indicates which O&M accounts are aggregated into each expense account. FCC account number is used to identify O&M accounts. Accounts not appearing in this table are not included in any of the two expense accounts.

EXHIBIT B-2

OPERATIONS AND MAINTENANCE EXPENSE ACCOUNTS

Account	Operations	Maintenance
602		*
603		*
604		*
605		*
606		*
610		*
611		*
612		*
621	*	
622	*	
623	*	
624	*	
626	*	
626	*	
627	*	
629	*	
630	*	
631	*	
632	*	
633	*	
634	*	
635	*	
640	*	
642	*	
643	*	
644	*	
645	*	
648	*	
649	*	

EXHIBIT B-2--continued
OPERATIONS AND MAINTENANCE EXPENSE ACCOUNTS

Account	Operations	Maintenance
650	*	
661	*	
662	*	
663	*	
664	*	
665	*	
668	*	
669	*	
671	*	
672	*	
673	*	
674	*	
675	*	
676	*	
677	*	

Deferred Items and Tax Credits

$$ITC_t = pe_t * ritc_t * CE_t \quad \text{(B-30)}$$

$$ITCAM_t = (ITC_t + ITCC_{t-1})/depn_t \quad \text{(B-31)}$$

$$ITCC_t = ITCC_{t-1} + ITC_t - ITCAM_t \quad \text{(B-32)}$$

$$TXCR_t = ITC_t - ITCAM_t \quad \text{(B-33)}$$

$$DEF_t =$$

$$.0 \quad \text{if flow-through} \quad \text{(B-39a)}$$

$$.\ (tfed_t + tsl_t) * (DEPA_t - DEP_t) \text{ if normalized} \quad \text{(B-34b)}$$

$$DEFC_t = DEFC_t\text{-}1 + DEF_t \quad \text{(B-34c)}$$

Fixed Obligations

If $(DEBTER_t > 0)$

then:

- $n_t = n_{t-1} + 1$ (B-35)
- $n = n_t$ (B-36)
- $DEBTIN_n = DEBTER_t$ (B-37)
- $SFDJ_n = 0$ (B-38)
- $rintj_n = rint_t$ (B-39)
- $ddate_n = \text{July } 1$ (B-40)
- $diss_n = t$ (B-41)
- $dexp_n = diss_n + mat_t$ (B-42)

Otherwise

- $n_t = n_{t-1}$ (B-43)

If (PFERt > 0)

Then:

- $m_t = m_{t-1} + 1$ (B-44)
- $m = m_t$ (B-45)
- $PFJIN_m = PFER_t$ (B-46)
- $SFPJ_m = 0$ (B-47)
- $rpfd_m = rpf_t$ (B-48)
- $pdate_m = \text{July } 1$ (B-49)
- $piss_m = t$ (B-50)
- $pexp_m = 3000$ (B-51)

Otherwise

- $m_t = m_{t-1}$ (B-52)

$DEBTJ_{nt}$ =

- $DEBTIN_n$ if $t = diss_n$ (B-53)
- Maximum $SEBTJ_{nt-1} - SFDJ_n;0$ if $diss_n < t < dexp_n$ (B-54)
- 0 if $t < diss_n$ or $t > dexp_n$ (B-55)

PFJ_m =

- $PFJIN_m$ if $t - piss_m$ (B-56)
- Maximum $PFJ_{mt-1} - SFPJ_m;0$ if $t > piss_m$ (B-57)
- 0 if $t < piss_m$ (B-58)

$$RFD_t = \sum_{dexp_{n=t}} DEBTJ_{nt} + \sum_{\substack{diss_n < t \\ t < dexp_n}} SFDJ_{jn} \tag{B-59}$$

$$SFP_t = \sum_{\substack{j \\ piss_t \neq t}} (PFJ_{mt} - PFJ_{mt} - PFJ_{mt-1}) \tag{B-60}$$

$$SFPINT_t = \sum_{piss_m < t} SFPJ_m * rpfj_m \tag{B-61}$$

$$\pi$$
$$PFJ_{mt} > 0$$

$INTLTDJ_{nt}$ =

- $(1-dpct_n) * rint_{jn} * DEBTJ_{nt}$ if $t = diss_n$ (B-62)
- $rintd_n * DEBTJ_{nt}$ if $diss_n < t < dexp_n$ (B-63)
- $dpct_n * rintj_n * DEBT_{nt}$ if $t = dexp_n$ (B-64)
- 0 if $t < diss_n$ or $t > dexp_n$ (B-65)

$$INTLTD_t = \sum_{n} INTLTDJ_{nt} \tag{B-66}$$

$DIVPJ_{mt}$ =

- $(1-ppct_m) * rpfj_m * PFJ_{mt}$ if $t = piss_m$ (B-67)
- $rpfi_m * PFJ_{mt}$ if $t > piss_m$ (B-68)
- 0 if $t < piss_m$ (B-69)

$$DIVP_t = \sum_{m} DIVPJ_{mt} \tag{B-70}$$

$$INTSDT_t = istd_t \quad \frac{STDC_t + STDC_{t-1}}{2} \tag{B-71}$$

Income

If income is based on return on equity (roe_t) then

• $NI_t = DIVP_t + roe_t * (EQ_t + EQ_{t-1})/2$ (B-72)

• $OPINC_t + NI_t + INTSTD_t + INTLTD_t - AFDC1_t - OINCON_t$ (B-73)

if income is based on return on net plant value ($rnpv_t$) then

• $OPINCt = rnpv_t * RATEBASE_t$ (B-74)

$$RATEBASEt = \frac{(GPV_{t-1} - DEPC_{t-1}) + GPV_t - DEPC_t)}{2} \quad \text{(B-75)}$$

$$+ \frac{(AFDC2C_{t-1} - DEPAFC_{t-1}) + (AFDC2C_t - DEPAFC_t)}{2}$$

$$- rdefc_t * \frac{DEFC_{t-1} + DEFC_t}{2} - ritcrb_t * \frac{ITCC_{t-1} + ITCC_t}{2}$$

$$+ RBNWC_t$$

. $NI_t = OPINC_t + OINCOM_t + AFDC1_t - INTLTD_t - INTSTD_t$ (B-76)

If income is based on operating revenue ($oprev_t$) then:

. $OPINC_t = oprev_t - OPER_t - MAINT_t$ (B-77)

$- DEP_t - DEPAFD_t - OTAX_t - TXPS_t - TXPF_t - DEF_t - TXCR_t$

. $NI_t = OPINC_t + OINCOM_t + AFDC1_t - INTLTD_t - INTSTD_t$ (B-78)

If dividends based on dividend payout ratio (dpr_t) then

- $DIVC_t = (NI_t - DIVP_t) * dpr_t$ (B-79)

If dividends based on dividends per share (dps_t) then

- $DIVC_t = (NSH_{t-1} + NSH_t) * dps_t/2$ (B-80)
- $REAC_t = REAC_{t-1} + REA_t$ (B-81)
- $BVCOM_t = EQ_t/NSH_t$ (B-82)
- $NSH_t + NSH_{t-1} + EQER_t/(BVCOM_{t-1} * frbook_t)$ (B-83)
- $DPR_t = (DIVC_t/(DIVC_t + REA_t)$ (B-84)

Sources of Funds

$$MXSTD_t = mxstd_t * (CS_{t-1} + PF_{t-1} + DEBT_{t-1}) \quad \text{(B-85)}$$

$$MNCST_t + uncst_t * Integer(mncst_t/uncst_t) \quad \text{(B-86)}$$

$$MNCST_t + uncst_t * Integer(mxcst_t/uncst_t) \quad \text{(B-87)}$$

$$MNLTD_t + unltd_t * Integer(mnltd_t/unltd_t) \quad \text{(B-88)}$$

$$MXLTD_t + unltd_t * Integer(mxltd_t/unltd_t) \quad \text{(B-89)}$$

$$MNPST_t + unpst_t * Integer(mnpst_t/unpst_t) \quad \text{(B-90)}$$

$$MXPST_t + unpst_t * Integer(mxpst_t/unpst_t) \quad \text{(B-91)}$$

$$PLANET_t = GPV_t + AFDC1C_t + AFDC2C_t + CWIP_t - DEPC_t - DEPAFC_t \quad \text{(B-92)}$$

$$CURLI_t = forcli_t * OPREV_{t-1} + fnpcli_t * PLANET_t + addcli_t \quad \text{(B-93)}$$

$$CURAS_t = forcas_t * OPREV_{t-1} + fnpcas_t * PLANET_t + addcas_t \quad \text{(B-94)}$$

$$NWT_t = CURAS_t - CURLI_t - NWCC_{t-1} \quad \text{(B-95)}$$

$$GRREQ_t = CE_t + AFDC1_t + NWC_t + SFP_t + RFD_t - DEP_t - DEPAFD_t - DEF_t - TXCR_t \quad \text{(B-96)}$$

If $(STDC_{t-1} + GRREQ_t = MXSTD_t)$ Then

- $EQER_t = MNCST_t$ (B-97)
- $EQ_t = EQ_{t-1} + EQER_t + REA_t$ (B-98)
- $PFER_t = MNPST_t$ (B-99)
- $PF_t = PF_{t-1} + PFER_t - SFP_t$ (B-94)
- $DEBTER_t = MNLTD_t$ (B-95)

• $(STDC_{t-1} + GRREQ_t - REA_t - EQER_t - PFER_t$ (B-96)

$- DEBTER_t > 0)$ Then

• $STDC_t = STDC_{t-1} + GRREQ_t - REA_t$

$- EQER_t - PFER_t - DEBTER_t$

Otherwise

. $STDC_t = 0$ (B-97)

. $CURAS_t = CURAS_{t-1} - NWC_t + (STDC_{t-1}$ (B-98)

$+ GRREQ_t - REA_t - EQER_t - PFER_t$

$- DEBTER_t) + CURLI_t - CURLI_{t-1}$

If $(STDC_{t-1} + GRREQ_t > MXSTD_t)$ Then

• $STDC_t = mnstd_t$ (B-99)

. EQ_t = Minimum $EQ_{t-1} + REA_t + MXCST_t$; (B-100)

Maximum $[EQ_{t-1} + REA_t + MNCST_t$;

$rec_t * (CAPT_{t-1} + GRREQ_t - (STDC_t - STDC_{t-1}) - RFD_t)]$

• $EQER_t = uncst_t *$ Integer $[(EQ_t - EQ_{t-1} - REA_t)/uncst_t]$ (B-101)

• PF_t = Minimum $PF_{t-1} - SFP_t + MXPST_t$; (B-102)

Maximum $[PF_{t-1} - SFP_t + MNPST_t$;

$ret_t * (CAPT_{t-1} + GRREQ_t - (STDC_t - STDC_{t-1}) - RFD_t) - EQ_t]$

• $PFER_t = unpst_t *$ Integer $[(PF_{t-1} - SFP_t + MNPS_t)/unpst_t]$ (B-103)

• $DEBTER_t$ = Minimum $MXLTD_t$; Maximum $[MNLTD_t$; (B-104)

$GRREQ_t - (STDC_t - STDC_{t-1}) - PFER_t$

$- EQER_t - REA_t]$

• $DEBTER_t = unltd_t *$ Integer $[DEBTERtunltd_t]$ (B-105)

. $STDC_t = STDC_{t-1}$ (B-106)

$+ GRREQ_t - mnstd_t - DEBTER_t - PFER_t - EQER_t - REA_t$

$$NWCC_t = CURAS_t - CURLI_t \tag{B-107}$$

$$NWC_t = NWCC_t - NWCC_{t-1} \tag{B-108}$$

$$STD_t = STDC_t - STDC_{t-1} \tag{B-109}$$

$$CS_t = CS_{t-1} + EQER_t \tag{B-110}$$

$$DEBT_t = DEBT_{t-1} + DEBTER_t - RFD_t \tag{B-111}$$

$$CAPT_t = EQ_t + PF_t + DEBT_t \tag{B-112}$$

Taxes

$$TXPROP_t = tprop_t * 0.5 * [GV_{t-1} + AFDC2C_{t-1} + GPV_t + AFDC2C_t] \quad \text{(B-113)}$$

$$TXOREV_t = OPREV_t * toprev_t \quad \text{(B-114)}$$

$$OTAX_t = TXPROP_t + TXOREV_t \quad \text{(B-115)}$$

$$\begin{aligned} TIF_t = {} & OPREV_t + OINCOM_t - INTLTD_t - INTSTD_t \\ & - OPER_t - MAINT_t \\ & - DEPA_t - OTAX_t - TXPS_t - mdedf_t \end{aligned} \quad \text{(B-116)}$$

$$TXPF_t = [tfed_t * TIF_t] - ITC_t \quad \text{(B-117)}$$

$$\begin{aligned} TIS_t = {} & OPREV_t + OINCOM_t - INTLTD_t - INTSD_t \\ & - OPER_t - MAINT_t \\ & - DEPA_t - OTAX_t - mdeds_t \end{aligned} \quad \text{(B-118)}$$

$$TXPS_t = tsl_t * TIS_t \quad \text{(B-119)}$$

Operating Revenues

$$
\begin{aligned}
OPREV_t = {} & OPER_t + MAINE_t \\
& + DEP_t + DEPAFD_t \\
& + OTAX_t + TXPS_t + TXPF_t \\
& + DEP_t + TXCR_t \\
& + OPINC_t
\end{aligned} \qquad (B\text{-}120)
$$

APPENDIX C

CONSTRUCTION OF FINANCIAL STATEMENTS

Appendix C is intended to be the link between the equations in Appendix B and the financial statements which are the output of RAm. This is accomplished in two steps. First, the relationship between variables in the Appendix B equations and the elements of the Master File is established (exhibit C-1). Second, the construction of RAMTEL's two financial statements from the Master File is outlined (exhibits C-2 and C-3).

Appendices B and C together fully identify the flow of calculations from the input files through to the financial output. They also exhibit the usefulness of the Master File as a diagnostic tool, because it contains more detailed information than the financial statements.

EXHIBIT C-1

ELEMENTS OF THE MASTER FILE

Line	Variable	Description
1	-	File number, creation date, company code and name
2	-	Finance options, file names
3	-	GNP deflator
4	GPV	Gross plant in service, excluding AFDC
5	CWIP	Construction work in progress, excluding AFDC
6	DEPC	Cumulative book (straight line) depreciation
7	DEPA	Tax (accelerated) depreciation this period
8	NWCC	Cumulative net working capital
9	CS	Cumulative common stock issued
10	EQER	Common stock issued this period
11	REAC	Cumulative retained earnings
12	REA	Retained earnings generated this period
13	PF	Cumulative preferred stock issued
14	PFER	Preferred stock issued this period
15	DEBT	Cumulative long-term debt
16	DEBTER	Long-term debt issued this period
17	RFD	Long-term debt refunded this period
18	STDC	Cumulative short-term debt
19	STD	Short-term debt issued this period
20	DEFC	Cumulative income tax deferrals
21	DEF	Income tax deferrals this period
22	AFDC2C	Cumulative AFDC capitalized
23	AFDC2	AFDC capitalized this period
24	OPREV	Operating revenues
25	-	not used
26	-	not used
27	OPER	Operation expense
28	MAINT	Maintenance expense

EXHIBIT C-1--continued

ELEMENTS OF THE MASTER FILE

Line	Variable	Description
29	DEP	Book (straight line) depreciation this period
30	TXPS	State income taxes paid
31	TXPF	Federal income taxes paid
32	OTAX	Other taxes (operating revenues and property)
33	OINCOM	Other income
34	AFDC1	Annual AFDC associated with CWIP
35	INTLTD	Long-term debt interest expense
36	-	Long-term debt average interest rate
37	-	Long-term debt end-of-period interest rate
38	DIVP	Preferred stock dividend expense
39	-	Preferred stock
40	-	Preferred stock end-of-period interest rate
41	INSTD	Short-term debt interest expense
42	RITCRB	Fraction ITC excluded from ratebase
43	DIVC	Common dividends
44	RET	Retirements (gross value)
45	rcwip	Fraction CWIP in ratebase
46	rdefc	Fraction deferrals excluded from ratebase
47	NI	Net income
48	ITC	Investment tax credit
49	ITCAM	Investment tax credit amortized
50	CEP	Capital expenditure (gross value of plant entering service, excluding AFDC)
51	SFP	Sinking fund payment this period--preferred stock
52	CE	Construction expenditure (Annual cash expenditure, excluding AFDC)
53	NWC	Change in net working capital this period
54	DEPAFC	Cumulative AFDC depreciation
55	ITCC	Cumulative investment tax credit (deferred)
56	TXCR	Investment tax credit deferred

EXHIBIT C-1--continued

ELEMENTS OF THE MASTER FILE

Line	Variable	Description
57	AFDCIC	AFDC cumulative in CWIP
58	DEPAFD	AFDC depreciation this period
59	RATEBASE	Ratebase
60	RBNWC	Net working capital included in ratebase
61	TXPROP	Property taxes paid
62	MXSTD	Maximum short-term debt
63	BVCOM	Book value per share of common stock
64	NSH	Number of common shares outstanding
65	DPR	Dividend payout ratio
66	FRBOOK	Market-to-book ratio
67	CURLI	Current liabilities not elsewhere classified
68	TIF	Taxable income--federal
69	TIS	Taxable income--state

EXHIBIT C-2

INCOME STATEMENT ACCOUNTING RELATIONSHIPS

Item	Accounting Relationship Based on Master File Elements	
Operating Revenues	47 + 41 + 35 - 34 - 33 + 27 + 28 + 29 + 58 + 32 + 30 + 31 + 21 + 56	
- Operation		27
- Maintenance		28
- Depreciation		29 + 58
Total operating expenses	27 + 28 + 29 + 58	
- Other tax		32
- Income tax paid		30 + 31
- Deferred income tax		21
- Deferred investment tax credit		56
Total expenses	27 + 28 + 29 + 58 + 32 + 30 + 31 + 21 + 56	
Operating income	47 + 41 + 35 - 34 - 33	
+ Other income		33
+ AFDC		34
Income before interest	47 + 41 + 35	
- Interest--LTD		35
- Interest--STD		41
Net income		47
- Preferred dividends		38
Earnings available to common	47 - 38	
- Common dividends		43
Retained earnings		12

EXHIBIT C-3

BALANCE SHEET ACCOUNTING RELATIONSHIPS

Item	Accounting Relationship Based on Master File Elements
Common stock	9
+ Retained earnings	11
Total common equity	9 + 11
+ Preferred stock	13
+ Long-term debt	15
Total capital	9 + 11 + 13 + 15
+ Short-term debt	18
+ Deferred income taxes	20
+ Deferred investment tax credit	55
+ Current Liabilities N.E.C.	67
Total Liabilities	9 + 11 + 13 + 15 + 18 + 20 + 55 + 67
Gross plant in service	4 + 22
- Accumulated depreciation	6 + 54
Net plant value	4 + 22 - 6 - 54
+ CWIP	5 + 57
Net utility plant	4 + 22 - 6 - 54 + 5 + 57
Current assets N.E.C.	8 + 67
Total Assets	4 + 22 - 6 - 54 + 5 + 57 + 8 + 67

EXHIBIT C-4

SOURCES AND USES OF FUNDS STATEMENT ACCOUNTING RELATIONSHIPS

Item	Accounting Relationship Based on Master File Elements
Sources:	
Internal	
Net income	47
Depreciation	29 + 58
Deferred income taxes	21
Deferred investment tax credit	56
Total internal	47 + 29 + 58 + 21 + 56
External	
Common stock	10
Preferred stock	14
Long-term debt	16
Short-term debt	19
Total external	10 + 14 + 16 + 19
Total Sources	47 + 29 + 58 + 21 + 56 + 10 + 14 + 16 + 19
Uses:	
Gross plant additions (including AFDC)	50 + 23
CWIP increment	52 + 34 - 50 - 23
Total construction expenditures	52 + 34
Preferred dividends	38
Common dividends	43
Debt retirement	17
Preferred retirement	51
Net increase in working capital	53
Total Uses	52 + 34 + 38 + 43 + 17 + 51 + 53

EXHIBIT C-5

SUPPLEMENTARY FINANCIAL VARIABLES REPORT ACCOUNTING RELATIONSHIPS

Item	Accounting Identity Based on Master File Elements
Common dividends per share	43/(0.5*(64+64'))
Earnings per share common	(47-38)/(0.5*(64+64'))
Dividend payout ratio	65
Return on common equity	(43+12)/(0.5*(9+9'+11+11'))
Return on ratebase	(47+41+35-34-33)/59
Interest coverage ratio	
Including AFDC	(47+41+35-33+30+31+21+56)/(35+41)
Excluding AFDC	(47+41+35-34-33+30+31+21+56)/(35+41)
Including AFDC with limit	(47+41+35-34-33+30+31+21+56+ Minimum(34,0.1*85))/(35+41)
Book value per share	63
Number of shares of common	64
Capitalization ratios	
Long-term debt/capital	15/(9+11+13+15)
Common equity/capital	(9+11)/(9+11+13+15)
Preferred stock/capital	13/(9+11+13+15)
Market price per share	$63*66^n$
Dividend yield	$43//(0.5*(64+64')*63*66^n)$
Cash flow dividend coverage	(47-38+21+56+29+58-34)/43
Interest and preferred dividend	(47+41+35-34-33+30+31+21+56)/ 35+38+41)
Internal funds/total financing	$\dfrac{9+13+15+18}{9+13+15+18+12-34+29+58+21+56}$
AFDC portion of earnings available for common	34/(47-38)
Internal funds/construction expenditures (3-year running average)	$\dfrac{\sum_{n=0}^{2}(12^n-34^n+29^n+58^n+21^n+56^n)}{\sum_{n=0}^{2}52^n}$
Construction expenses (3-year)/ GPV including AFDC	$\dfrac{\sum_{n=0}^{2}(52^n+34^n)}{4'+22'}$

Notes: 1) An apostrophe (') after a row number means last year's value for that row's element.

2) A superscript (n) after a row number means next year's value for that tow's element: n=0 implies the current year; n=1 implies a lag of one year; n=2 implies a lag of two years; n=3 implies a lag of three years.

APPENDIX D

ENHANCEMENTS OF RAm INTRODUCED INTO RAMTEL

The current version of RAMTEL incorporates certain enhancements to the PUCO version of RAm. The enhancements have primarily been made to the regression process, and the tax depreciation calculations. The former involves the regression calculations in the PERFORM Module and the regression-related outputs generated by the REPORT Module. The latter involves the calculation of accelerated depreciation in the PLANT Module. In addition, minor modifications have been made to the other modules to improve the clarity of computer prompts and outputs.

Modifications of the Regression Process

The PERFORM Module of RAMTEL projects operations and maintenance expenses over the period analyzed. For each O&M account, it extrapolates values for a number of years, using an equation specified by the user or derived from historical data using the regression technique. The regression process involves computing the regression coefficients, the square of the correlation coefficient (r^2), the standard deviation of dependent variable, and the standard errors of estimates. The regression coefficients are then used to extrapolate future values.

The PUCO version of RAm, like some other earlier versions, contained some inaccuracies in the regression process. While it calculated the regression coefficients and the r^2 correctly, it used either incorrect equations or reported inappropriate values for the other quantities. These inaccuracies are summarized below.

1. The standard deviation calculated was based on the variance of actual input values of the dependent variable (historical O&M expenses). The appropriate value should be based on the

differences between the actual values and the values estimated using the regression coefficients.

2. Only a single value of standard error was reported. There are, however, standard errors associated with the estimated values of the intercept, and for each of the regression coefficients corresponding to each exogenous variable. Therefore, the appropriate number of standard errors should have been equal to the number of exogenous variables plus one.

3. The regression summary report was not informative. In addition to reporting only one standard error, it did not list the value of the intercept.

4. In spite of the above inaccuracies, the earlier version of RAm did correctly extrapolate the future values (because the regression coefficients were correctly estimated) and generated, an appropriate measure of "goodness of fit" (because r^2 was correctly estimated). However, there was either missing or incorrect information on the precision of the regression coefficients (because not all the standard errors were reported) or "tightness" of the extrapolation (because the standard deviation was incorrectly computed and reported). Without such information, one cannot correctly analyze either the precision of the regression model or the contribution of any chosen exogenous variable to the model.

In RAMTEL, enhancements were made to improve the regression process of the PERFORM Module and the output content of the REPORT Module. In addition, the number of exogenous variables to be stored on the Exogenous File has been increased from 24 to 30. No additional input is needed to run the present version of the PERFORM and the REPORT Modules.

The following sections contain equations used for regression analysis and productivity analysis. These equations were not reported in the documentation for earlier versions of RAm.

Equations for Regression Analysis

The regression equation with M exogenous variables is given by:

$$Y_i = b_o + \sum_{k=1}^{M} b_k X_{ik} + \xi_i = \sum_{k=0}^{M} b_k X_{ik} + \xi_i \qquad \text{(D-1)}$$

where Y_i: Value of the dependent variable at year i.

b_o: Value of the intercept (the o-th regression coefficient).

b_k: Regression coefficient for exogenous variable k.

X_{ik}: Value of exogenous variable k at year i, with $X_{io} = 1$.

ξ_i : Error term in year i.

The least squares equations for multilinear regression in matrix notation are given by:

$$(\underline{X}'\underline{Y}) = (\underline{X}'\underline{X})\,\hat{\underline{b}} \qquad \text{(D-2)}$$

where $\underline{X}$: A matrix with elements X_{ik}.

$\underline{Y}$: A vector with elements Y_i.

$\hat{\underline{b}}$: A vector with elements $\hat{b}_k$.

$\hat{b}_k$: An estimated value of b_k based on the least squares method.

$\underline{X}'$: Transpose of $\underline{X}$

$\underline{Y}'$: Transpose of $\underline{Y}$

Let us introduce quantities p_k and m_{jk} as:

$$p_k = \sum_{i=1}^{N} Y_i X_{ik} - NYX_k \qquad \text{(D-3)}$$

$$m_{jk} = \sum_{i=1}^{N} X_{ij} X_{ik} - NX_j X_k \qquad \text{(D-4)}$$

where Y: Average of Y_i's

X_j: Average of X_j's

N: Number of years

Then $\underline{X}'\underline{Y}$ and $\underline{X}'\underline{X}$ are given by:

$$\underline{X}'\underline{Y} = [p_k] \tag{D-5}$$

$$\underline{X}'\underline{X} = [m_{jk}] \tag{D-6}$$

where $[p_k]$: A vector with elements p_k

$[m_{jk}]$: A matrix with elements m_{jk}

The solutions to equation D-2 are:

$$\hat{\underline{b}} = (\underline{X}'\underline{X})^{-1} (\underline{X}'\underline{Y}) \tag{D-7}$$

$$\hat{b}_o = Y - \sum_{k=1}^{M} b_k X_{ik} \tag{D-8}$$

Let us define $\hat{Y}_i$ as estimated values of Y_i using estimated regression coefficients $\hat{b}_k$. Then, the unbiased estimator of variance, denoted by S^2 is given by:

$$S^2 = [\sum_{i=1}^{N} (Y_i - \hat{Y}_i)^2]/[1/(N-M-1)] \tag{D-9}$$

The standard deviation is simply the positive square root of the above expression.

$$STDEV = (S^2)^{1/2} \tag{D-10}$$

The variances of the regression coefficients are given by

$$Var\ (\hat{\underline{b}}) = S^2 (\underline{X}'\underline{X})^{-1} \tag{D-11}$$

where Var $(\hat{\underline{b}})$: A diagonal matrix with elements Var $(\hat{b}_k)$

The standard errors of the estimated regression coefficients are given by:

$$STDERR_k = [Var(\hat{b}_k)]^{1/2} \tag{D-12}$$

The square of the correlation coefficient, r^2, (which is also called the coefficient of determination) is given by:

$$r^2 = \sum_{i=1}^{N} (\hat{Y}_i - Y)^2 / \sum_{i=1}^{N} (Y_i - Y)^2 \tag{D-13}$$

The extrapolated values for all future years are given by:

$$\hat{Y}_i = a_i * \sum_{k=1}^{M} b_k X_{ik} + C_i \tag{D-14}$$

where a_i: Post-regression multiplicative (or divisive) adjustment factor

c_i: Post-regression additive (or subtractive) adjustment factor

Equations for Productivity Analysis

The following equations explain the quantities reported in the productivity analysis report of the REPORT Module.

The "DEFLATOR" and "INFLATOR" represents the pre-regression and post-regression adjustment factors used for each O&M account.

The "OUTPUT" is the value of the exogenous account for each year in the study period.

$$OUTPUT_{ik} = X_{ik} \tag{D-15}$$

where X_{ik}: Value of the exogenous account k in year i.

The "NORMALIZED" quantity refers to the values of the exogenous account normalized with respect to its value at the first year of the study period.

$$NORM_{ik} = X_{ik}/X_{bk} \tag{D-16}$$

where X_{bk}: Value of the exogenous account k at the beginning year b.

The "ACCOUNT" values are either the historical or extrapolated values of a particular O&M account being analyzed.

$$ACCT_i = Y_i \text{ if i is a historical year}$$
$$\underline{\text{or}},\ \hat{Y}_i \text{ if i is a future year}$$

where Y_i: Value of O&M account in historical year i

$\hat{Y}_i$: Extrapolated value of O&M account in future year i

The "PROJECTION" quantities are values obtained by projecting the O&M account values linearly with respect to the normalized output values. Please note that these are different from extrapolated future O&M account values obtained by using linear regression.

$$PROJ_i = ACCT_b * NORM_{ik} \tag{D-18}$$

The "OUTPUT CHANGE" is defined as the change in output transformed into equivalent "ACCOUNT" values.

$$OUTCH_i = ACCT_{i-1} * [(NORM_{ik}/NORM_{i-1,k}) - 1] \tag{D-19}$$

The "INFLTN CHANGE" (inflationary change) is the difference between the current year's 'PROJECTION" and the previous year's "ACCOUNT" values adjusted for "OUTPUT CHANGE."

$$INFLT_i = PROJ_i - ACCT_{i-1} - OUTCH_i \tag{D-20}$$

The "PRDTVY CHANGE" (productivity change) is the difference between "PROJECTION" and "ACCOUNT" values. Please note that for a future year, "PROJECTION" represents an exogenous account value expressed as an equivalent O&M account value using linear projection while "ACCOUNT" represents an extrapolated value using linear regression.

$$PRDT_i = PROJ_i - ACCT_i \tag{D-21}$$

Finally, "PCT CHG PRDVY" (percentage change in productivity) represents the above quantity expressed as a percentage.

$$PCTPRD_i = (PRDT_i/ACCT_i) * 100 \tag{D-22}$$

Modifications of the Tax Depreciation Caculations

In RAMTEL, the tax depreciation calculations have been enhanced from what they were in RAm. In the earlier version of RAm, the double declining balance method was the only option for calculating accelerated depreciation. No other options were included, although they might be applicable in specific situations.

In addition, the double declining balance method was applied throughout the tax life of a plant. This could cause a plant to be depreciated about two thirds of its gross value at the end of its tax life. In order to compensate for this deficiency, the residual net plant value was written off as depreciation during the last year of its tax life. This caused an unusually large depreciation charge during the last year.

To remedy the above deficiencies, RAMTEL provides the following options:

1. Straight line method
2. Sum of years' digits method
3. Double declining balance method with switch to straight line depreciation, whenever the latter produces larger depreciation charges
4. Depreciation schedule

Methods 1, 2, and 3 are well known and are not described here. In method 4, the depreciation is calculated directly from a user-specified depreciation schedule. The depreciation schedule is represented by a series of depreciation rates (percent of gross plant value) in each year of service throughout the tax life of a plant. Method 4 allows the user to incorporate any future changes in tax laws into the depreciation calculations.

The modifications of tax depreciation calculations require an additional input file to the Plant Module. The description of this file, named depreciation file, follows.

Description of the Depreciation File

The depreciation file contains user specifications on the method of calculating tax depreciation for each plant account. It is a formatted numeric file which is used directly as input to the Plant Module.

The depreciation file contains two sets of data, one each for the future and the existing plants.

The file begins with the data for the future plant accounts. The user is responsible for grouping the future plants into different accounts and the grouping should be identical to that in the budget file. Exhibit D-1 is a description of data items and their formats in the depreciation file. Following line 4, the data in lines 2 through 4 should be entered for other future years until the total range of future years equals 29. This completes data for a single account. The data for other future plant accounts are then entered using the same formats. The total number and sequence of future plant accounts must be identical to that in the budget file.

The data for existing plants follow the data for future plants. The maximum number of allowable existing plant accounts is 15. Each existing plant account is subdivided into a number of vintages. Each vintage represents plants of the same age, based on the beginning years of service. The number of vintages allowed under a given plant account is unlimited. Exhibit D-2 contains a description of data items and format. Line 1 in exhibit D-2 is the line immediately following the last line of data for future plants. Line 4 completes the data for a single vintage of the first existing plant account. The data are repeated until all the vintages under that account are covered. Finally, the data input for other accounts is repeated using the same formats as for the first account. The sequence of account numbers for existing plants in the depreciation file must be identical to that in the budget file.

If depreciation method 4 (specified depreciation schedule) is used for either a future or an existing plant account, the tac life specified for this account in the budget file should not exceed 29.

EXHIBIT D-1
ORGANIZATION OF FUTURE PLANT DATA IN THE DEPRECIATION FILE

Line	Data Element No.	Description of Data Item	Format
1	1	Plant account no.	I4
	2	Unused space	1x
	3	Data option identifier DATA-depreciation data follows. COPY-depreciation data is identical to those of the preceding plant account. If this is specified go back to line 1 for another account.	A4
2	1-2	Range of calendar years for which following depreciation method/ schedule should be used. Each year in the range represents a beginning year of the service.	2I5
	3	Depreciation method identifier 1-Straight line 2-Sum of the years' digits 3-Double declining balance with a switch to the straight line method whenever the latter gives larger depreciation. 4-Depreciation schedule follows. The depreciation schedule is expressed as depreciation rate in each year of service.	I2

EXHIBIT D-1--continued
ORGANIZATION OF FUTURE PLANT DATA IN THE DEPRECIATION FILE

Line	Data Element No.	Description of Data Item	Format
3	1-8	Depreciation rates (percent) in each year of service for years 1 through 8.	8F5.1
4	1-8	Depreciation rates (percent) in each year of service for years 9 through 16.	8F5.1
5	1-8	Depreciation rates (percent) in each year of service for years 17 through 24	8F5.1
6	1-5	Depreciation rates (percent) in each year of service for year 25 through 29.	8F5.1

EXHIBIT D-2
ORGANIZATION OF EXISTING PLANT DATA IN THE DEPRECIATION FILE

Line	Data Element No.	Description of Data Item	Format
1	1	Plant account no. No. of vintages	I4 I3
2	1	Gross plant value for the 1st vintage as percent of total gross plant value of above plant.	F10.2
	2	Remaining life (years) of the plants of 1st vintage at the end of the base year. This must be less than the tax life of the plant.	
	3	Unused space.	1X
	4	Depreciation method identifier. Same as for future plants.	
3	1-8	Depreciation rates (percent) in each year of service for years 1 through 8.	8F5.1
4	1-8	Depreciation rates (percent) in each year of service for years 9 through 16.	8F5.1
5	1-8	Depreciation rates (percent) in each year of service for years 17 through 24	8F5.1
6	1-5	Depreciation rates (percent) in each year of service for year 25 through 29.	8F5.1

Equations For Tax Depreciation Calculations

The calculation of accelerated depreciation for tax purposes proceeds in three steps. First, depreciation factors (rates) for each plant account for each year of service are computed. Second, the appropriate bases for depreciation for each plant account are determined. Finally, the depreciation bases and factors are multiplied together to find the depreciation charges. The symbols used in the equations to calculate tax depreciation are defined below.

F_j:	Depreciation factor for the j-th year of <u>service</u>
tlife:	Tax life of the plant
$FNJV_j$:	The undepreciated plant at the j-th year of service
$R1_j$:	F_j using linear method
$R2_j$:	F_j using the double declining method
$XGPV_k^{(m,i)}$:	Depreciation base for existing plants belonging to the m-th account and the ith vintage at k-th <u>future</u> year. R=0 corresponds to the base year.
$RET_k^{(m,i)}$:	Existing plants retired belonging to the m-th account and i-th vintage at the k-th future year.
$NPV_0^{(m,i)}$:	Net existing plant belonging to the m-th account and the i-th vintage at the beginning of the base year.
N:	Number of plant accounts.
V:	Number of vintages.
$FGPV_k^{(m)}$:	Depreciation base for future plants belonging to the m-th account in the k-th future year.
$CEP_R^{(m)}$:	Capital expenditure for future plants belonging to the m-th account in the k-th future year.
$FAC_{b,R}$:	Depreciation factor for the k-th future year for plants which begin service at the b-th future year. For existing plants, b=0.
rlife:	Remaining life for existing plants may be different for each plant account and vintage. (Subscripts not used to avoid confusion.)

$DEPT_k^{(m,i)}$: Annual depreciation for existing plants belonging to the m-th account and i-th vintage at the k-th future year.

$DEPET_k$: Annual depreciation for all existing plants at the k-th future year.

$DEPFT_k$: Annual depreciation for all future plants at the k-th future year.

Depreciation Factors

Linear:

$$F_j = 1/tlife \text{ for } j \neq 1,\ j \neq tlife + 1 \qquad \text{(D-23)}$$

$$F_1 = 0.5/tlife \qquad \text{(D-24)}$$

$$FNPV_j = 1 - \sum_{k=1}^{tlife} F_k \qquad \text{(D-25)}$$

$$F_{tlife + 1} = FNPV_{tlife} \qquad \text{(D-26)}$$

Sum-of-Years' Digits:

$$F_j = (tlife - j + 1)/\sum_{k=1}^{tlife} k \qquad \text{(D-27)}$$

for $j \neq 1$, $j \neq tlife + 1$

$$F_1 = 0.5 * tlife/\sum_{k=1}^{tlife} k \qquad \text{(D-28)}$$

$$FNPV_j = 1 - \sum_{k=1}^{j} F_k \qquad \text{(D-29)}$$

$$F_{tlife + 1} = FNPV_{tlife} \qquad \text{(D-30)}$$

Double Declining Balance: $R1_j = 2/tlife$ for $j \neq 1$ (D-31)

$$R1_1 = 1/tlife \quad \text{(D-32)}$$

$$R2_j = (FNPV_j - 1)\ (tlife - j + 1) \quad \text{(D-33)}$$

$R1_j$ and $R2_j$ are compared for each j. As long as $R1_j > R2_j$,

$$F_j = R1_j. \quad \text{(D-34)}$$

Let k be the smallest j for which $R1_j \leq R2_j$. Then

$$F_j = R2_k \text{ for all } k < j \leq tlife \quad \text{(D-35)}$$

$$F_{tlife + 1} = FNPV_{tlife} \quad \text{(D-36)}$$

User Specified Schedule: F_j = User input (D-37)

Depreciation Bases

Existing Plants: $XGPV_R^{(m,i)} = XPGV_{k-1}^{(m,i)} - 0.5 * RET_k^{(m,i)}$ (D-38)

$$XGPV_o^{(m,i)} = NPV_o^{(m,i)} \quad \text{(D-39)}$$

Future Plants: $FGPV_k^{(m)} = CEP_k^{(m)}$ (D-40)

Depreciation Charges

Let us define $FAC_{b,k} = F_{k - b + 1}$ (D-41)

Existing Plants: $DEPT_k^{(m,i)} = XGPV_k^{(m,i)} * FAC_{1,k}$ (D-42)

If rlife > 0,

$$DEPET_k = \sum_{m=1}^{N} \sum_{i=1}^{V} DEPT_k^{(m,i)}$$

where k = tlife - rlife (D-43)

Otherwise, $DEPET_k = 0$ (D-44)

Future Plants:

$$DEPFT_k = \sum_{m=1}^{N} \sum_{b=2}^{k} FGPV_b^{(m)} * FAC_{b,k} \qquad \text{(D-45)}$$

PART II

OPERATING INSTRUCTIONS

CHAPTER 1
INTRODUCTION

The information contained in this part of the documentation for the Regulatory Analysis Model for Telecommunications Applications, RAMTEL, is intended primarily for those individuals responsible for the operation of the model. Use of the model requires knowledge of the following items covered in detail in Part II:

- basic structure of the model
- the functions of each of the independent parts of the model
- the type and format of data required by the model
- detailed instructions for operating each part of the model, and
- the type of data produced by the model

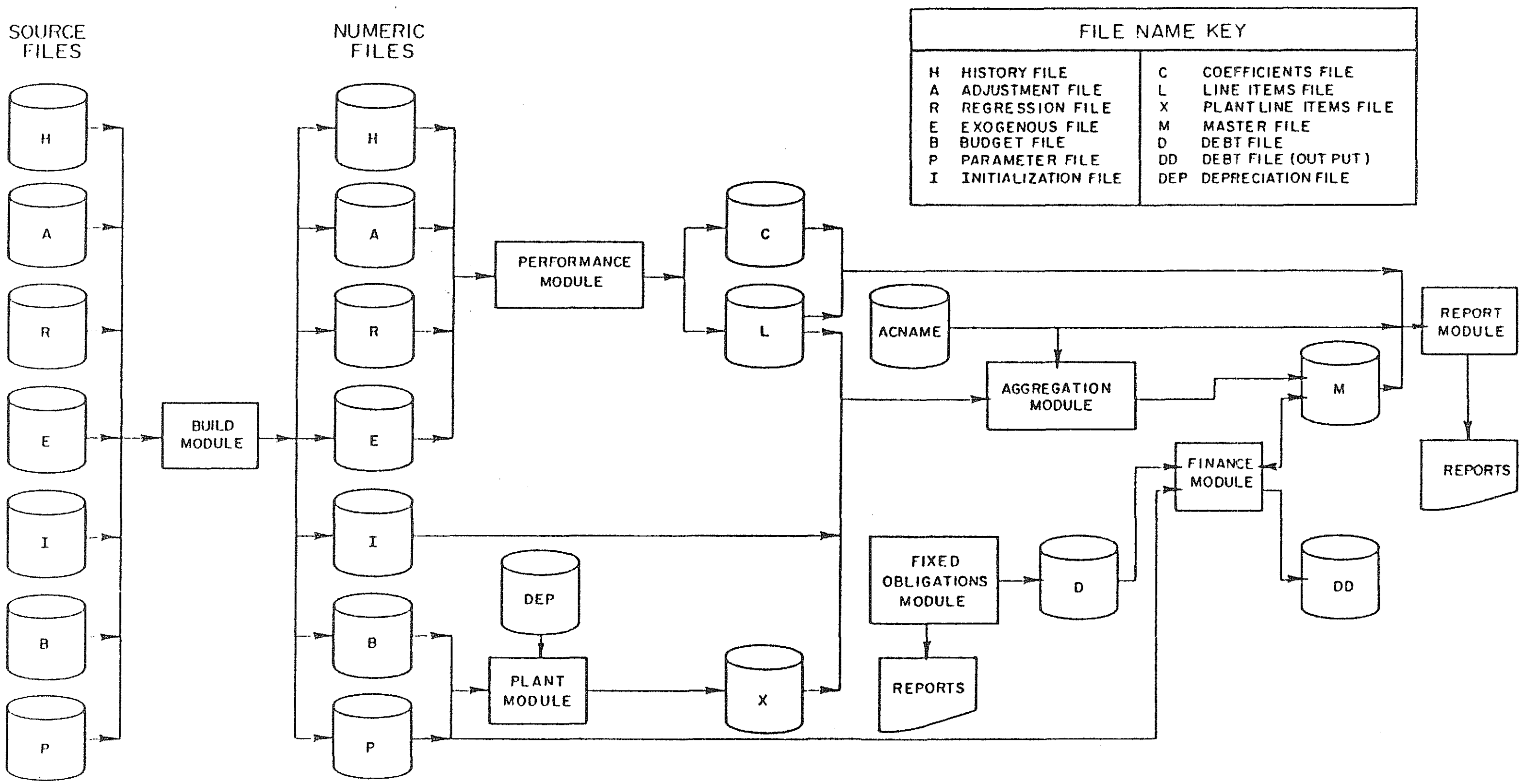
This portion of the report contains an introductory overview of the model, details on the data input files required to run RAMTEL, and operating instructions for each component of the model. A detailed, technical explanation of the computer structure of RAMTEL can be found in Part Three of the report.

Overview of RAMTEL

Although RAMTEL can be envisioned as a single model, it is composed of distinct program modules and data files. Exhibit 1 is a conceptual diagram of these modules and files. The rectangular boxes represent the executable modules. The magnetic disk symbols represent both the alphanumeric data files and the intermediate numeric data files.

Exhibit 1 illustrates two important facets of the operation of the model. First, the lines and arrows indicate that programs must be run a particular order. (There are some exceptions which will be covered in this section of the report.) Second, each of the modules requires that a given set of input files be present prior to execution.

EXHIBIT 1
RAMTEL FLOWCHART



The remainder of this section is devoted to a brief description of the major functions and calculations performed by each of the modules in RAMTEL.

Build Module (BUILD)

The Build Module converts input data files from a form which contains both explanatory comments and data to a solely numeric form. The intermediate numeric files can be listed for inspection.

One can view the Build Module as analogous to a compiler. It converts annotated source files (alphanumeric) to formatted files (numeric). Thus all annotated files must be processed by the Build Module before they are used by any of the other RAMTEL modules.

Performance Module (PERFORM)

The Performance Module projects operations and maintenance (O&M) expenses over the period analyzed. The Performance Module:

- Makes additive or multiplicative adjustment to historical O&M account and subaccount data. Common adjustments are the conversion of data from current to constant dollars and correction of abnormal conditions.

- Aggregates all subaccounts for each O&M account.

- Extrapolates values for a number of years (40 minus the number of years of historical data) for each O&M account using an equation specified by the user or derived from historical data using one of the following regression methods:

  - trend analysis
  - least squares linear regression
  - least squares lon-linear regression

- Links to the Report Modules to produce graphs and/or tables of historical and extrapolated future expenses.

It is important to note that O&M projections may be made for almost any level of detail. For example, projections could be made for:

- each O&M account
- subaccounts such as labor and materials of each O&M account
- total O&M, or
- subtotals of O&M accounts

The Performance Module can also be used for performance evaluation. It allows the user to compare O&M expenses of a utility at different points in time (with adjustment for inflation) or to compare the expenses of two or more utilities.

Plant Module (PLANT)

The Plant Module computes entries to capital asset accounts given a capital budget. More specifically, it:

- calculates gross plant in service from input data on plant additions (capital expenditures)

- calculates book depreciation and tax depreciation, each by plant or equipment type (e.g., outside plant, station equipment and central office equipment) or plant account

- computes total construction expenditures (CE)

- computes retirements to plant in service

- also calculates allowance for funds used during construction (AFDC) and construction work in progress (CWIP)

The last two items are not very important for telephone utilities and has been retained from the older, electric utility version of the model for completeness.

Aggregation Module (AGGREG)

The Aggregation Module is used to aggregate output data from the Performance Module and the Plant Module.

The Aggregation Module computes the following items from the output of Performance Module (although other aggregations are possible):

total operations expense, and
total maintenance expense.

It also aggregates the following across plant types or accounts from the output of the Plant Module:

- construction expenditures
- capital expenditures (annual additions to plant-in-service)
- gross plant value
- CWIP
- AFDC
- retirements, and
- tax and book depreciation, both annual and accumulated

Finance Module (FINANCE)

The Finance Module of RAMTEL determines the financing of the capital requirements in the Plant Module and operating revenues necessary to meet specified income requirements and the expenses calculated by the Performance Module and the Fixed Obligations Module. It performs the calculations necessary to develop a pro forma balance sheet, income statement, and sources and uses of funds statement. Specifically, the Finance Module calculates:

- investment tax credit, income tax deferrals, income taxes paid, and property and revenue taxes
- gross revenues
- changes in net working capital and short-term debt
- the amount of common stock, preferred stock, and long-term debt required to finance each year's capital expenditures
- net income, based on either a given return on net plant value or a given return on common equity
- retained earnings
- common and preferred stock dividends
- long-term and short-term debt interest
- long-term debt refundings, and
- long-term debt and preferred stock sinking fund payments

Fixed Obligations Module (FIXOBS)

The Fixed Obligations Module handles all long-term debt and preferred stock issues, and the interest and dividends due on each. Specifically, the Fixed Obligations Module:

- creates long-term debt and preferred stock files for any number of companies
- adds, revises or deletes issues from these files
- calculates the amount of interest and preferred dividends required each year for each issue in the files
- calculates the embedded interest rate on long-term debt and preferred stock by year
- summarizes interest and preferred dividend requirements, by year
- determines the cost of proposed or anticipated issues, and
- prints summary and/or detailed reports of the issues outstanding, interest charges, and interest rates

Report Module (REPORT)

The Report Module prints formated reports from output files created by other modules. Specifically, the Report Module:

- prints six formatted reports--the income statements, the balance sheet, the sources and uses of funds report, the operation and maintenance projection, the regression summary, and the productivity analysis report
- prints graphs of historical and projected values of O&M expenses
- is structured such that any number of new reports can easily be designed and added
- prints its reports in current or constant dollars, rounded to thousands or millions
- prints on a narrow or a wide carriage terminal or to a file for off-line printing
- allows the user to make a report for a single year, a range of years, or a number of specific years

- allows the user to print specified lines of a report for specific O&M accounts, and

- allows the user to extract specific elements from the Master Data File or display the entire file

Difference Module (DIFFER)

As has been discussed earlier, RAMTEL can be used to compare the effect of various regulatory alternatives and financial parameters. For example, the user could compare the effect of alternative regulatory treatments (normalized or flow-through) of deferred taxes on after-tax income. One could also test the effect of varying interest rates on net income. The proforma financial statements and the Master File can be used to carry out any desired sensitivity analysis. To help the user in this task further, RAMTEL has an additional module, namely the Difference Module (DIFFER), which can be used to compare the entries in the Master File. DIFFER can be used to construct a master file whose entries are the <u>differences</u> between corresponding entries of two master files. In addition to comparing the effect of alternative regulatory or accounting treatments on a single utility, one can use DIFFER to make financial comparisons of two different utilities.

<u>Summary Guidelines for the RAMTEL User</u>

The use of RAMTEL for analyzing utility operations requires meticulous data preparation, careful execution of the program modules in a specified sequence (exhibit 1), and an informed interpretation of the output results. The steps involved in the process has been generally discussed in chapter 3, Part I of this document. They are summarized below.

1. Collect input data. The data may be available from utility or public sources. Some of the data items may require estimation by the user. Chapter 2 has information of possible sources of data for individual items.

2. Format the input data. The data has to be arranged in formats acceptable to RAMTEL. Chapter 2 specifies these formatting requirements.

3. Load the data into model input files. The data is entered through input terminals and stored in computer files.

4. Run the model. Run preparatory command procedures, and then execute the program modules, beginning with the BUILD Module, according to the logic shown in exhibit 1. As exhibit 1 shows, certain modules have to be run in sequence while others can be run in parallel (independently of each other). The function and operation of each program module has been briefly discussed in the preceding section. Complete operating instructions for running the modules are provided in chapter 3.

5. Print reports. The last program module in RAMTEL, namely the REPORT Module, is used to print financial statements and other reports.

6. Analyze the results. The reports generated by the REPORT Module are checked for discrepancies caused by input errors or inappropriate execution of the program modules. After the necessary corrective steps have been taken, the model is re-run. The final results are then analyzed to study the effects of various regulatory and financial alternatives.

The user is urged to go through steps 1 and 3 very carefully and meticulously, as errors made in these steps can lead to substantial waste of effort in the later stages of the process. The technical information needed by the user to carry out the above steps are provided in chapters 2 and 3.

CHAPTER 2

INPUT FILE DESCRIPTIONS

Data used by the RAMTEL modules are contained in ten different files. Such separation reflects both the different sources of data and the processing flexibility which allows some modules to be run without others.

The ten data files listed below are required by one or more of the RAMTEL modules.

1. History File (Operations and Maintenance)
2. Adjustment File
3. Regression Methods File
4. Exogenous Variables File
5. Initialization File
6. Budget File
7. Parameter File
8. Debt File
9. Account Names File
10. Depreciation File

The first seven files are entered into the computer in a user oriented alphanumeric format from a terminal. These "source" files must then be converted into numeric files by the Build Module before they become usable by the other modules. The Debt File is created, altered, and printed by the user with the aid of the Fixed Obligations Module or with the editing feature of the host computer. The Account Names File and the Depreciation File are numeric files which are used directly by the Aggregation and the Plant Modules. <u>Examples of input files are given in Appendix A</u>.

Following a general discussion of file format, each file will be described in greater detail. The discussion will include the best available source or sources for the information required in the input files. The sources listed are by no means the only sources available. The user may prefer to utilize his or her own data sources. If no source is given for a particular input file or element of that file, it should be assumed that the data is supplied by the user.

The general format of the seven alphanumeric files is:

```
(sequence number)    (row number);    (value)    (value)...(value)
(sequence number)                     (value)    (value)...(value)
```

Every line in a source (alphanumeric) file must have a sequence number. Sequence numbers are positive increasing integers. Sequence number increments can be any positive number and need not be constant.

While the sequence number determines the order of lines in the source file, the row number determines the order of rows in the numeric file. Data for one row may be contained on more than one line as shown above by use of the symbol > at the end of the line to be continued and omitting the row number on the continuation line.

The files processed by the Build Module have certain requirements placed on their size and content. Each file must contain a specified number of data elements in each row. Each data element corresponds to a column in the numeric file. If a row is left out of a source file, zeros will be assigned by the Build Module to all the values in that row in the resulting binary file. If a row contains more or less than the specific number of elements for the particular type of file, the Build Module will generate error messages and either delete the extra values or insert zeros until the row contains enough values.

The following is an example of a source (alphanumeric) file:

```
BUDABC
C
C                       OHIO BELL
C                       BUDGET FILE
C                       PLANT ACCOUNTS
C                       1969 - 1981
C
C       CWIP (INITIAL)
C
        131; 54.7564 28*Ø
C
C       AFDC (INITIAL)
C
        133; Ø 28*Ø
C
C*************** NEW PLANT ***************
C
C       ACCOUNT NO,BOOK LIFE,TAX LIFE
C
        1; 2ØØ 19.Ø 19.Ø 26*Ø
C
C       CAPITAL EXPENDITURES
C
        2; Ø.Ø 191.5Ø222Ø 234.51647Ø 246.656Ø2Ø >
        287.Ø7626Ø 3Ø2.77564Ø 29Ø.76177Ø 266.294Ø6Ø >  >
        311.58361Ø 4Ø6.45794Ø 4Ø9.68819Ø 424.22797Ø >  >
        411.Ø5692Ø 16*12.5P
C
C       CONSTRUCTION EXPENDITURES
C
        3; Ø.Ø 2Ø9.Ø633ØØ 242.75Ø67Ø  261.76754Ø >
        278.Ø4237 3ØØ.73762 272.677738 251.92261Ø 262.4616ØØ >
        39Ø.841Ø7Ø 4Ø8.191Ø9Ø 415.56637Ø 384.27935Ø 16*13.25P
C
C*************** EXISTING PLANT ***************
C
C       TAX LIFE (GPV WEIGHTED), TAX DEPR RATE,
C       TAX DEPR, TAX NPV
C
        134; 19.Ø Ø Ø Ø 25*Ø
C
C       ACCOUNT NO,GPV,BOOK NPV,BOOK DEPR RATE,
C       GR AFDC, NET AFDC
C
        71; 3ØØ 1463.839966 1Ø82.51ØØØØ Ø.Ø53 >
        Ø Ø 23*Ø
C
C       RETIREMENTS
C
        72; 1 49.Ø6Ø929 63.562253 72.267267 >
        89.86469Ø 11Ø.Ø83ØØØ 113.8159ØØ 115.58987Ø 118.39865Ø >
        14Ø.8Ø728Ø 146.28424Ø 18Ø.9Ø755Ø 132.388368 6*21.8Ø 1Ø*Ø
END OF FILE
```

Data values can be any number of digits and are separated by blanks (as shown in the example above) or commas. A decimal point in integer values is optional. Values can be entered in normal or exponential notation. <u>Note that each alphanumeric file must have a three-character file identifier and a three-character company code as the header</u>.

A number of special characters are used in creating the data files. Some are optional; others are required. Use of these special characters is explained below:

, A comma may be used in lieu of blank spaces to separate individual data items.

; A semicolon must appear after the row number (the first number after the sequence number) in every row in every file.

C As the first non-blank character in a line, C denotes a comment line. Comment lines are not converted into the numeric files by the Build Module. They are merely for the convenience of the programmer. Any alphanumeric information can be placed on comment lines.

> Continuation symbol. If the number of values required for a row will not fit on a single line, the row may be continued on the next line by placing a > at the end of each line to be continued.

E Exponential notation. For example, 1.721E6 is equivalent to 1721000.

* Denotes a replication factor. For example, 3*11 is equivalent to 11 11 11.

P Signifies a percentage increase over the previous data value. For example, 3 8P is equivalent to 3 3.24.

I Signifies an additive increase over the previous data value. For example, 10 5I is equivalent to 10 15, and 10-5I is equivalent to 10 5.

The replication factor (*) can also be used with the additive (I) or percentage (P) increase. For example, 1.0 3*10P is equivalent to 1.0 1.1 1.21 1.331.

<u>History File (HISxxx): Operations and Maintenance Expenses</u>

The History File is an input file to the Performance Module of RAMTEL. It contains historical operations and maintenance data and is used as an historical base from which future O&M costs are projected.

The History File contains up to 180 rows, each row (other than the first) may correspond to a single account according to the uniform system of accounts (USOA). The user has the option of projecting O&M expenses on a USOA O&M account basis, dividing each account into subaccounts, or combining accounts into a set of (or just one) aggregate accounts.

The first row of the History File contains information which describes the remainder of the file. The format of the row is as follows: line sequence number, row number, semicolon, data elements. Each element is described below:

Element 1	The base year of the History File. This is the latest year (i.e., most current) of historical data in the file. If the O&M projections were to start in the year 1970, the base year would be 1969. The O&M projections always start the year following the base year.
Element 2	Number of years of historical data. The user can place between one and forty consecutive years of historical data in the History File, ending with the base year. If the historical data covered the period 1960-1969, this number would be 10, and the base year would be 1969.
Element 3	The scale factor of the O&M historical data. If the historical data is in dollars, this factor is 1. If the data is in thousands of dollars, this factor is 1000. Any scale factor can be used.
Remaining elements in the row	Unused elements, filled with zeros. The number of zeros equals the number of years of data in row 2 and the remaining rows plus 2. Up to 40 years of data can be entered in each of these rows while element 2 of row 1 is used to specify how much of these data is to be treated as historical. <u>This allows the user to treat a part or all of the input data as historical</u>.

The remaining rows of the History File beginning with row 2, have the following format:

Element 1	USOA O&M account or subaccount number. Account numbers are three-digit numbers between 500 and 999. If there are subaccounts, the number should have a two-digit decimal portion (Example: 500.01). All subaccounts or a particular account must have contiguous row numbers.
Element 2	The number of a row in the Adjustment File whose values are <u>multiplied</u> against the values of the History File. This multiplicative process can be used to adjust the O&M history figures to constant (deflated) dollars prior to making projections. If no adjustment is to be made a one should be entered.

Element 3	The number of a row in the Adjustment File whose values are <u>added</u> to the values in the History File. This adjustment is made after the multiplicative adjustment and can be used to adjust abnormal values of O&M data. If no adjustment is to be made a zero should be entered.
Elements 4 and 5	The numbers of rows in the Adjustment file whose values are <u>divided</u> (element 4) and <u>subtracted</u> (element 5) from the values in the History File and the projected values after the projections have been made. If elements 4 and 5 are the same as elements 2 and 3 (they don't have to be), these adjustments restore the values in the History File to their original state. This process is normally used to restore the values to current dollars. If no adjustment is to be made, a one and a zero respectively should be entered as elements 4 and 5.
Remaining elements in the row	Historical O&M data, in current dollars.[1] Element 6 contains the earliest value, and the last element contains the latest, available or projected data. For example, if historical data were available for the period 1960-1969, element 6 would be the value for 1965 and element 10 would be the value for 1969. It is also possible to treat only a segment of the data entered here as historical. For example, the user could enter data for the years 1960-1987, and then treat the period 1960-1969 as historical by entering 10 for element 2 of row 1. Data Source: FCC Form M, schedule 35 column (b). The Form M is submitted annually by each utility to the FCC.

Regression File (REGxxx)

The Regression File contains information used by the Performance Module to calculate future operating and maintenance expenses. The Performance Module offers six methods of estimating future expenses: three regression methods and three fixed equation forms specified by the user.
Each row in the Regression File specifies the method to be used to project each O&M account and the exogenous variables to be used in the projection.

The Regression File contains up to 120 rows, each with 13 data elements. Each row corresponds to a single O&M account, and is identified by the same O&M account number as its corresponding account number in the

[1] Current dollars are the actual expenditures in the year of occurrence. No adjustment for inflation is included. Constant dollars are current dollars adjusted for inflation to a constant base.

History File. The type of data in each row varies somewhat, but always follows this general format: sequence number, row number, semicolon, and 13 data elements. A description of each data element follows.

Element 1	O&M account number. Subaccount numbers are not used because the Performance Module aggregates subaccounts before extrapolation.
Element 2	Regression method number. The method number is an integer between 1 and 6 which is a code causing the corresponding method below to be used.

Code	Regression Method
1	linear trend against time
2	least-squares linear regression
3	least-squares log-linear regression
4	linear equation against time
5	additive linear equation
6	multiplicative equation

Elements 3- 13	Data elements 3 - 13 are dependent on the regression method in Element 2 as described below.
Method 1	No further information is needed for a linear trend. Enter 11 zeros (or 11*0).
Method 2	Exogenous variables are needed to perform a regression. Enter from one to five exogenous variable account numbers (4 digits) from the Exogenous Variables File into elements 3-7. If less than five exogenous variables are specified, fill all unused elements with zeros. Always fill elements 8-13 with zeros.
Method 3	Same as Method 2.
Method 4	The extrapolation is performed utilizing a user specified starting point and yearly rate of increase (slope) in constant dollars. The equation utilized has the form y = ax+b. Element 3 contains the starting point (usually the most current historical data in constant base year dollars) and element 4 contains the slope of the extrapolation line. Elements 5-13 contain zeros. (Note: If no post-extrapolation adjustment is made, then both the slope and intercept should be in current dollars.)
Method 5	The equation which will be used to calculate future expenses has the form:

$$y = a_0 + a_1 x_1 + a_2 x_2 + . . . + a_5 x_5,$$

where a_1 is user specified coefficient and x_i is the value of an account inthe Exogenous Variables File. Elements 3-13 contain the following coefficients and variable account values:

$a_0, x_1, a_1, x_2, a_2, x_3, a_3, x_4, a_4, x_5, a_5$.

Method 6 The equation which will be used to calculate future expenses has the form:

$$y = a_0 * (x_1)^{a_1} * (x_2)^{a_2} * (x_3)^{a_3} * (x_4)^{a_4} * (x_5)^{a_5}$$

Data are entered in the same order as Method 5.

If there is no entry in the Regression File for a particular O&M account, or if the Regression File is not filed under the name Rxxx, (where xxx is the three-letter company code), linear trend against time (Method 1) is used as a default.

Adjustment File (ADJxxx)

The Adjustment File is an input to the Performance Module. It may be used to adjust or transform historical data in any manner desired before processing the data for forecasts. Each subaccount in the History File may be adjusted separately with an additive and/or multiplicative constant before regression and extrapolation and readjusted after extrapolation by subtraction and/or division. The post-adjustment set need not be the same as the pre-adjustment set. For example, the data may be multiplied by the GNP deflator for the year to convert current-dollar to constant-dollar data. Labor subaccounts could be adjusted at a different rate than materials subaccounts to reflect different rates of inflation. Unusual values could be removed or adjusted so they do not exert undue influence on the projections.

Adjustments are made by entering the appropriate Adjustment File row numbers in data elements 2, 3, 4 and 5 of the History File.

The Adjustment File contains up to 12 rows, each with 40 data elements. The GNP series must be in row 1. Each row corresponds to a specific adjustment to be made to a History File data row and/or the projected data for an O&M account. The format of each row is the same: line sequence number, row number, semicolon, and 40 data elements. A description of the data elements is given below:

Elements 1 - 40	The elements are adjustment factors for consecutive years, beginning with the earliest year of historical O&M data. The forty elements contain factors not only for the historical data but projected data as well, covering a period of forty years. For example, if the first year of historical O&M data is 1960, the values in the Adjustment File will correspond to the years 1960-1999. If adjustments are to be made to historical data only, zeros should be entered in the elements corresponding to future years.

The main use of the Adjustment File is the deflation and inflation of current dollars to constant dollars. If the current year is 1977, and historical O&M data are available for the period 1970-1976, elements 1-7 of the Adjustment File would contain inflation factors, element 8 would contain a unity factor, and elements 9-40 would contain deflation factors. (This assumes the user wants 1977 constant dollars.) The user should remember, however, that the Adjustment File can be used for all types of adjustments, not just current dollar-constant dollar conversions.

Exogenous File (EXOxxx)

The Exogenous File contains data for the variables used in the regression and the extrapolation of operations and maintenance expenses. It is an input to the Performance Module. The variables are used to perform regressions, linear trends, and user-specified calculations.

Exogenous variables can be used for two purposes. First,they can be used as independent variables in O&M regressions. Total minutes of use, number of calls, and numbers of customers are examples of exogenous variables which may be statistically correlated with O&M expenses. The second use is in direct calculation of certain O&M expense items. To calculate directory expenses, for example, the number of customers, the number of lines per customer, the number of lines per page and the cost of printing per page could be entered as exogenous variables and appropriately combined together using regression method 6. Note that in the above examples, number of customers is used for both purposes.

The Exogenous File contains up to 30 rows of data, with each row containing 41 elements. All rows have the same format. Each row contains a set of variables which may be used by one or more regressions and/or fixed equations. The first number in each row is the sequence number, followed by the row number and a semicolon. The first data element of each row is the first value after the semicolon.

Element 1	The exogenous variable account number. Exogenous variable accounts are numbered 1000 and up, and are specified by the user.
Elements 2-41	Historical and future data for 40 consecutive years, beginning with the earliest year of historical O&M data. (see the description of the History File and the Adjustment File). If the projection of the exogenous variable stops at a given year, zeros should be entered in the remaining data elements. If historical datum is not known for a particular year, the value 1E34 should be entered for the corresponding element. When regression method 4, 5, or 6 is used, there is no need for historical data, and zeros can be entered. All exogenous variables must begin and end in the same years at the Adjustment File.

Initialization File (INIxxx)

The Initialization File contains one time series, one initial financial variable, and eleven items from the balance sheet and income statement for the base year. The file is an input to the Aggregation Module and is used to help initialize the Master Data File.

The Initialization File contains 13 rows of data, the first row with 29 elements and the remainder with one element each. The row number is the first number after the sequence number in each row, followed by a semicolon. Element 1 of each row is the first value after the semicolon.

The Initialization File is a row-oriented file. That is, the type of data in each row is different. The type of data in each row is as follows:

Row 1	Other income. Elements 1-29 correspond to the value of income derived and expected to be derived from sources and assets not reflected in the company's capital structure (e.g., subsidiary companies). Values should be in millions of current dollars. Element 1 corresponds to the base year (as defined in the History File) and the remaining elements are subsequent years. Data Source: Utility projections or user's judgement.

Row 2 — Current assets not elsewhere classified. This item, less current liabilities (Row 12) yields net working capital in base year. This is computed as total assets less the sum of net plant value and CWIP (including AFDC).

Row 3 — The value of common stock outstanding at the end of the base year. (Par value plus other paid-in capital).

Row 4 — Retained earnings at the end of the base year.

Row 5 — The value of preferred stock outstanding at the end of the base year.

Row 6 — The value of long-term debt outstanding at the end of the base year.

Row 7 — The value of short-term debt outstanding at the end of the base year.

Row 8 — Cumulative deferred income taxes at the end of the base year.

Row 9 — Electric operating revenues for the base year.

Row 10 — Dividend expense for preferred stock for the base year. It should include the equivalent of a full year's dividends for stock issued during the year.

Row 11 — Cumulative deferred investment tax credit at the end of the base year.

Row 12 — Liabilities, not elsewhere classified, at the end of the base year. This is computed as total liabilities less common stock, retained earnings, preferred stock, long-term debt, short-term debt, deferred income taxes, and deferred investment tax-credits.

Row 13 — The number of shares of common stock outstanding at the end of the base year.

All values must be in millions of dollars except in row 13 where it is a number. The sources of these data are a base year income statement and balance sheet for the utility being studied, available in the FCC Form M annual report.

RAMTEL is intended to model only the telephone portion of utilities. Balance sheet and income statement figures must be adjusted and interpreted accordingly. For companies whose operations are not 100% telephone, the data in rows 3-8 and 10-11 must be multiplied by the company's share of telephone operations. That is, if a company is 90% telephone (on a gross plant value basis) then the values in rows 3-8 and 10-11 must be multiplied by 90% before they are entered in the Initialization File. The value of the company's share of telephone operations used in this calculation must be the same as that found in the Parameter File, row 19 (described in detail below).

Net working capital (row 2 minus row 12) is the most difficult entry on which to make adjustments. It should be the last item entered and should be calculated carefully to insure the base year balance sheet as calculated by RAMTEL does in fact balance.

Budget File (BUDxxx)

The Budget File contains both the capital budget for future plant and equipment and the current accounting value of existing plant. It is an input to the Plant Module.

The Budget File contains up to 136 rows, each with 29 data elements. Not all of the rows will exist in the file the user sees. The Plant Module makes a copy of the Budget File (the X-file) and fills in the missing rows. The first number in each row is the row number and is followed by a semicolon. Element 1 of each row is the first value after the semicolon. All monetary values must be in millions of current dollars.

There are three sections in the Budget File which respectively contain the summary information, the capital budget for future plant, and the status of existing plant.

The first section has only two rows as follows:

Row 131 Base year value of CWIP (<u>excluding</u> AFDC), followed by 28 zeros.
Data Source: Utility or user estimate. Conventional financial statements show CWIP inclusive of AFDC. If the utility cannot provide the AFDC component of CWIP, the user will have to make his or her own estimate. The difference is insignificant for telephone utilities.

Row 133 Base year value of the AFDC portion of CWIP, followed by 28 zeros.
Data Source: See data source for row 2 below.

The second section contains up to ten groups of seven rows. In each group, three data rows are entered by the user. The Plant Module completes the remaining rows.

Row 1	Element 1	Plant account number for plant. This account number and the numbers for the other plant accounts are determined by the user, and must be three digit integers. To avoid confusion with other accounts, it is recommended that the plant account numbers be between 200-299.
	Element 2	Expected tax depreciable life (in years) of future outside plant. Data Source: Utility or user's judgement
	Element 3	Expected book depreciable life (in years) of future production plant. Data Source: Utility or user's judgement
	Elements 4-29	Zeros (unused data elements)

Row 2 Capital expenditure budget for outside plant for a period of 29 consecutive years, beginning with the base year (base year as specified in the O&M History File). Capital expenditures are defined as the amount of new production plant <u>placed in service</u> each year, excluding AFDC. It is <u>not</u> the amount spent on outside plant each year. The data should be entered in millions of current dollars.
Data Source: Utility forecasts, bond prospectuses, or user's judgement.

Row 3 Construction expenditure budget for outside plant for a period of 29 consecutive years, beginning with the base year. Construction expenditures are defined as the amount of money spent on production plant each year, excluding AFDC, regardless of whether or not the project is still under construction or is placed in service that year. The data should be entered in millions of current dollars.
Data Source: Utility forecast, bond prospectuses, or user's judgement.

Rows 4-7 Reserved for data generated by the Plant Module.

Rows 8-70 Data similar to that entered in rows 1-7, but for other capital accounts. The data described above as being required for the outside plant is also required for every distinct capital account the user desires. The only requirements are that there be no more than ten distinct capital accounts and that capital accounts be mutually exclusive and collectively exhaustive. That is, the utility's entire capital budget for telephone utility plant must be included in the capital accounts selected. This allows the user to combine two or more capital accounts into a single account. In particular, all the capital accounts can be combined into a single account if so desired, as has been done in the validation run of RAMTEL (appendix A, Part I).

It is important to note that RAMTEL always completes its calculations for all 29 years. Entering data for only a subset of years is possible. However, if this is done, the Plant Module requires specific adjustments. The user must insure that CWIP is zero after the last year for which valid capital expenditures are entered. This is necessary because of the AFDC adjustments made over the entire 29 year horizon. To balance the capital budget the user must insure that initial CWIP plus all construction expenditures (for all years and plant accounts) minus capital expenditures equals zero.

If less than ten capital accounts are used, the unused rows are left blank. Exhibit 2 shows proper rows to use for each capital account. For each of ten plant accounts, it gives the row numbers for the account number and plant life, capital expenditures (CEP), and construction expenditures (CE).

EXHIBIT 2

BUDGET FILE Row Numbers

Capital Account	Account Number	CEP	CE
Account 1	1	2	3
Account 2	8	9	10
Account 3	15	16	17
Account 4	22	23	24
Account 5	29	30	31
Account 6	36	37	38
Account 7	43	44	45
Account 8	50	51	52
Account 9	57	58	59
Account 10	64	65	66

The third section of the Budget File contains information on existing plant in service. The information is arranged in groups of four data rows, with up to 15 groups. Each group corresponds to a particular type for electric plant in service. The groups can be by UOSA account number or by some other user-specified method.

The first row of this section of the Budget File is not part of any of the data row groups. It is called the header row and is described below.

Row 134 Header Row

Element 1 Expected tax depreciable life (in years) of existing telephone plant in service. This figure should be a weighted average of all existing plant.
Data Source: Utility or user estimate

Element 2 Enter a zero.

Element 3 Base year tax depreciation (millions of dollars).
Data Source: Utility or user estimate.

Element 4 Base year net plant value for tax purposes (millions of dollars). This element is optional.
Data Source: Utility or user estimate.

The remainder of the Budget File consists of existing plant data in groups of four data rows, as mentioned above. Each group contains the same type of data, and is described below:

Row 71 Element 1 Plant account number

Element 2 Existing gross outside plant value (excluding AFDC) at the end of the base year (millions of current dollars).
Data Source: Gross value of outside plant including AFDC is available from a variety of sources (FCC Form M Annual Report). The AFDC portion of gross plant value may be obtained from the utility or estimated by the user.

Element 3 Existing net book value of outside plant (excluding AFDC) at the end of the base year (millions of current dollars).
Data Source: See element 2 above.

Element 4 Book depreciation rate.
Data Source: FCC Form M, schedule 14C.

	Element 5	AFDC portion of existing gross plant value at the end of the base year (millions of current dollars). Data Source: See element 2 above.
	Elements 7-29	Unused elements. Filled with zeros
Row 72	Element 1	Refers to elements 2-29 of this row. If those elements (plant retirements) are in millions of dollars enter 1 for element 1. If they are to be percentages of plant value, enter -1.
	Elements 2-29	Plant retirements for a 28 year period, beginning one year after the base year. Retirements can be entered either in millions of dollars or as a percent of the previous year's gross plant value of plants existing in the base year. Retirements exclude AFDC because it is assumed that plant which is old enough to be retired was built before the accounting concept of AFDC was introduced. Data Source: Utility forecast or user estimate.
Rows 73-74		Reserved for data entered by Plant Module.

The remaining rows in the Budget File, rows 75-130, contain data similar to rows 71-74, but for other plant accounts. There can be up to 15 accounts, with the user responsible for deciding the method of disaggregating the utility telephone plant into separate accounts.

Parameter File (PARxxx)

The Parameter File contains rates, ratios, and other important values which are needed by several of the RAMTEL modules. It is an input to the Plant Module and the Finance Module.

The Parameter File contains 54 different types of parameters each in a separate data row. Each row has 29 data elements. With the exception of rows 20-29 the 29 data elements in each row represent the value of the parameter for each of the 29 consecutive years, beginning with the base year. A description of each type of parameter follows.

Row 1	Fraction of new telephone plant eligible for investment tax credit (ITC). Not all expenditures for new plant are eligible for ITC's. For example, land and buildings are not included. this fraction is the portion of plant construction expenditures eligible for ITC each year.

Data Source: Utility estimate, user estimate based on examination of historic data.

Row 2 Investment tax credit rate (fraction).
Data Source: Internal Revenue Service

Row 3 Straight-line depreciable life (in years) of investment tax credit (That is, the number of years over which the credit is normalized).
Data Source: Utility estimate, state public utility commission, user estimate.

Row 4 Federal income tax rate (fraction).
In cases where there exist adjustments to taxable income other than accelerated depreciation and investment tax credits, the rate should be an effective income tax rate.
Data Source: Internal Revenue Service

Row 5 State and local income tax rate (fraction, combination of local and state rates).
Data Source: Utility, state public utility commission.

Row 6 Fraction of previous year's operating revenues attributed to current assets. (This is intended to keep working capital growing in proportion to the size of the firm. See appendix B, Part I.)
Data Source: User specified ratio.

Row 7 Maximum allowable short-term debt (millions of dollars). This is the level to which short-term debt will be allowed to rise prior to issuance of long-term debt, preferred stock and common stock.
Data Source: Utility, user estimate.

Row 8 Minimum allowable short-term debt (millions of dollars). This is the value to which short-term debt will be reduced (millions of dollars) when long-term debt, preferred stock, and common stock are issued.
Data Source: Utility, user estimate.

Row 9 Dividend payout ratio (fraction). The fraction of earnings available for common which will be paid as common dividends.
Data Source: User analysis of historical dividend payout ratios.

Row 10 Ratio of common equity to total capitalization.
Data Source: Utility, user estimate.

Row 11 Ratio of common equity plus preferred stock to total capitalization.
Data Source: Utility, user estimate

Row 12 Preferred stock interest rate (fraction).
Data Source: User estimate, utility.

Row 13 Return on average common equity (fraction).
Used when making financial projections based on return on equity.
Data Source: User estimate, utility.

Row 14 Long-term debt interest rate (fraction).
The interest rate on new debt issues.
Data Source: User estimate, utility.

Row 15 Long-term debt maturity time (years).
Life of new debt issues.
Data Source: User estimate, utility.

Row 16 Return on rate base (fraction).
Used when making financial projections based on return on net plant value. It is the ratio of operating income (net of taxes) to average rate base.
Data Source: User estimate, state commission, utility.

Row 17 Interest rate on new short-term debt (fraction).
Data Source: User estimate based on prime interest rate.

Row 18 Miscellaneous tax deductions--federal (millions of dollars).
Data Source: Utility.

Row 19 Share of telephone operations (fraction).
This is the portion of the utility's assets which are used for telephone operations. This ratio is 100% for companies which are telephone utilities only. The ratio is used to allocate interest payments on existing debt, and in determining some of the values in the Initialization File. The ratio is determined by dividing the gross telephone plant by gross utility plant.
Data Source: Utility balance sheets, available in the FCC Form M and annual reports to stockholders.

Rows 20-29 ADFC Factor.
Used to compute the AFDC component of the plant going into service each year. Each row has only one factor for all future years. The remaining elements in each row are filled with zeros. These ten rows correspond to (and must be in the same order as) the ten future plant capital accounts in the Budget File. The method of calculating these factors can be found in appendix B of Part II.
Data Source: Calculated from data supplied by the utility or user estimate of typical construction schedules.

Row 30 Dividends per share (dollars).
Data Source: User estimate, utility.

Row 31 Market-to-book ratio for common stock (fraction).
Data Sources: User estimate, utility.

Row 32 Property tax rate (fraction).
Determined by dividing the annual property taxes by the average gross plant value (including AFDC).
Data Source: User estimate, state commission

Row 33 Operating revenue tax rate (fraction).
Determined by dividing the annual taxes other than income and property taxes by the operating revenues.
Data Sources: User estimate, state commission

Row 34 Rate of AFDC on CWIP (fraction).
Data Source: Utility, state commission, annual report to stockholders.

Row 35 Fraction of investment tax-credits excluded from the ratebase.
Data Source: Utility, user estimate.

Row 36 Target operating revenues (millions of dollars). This is used only with the OPRV option in the Plant Module (see chapter 3, Part II).
Data Source: Utility, user estimate.

Row 37 Miscellaneous tax deductions--state (millions of dollars).
Data Source: Utility.

Row 38 Fraction of CWIP included in the ratebase.
Data Source: User estimate, state commission.

Row 39 Fraction of deferrals deducted from the rate base. The fraction of the value of deferred income taxes and deferred investment tax-credits deducted from the ratebase.
Data Source: User estimate, utility.

Row 40 Working capital included in the ratebase (millions of dollars) A direct dollar addition (or deduction if a negative value is entered) to the ratebase.
Data Source: User estimate.

Row 41 Unit of common stock issue (millions of dollars). This is the size of the smallest incremental block of common stock which might practically be issued.
Data Source: Utility, user estimate.

Row 42 Minimum common stock issue (millions of dollars). The smallest practical issue, as specified here, is internally rounded in units of row 41 before being used.
Data Source: Utility, user estimate.

Row 43 Maximum common stock issue (millions of dollars), internally rounded as above.
Data Source: Utility, user estimate.

Row 44 Unit of preferred stock issue (millions of dollars). As in row 41, but for preferred.

Row 45 Minimum preferred stock issue (millions of dollars). As in row 42, but for preferred.

Row 46 Maximum preferred stock issue (millions of dollars). As in row 43, but for preferred.

Row 47 Unit of long-term debt issue (millions of dollars). As in row 41, but for debt.

Row 48 Minimum long-term debt issue (millions of dollars). As in row 42, but for debt.

Row 49 Maximum long-term debt issue (millions of dollars). As in row 43, but for debt.

Row 50 Fraction of net utility plant attributed to current assets. (This is intended to keep working capital growing in proportion to the size of the firm.)
Data Source: User estimate, see row 6.

Row 51 Additional current assets (millions of dollars). This constant term augments the two linear terms implied by rows 6 and 50.

Row 52 Fraction of operating revenues attributed to current liabilities. As row 6, but for liabilities.

Row 53 Fraction of net utility plant attributed to current liabilities. As row 50, but for liabilities.

Row 54 Additional current liabilities (millions of dollars). As row 51, but for liabilities.

Debt File

The Debt File contains information on long-term debt and preferred stock issues which are outstanding in the base year. This file is created and edited interactively by running the FIXOBS Module. The Finance Module creates an output Debt File which contains updated information on existing issues as well as future issues created by the model.

The input Debt File contains the following information for each issue:

- a description of the issue
- month, day, and year of issue
- year of maturity
- amount of original issue
- amount outstanding (this is updated by the Finance Module)
- sinking fund requirement, and
- interest rate

Account Names File

This file simply lists the number and names of O&M accounts without any other data. The accounts are the same as that of the History File. This file is used by the Aggregation Module to group O&M accounts into two categories: operation (category 1) and maintenance (category 2). The data format is given below.

Row 1	Number of accounts plus one. If there are 28 accounts, this number should be 29. The format is I4.
Row 2-31	These contain 3 data entries. The first entry is the account number. The second entry is the category number (1 or 2). Finally, the last entry is the account name. The format is I4, I3, 1X, 17A4.

Depreciation File

This file contains data for tax depreciation calculations in the Plant Module. The data description and format is given in Appendix D of Part I.

CHAPTER 3

OPERATION OF RAMTEL

As explained in chapter 1, RAMTEL consists of multiple executable programs, or modules. A "model run" consists of running some or all of these modules in the sequence shown in exhibit 1. Although the modules use common input and output files, they are not linked in any way and must be executed individually. The instructions for operating each module differ as to the information the operator must supply concerning input and output files and program options. Detailed instructions for operating each part of RAMTEL follow.[2]

The first time that RAMTEL is executed, the following steps must be performed in the order specified:

1. The seven alphanumeric files must be created by the user. This can be done by using the editing facilities of the host computer.

2. The source (FORTRAN) program of each module have to be compiled into an object program. To compile the fortran program F870BU.FORT (the source program for the BUILD Module), enter the following command:

   ```
   fort77  f870bu.fort  langlvl (66)
   ```

   The above command indicates that the FORTRAN77 compiler is being used. The LANGLVL parameter allows certain statements from the older version of FORTRAN to pass the compiler.

3. The object program is linked to a load module. Use the following set of commands to link F870BU.OBJ (the object program for BUILD) to the load module PUCO.LOAD.

   ```
   free file(syslib)

   alloc file(syslib) data ('sys1.vlnkmlib',
        'sys1.vfortlib', 'sys1.fortlib',
        'sys1.imsl.double', 'sys4.testrand.loadlib')

   link f870bv.obj load [puco.load (f870bv)]
        lib ('sys1.vlnklib', 'sys1.vfortlib')
   ```

---

[1] It is assumed throughout this chapter that the model is used on a timesharing, interactive computer system.

4. Each alphanumeric file must be converted to numeric form by using the Build Module.

5. The Performance Module and the Plant Module are executed in either order.

6. The Aggregation Module is executed to initialize a Master File.

7. The Fixed Obligations Module is executed to initialize a Debt File.

8. The Finance Module is executed.

9. The Report Module is executed to print reports.

Steps 2 and 3 may not be needed if all object programs are available and already linked to the load module. These must be repeated for any of the program modules that have been modified. Step 4 must be repeated each time an alphanumeric file has been modified.

Each of the modules can be executed by running the corresponding member of a command file (PUCO.CLIST). This step can further be simplified for IBM systems by allocating the system file SYSPROC to PUCO.LIST. Then BUILD can be run by simply entering BUILD. The same goes for other modules. The following shows the commands (small letters) and computer responses (capital letters) for allocating the system file SYSPROC to the command file PUCO.CLIST.

```
free f(sysproc)
READY
Alloc f(sysproc) da (puco.clist) shr
READY
```

Exhibit 1 can be useful for understanding the required order of program execution. For example, the diagram shows that the Aggregation Module cannot be run before both the Performance Module and the Plant Module have been executed because the L- and X-files are required by the Aggregation Module.

To correct mistakes, to test alternative policies and/or assumptions, and to perform sensitivity analyses, parts or all of the model may be run with different inputs. Exhibit 1 also aids in determining which parts of the model need to be run for different alterations. For example, the input Debt File contains initial long term debt issues. To determine the effect of different interest rates in the initial portfolio, only the Fixed Obligations, Finance and Report Modules need be run. If, in addition, the effects of a different capital budget (contained in the Budget File) were to be examined, the Build, Plant and Aggregation Modules would have to be rerun also using the same Performance Module output files.

There may be many versions of a file in existence at the same time. For example, there may be ten output Master Files resulting from ten different executions of the Finance Module. Numeric suffixes are used to distinguish among these files.

Exhibit 3 is a sample control sheet which is useful in making model runs. The names of the source files and the associated output files are clearly associated with a particular scenario description.

EXHIBIT 3
RAMTEL CONTROL SHEET

ABC Telephone Company

Scenario Description: Program run 5

Input Files (Alphanumeric)		Output Files (Numeric)	
H:	HISABC.DATA	L/C:	LABC05,CABC05
A:	ADJABC.DATA	X:	XABC05
R:	REGABC.DATA	M:	MABC05
E:	EXOABC.DATA	DD:	DDABC05
P:	PARABC.DATA		
I:	INIABC.DATA		
D:	DABC05.DATA		

Build Module (BUILD)

The Build Module is a file manipulating program which is used to convert alphanumeric input files which contain explanatory comments and data into numeric files which can be used by the other modules in RAMTEL.

When using any one or a combination of modules, the user will probably want to make alterations to input files and rerun the programs. The Build Module must be rerun every time that a source input file is altered.

The Build Module requires one alphanumeric input file and generates one numeric output file. The input file can be any one of the seven BCD files shown in exhibit 1 and in exhibit 4. Exhibit 4 also contains information about the number of rows and columns of each input file and the required naming convention for the output file. When calling the program the user will be asked to supply the alphanumeric file name for whichever file is used as input. The Build Module will convert all of the alphanumeric files found in exhibit 4 if supplied with the word ALL.

EXHIBIT 4

RAMTEL MODEL INPUT FILES REQUIRING BUILD MODULE

File Name	Alphanumeric File Name	Code Letters	Numeric[1] File Name	Rows	Columns	Flipped
Initialization File	INI	I	Ixxx	13	29	No
Budget File	BUD	B	Bxxx	136	29	Yes
Parameter File	PAR	P	Pxxx	54	29	No
History File	HIS	H	Hxxx	180	45[2]	Yes
Adjustment File	ADJ	A	Axxx	12	40	Yes
Exogenous File	EXO	E	Exxx	30	41	Yes
Regression File	REG	R	Rxxx	120	13	Yes

[1] The xxx is a three-character alphabetic code which uniquely identifies the company.
[2] The number of nonzero columns in the History File is equal to 5+ the number of years of historical data.

It is quite possible that the actual number of rows in an input file may not equal the values listed in exhibit 4. For example, if historical data for operations and maintenance subaccounts is undesired or unavailable, then the History source file may contain no more than 120 rows. The Build Module will fill in the missing rows in the resulting numeric file with zeros, and no error message will be printed at the terminal.

Each existing row in the source file must, however, contain the specified number of columns, i.e., values in each row. If, for example, only 1960-1969 data are available or desired for the Exogenous File instead of 1960-1999, 18 zeros must be supplied at the end of each row in the source file. If this is not done, then the Build Module will supply sufficient zeros to complete the row in the numeric file but not in the source file. An error message will be typed at the terminal for each row so completed. It is recommended that the user enter sufficient values in the source file so that the row completion error check can be used to locate typographical errors.

Program Execution

The Build Module is run by entering the command BUILD. The program will respond by asking the operator the questions listed below:

COMPUTER: ENTER 3-CHARACTER COMPANY CODE

RESPONSE: Type the three letter code which represents the company being studied.

COMPUTER: ENTER CODE/ALL, ADJ, BUD, EXO, HIS, INI, PAR, REG, END/..

RESPONSE: Type the name of the input alphanumeric file or "ALL" if all file names should be used as input to BUILD.

Sample Run

Two sample run executions of BUILD, one for the input file REGABC and output file RABC and the other for all input files, are shown below[3].

```
build

ENTER 3-CHARACTER COMPANY CODE...abc

ENTER CODE /ALL,ADJ,BUD,EXO,HIS,INI,PAR,REG,END/...all

BUILD MODULE, LAST MODIFIED Ø8/Ø6/8Ø
FILE CREATED:  AABC
NORMAL EXIT FROM BUILD MODULE
BUILD MODULE, LAST MODIFIED Ø8/Ø6/8Ø
FILE CREATED:  BABC
NORMAL EXIT FROM BUILD MODULE
BUILD MODULE, LAST MODIFIED Ø8/Ø6/8Ø
FILE CREATED:  EABC
NORMAL EXIT FROM BUILD MODULE
BUILD MODULE, LAST MODIFIED Ø8/Ø6/8Ø
FILE CREATED:  HABC
NORMAL EXIT FROM BUILD MODULE
BUILD MODULE, LAST MODIFIED Ø8/Ø6/8Ø
FILE CREATED:  IABC
NORMAL EXIT FROM BUILD MODULE
BUILD MODULE, LAST MODIFIED Ø8/Ø6/8Ø
FILE CREATED:  PABC
NORMAL EXIT FROM BUILD MODULE
BUILD MODULE, LAST MODIFIED Ø8/Ø6/8Ø
FILE CREATED:  RABC
NORMAL EXIT FROM BUILD MODULE
READY
```

Plant Module (PLANT)

The Plant Module requires two numeric files and generates one numeric output file. The input files are the Budget File and the Parameter File, designated Bxxx and Pxxx, respectively (xxx is a three-letter company identification code). The output file is an intermediate file designated Xxxxdd, where dd is a user specified file number (this and other intermediate files are only used for subsequent processing and do not represent system output).

---

[3] In this and all the sample runs that follow, small letters indicate user inputs and capital letters indicate computer prompts and messages.

Program Execution

To run the Plant Module, enter the command PLANT. The program will respond by asking the operator the questions detailed below.

COMPUTER:	ENTER 3-CHARACTER COMPANY CODE...
RESPONSE:	Type the three-letter code which represents the company being studied.
COMPUTER:	ENTER 2-DIGIT NUMERIC SUFFIX FOR OUTPUT FILE /X/...
RESPONSE:	Type a two-digit number (dd) which uniquely identifies the program run.
COMPUTER:	ENTER COMPANY NAME (UP TO 32 CHARACTERS)
RESPONSE:	Type the full company name as it is to be printed on the final reports.

The program is complete when the program types NORMAL EXIT FROM PLANT MODULE.

Sample Run

The sample computer execution below is for company ABC and is the first run.

Inputs:	BABC PABC
Outputs:	XABC01

```
plant

ENTER 3-CHARACTER COMPANY CODE...abc

ENTER 2-DIGIT NUMERIC SUFFIX FOR OUTPUT FILE /X/...Ø1

PLANT MODULE, LAST MODIFIED Ø6/15/87
ENTER COMPANY NAME (UP TO 32 CHARACTERS)
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
ABC Telephone Company

IS INCOME BASED ON NET PLANT VALUE, OPERATING REVENUES,
OR RETURN ON EQUITY?  ENTER NPV, OPRV, OR ROE
roe

CAPITAL-EXPENDITURES SUBROUTINE COMPLETED

DEPRECIATION SUBROUTINE COMPLETED
ENTER TODAY'S DATE
MM/DD/YY
6/24/87

FILE CREATED:  XABCØ1
NORMAL EXIT FROM PLANT MODULE
READY
```

Performance Module (PERFORM)

The Performance Module requires four numeric input files and produces two numeric output files. The names of the files are formed from two items of information supplied by the user at the time of execution. The first item supplied is a three-letter code which uniquely identifies the company (referred to below as xxx). The second item supplied is a two-digit numeric code which is used to identify the output files of a particular program run (referred to below as dd).

The four input files are:

Hxxx — The History File--contains a variable number of years of historical data for all O&M accounts and subaccounts.

Axxx — The Adjustment File-- contains adjustment both to historical and extrapolated O&M data.

Rxxx — The Regression File-- specifies the regression techniques to be used for each O&M account.

Exxx — The Exogenous File--contains data on exogenous, non-O&M items such as total number of local loops and total minutes of use.

The two output files are:

Lxxxdd The O&M Line Items File--contains adjusted historical and future cost data.

Cxxxdd The Coefficient File--contains regression equation parameters.

Program Execution

The Performance Module is run by entering the command PERFORM at the terminal. The program will respond by asking the operator the following questions:

COMPUTER: ENTER 3-CHARACTER COMPANY CODE...

RESPONSE: Type the three-letter code which represents the company being studied.

COMPUTER: ENTER 2-DIGIT NUMERIC SUFFIX FOR OUTPUT FILES /L/ AND /C/...

RESPONSE: Type a two-digit number (dd) which uniquely identifies the program run.

COMPUTER: ENTER COMPANY NAME (UP TO 32 CHARACTERS)

RESPONSE: Type the full company name as it is to be printed on the O&M Projections (legend and graph).

COMPUTER: OK TO OVERWRITE FILES LABCdd AND CABCdd?

RESPONSE: Type no if already existent O&M Line Items and Coefficient Files are to be salvaged. The program will terminate upon receiving this response allowing the user to rename the catalogued files or designate alternate suffixes when PERFORM is rerun.

The program run is complete when the terminal types NORMAL EXIT FROM PERFORMANCE MODULE. The terminal will then type WHICH REPORT to indicate that a link has been made to the Report Module. Typing NONE will terminate the Report Module without printed output. The section describing the Report Module gives instructions for creating printed output from the Performance Module. The only difference in running the Report Module directly from the Performance Module is that the program does not ask which output L- and C-files to use; it uses the ones just created. Exhibit 5 shows the error messages frequently encountered during the execution of the Performance Module.

EXHIBIT 5

PERFORMANCE MODULE ERROR MESSAGES FREQUENTLY ENCOUNTERED

Message	Meaning
ADJUST ERROR-CODE 1	No adjustment entry for some history entry.
ADJUST ERROR-CODE 2	Fewer than minimum number of data in some history file.
REGRESS ERROR-CODE 1	Too few data points to regress.
REGRESS ERROR-CODE 2	No data for some variable.
REGRESS ERROR-CODE 4	Non-existent exogenous variable.
REGRESS ERROR-CODE 5	Exogenous variables not specified.
REGRESS ERROR-CODE 6	Zero or negative historical datum on Method 3.
EXTRAPOLATION ERROR-CODE 3	Regression has not been performed.
EXTRAPOLATION ERROR-CODE 6	Missing future data for exogenous variable.
EXTRAPOLATION ERROR-CODE 9	All future years undefined due to regression error.

Sample Run

A sample run of the Performance Module based upon the input files HABC, AABC, RABC, EABC, and output files LABC01, CABC01 is shown below.

```
perform

ENTER 3-CHARACTER COMPANY CODE...abc

ENTER 2-DIGIT NUMERIC SUFFIX FOR OUTPUT FILES /L/ AND /C/...Ø1

PERFORMANCE MODULE, LAST MODIFIED Ø6/15/87
ENTER COMPANY NAME (UP TO 32 CHARACTERS)
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
ABC Telephone Company
OK TO OVERWRITE FILES LABCØ1 AND CABCØ1?  YES OR NO
yes

THE H-FILE CONTAINS DATA FROM YEARS 196Ø TO 1969;
ENTER THE INCLUDED RANGE YOU WILL USE FOR REGRESSIONS:
YYYY-YYYY
196Ø-1969

ENTER TODAY'S DATE
MM/DD/YY
6/24/87
PRE-REGRESSION ADJUSTMENTS COMPLETED
REGRESSIONS COMPLETED
REPORT MODULE, LAST MODIFIED Ø6/15/87

WHICH REPORT
none

READY
```

Aggregation Module (AGGREG)

The Aggregation Module requires four numeric input files: the Initialization File (Ixxx, where xxx is the three-character company code used in the Plant Module and the Performance Module), the O&M Line Items File (Lxxdd, produced by the Performance Module), the Intermediate Output File from the Plant Module (Xxxxdd), and ACNAMES (which contains the O&M aggregation scheme.) The Aggregation Module produces a Master File called Mxxxdd. The numeric suffixes for the input and output files (dd) are determined by the user and should be carefully recorded to insure the reproducibility of each model run.

Program Execution

The Aggregation Module is run by entering the command AGGREG. The program will respond by asking the operator the following questions:

COMPUTER: ENTER 3-CHARACTER COMPANY CODE...

RESPONSE: Type the three-letter code which represents the company being studied.

COMPUTER: ENTER 2-DIGIT SUFFIX FOR INPUT FILE /X/...
ENTER 2-DIGIT SUFFIX FOR INPUT FILE /L/...
ENTER 2-DIGIT SUFFIX FOR MASTER FILE TO BE FORMED /M/...

RESPONSE: For all of the above prompts, type a two-digit number (dd) which uniquely identifies the program run.

The program is complete when the program types NORMAL EXIT FROM AGGREGATION MODULE.

Sample Run

A sample execution of AGGREG is shown below. In this example, the input files are IABC, XABC01, LABC01, and ACNAMES. The output file is MABC01.

```
aggreg

ENTER 3-CHARACTER COMPANY CODE...abc

ENTER 2-DIGIT SUFFIX FOR INPUT FILE /X/...Ø1

ENTER 2-DIGIT SUFFIX FOR INPUT FILE /L/...Ø1

ENTER 2-DIGIT SUFFIX OF MASTER FILE TO BE FORMED /M/...Ø1

AGGREGATION MODULE. LAST MODIFIED Ø6/Ø9/8Ø
OK TO OVERWRITE FILE MABCØ1?  YES OR NO
yes

ENTER TODAY'S DATE
MM/DD/YY
6/24/87

MASTER DATA FILE INITIALIZED
PLANT AGGREGATIONS COMPLETED
O-AND-M AGGREGATIONS COMPLETED
FILE CREATED:  MABCØ1
NORMAL EXIT FROM AGGREGATION MODULE
READY
```

Fixed Obligations Module (FIXOBS)

The Fixed Obligations Module uses the same Debt File for input and output. The user specifies the name of this file, which is of the form Dxxxdd, where xxx is the three letter company code and dd is a two-digit suffix.

Program Execution

The Fixed Obligations Module is run by entering the command FIXOBS. The program will respond with the following questions:

COMPUTER: ENTER 3-CHARACTER COMPANY CODE...

RESPONSE: Type the three-letter code which represents the company being studied.

COMPUTER: ENTER 2-DIGIT SUFFIX FOR DEBT FILE /D/...

RESPONSE: Type the suffix of the input file to be created or used.

The program is completed when the program types NORMAL EXIT FROM FIXED OBLIGATIONS MODULE.

After the data input file is specified, the operator has a number of options available, prompted by the following questions from the terminal.

DO YOU WISH TO ENTER, REVISE AND/OR PRINT ISSUE(S)?

If NO is entered, the program proceeds to the report printing options described later. If YES is entered, the operator can add, delete, or print the input data file. The next question is:

LONG-TERM DEBT: DELETE, ADD, PRINT, OR NONE?

If PRINT is entered, the long-term debt issues in the file are printed. If NONE is entered, the operator is finished making changes to the long-term debt portion of the file. Entering ADD will prompt questions from the terminal to allow new records to be added. If DELETE is entered, records can be deleted by entering the number of the record when prompted by the terminal.

When adding records, the user must enter data according to the following rules:

- commas between the month, day and year of issue;
- amount of issue in thousands of dollars; and
- interest rate in percent, with a decimal point.

When the operator enters NONE to the question:

LONG-TERM DEBT: DELETE, ADD, PRINT, OR NONE?

the program responds with the question:

PREFERRED STOCK: DELETE, ADD, PRINT, OR NONE?

Changes are made to the preferred stock portion of the file in the same way as to the long-term debt portion. When the operator has finished making changes to the preferred stock portion of the file, the program will question the operator about the refunding of present debt as well as printing output.

WILL REFUNDING OF PRESENT DEBT BE CONSIDERED?
YES OR NO
ENTER THE REPORT FORMAT: SHORT, LONG, OR NONE.

If NONE is entered, the program skips over the reports. If LONG or SHORT is entered, the program will print the specified report for the number of years specified. (Note: The ending year must never be less than the beginning year.) Exhibits 6 and 7 are examples of reports printed by the Fixed Obligations Module.

After the reports are printed or skipped, the terminal will ask the operator if the changes to the input files which were made during the program run should be saved. If no changes were made, NO should be entered. It is important to note that additions or changes in the Debt File will not be saved if NO is entered or if the program is prematurely terminated (as with the INTERRUPT key).

EXHIBIT 6

FIXED OBLIGATIONS MODULE--LONG REPORT

ABC LONG-TERM DEBT 1968

ISSUE	YR OF ISSUE	INT RATE	ORIGINAL AMOUNT	PRESENT AMOUNT	INT/DIV EXPENSE	NEW RET
FORTY YR DEBENTURES	1966	5.000	60000.	60000.	3000.	
FORTY YR DEBENTURES	1967	5.375	75000.	75000.	4031.	
FORTY YR DEBENTURES	1968	6.750	55000.	55000.	1856.	N
TOTAL		5.469	190000.	190000.	8887.	

ABC PREFERRED STOCK 1968

ISSUE	YR OF ISSUE	INT RATE	ORIGINAL AMOUNT	PRESENT AMOUNT	INT/DIV EXPENSE	NEW RET
TOTAL		0.0	0.	0.	0.	

EXHIBIT 7

FIXED OBLIGATIONS MODULE--SHORT REPORT

ABC FIXED OBLIGATIONS

YEAR	TYPE	ORIG AMT	AMT OUT	INT/DIV	AVG RATE
1966	LTD	60000.	60000.	2737.	5.000
1966	PST	0.	0.	0.	0.0
1967	LTD	135000.	135000.	6369.	5.192
1967	PST	0.	0.	0.	0.0
1968	LTD	190000.	190000.	8887.	5.469
1968	PST	0.	0.	0.	0.0

Finance Module (FINANCE)

The Finance Module depends on other RAMTEL modules to provide it with input data. Before it can be run, an input Master File (created by the Aggregation Module) and an input Debt File (created by the Fixed Obligations Module) must exist.

The Finance Module requires three numeric input files and creates two output files.

The first input file is the Debt File, which contains the long-term debt and preferred stock issues at the beginning of the first forecast year. This file is called Dxxx where xxx is the same 3-letter company identification code used in the other modules.

The second input file is the Master File created by the Aggregation Module. It is called Mxxxdd where xxx is the company code and dd is a numeric suffix. The Master File contains various initial financial values as well as the capital expenditure, O&M, plant, and depreciation data.

The third input file is the same Parameter File (Pxxx) that was used in the Plant Module.

The Finance Module creates an output Debt File which contains a record by year of issue of the original debt issues plus all new issues which resulted from the simulation. This file is called DDxxxdd, where xxx is previously-used company code and dd is a two-digit numeric suffix supplied by the user at execution time to uniquely identify the output each time the program is run. The output Debt File suffix must always be the same as that of the Master File.

From data in the input Master File, the Finance Module calculates additional items and creates an output Master File called Mxxxdd, where xxx is the company code specified for the Master File in the Aggregation Module.

Program Execution

The Finance Module is run by entering the command FINANCE. The program will respond with the following questions.

COMPUTER:	ENTER 3-CHARACTER COMPANY CODE...
RESPONSE:	Type the three-letter code which represents the company being studied.
COMPUTER:	ENTER 2-DIGIT NUMERIC SUFFIX FOR INPUT FILE /D/...
RESPONSE:	Type the two-digit number (dd) of the appropriate Debt File. (This suffix will generally be the same as suffix specified in FIXOBS.)
COMPUTER:	ENTER 2-DIGIT SUFFIX FOR OUTPUT FILE /D/ AND MASTER FILE /M/...
RESPONSE:	Type the two-digit number (dd) that was specified for the Master File in the Aggregation Module.
COMPUTER:	WILL PROJECTIONS BE BASED ON FLOWTHROUGH OR NORMALIZED ACCOUNTING? ENTER FLOW OR NORM
RESPONSE:	Type the indicated code for the tax accounting method selected.
COMPUTER:	WILL DIVIDENDS BE COMPUTED USING A PAYOUT RATIO, OR ON A PER-SHARE BASIS? ENTER DPR OR DPS
RESPONSE:	Type the indicated code for the selected method of computing common dividends.
COMPUTER:	(If in ROE mode) ENTER ITERATION PRINT-LEVEL CODE, LOW TO HIGH: 0, 1, OR 2. (FOR EXPLANATION OF CODES ENTER 3)
RESPONSE:	Type the indicated single-digit response; levels 1 and 2 provide an abundance of data useful for trouble-shooting.

Following a prompt for the execution date, the program run terminates with NORMAL EXIT FROM FINANCE MODULE.

Sample Run

A sample run of the Finance Module is shown below. The company modeled was ABC, using MABC01, DABC00, and PABC as input files and generating MABC01 and DABC01 as output files.

```
finance
ENTER 3-CHARACTER COMPANY CODE...abc

ENTER 2-DIGIT NUMERIC SUFFIX FOR INPUT FILE /D/...Ø1

ENTER 2-DIGIT SUFFIX FOR OUTPUT FILE /D/ AND MASTER FILE /M/...Ø1
FINANCE MODULE, LAST MODIFIED Ø6/15/87
WILL PROJECTIONS BE BASED ON FLOWTHROUGH OR NORMALIZED ACCOUNTING?
ENTER FLOW OR NORM
AAAA
norm

WILL DIVIDENDS BE COMPUTED USING A PAYOUT RATIO,
OR ON A PER-SHARE BASIS? ENTER DPR OR DPS
DDD
dpr

ENTER TODAY'S DATE
MM/DD/YY
6/24/87
FILE CREATED: DDABCØ1
NORMAL EXIT FROM FINANCE MODULE
READY
```

Report Module (REPORT)

Program Execution

The Report Module is executed by entering the command REPORT. The program will respond by asking the operator the questions detailed below.

COMPUTER: ENTER THE 3-CHARACTER COMPANY CODE

RESPONSE: Type the three-letter code which represents the company being studied.

COMPUTER: ENTER THE 2-DIGIT SUFFIX FOR INPUT FILE /M/...

RESPONSE: Type the two-digit number (dd) that was specified for the Master File in the Aggregation Module.

COMPUTER: ENTER 2-DIGIT SUFFIX FOR INPUT FILES /L/ AND /C/...

RESPONSE: Type the two-digit number (dd) that was specified for these files in the Performance Module.

Sample Run

The first part of a sample run of the Report Module is shown below. The company modeled was ABC and the input files are MABC01, LABC01 and CABC01.

```
report
ENTER 3-CHARACTER COMPANY CODE...abc
ENTER 2-DIGIT SUFFIX FOR INPUT FILE /M/...Ø1
ENTER 2-DIGIT SUFFIX FOR INPUT FILES /L/ AND /C/...Ø1
```

The rest of the sample run is illustrated in the following paragraphs.

Specifying Reports

The program requires three pieces of information from the user: the name of the report, any options, and the name of the data file to which the report may be written. The program's first question will be:

WILL ANY REPORTS BE WRITTEN TO A DISK FILE?
YES OR NO

By responding YES to this questions, a disk file (named by the user) is allocated for future use. This disk file is not allocated when NO is the response.

```
WILL ANY REPORTS BE WRITTEN TO A DISK FILE? (YES OR NO)...yes
ENTER THE PARTIAL DATASET-NAME FOR OUTPUT,
E.G., PRINT.DATA...outØ4.data
USE "OUTPUT" OPTION TO WRITE TO THE DISK"
REPORT MODULE, LAST MODIFIED Ø6/15/87
```

The program's next question will be:

WHICH REPORT

To list the reports available, enter the word HELP. An example of using the HELP command follows.

```
WHICH REPORT
help

AVAILABLE CHOICES ARE:
   BALANCE
   INCOME
   SOURCES
   MASTER
   GRAPHS
   OMDATA
   REGSUMRY
   PRODANAL
   SUPPVAR
   NONE
   OPTIONS
   RETAIN
   CANCEL
   HELP
   PRINT
```

The following is a legend for the first nine of the report choices above. The rest are explained later.

BALANCE	- Balance Sheet Report
INCOME	- Income Statement Report
SOURCES	- Sources and Uses of Funds Report
MASTER	- Master File Report
GRAPHS	- O&M Projections (graph, data, and legend)
OMDATA	- O&M Projections (data and legend only)
REGSUMRY	- Regression Summary Report
PRODANAL	- Productivity Analysis Report
SUPPVAR	- Supplementary Financial Variables Report

If any of the above is typed in response to WHICH REPORT, a report request is registered internally, and the terminal will again ask WHICH REPORT. This process <u>will be repeated ten times</u> (GRAPH or OMDATA, however, counts as two requests) or <u>until the user types the word PRINT</u>. The reports are then printed (or written to a file, if desired) and the program again asks WHICH REPORT. At this point up to ten more report requests can be made.

When GRAPHS, OMDATA, REGSUMRY or PRODANAL is requested, the program asks:

DO YOU WANT THIS REPORT WRITTEN TO A FILE? YES OR NO

If YES was answered to the Report Module's first question relating to the disk file, the user has the option of specifying YES or NO to this question. If NO was the response to the first question, the disk file was not allocated for use and therefore NO must be the response to this question also.

In response to WHICH REPORT the user has six other options:

Typing NONE will terminate the program.

Typing OPTIONS will list available options in a report request. An example of using the OPTIONS command follows.

```
WHICH REPORT
options

AVAILABLE OPTIONS ARE:
   ROWS
   YEARS
   OUTFILE
   TERMINAL
   WIDE
   NARROW
   CONSTANT
   CURRENT
   THOUSAND
   MILLIONS
```

Typing RETAIN will initiate another report request identical to the previous request except for options which the user specifies to be different. The RETAIN option does not apply to the GRAPH or OMDATA reports. Typing CANCEL cancels the previous report request. Typing HELP lists report choices. Typing PRINT will print (on the terminal or to a disk file) all reports requested since the last printing. If none has been requested, the program will stop. After printing, the program will return with WHICH REPORT.

Specifying Report Options

After entering the name of the report, the user may specify additional options. These options are entered on the same line after the name of the report, in any order, separated by blanks or commas. If no options are specified, the program will default to the following assumptions:

All rows are to be printed.

The first five years are to be printed, beginning with the base year, for BALANCE, INCOME, SOURCES, SUPPVAR, MASTER, AND REGSUMRY. (Although other years may be specified for REGSUMRY, only five years will print per request.) PRODANAL will print 11 years; GRAPHS and OMDATA print 40 years of reports.

The printing will be done in a wide-carriage (133 characters) format for BALANCE, INCOME, SOURCES, SUPPVAR, MASTER, GRAPHS, AND OMDATA. The others have a narrow carriage (109) default.

No files are to be created. (GRAPHS, OMDATA, REGSUMRY, AND PRODANAL will specifically inquire about this if the OUTFILE option is not specified.)

The report will be in millions of current dollars for BALANCE, INCOME, SOURCES, SUPPVAR, AND MASTER. For REGSUMRY, PRODANAL, GRAPH, AND OMDATA, the scale is determined individually for each report.

The method of specifying report options is shown in the following examples:

```
WHICH REPORT
income
```

In this case, the Income Statement has been requested with no options. The report will be printed with the program making the default assumptions listed above. MABC01 is the name of the Master File on which the report will be based.

```
WHICH REPORT
balance thousands
```

The Balance Sheet in thousands of dollars has been requested, using data file MABC01 as input. With the exception of the report being in thousands of dollars, the program makes the default assumptions above.

```
WHICH REPORT
sources years

WHICH YEARS
NNNN-NNNN
1970-1975 1979
```

The Sources and Uses of Funds Report for the years 1970 through 1975 and the year 1979 has been requested. When specifying a series of years, a dash mark must be included. Individual years need only be separated by blank spaces or commas.

```
WHICH REPORT
income rows
WHICH ROWS
NNNN-NNNN
0004 0006
```

The Income Statement has been requested, but only lines 4 and 6 will be printed.

```
WHICH REPORT
income rows thousands years

WHICH ROWS
NNNN-NNNN
0003-0007

WHICH YEARS
NNNN-NNNN
1972 1976 1980
```

The Income Statement has been requested in thousands of dollars, but only lines 3 through 7 for the year 1972, 1976, and 1980 will be printed. This example shows how a number of report options can be specified. They may be in any order (after the report name), separated by spaces or commas.

```
WHICH REPORT
income narrow
```

The Income Statement has been requested for printing on a narrow carriage terminal.

```
WHICH REPORT
retain constant
```

If this command follows the previous Income Statement request, then the Income Statement will have been requested in constant dollars for printing on a narrow carriage terminal. Although the default option is a wide terminal, the RETAIN statement specifies all options from the previous request except those modified by the RETAIN request.

The reports OMDATA and GRAPH print operations and maintenance reports from the Performance Module. The former prints the legend, which includes identification information and the equation used to calculate future values and data for the years specified. GRAPH prints a graph in addition to the legend and data.

```
WHICH REPORT
omdata constant

DO YOU WANT THIS REPORT WRITTEN TO A FILE (YES OR NO)
no

ENTER ACCOUNT NUMBERS FROM L-FILE, UP TO 5 OR "ALL"
NNNN,NNNN,NNNN,NNNN,NNNN
Ø6Ø2
```

The above report request specifies the printing of the legend and data for account 602 in constant dollars for all years based on files LABC01 and CABC01.

```
WHICH REPORT
graph current

ENTER ACCOUNT NUMBERS FROM L-FILE, UP TO 5 OR "ALL"
NNNN,NNNN,NNNN,NNNN,NNNN
Ø6Ø2
```

The above report request specifies the graph of account 602 in current dollars. This allows graphical and analytical comparison of the results of five different extrapolation methods.

```
WHICH REPORT
graph years

WHICH YEARS
NNNN-NNNN
£Ø1Ø-ØØ2Ø

DO YOU WANT THIS REPORT WRITTEN TO A FILE (YES OR NO)
no

ENTER ACCOUNT NUMBERS FROM L-FILE, UP TO 5 OR "ALL"
NNNN,NNNN,NNNN,NNNN,NNNN
all

ENTER THE FOUR-DIGIT BEGINNING ACCOUNT-NUMBER, NON-ZERO
NNNN
Ø6Ø2
```

The above requests the GRAPH report for all accounts for which historical data were entered in the History File. The ALL option can be used with either GRAPH or OMDATA and always results in one account per graph (or table). One account number is specified as the account with which to begin the report (for example, 602).

The above request also illustrates the capability to refer to years by index number instead of calendar year. Year 1 refers to the first year for which historical data were entered in the History File. Because 1960 was the first historical year in LABC01, the above request will print data for 1969 to 1988.

```
WHICH REPORT
balance outfile
```

The option OUTFILE causes the program to print the reports in a computer file rather than at the terminal. The file contains carriage control characters to cause proper spacing and paging when the file is printed on a line printer.

Any report name or option may be abbreviated by the first four letters.

Examples of possible reports produced by the Report Module are shown in exhibits 8-16.

The program run is complete after the user types NONE in answer to the questions WHICH REPORT.

```
WHICH REPORT
none

READY
```

Difference Module (DIFFER)

As has been discussed earlier, RAMTEL can be used to compare the effect of various regulatory alternatives and financial parameters such as alternative treatments (normalized or flow-through) of deferred taxes on after-tax income. One could also test the effect of varying interest rates on net income. The proforma financial statements and the Master File can be used to carry out any desired sensitivity analysis. To help the user in this task further, RAMTEL has an additional module, namely the Difference Module (DIFFER), which can be used to compare the entries in the Master File. DIFFER can be used to construct a master file whose entries are the <u>differences</u> between corresponding entries of two master files. In addition to comparing the effect of alternative regulatory or accounting treatments on a single utility, one can use DIFFER to make financial comparisons of two different utilities.

Program Execution

The Difference Module is executed by entering the command DIFFER. Since the program assumes, for simplicity, that file comparisons will be made across runs for a common (single) company, an existing master file may need to be renamed to conform. The program responds with the following prompts.

COMPUTER:	ENTER 3-CHARACTER COMPANY CODE...
RESPONSE:	Type the three-letter company code common to the two files being compared.
COMPUTER:	ENTER 2-DIGIT NUMERIC SUFFIX FOR MINUEND FILE (THAT FROM WHICH ANOTHER IS TO BE SUBTRACTED). /M/...
RESPONSE:	Type the suffix of that file whose elements are treated positively in the subtraction.
COMPUTER:	ENTER 2-DIGIT NUMERIC SUFFIX FOR SUBTRAHEND FILE (THAT WHICH IS TO BE SUBTRACTED). /M/...
RESPONSE:	Type the suffix of that file whose elements are treated negatively in the subtraction.
COMPUTER:	ENTER 2-DIGIT NUMERIC SUFFIX FOR DIFFERENCE FILE. /M/...
RESPONSE:	Type the suffix for the output file.
COMPUTER:	ENTER COMPANY CODE, FILE SUFFIX, TODAY'S DATE, AND DESCRIPTIVE TITLE FOR FILE 3.
RESPONSE:	In the indicated field, type the internal documentation for the difference file. (This data will be used in the report heading.)
COMPUTER:	ENTER 1 OR 2 AS INDEX OF FILE TO BE GIVEN PRIORITY IN ELEMENTS NOT SUBTRACTED.
RESPONSE:	Type in the index of that file having preferred values.

Sample Run

A sample execution of the Difference Module based upon the input files MXYZ01 and MXYZ02 is shown below.

```
differ
ENTER 3-CHARACTER COMPANY CODE...abc
ENTER 2-DIGIT NUMERIC SUFFIX FOR MINUEND FILE
  (THAT FROM WHICH ANOTHER IS TO BE SUBTRACTED)  /M/...01
ENTER 2-DIGIT NUMERIC SUFFIX FOR SUBTRAHEND FILE
  (THAT WHICH IS TO BE SUBTRACTED)               /M/...02
ENTER 2-DIGIT NUMERIC SUFFIX FOR DIFFERENCE FILE /M/...09
MASTER-FILE DIFFERENCING PROGRAM, LAST MODIFIED 06/20/87

CREATE FILE 3, WHOSE ELEMENTS ARE THE DIFFERENCE
BETWEEN THOSE OF FILE 1 (+) AND FILE 2 (-)
FILE 1:   MABC 1.  62487. ABC TELEPHONE COMPANY
FILE 2:   MABC 2.  62087. ABC TELEPHONE COMPANY

ENTER 3-CHARACTER COMPANY CODE....CCC
abc
ENTER FILE SUFFIX (INCL DEC PT)....NN.
09.
ENTER TODAY'S DATE (INCL DEC PT)....MMDDYY.
062587.
ENTER DESCRIPTIVE TITLE FOR FILE 3...UP TO 32 CHARS
comparison of actual & proj expenses
FOR COMPARISON, THE SECOND LINES ARE LISTED FOR
FILE 1:   ROE   NORM DPR   1969. XABC 1   LABC 1
FILE 2:   ROE   NORM DPR   1969. XABC 2   LABC 2
ENTER 1 OR 2 AS INDEX OF FILE TO BE GIVEN PRIORITY IN ELEMENTS NOT
N                                                          SUBTRACTED
1
NORMAL EXIT FROM DIFFER MODULE:
FILE CREATED:  MABC09.
READY
```

EXHIBIT 8

O & M PROJECTION TABLE

LEGEND:

```
* =     ACCOUNT-  6Ø2          FILE- LABC 2
        COMPANY- ABC           DATE-  6/2Ø/87

   REPAIRS OF OUTSIDE PLANT

        MULTIVARIATE LINEAR REGRESSION
        N = -7312.72       + Ø.137237E-Ø2*<1ØØ4>
        R-SQUARED OF Ø.932Ø BASED ON 1Ø POINTS, WITH STD DEV OF    972.ØØ22

+ =     ACCOUNT-  6Ø3          FILE- LABC 2
        COMPANY- ABC           DATE-  6/2Ø/87

   TEST DESK WORK

        MULTIVARIATE LINEAR REGRESSION
        N = -9235.79       + -.724463E-Ø2*<1ØØ1>
                           +  48.Ø97Ø     *<1ØØ3>
                           + Ø.124532E-Ø2*<1ØØ4>

        R-SQUARED OF Ø.9872 BASED ON 1Ø POINTS, WITH STD DEV OF    284.8274

   NOTE: SYMBOLS MAY MASK EACH OTHER IN DESCENDING ORDER
```

ANNUAL ACCOUNT DATA:

DEC 31, ACCOUNT	196Ø	1961	1962	1963	1964	1965	1966	1967	1968	1969	197Ø
6Ø2	98Ø9.43	1ØØ93.4Ø	9947.91	9839.44	11383.37	13226.65	13826.Ø9	14477.ØØ	16517.89	2Ø437.26	21Ø54.94
6Ø3	3829.76	4141.45	4319.72	4392.79	5225.82	5931.66	6792.59	7754.34	8521.12	9712.35	9291.41

DEC 31, ACCOUNT	1971	1972	1973	1974	1975	1976	1977	1978	1979	198Ø	1981
6Ø2	23Ø37.23	25Ø13.12	27531.86	29649.66	3Ø696.72	31736.93	33617.Ø5	35114.38	36479.55	37546.46	38595.41
6Ø3	12845.26	137Ø8.62	15413.5Ø	17Ø43.12	1758Ø.32	18572.34	19728.41	2Ø8Ø1.12	21943.18	23Ø71.Ø7	24814.83

EXHIBIT 9

O & M PROJECTION GRAPH

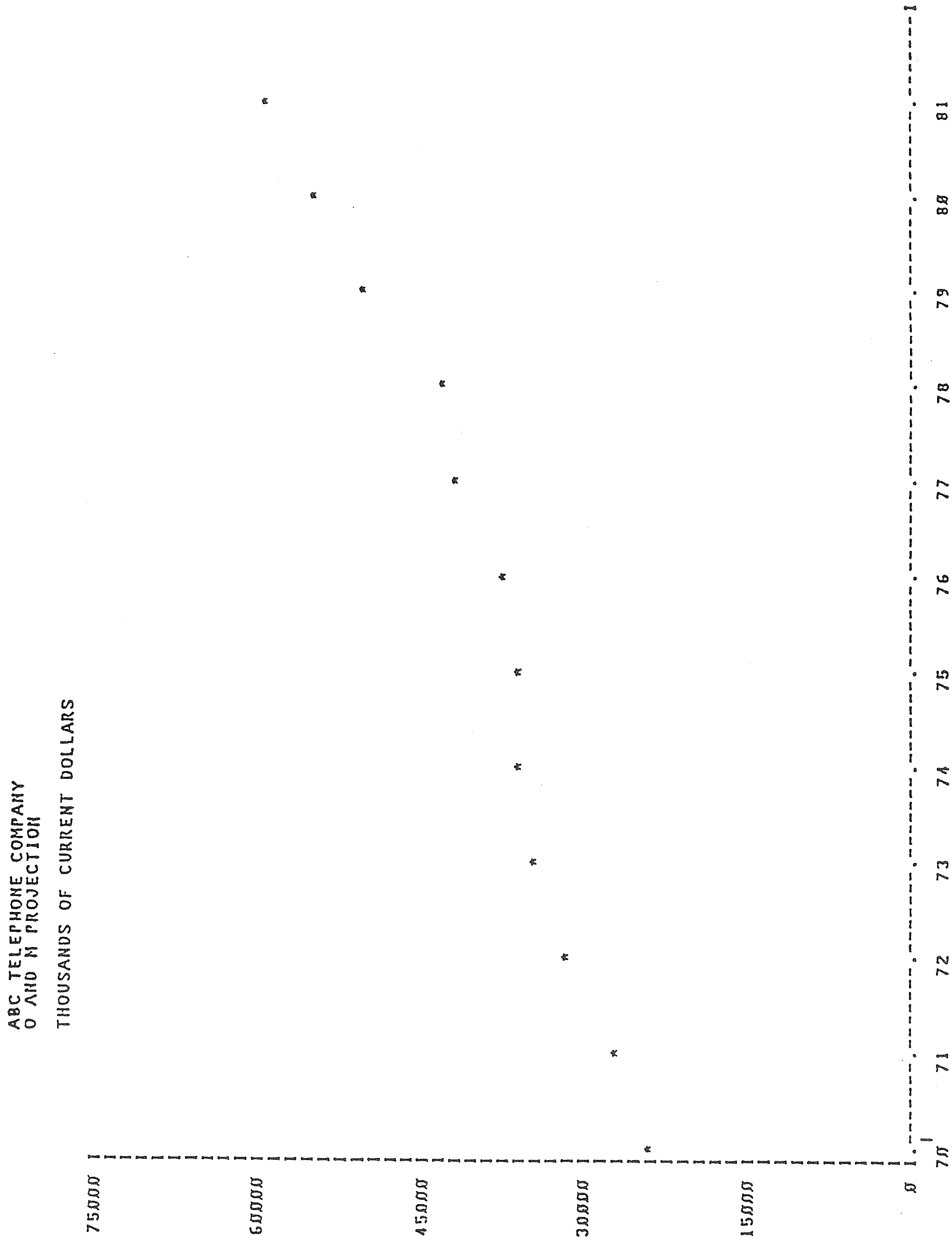


EXHIBIT 10

BALANCE SHEET

COMPANY ABC
FILE NO. 1
DATE 6/24/87

ABC TELEPHONE COMPANY
BALANCE SHEET

MILLIONS OF CURRENT DOLLARS

DECEMBER 31,	1970	1971	1972	1973	1974	1975
ASSETS						
GR PLANT INS (INCL AFDC)	1606.28	1777.23	1951.62	2148.83	2341.53	2518.47
-ACCUM DEPREC	413.59	439.58	465.92	484.42	492.92	507.38
NET PLANT VALUE	1192.69	1337.66	1485.70	1664.41	1848.60	2011.09
+CWIP	72.32	80.55	95.66	86.63	84.59	66.51
NET UTILITY PLANT	1265.01	1418.21	1581.36	1751.04	1933.20	2077.60
+ASSETS N.E.C.	110.61	118.45	125.10	140.50	154.61	160.20
TOTAL ASSETS	1375.62	1536.66	1706.46	1891.55	2087.80	2237.80
LIABILITIES						
COMMON STOCK	720.04	737.28	751.51	840.58	978.20	998.47
+RETAINED EARNINGS	143.57	134.09	113.61	101.45	102.84	80.72
TOTAL COMMON EQUITY	853.61	871.37	865.12	942.03	1081.04	1079.20
+PREFERRED STOCK	0.00	0.00	0.00	0.00	0.00	0.00
+LONG TERM DEBT	339.69	467.96	496.44	661.15	697.19	737.74
TOTAL CAPITAL	1203.31	1339.33	1361.56	1603.18	1778.23	1816.93
+SHORT TERM DEBT	11.25	12.66	118.55	16.02	7.63	66.66
+ACCUM DEF INCOME TAXES	6.98	19.39	36.48	58.98	86.08	116.35
+ACCUM DEF INV TAX CR	15.00	16.14	22.49	29.24	37.19	56.35
+LIABILITIES N.E.C.	139.09	149.13	167.38	184.13	178.67	181.50
TOTAL LIABILITIES	1375.62	1536.66	1706.46	1891.54	2087.80	2237.79

EXHIBIT 11

INCOME STATEMENT

COMPANY ABC
FILE NO. 1
DATE 6/24/87

ABC TELEPHONE COMPANY
INCOME STATEMENT

MILLIONS OF CURRENT DOLLARS

DECEMBER 31,	1970	1971	1972	1973	1974	1975
OPERATING REVENUES	561.08	605.37	634.27	710.06	820.16	857.68
-OPERATION	175.97	194.03	211.22	230.66	253.06	291.20
-MAINTENANCE	124.01	141.11	156.46	170.94	191.08	208.31
-DEPRECIATION	81.32	89.55	98.61	108.36	118.59	128.27
TOTAL OPERATING EXPENSES	381.30	424.69	466.29	509.96	562.73	627.78
-OP REVENUE TAX	13.75	17.01	18.39	18.96	22.06	25.04
-PROPERTY TAX	35.00	40.26	43.07	47.98	52.09	52.24
-INCOME TAX PAID	47.04	36.96	15.10	18.37	35.36	2.95
-DEFERRED INCOME TAX	6.98	12.42	17.08	22.50	27.10	30.27
-DEF INVEST TAX CREDIT	0.51	1.14	6.34	6.76	7.95	19.16
TOTAL EXPENSES	484.58	532.48	566.28	624.51	707.30	757.44
OPERATING INCOME	76.50	72.89	67.99	85.55	112.86	100.24
+OTHER INCOME	4.36	6.24	6.24	7.38	7.15	6.14
+AFDC	0.00	0.00	0.00	0.00	0.00	0.00
INCOME BEFORE INTEREST	80.86	79.12	74.23	92.93	120.01	106.38
-INTEREST ON LTD	14.46	21.47	25.64	31.47	37.70	40.41
-INTEREST ON STD	4.49	0.57	3.79	6.52	1.19	2.25
NET INCOME	61.92	57.08	44.80	54.94	81.12	63.73
-PREFERRED DIVIDENDS	0.00	0.00	0.00	0.00	0.00	0.00
EARNINGS AVAIL COMM	61.92	57.08	44.80	54.94	81.12	63.73
-COMMON DIVIDENDS	57.12	66.56	65.29	67.09	79.74	85.84
RETAINED EARNINGS	4.80	-9.48	-20.49	-12.16	1.39	-22.11

EXHIBIT 12

SOURCES AND USES OF FUNDS REPORT

COMPANY ABC
FILE NO. 1
DATE 6/24/87

ABC TELEPHONE COMPANY
SOURCES AND USES OF FUNDS

MILLIONS OF CURRENT DOLLARS

DECEMBER 31,	1970	1971	1972	1973	1974	1975
SOURCES						
INTERNAL						
NET INCOME	61.92	57.08	44.80	54.94	81.12	63.73
DEPRECIATION	81.32	89.55	98.61	108.36	118.59	128.27
DEFERRED INCOME TAXES	6.98	12.42	17.08	22.50	27.10	30.27
DEF INVEST TAX CREDIT	0.51	1.14	6.34	6.76	7.95	19.16
TOTAL INTERNAL	150.73	160.19	166.84	192.55	234.76	241.42
EXTERNAL						
COMMON STOCK	110.04	17.23	14.24	89.07	137.62	20.27
PREFERRED STOCK	0.00	0.00	0.00	0.00	0.00	0.00
LONG TERM DEBT	114.19	128.27	28.48	164.71	36.04	40.55
SHORT TERM DEBT	-102.88	1.41	105.90	-102.54	-8.38	59.03
TOTAL EXTERNAL	121.35	146.91	148.61	151.24	165.28	119.85
TOTAL SOURCES	272.08	307.10	315.45	343.80	400.04	361.27
USES						
GR PLANT ADDITIONS +AFDC	191.50	234.52	246.66	287.08	302.78	290.76
CWIP INCREMENT	17.56	8.23	15.11	-9.03	-2.04	-18.08
TOTAL CONST EXPENDITURES	209.06	242.75	261.77	278.04	300.74	272.68
PREFERRED DIVIDENDS	0.00	0.00	0.00	0.00	0.00	0.00
COMMON DIVIDENDS	57.12	66.56	65.29	67.09	79.74	85.84
DEBT RETIREMENT	0.00	0.00	0.00	0.00	0.00	0.00
PREF RETIREMENT	0.00	0.00	0.00	0.00	0.00	0.00
NET INCR WORKING CAPITAL	5.90	-2.21	-11.61	-1.34	19.56	2.75
TOTAL USES	272.08	307.10	315.45	343.80	400.04	361.27

EXHIBIT 13

MASTER DATA FILE

COMPANY ABC
FILE NO. 1
DATE 6/24/87

ABC TELEPHONE COMPANY
MASTER DATA FILE

MILLIONS OF CURRENT DOLLARS

DECEMBER 31,	1970	1971	1972	1973	1974	1975
FILE, SUFFIX, DATE, ETC.	MABC	1	62487	TELE	PHON	E CO
INBASE ACMETH DCMETH BSYR	ROE	NORM	DPR	1969.	1	LAEC
GNP DEFLATOR	1.00	1.00	1.00	1.00	1.00	1.00
GROSS PLANT IN SERVICE	1606.28	1777.23	1951.62	2148.83	2341.53	2518.47
CONST WORK IN PROGRESS	72.32	80.55	95.66	86.63	84.59	66.51
ACCUM DEPRECIATION	413.59	439.58	465.92	484.42	492.92	507.38
DEPREC THIS PER (ACCEL)	95.86	115.41	134.20	155.23	175.05	191.33
NET WORKING CAPITAL CUM	-28.47	-30.68	-42.29	-43.62	-24.05	-21.31
CUM COMMON STK ISSUED	720.04	737.28	751.51	840.58	978.20	998.47
COM STK ISSUED THIS PER	110.04	17.23	14.24	89.07	137.62	20.27
CUM RET EARNINGS GENER	143.57	134.09	113.61	101.45	102.84	80.72
RET EARNINGS GEN THIS PER	4.80	-9.48	-20.49	-12.16	1.39	-22.11
CUM PREF STK ISSUED	0.00	0.00	0.00	0.00	0.00	0.00
PREF STK ISSUED THIS PER	0.00	0.00	0.00	0.00	0.00	0.00
CUM LONG TERM DEBT	339.69	467.96	496.44	661.15	697.19	737.74
LNG TRM DBT ISS THIS PER	114.19	128.27	28.48	164.71	36.04	40.55
LNG TRM DBT REF THIS PER	0.00	0.00	0.00	0.00	0.00	0.00
CUM SHORT TERM DEBT	11.25	12.66	118.55	16.02	7.63	66.66
SHT TRM DBT ISS THIS PER	-102.88	1.41	105.90	-102.54	-8.38	59.03
CUM INC TAX DEFERRALS	6.98	19.39	36.48	58.98	86.03	116.35
INC TAX DEF THIS PER	6.98	12.42	17.08	22.50	27.10	30.27
CUM AFDC CAPITALIZED	0.00	0.00	0.00	0.00	0.00	0.00
AFDC CAPITALIZED THIS PER	0.00	0.00	0.00	0.00	0.00	0.00
OPERATING REVENUES	561.08	605.37	634.27	710.06	820.16	857.68
OPERATION EXPENSE	175.97	194.03	211.22	230.66	253.06	291.20
MAINTENANCE EXPENSE	124.01	141.11	156.46	170.94	191.08	208.31
DEPREC EXPENSE (STR LIN)	81.32	89.55	98.61	108.36	118.59	128.27
STATE INCOME TAXES	0.00	0.00	0.00	0.00	0.00	0.00
FEDERAL INCOME TAXES	47.04	36.96	15.10	18.37	35.36	2.95
OPERATING-REVENUE TAXES	13.75	17.01	18.39	18.96	22.06	25.04

EXHIBIT 13--(continued)

MASTER DATA FILE

OTHER INCOME	4.36	6.24	6.24	7.38	7.15	6.14
ALLOW FUNDS DURING CONST	0.00	0.00	0.00	0.00	0.00	0.00
INT EXP LONG TERM DEBT	14.46	21.47	25.64	31.47	37.70	40.41
INT RATE LTD AVERAGE	5.35	5.83	5.74	5.79	5.86	5.92
INT RATE LTD END OF PER	5.37	5.73	5.75	5.82	5.89	5.96
DIVIDEND EXP PREF STOCK	0.00	0.00	0.00	0.00	0.00	0.00
INT RATE PREF STK AVERAGE	0.00	0.00	0.00	0.00	0.00	0.00
INT RATE PREF STK END PER	0.00	0.00	0.00	0.00	0.00	0.00
INT EXP SHORT TERM DEBT	4.49	0.57	3.79	6.52	1.19	2.25
FRACTION ITC NOT IN RATE BASE	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
COMMON DIVIDENDS	57.12	66.56	65.29	67.09	79.74	85.84
RETIREMENTS	49.06	63.56	72.27	89.86	110.08	113.82
FRACTION CWIP IN RATE BASE	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
FR DEFERRAL NOT IN RATE BASE	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NET INCOME	61.92	57.08	44.80	54.94	81.12	63.73
INVESTMENT TAX CREDIT	1.87	2.27	7.81	8.36	10.27	22.51
INVEST TAX CREDIT AMORT	1.36	1.13	1.47	1.61	2.32	3.35
CAPITAL EXPENDITURE PLANT	191.50	234.52	246.66	267.08	302.78	290.76
SINKG FUND PAY THIS PER	0.00	0.00	0.00	0.00	0.00	0.00
CONSTRUCT EXPEND PLANT	209.06	242.75	261.77	278.04	300.74	272.68
NET WORK CAPITAL THIS PER	5.90	-2.21	-11.61	-1.34	19.56	2.75
DEPRECIATION AFDC - CUM	0.00	0.00	0.00	0.00	0.00	0.00
INVEST TAX CREDIT CUMUL	15.00	16.14	22.49	29.24	37.19	56.35
INVEST TAX CREDIT DEFERRED	0.51	1.14	6.34	6.76	7.95	19.16
AFDC - CUM IN CWIP	0.00	0.00	0.00	0.00	0.00	0.00
DEPREC AFDC - THIS PER	0.00	0.00	0.00	0.00	0.00	0.00
RATE BASE	1137.60	1265.17	1411.68	1575.06	1756.51	1929.35
NET WKG CAP IN RATE BASE	0.00	0.00	0.00	0.00	0.00	0.00
PROPERTY TAXES	35.00	40.26	43.07	47.98	52.09	52.24
MAXIMUM SHORT-TERM DEBT	112.50	126.56	142.38	160.18	180.20	202.73
BOOK VALUE PER SHARE	0.00	0.00	0.00	0.00	0.00	0.00
NUMBER OF COMMON SHARES	6996485.	7136095.	7252697.	7999385.	9167994.	9339921.
DIVIDEND PAYOUT RATIO	0.92	1.17	1.46	1.22	0.98	1.35
MARKET-TO-BOOK RATIO	1.00	1.00	1.00	1.00	1.00	1.00
CURRENT LIABILITIES N.E.C.	139.09	149.13	167.38	184.13	178.67	181.50
TAXABLE INCOME - FEDERAL	101.91	81.73	47.74	55.69	35.07	53.05
TAXABLE INCOME - STATE	0.00	0.00	0.00	0.00	0.00	0.00

EXHIBIT 14

PRODUCTIVITY ANALYSIS REPORT

ABC TELEPHONE COMPANY DATE: 62087

PRODUCTIVITY ANALYSIS

CURRENT DOLLARS

YEAR	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
DEFLATOR	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
INFLATOR	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
OUTPUT 1004	11607050.	12106653.	12740355.	13368713.	14069202.	14787262.	15639947.	16580654.	17689856.	19101008.	20670624.
NORMALIZED	1.0000	1.0430	1.0976	1.1518	1.2121	1.2740	1.3475	1.4285	1.5241	1.6456	1.7809
ACCOUNT 602	9809.43	10093.40	9947.91	9839.44	11383.37	13226.65	13826.09	14477.00	16517.89	20437.26	21054.94
PROJECTION	9809.43	10231.65	10767.21	11298.25	11890.25	12497.11	13217.73	14012.75	14950.17	16142.77	17469.29
OUTPUT CHANGE	0.00	422.22	528.32	490.62	515.56	580.98	762.69	831.60	968.47	1317.65	1679.40
INFLTN CHANGE	0.00	0.00	145.49	859.72	1535.25	532.76	-771.61	-644.94	-495.31	-1692.77	-4647.36
PRDTVY CHANGE	0.00	138.25	819.30	1458.81	506.88	-729.54	-608.36	-464.25	-1567.72	-4294.49	-3585.65
PCT CHG PRDVY	0.00	1.37	8.24	14.83	4.45	-5.52	-4.40	-3.21	-9.49	-21.01	-17.03

EXHIBIT 15

REGRESSION SUMMARY REPORT

ABC TELEPHONE COMPANY DATE: 62087

COEFFICIENTS OF REGRESSION, LINE-BY-LINE SUMMARY

CURRENT DOLLARS

ACCOUNT	1960	1961	1962	1963	1964	M/PT	EXOGEN	COEFFICIENT	SCALE	RSQUARED	STD DEV	STD ERR
602	9809.43	10093.40	9947.91	9839.44	11383.37	2 10		-7312.72	10**3	0.93199	972.00	1960.1
							<1004>	0.137237E-02	10**3			0.13107E-03
603	3829.76	4141.45	4319.72	4392.79	5225.82	2 10		-9235.79	10**3	0.98718	284.83	3395.9
							<1001>	-.724463E-02	10**3			0.65093E-02
							<1003>	48.0970	10**3			40.270
							<1004>	0.124532E-02	10**3			0.55828E-03
604	13408.89	14174.31	15335.80	16282.93	18279.76	2 10		-43512.9	10**3	0.96424	1257.3	4370.5
							<1003>	149.308	10**3			10.166
605	19131.61	19779.98	20620.59	21387.64	23603.60	2 10		-25597.5	10**3	0.97694	1077.1	2847.1
							<1001>	0.158897E-01	10**3			0.86322E-03
606	1117.79	1201.78	1208.99	1313.76	1432.25	2 10		-4392.88	10**3	0.86010	251.90	877.22
							<1003>	14.2828	10**3			2.0368
610	812.44	925.11	983.15	1055.04	1102.10	2 10		-160.393	10**3	0.98160	32.056	64.641
							<1004>	0.893026E-04	10**3			0.43227E-05
612	424.45	531.46	593.78	800.92	159.52	2 10		6197.65	10**3	0.81428	114.84	1197.4
							<1003>	-27.3435	10**3			6.3419
							<1004>	0.397590E-03	10**3			0.10577E-03
621	4450.69	4519.60	4442.97	4420.60	4618.52	2 10		5907.57	10**3	0.93350	213.31	2954.8
							<1002>	0.191593E-04	10**3			0.69202E-05
							<1003>	-10.4827	10**3			9.8670
622	1123.31	1284.22	1368.77	1522.34	1783.93	2 10		-1081.08	10**3	0.95333	82.994	219.37
							<1001>	0.850270E-03	10**3			0.66512E-04
624	22829.01	22242.57	22955.01	23311.80	24037.37	2 10		11444.4	10**3	0.90022	732.61	818.13
							<1002>	0.827229E-04	10**3			0.41546E-05
626	346.28	303.99	320.14	272.37	257.85	2 10		496.000	10**3	0.19952	44.854	156.20
							<1003>	-.511766	10**3			0.36268
627	1023.06	822.30	782.11	856.32	1009.07	2 10		142.579	10**3	0.85302	125.00	1731.5
							<1002>	0.421572E-05	10**3			0.40552E-05
							<1003>	0.437562	10**3			5.7820
629	682.78	666.44	653.96	652.93	765.57	2 10		-387.598	10**3	0.70761	75.877	264.23
							<1003>	2.69934	10**3			0.61353
630	245.77	222.64	200.74	191.71	200.56	2 10		28.5302	10**3	0.36001	26.538	92.416
							<1003>	0.463076	10**3			0.21458
631	391.19	441.42	442.43	488.49	628.87	2 10		-2615.59	10**3	0.97645	53.274	185.52
							<1003>	7.84471	10**3			0.43077
632	214.46	221.58	67.91	58.89	59.25	2 10		395.371	10**3	0.43124	54.442	125.00
							<1005>	-.696102E-02	10**3			0.28269E-02
633	27454.00	24632.00	14171.00	13639.00	13565.00	2 10		179283.	10**0	0.52682	6799.6	94186.
							<1002>	0.480086E-03	10**0			0.22059E-03
							<1003>	-578.304	10**0			314.52
634	401.85	398.02	409.62	460.50	456.21	2 10		-805.121	10**3	0.67182	61.114	846.54
							<1002>	-.443789E-05	10**3			0.19026E-05
							<1003>	4.72273	10**3			2.0269
640	3569.28	4126.80	4404.45	4445.95	4700.49	2 10		5587.61	10**3	0.95549	226.65	3180.8
							<1001>	0.516333E-02	10**3			0.35561E-02
							<1002>	0.942528E-05	10**3			0.10614E-04
							<1003>	-45.2150	10**3			27.144
642	1846.48	1837.54	1882.84	1957.06	2063.89	2 10		-1081.09	10**3	0.84512	190.77	504.25
							<1001>	0.101007E-02	10**3			0.15280E-03
643	3663.14	3550.26	3952.63	3802.24	3452.79	2 10		3786.98	10**3	0.00761	311.20	822.58
							<1001>	-.599416E-04	10**3			0.24940E-03
644	273.86	281.37	295.03	312.04	323.75	2 10		-109.948	10**3	0.97560	9.6547	25.519
							<1001>	0.138385E-03	10**3			0.77373E-05
645	7738.94	7931.27	7871.55	8581.50	9138.84	2 10		-7634.69	10**3	0.96980	421.48	1114.1
							<1001>	0.541407E-02	10**3			0.33770E-03
648	1801.63	1855.95	1879.91	2001.38	2122.87	2 10		66.3970	10**3	0.89135	116.71	268.15
							<1005>	0.498969E-01	10**3			0.60603E-02
649	9069.36	9133.46	9637.87	10361.95	10353.98	2 10		-1164.17	10**3	0.98491	202.99	536.54
							<1001>	0.371662E-02	10**3			0.16267E-03
650	7613.00	10133.00	12178.00	10085.00	4512.00	2 10		-8796.80	10**0	0.24150	4587.6	12126.
							<1001>	0.586747E-02	10**0			0.36765E-02
666	15446.43	15865.40	16813.31	17963.28	15205.13	2 10		20010.6	10**3	0.98672	635.07	8935.0
							<1001>	0.462866E-02	10**3			0.99643E-02
							<1002>	0.963736E-04	10**3			0.29739E-04
							<1003>	-76.7840	10**3			76.056
680	13523.38	14419.69	14742.22	15292.58	18883.89	2 10		-16603.4	10**3	0.99062	734.30	10331.
							<1001>	-.162805E-01	10**3			0.91521E-01
							<1002>	0.105082E-03	10**3			0.34386E-04
							<1003>	164.400	10**3			87.941

EXHIBIT 16

THE SUPPLEMENTARY VARIABLES REPORT

COMPANY ABC
FILE NO. 1
DATE 6/24/87

ABC TELEPHONE COMPANY
SUPPLEMENTARY FINANCIAL VARIABLES

DECEMBER 31,	1970	1971	1972	1973	1974	1975
RETURN ON RATEBASE (PCT)	6.73	5.76	4.82	5.43	6.43	5.19
RETURN ON COMMON EQUITY (PCT)	7.68	6.58	5.16	6.08	8.02	5.90
EARNINGS PER SHARE COMMON	0.00	0.00	0.00	0.00	0.00	0.00
COMMON DIVIDENDS PER SHARE	0.00	0.00	0.00	0.00	0.00	0.00
COMMON DIV PAYOUT RATIO (PCT)	92.25	116.60	145.73	122.13	98.29	134.70
DIVIDEND YIELD (PCT)	7.07	7.71	7.61	7.47	7.88	8.03
NUMBER OF COMMON SHARES	6996485.	7136095.	7252697.	7999385.	9167994.	9339921.
BOOK VALUE PER SHARE COMMON	0.00	0.00	0.00	0.00	0.00	0.00
MARKET PRICE PER SHARE	0.00	0.00	0.00	0.00	0.00	0.00
MARKET-TO-BOOK RATIO	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
INTEREST COVERAGE RATIO						
INCLUDING AFDC	6.92	5.60	3.62	3.51	4.71	3.58
EXCLUDING AFDC	6.92	5.60	3.62	3.51	4.71	3.58
INCLUDING AFDC W/LIMIT	6.92	5.60	3.62	3.51	4.71	3.58
INT+PREF DIV COVER(EXCL AFDC)	6.92	5.60	3.62	3.51	4.71	3.58
CASH FLOW DIVIDEND COVERAGE	2.64	2.41	2.56	2.87	2.94	2.81
CAPITALIZATION RATIOS						
LONG-TERM DEBT/CAPITAL	0.2823	0.3494	0.3646	0.4124	0.3921	0.4060
COMMON EQUITY/CAPITAL	0.7177	0.6506	0.6354	0.5876	0.6079	0.5940
PREFERRED STOCK/CAPITAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
AFDC FRAC EARN AVAIL COMMON	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
INTERN FUNDS/TOTAL FINANCING	0.0804	0.0714	0.0692	0.0764	0.0843	0.0794
INTERN FUNDS/CONSTR EXP(3YR)	0.4047	0.4097	0.4545	0.5121	0.6255	0.7858
CONSTRUCT EXP(3YR)/GPV(1YR)	0.4875	0.4872	0.4730	0.4363	0.3841	0.3361

APPENDIX A

The following pages (exhibits A-1 through A-10) contain examples of RAMTEL input files. In preparing input files, care should be taken to conform to the formatting rules already explained in chapter 2, using exhibits A-1 through A-10 as guides.

EXHIBIT A-1

HISTORY FILE (partially completed)

```
HISABC
C
C             OHIO BELL
C             HISTORY FILE
C             O & M EXPENSES
C             196Ø - 1981
C
C
C      HEADER ROW
C      ROW NO, BASE YEAR, NO OF HIST YRS, SCALE, UNUSED ZEROES
C
        1; 1969 1Ø 1 42*Ø
C
C      REPAIRS OF OUTSIDE PLANT
C
        2; 6Ø2 1 Ø 1 Ø 98Ø9432 1ØØ934Ø5 9947912 9839439 >
       11383371 13226653 138260Ø91 144770ØØ3 16517891 2Ø437273 >
       24436139 2726ØØ46 3Ø981282 341Ø6378 36527827 36695669 >
       38Ø56564 4162Ø715 43ØØ7249 51212286 55748498 6Ø173411 >
       18*Ø
C
C      TEST DESK WORK
C
        3; 6Ø3 1 Ø 1 Ø 3829762 4141457 4319719 4392796 5225821 >
       5931659 6792591 7754345 8521126 9712351 1Ø867876 12774581 >
       14491711 17514799 2Ø437444 235Ø5153 26452477 3Ø245531 3Ø89Ø326 >
       39ØØ8Ø77 445Ø1475 49966756 18*Ø
C
C      REPAIRS OF CENTRAL OFFICE EQUIPMENT
C
        4; 6Ø4 1 Ø 1 Ø 134Ø8891 14174311 15335798 16282932 >
       1827976Ø 2Ø384737 22715759 243897Ø5 28130471 3215Ø522 >
       3749Ø35Ø 435Ø1587 46569155 48847148 55261753 59827225 >
       62533692 77Ø211ØØ 8149Ø213 88769879 91151684 1Ø5629689 >
       18*Ø
C
C      REPAIRS OF STATION EQUIPMENT
C
        5; 6Ø5 1 Ø 1 Ø 19131628 19779998 2Ø62Ø6Ø9 21387663 >
       236Ø36Ø2 26884118 2924Ø258 31Ø98988 3373254Ø 38862Ø61 >
       45391468 5Ø58Ø16Ø 56658Ø55 61Ø8Ø143 66687588 74391717 >
       81375581 9286199Ø 1Ø2734222 1Ø7ØØ2385 113Ø166Ø3 147223456 >
       18*Ø
C
C      REPAIRS OF BUILDINGS AND GROUNDS
C
        6; 6Ø6 1 Ø 1 Ø 1117791 12Ø178Ø 12Ø8987 1313762 1432251 >
       183163Ø 1811217 1862742 2441198 31Ø8824 344128Ø 3873167 >
       4439254 4542948 561Ø918 54Ø2Ø51 4667171 6838658 78Ø6685 >
       7936372 8533533 991770Ø1 18*Ø
C
C      MAINTAINING TRANSMISSION POWER
C
        7; 61Ø 1 Ø 1 Ø 812443 925114 983149 1Ø55Ø39 11Ø2Ø98 >
       1196947 1257724 132960ØØ 1419Ø76 15Ø4Ø53 2Ø42653 2427137 >
       2525849 2765174 3512252 4266457 43Ø7695 5Ø6Ø117 5749794 >
       6322465 682875Ø 78164Ø8 18*Ø
C
C      OTHER MAINTENANCE EXPENSES
C
        8; 612 1 Ø 1 Ø 424454-531465 59378Ø 8ØØ916 159525 118ØØ9 >
       11Ø61Ø 2Ø697Ø 197Ø44 277875 343143 695128 796Ø19 2Ø83717 >
       3Ø46361 422314Ø 5289632 4Ø91564 48344Ø6 5436566 4645662 >
       499758Ø 18*Ø
```

EXHIBIT A-2

REGRESSION METHODS FILE

```
 DSN=TS4754.REGABC.FINAL.DATA,VOL=IRCC71
REGABC
C
C             OHIO BELL
C             REGRESSION METHODS FILE
C
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   2; 6Ø3 2 1ØØ1 1ØØ3 1ØØ4 2*Ø 6*Ø
   3; 6Ø4 2 1ØØ3 4*Ø 6*Ø
   4; 6Ø5 2 1ØØ1 4*Ø 6*Ø
   5; 6Ø6 2 1ØØ3 4*Ø 6*Ø
   6; 61Ø 2 1ØØ4 4*Ø 6*Ø
   7; 612 2 1ØØ3 1ØØ4 3*Ø 6*Ø
   8; 621 2 1ØØ2 1ØØ3 3*Ø 6*Ø
   9; 622 2 1ØØ1 4*Ø 6*Ø
  1Ø; 624 2 1ØØ2 4*Ø 6*Ø
  11; 626 2 1ØØ3 4*Ø 6*Ø
  12; 627 2 1ØØ2 1ØØ3 3*Ø 6*Ø
  13; 629 2 1ØØ3 4*Ø 6*Ø
  14; 63Ø 2 1ØØ3 4*Ø 6*Ø
  15; 631 2 1ØØ3 4*Ø 6*Ø
  16; 632 2 1ØØ5 4*Ø 6*Ø
  17; 633 2 1ØØ2 1ØØ3 3*Ø 6*Ø
  18; 634 2 1ØØ2 1ØØ3 3*Ø 6*Ø
  19; 64Ø 2 1ØØ1 1ØØ2 1ØØ3 2*Ø 6*Ø
  2Ø; 642 2 1ØØ1 4*Ø 6*Ø
  21; 643 2 1ØØ1 4*Ø 6*Ø
  22; 644 2 1ØØ1 4*Ø 6*Ø
  23; 645 2 1ØØ1 4*Ø 6*Ø
  24; 648 2 1ØØ5 4*Ø 6*Ø
  25; 649 2 1ØØ1 4*Ø 6*Ø
  26; 65Ø 2 1ØØ1 4*Ø 6*Ø
  27; 666 2 1ØØ1 1ØØ2 1ØØ3 2*Ø 6*Ø
  28; 68Ø 2 1ØØ1 1ØØ2 1ØØ3 2*Ø 6*Ø
END OF FILE
```

EXHIBIT A-3

ADJUSTMENT FILE

```
ADJABC.DATA
C
C              OHIO BELL
C              ADJUSTMENT FILE
C              196Ø-1981
C
C
     1; 4Ø*1.Ø
C
END OF FILE
```

EXHIBIT A-4

EXOGENOUS VARIABLES FILE

```
DSN=TS4754.EXOABC.FINAL.DATA,VOL=IRCC71

EXOABC
C              EXOGENEOUS VARIABLES FILE
C
C              OHIO BELL TELEPHONE COMPANY
C
C              1960-1981
C
C
C    TOTAL NO OF TELEPHONES IN SERVICE
C
     1; 1001 2730536 2811459 2915558 3020001 3156202 >
     3315378 3476401 3616836 3771151 3932128 4049738 >
     4159347 4334136 4474041 4574113 4670947 4724054 >
     4819888 4939036 5058607 5116227 5046749 18*0
C
C    TOTAL NO OF TOLL CALLS
C
     2; 1002 122302944 127209587 139355338 151874219 >
     164393981 186063547 216039393 227267663 258746855 >
     295351459 296403641 304797497 302828354 306425347 299571873 >
     555046232 620941919 687571686 785450557 857635688 >
     899977293 908644884 18*0
C
C    TOTAL NO OF CENTRAL OFFICES
C
     3; 1003 378 382 390 399 420 436 451 465 477 491 460 >
     513 520 529 538 544 553 556 568 584 596 602 18*0
C
C    TOTAL MILES OF WIRE IN CABLE (OUTSIDE PLANT)
C
     4; 1004 11607050 12106653 12740355 13368713 14069202 >
     14787262 15639947 16580654 17689869 19101014 20670632 >
     22115078 23554844 25390155 26933336 27696292 28454266 >
     29824249 30915305 31910064 32687486 33451823 18*0
C
C    NO OF COIN-OPERATED PUBLIC TELEPHONES
C
     5; 1005 36159 36557 38849 40965 38401 44748 52610 >
     48386 50128 51465 52877 53684 53465 47384 45072 45382 >
     45152 45678 47564 49931 53970 56558 18*0
END OF FILE
```

EXHIBIT A-5

INITIALIZATION FILE

```
INIABC.DATA
C
C                    OHIO BELL
C                    INITIALIZATION FILE
C                    BASE YEAR: 1969
C
C       OTHER INCOME
C
        1: 2.908504 4.359893 6.235224 6.241716 7.382034 >
        7.147278 6.142611 4.632229 6.037823 6.973918    >
        2.285197 3.013463 3.901056 16*0
C
C       CURRENT ASSETS
C
        2: 98.681001
C
C       COMMON STOCK AND OTHER PAID IN CAPITAL
C
        3: 610.0
C
C       RETAINED EARNINGS
C
        4: 138.771199
C
C       PREFERRED STOCK
C
        5: 0.0
C
C       LONG TERM DEBT
C
        6: 225.59
C
C       SHORT TERM DEBT
C
        7: 114.1340
C
C       CUMULATIVE DEFERRED INCOME TAXES
C
        8: 0
C
C       OPERATING REVENUES
C
        9: 500.744118
C
C       DIVIDEND EXPENSE
C
        10: 53.3750
C
C       CUMULATIVE DEFERRED INVESTMENT TAX CREDIT
C
        11: 14.492410
C
C       CURRENT LIABILITIES
C
        12: 133.0503200
C
C       NO OF COMMON SHARES
C
        13: 61000000
END OF FILE
```

EXHIBIT A-6

BUDGET FILE

```
BUDABC
C
C                       OHIO BELL
C                       BUDGET FILE
C                       PLANT ACCOUNTS
C                       1969 - 1981
C
C       CWIP (INITIAL)
C
        131; 54.7564 28*Ø
C
C       AFDC (INITIAL)
C
        133; Ø 28*Ø
C
C**************** NEW PLANT ****************
C
C       ACCOUNT NO,BOOK LIFE,TAX LIFE
C
        1; 2ØØ 19.Ø 19.Ø 26*Ø
C
C       CAPITAL EXPENDITURES
C
        2; Ø.Ø 191.5Ø222Ø 234.51647Ø 246.656Ø2Ø >
        287.Ø7626Ø 3Ø2.77564Ø 29Ø.76177Ø 266.294Ø6Ø >  >
        311.58361Ø 4Ø6.45794Ø 4Ø9.68819Ø 424.22797Ø >  >
        411.Ø5692Ø 16*12.5P
C
C       CONSTRUCTION EXPENDITURES
C
        3; Ø.Ø 2Ø9.Ø633ØØ 242.75Ø67Ø  261.76754Ø >
        278.Ø4237 3ØØ.73762 272.677738 251.92261Ø 262.4616ØØ >
        39Ø.841Ø7Ø 4Ø8.191Ø9Ø 415.56637Ø 384.27935Ø 16*13.25P
C
C**************** EXISTING PLANT ****************
C
C       TAX LIFE (GPV WEIGHTED), TAX DEPR RATE,
C       TAX DEPR, TAX NPV
C
        134; 19.Ø Ø Ø Ø 25*Ø
C
C       ACCOUNT NO,GPV,BOOK NPV,BOOK DEPR RATE,
C       GR AFDC, NET AFDC
C
        71; 3ØØ 1463.839966 1Ø82.51ØØØØ Ø.Ø53 >
        Ø Ø 23*Ø
C
C       RETIREMENTS
C
        72; 1 49.Ø6Ø929 63.562253 72.267267 >
        89.86469Ø 11Ø.Ø83ØØØ 113.8159ØØ 115.58987Ø 118.39865Ø >
        14Ø.8Ø728Ø 146.28424Ø 18Ø.9Ø755Ø 132.388368 6*21.8Ø 1Ø*Ø
END OF FILE
```

EXHIBIT A-7

PARAMETERS FILE (partially completed)

```
PARABC.DATA
C
C            OHIO BELL
C            PARAMETERS FILE
C            1969-1981
C
C       FRACTION OF PLANT ELIGIBLE FOR
C       INVESTMENT TAX CREDIT
C
        1: 29*Ø.8
C
C       INVESTMENT TAX CREDIT RATE
C
        2: Ø.Ø261 Ø.Ø112 Ø.Ø117 Ø.Ø373 Ø.Ø376 Ø.Ø427 >
        Ø.1Ø32 Ø.1184 Ø.1162 Ø.Ø976 Ø.Ø994 Ø.Ø972 >
        Ø.Ø174 16*Ø.1Ø
C
C       ST LINE DEPR LIFE OF INV TAX CREDIT
C
        3: 16.8 12.Ø 15.3 16.3 19.2 17.Ø 17.8 2Ø.3 15.4 15.2 14.9 >
        13.4 11.1 16*13.Ø
C
C       FEDERAL INCOME TAX RATE
C
        4: 9*Ø.48 2Ø*Ø.46
C
C       STATE AND LOCAL INCOME TAX RATE
C
        5: 29*Ø
C
C       FRACTION OF OPERATING REVENUES ATTRIBUTED TO
C       CURRENT ASSETS
C
        6: Ø.Ø985 Ø.Ø785 Ø.Ø747 Ø.Ø755 Ø.Ø765 Ø.Ø733 Ø.Ø7Ø3 Ø.Ø76Ø >
        Ø.Ø712 Ø.Ø723 Ø.Ø717 Ø.Ø753 Ø.Ø755 16*Ø.Ø75
C
C       MAX ALLOWABLE SHORT TERM DEBT
C
        7: 1ØØ 28*12.5P
C
C       MIN SHORT TERM DEBT
C
        8: 1Ø.Ø 28*12.5P
C
C       DIVIDEND PAYOUT RATIO
C
        9: 1.Ø486 Ø.9225 1.166Ø 1.4573 1.2213 Ø.9829 1.347Ø >
        Ø.8256 Ø.6221 Ø.6579 Ø.7211 Ø.8771 Ø.7835 16*Ø.8
C
C       RATIO OF COMMON EQUITY TO TOTAL CAPITALIZATION
C
        1Ø: Ø.7685 Ø.7177 Ø.65Ø6 Ø.627Ø Ø.5876 Ø.6115 Ø.6Ø47 >
        Ø.6489 Ø.6678 Ø.6392 Ø.6368 Ø.6241 Ø.6381 16*Ø.63
C
C       RATIO OF TOTAL EQUITY TO TOTAL CAPITALIZATION
C
        11: Ø.7685 Ø.7177 Ø.65Ø6 Ø.627Ø Ø.5876 Ø.6115 Ø.6Ø47 >
        Ø.6489 Ø.6678 Ø.6392 Ø.6368 Ø.6241 Ø.6381 16*Ø.63
C
C       PREFERRED STOCK INTEREST RATE
C
        12: 29*Ø.Ø
C
C       RETURN ON AVERAGE COMMON EQUITY
C
        13: Ø.Ø68Ø Ø.Ø763 Ø.Ø658 Ø.Ø516 Ø.Ø6Ø8 Ø.Ø8Ø2 Ø.Ø59Ø >
```

EXHIBIT A-8

DEBT FILE

```
1.      DABC 1
2.      1  1 FORTY YR DEBENTURES    2  1 1966 2ØØ6 6ØØØØ.Ø 6ØØØØ.Ø     Ø.Ø  5.ØØØ
3.      1  2 FORTY YR DEBENTURES    3  1 1967 2ØØ7 75ØØØ.Ø 75ØØØ.Ø     Ø.Ø  5.375
4.      1  3 FORTY YR DEBENTURES    7  1 1968 2ØØ8 55ØØØ.Ø 55ØØØ.Ø     Ø.Ø  6.75Ø
5.      Ø
```

EXHIBIT A-9

ACCOUNT NAMES FILE

```
 29                                                                  ØØØØØØ1Ø
6Ø2  2 REPAIRS OF OUTSIDE PLANT                                      ØØØØØØ2Ø
6Ø3  2 TEST DESK WORK                                                ØØØØØØ3Ø
6Ø4  2 REPAIRS OF CENTRAL OFFICE EQUIPMENT                           ØØØØØØ4Ø
6Ø5  2 REPAIRS OF STATION EQUIPMENT                                  ØØØØØØ5Ø
6Ø6  2 REPAIRS OF BUILDINGS AND GROUND                               ØØØØØØ6Ø
61Ø  2 MAINTAINING TRANSMISSION POWER                                ØØØØØØ7Ø
612  2 OTHER MAINTENANCE EXPENSES                                    ØØØØØØ8Ø
621  1 GENERAL TRAFFIC SUPERVISION                                   ØØØØØØ9Ø
622  1 SERVICE INSPECTION AND CUSTOMER INSTRUCTION                   ØØØØØ1ØØ
624  1 OPERATORS' WAGES                                              ØØØØØ11Ø
626  1 REST AND LUNCHROOMS                                           ØØØØØ12Ø
627  1 OPERATORS' EMPLOYMENT AND TRAINING                            ØØØØØ13Ø
629  1 CENTRAL OFFICE STATIONERY PRINTING                            ØØØØØ14Ø
63Ø  1 CENTRAL OFFICE HOUSE SERVICE                                  ØØØØØ15Ø
631  1 MISCELLANEOUS CENTRAL OFFICE EXPENSES                         ØØØØØ16Ø
632  1 PUBLIC TELEPHONE EXPENSES                                     ØØØØØ17Ø
633  1 OTHER TRAFFIC EXPENSES                                        ØØØØØ18Ø
634  1 JOINT TRAFFIC EXPENSES (NET OF DR. AND CR.)                   ØØØØØ19Ø
64Ø  1 GENERAL COMMERCIAL ADMINISTRATION                             ØØØØØ2ØØ
642  1 ADVERTISING                                                   ØØØØØ21Ø
643  1 SALES EXPENSE                                                 ØØØØØ22Ø
644  1 CONNECTING COMPANY RELATIONS                                   ØØØØØ23Ø
645  1 LOCAL COMMERCIAL OPERATIONS                                   ØØØØØ24Ø
648  1 PUBLIC TELEPHONE COMMISSIONS                                  ØØØØØ25Ø
649  1 DIRECTORY EXPENSES                                            ØØØØØ26Ø
65Ø  1 OTHER COMMERCIAL EXPENSES                                     ØØØØØ27Ø
666  1 OFFICE SALARIES AND EXPENSES                                  ØØØØØ28Ø
68Ø  1 OTHER OPERATING EXPENSES                                      ØØØØØ29Ø
```

EXHIBIT A-10

DEPRECIATION FILE

```
2ØØ DATA
197Ø 1998 4
1Ø.5   9.4   8.9   8.4   7.8   7.3   6.8   6.3
 5.7   5.2   4.7   4.2   3.7   3.2   2.6   2.1
 1.6   1.Ø   Ø.5
3ØØ  1
  1ØØ.Ø        18.Ø  1
```

APPENDIX B

The AFDC Factors (Parameter File, Rows 20-29) are used to determine the amount of AFDC ultimately associated with a completed capital construction project. When a capital project is transferred to an "in-service account from the CWIP account, the total amount of AFDC charged to that project during its construction is included in the amount transferred. Since the AFDC portion of plant-in-service cannot be depreciated for tax purposes, it must be accounted for separately. The AFDC Factor enables RAm to compute and properly account for the AFDC portion of plant-in-service.

The Parameter File has room for up to ten AFDC Factors, one for each capital account in the Budget File. All new plant additions must be divided among one to ten accounts in the Budget File, and each Budget File capital account must have a corresponding AFDC Factor.

In determining an AFDC Factor, a number of assumptions must be made:

- All projects in a particular capital account take the same amount of time to complete;
- All projects in a particular capital account have the same relative pattern of expenditures, regardless of the size and cost of the project; and
- All projects take an integer number of years to complete.

Using these assumptions, the AFDC Factor is calculated by summing the ratio of average CWIP to total project cost over the life of a project.

Example

Assume a telephone plant takes seven years to complete (not a very likely event for most telephone plants) and the annual expenditures excluding AFDC as a percent of total cost are made as follows:

Year	1	2	3	4	5	6	7
Percent of Total Cost Spent During Year	3%	7%	10%	15%	25%	25%	15%

The CWIP balance (as a percent of total cost, excluding AFDC) at the end of each year and the average for each year is as follows:

Year	1	2	3	4	5	6	7
End of year CWIP Balance (percent)	3	10	20	35	60	85	0
Average CWIP Balance (percent)	1.5	6.5	15	27.5	47.5	72.5	42.5

The AFDC Factor is the sum of the average CWIP balance, divided by 100:

$$\frac{1.5 + 6.5 + 15 + 27.5 + 47.5 + 72.5 + 42.5}{100} = 2.13$$

The AFDC Factor is 2.13. Note that the AFDC Factor is independent of the AFDC rate. The amount of AFDC calculated by the model to be transferred from CWIP into plant-in-service is equal to the AFDC Factor (2.13 in this case) times the AFDC rate times the completed value of the project excluding AFDC.

PART III

ELECTRONIC DATA PROCESSING DESIGN

CHAPTER 1

INTRODUCTION

The EDP design of RAMTEL is described in this portion of the report. The functions and operating instructions are described in Parts I and II.

Exhibit 1 provides an overview of the EDP design described in this section of the report. This chart closely resembles charts of the model logic presented in Parts I and II. Each of the files and programs will be described in detail in the following chapters.

All programs are written in American National Standard (ANS) FORTRAN for a time-sharing environment.

This section of the report documents the current version of RAMTEL, modified and developed on the Ohio State University's IBM 3081-D computer, running in the foreground environment (time sharing options) under the IBM Operating System MVS/SP 1.3.4. This version differs significantly from the original and from extant conversions thereof, whose machine-dependent features made implementation troublesome at other installations. Specifically, their use of random-access I/O and unformatted worked files caused conversion problems, debugging difficulty, and high overhead during execution. In the current version, care has been taken to make each program module as straightforward and transportable as possible.

The EDP design of the RAMTEL system is described in the following chapters in the order of input files, processing and outputs.

Chapter 2 summarizes the content and specifies the structure of the input data files used by the different modules of the RAMTEL system. Seven of these files are alphanumeric and allow the use of headings and explanatory comments. These files are easy to create and edit by design. Each of these files is used at the beginning of the RAMTEL system as primary input and is converted into a numerica form by the Build Module (exhibit 1) to be processed by the other modules of RAMTEL. The three remaining files are numeric and are used directly by the intermediate modules of RAMTEL. Although these files are not as easy to manipulate as the seven alphanumeric files, they are relatively small in size and therefore do not require significant effort to either create or edit. The first part of chapter 2 specifies the structure of the seven alphanumeric files in terms of the number of records (rows) in each file, number and content fields (columns) in each record, and the formating requirements for each of the field entries. This is followed by similar specification of formats for the three numeric files.

Chapter 3 describes the processing of input files by each module of RAMTEL. The chapter has a section devoted to each module of RAMTEL. Each section describes the functions and features of the module in progressively increasing levels of detail. It starts out with a general statement about the function of the module and a flow-chart illustrating its overall structure. This is followed by a more detailed explanation of input file processing, computational steps and output generation in terms of individual subroutines. Program limitations are explained next. This is followed by a summary description of each subroutine which overlaps somewhat with preceding descriptions and explanations. Finally, a legend of the variables used in the main program and each subroutine of the module is provided. The information provided in each section of chapter 3 should enable an EDP professional to make desired modifications to any chosen module of RAMTEL.

Chapter 4 describes the generation of outputs by RAMTEL. It describes the Master File, which contains input or computed values of all important financial variables used by RAMTEL. The description is supported by a table specifying the source and content of each of the variables. Brief descriptions are provided for two intermediate files, namely the Plant Line Items file and the Coefficients File. Finally, a detailed description of the Report Module is provided. This description follows the same overall order and level of detail as that used for each module discussed in chapter 3.

CHAPTER 2

RAMTEL INPUT FILES

There are seven alphanumeric and three numeric input files shown in Exhibit 1. The program BUILD is used to convert the alphanumeric files to rigidly formatted numeric files which are then processed by the program modules of the RAMTEL system. The numeric input files are used directly by the RAMTEL program modules. The following parts of the chapter describe the formats of the input files. The description of the alphanumeric files precede that of the numeric files.

Using an analogy, the alphanumeric files may be viewed as source codes, BUILD as a compiler and the resulting numeric files (not to be confused with the three numeric files that are directly processed or generated) as object codes. From this analogy, it is clear that an alphanumeric file must be processed by BUILD each time a change (or changes) is made if those changes are to be processed by the RAMTEL system.

The structure of each alphanumeric (source) file is generally described below. (A description of the contents of each file can be found in Part II.) No field width is specified as the data are unformatted. Separation of fields is accomplished with a space or comma.

The general format of each row of each file is as shown below.

####	####;	###	###	###	
sequence number	row number	value	value	value	etc.

Every line in an alphanumeric (source) file must have a sequence number. Sequence numbers are positive increasing integers. Sequence number increments can be any positive number and need not be the same between all lines in a file. While the sequence number determines the order of lines in the alphanumeric file, the row number determines the order of rows in the intermediate numeric file. Data for one row may be contained on more than one line by placing the symbol > at the end of the line to be continued and omitting the row number on the continuation line, which must be the next line.

A number of special characters are used in creating the data files. Some are optional; others are required. Use of these special characters is explained below.

- ; A semicolon must appear after the row number (the first number after the sequence number) in every row in every file.

- C As the first non-blank character in a line, C denotes a comment line. Comment lines are not converted into the numeric files by the BUILD Module. They are merely for the convenience of the programmer. Any alphanumeric information can be placed on comment lines.

- > If the number of values required for a row will not fit on a single line, the row may be continued on the next line by placing a ">" at the end of each line to be continued and omitting the row number on the continuation line.

- * An asterisk denotes a replications factor. For example, 3*11 is equivalent to 11 11 11.

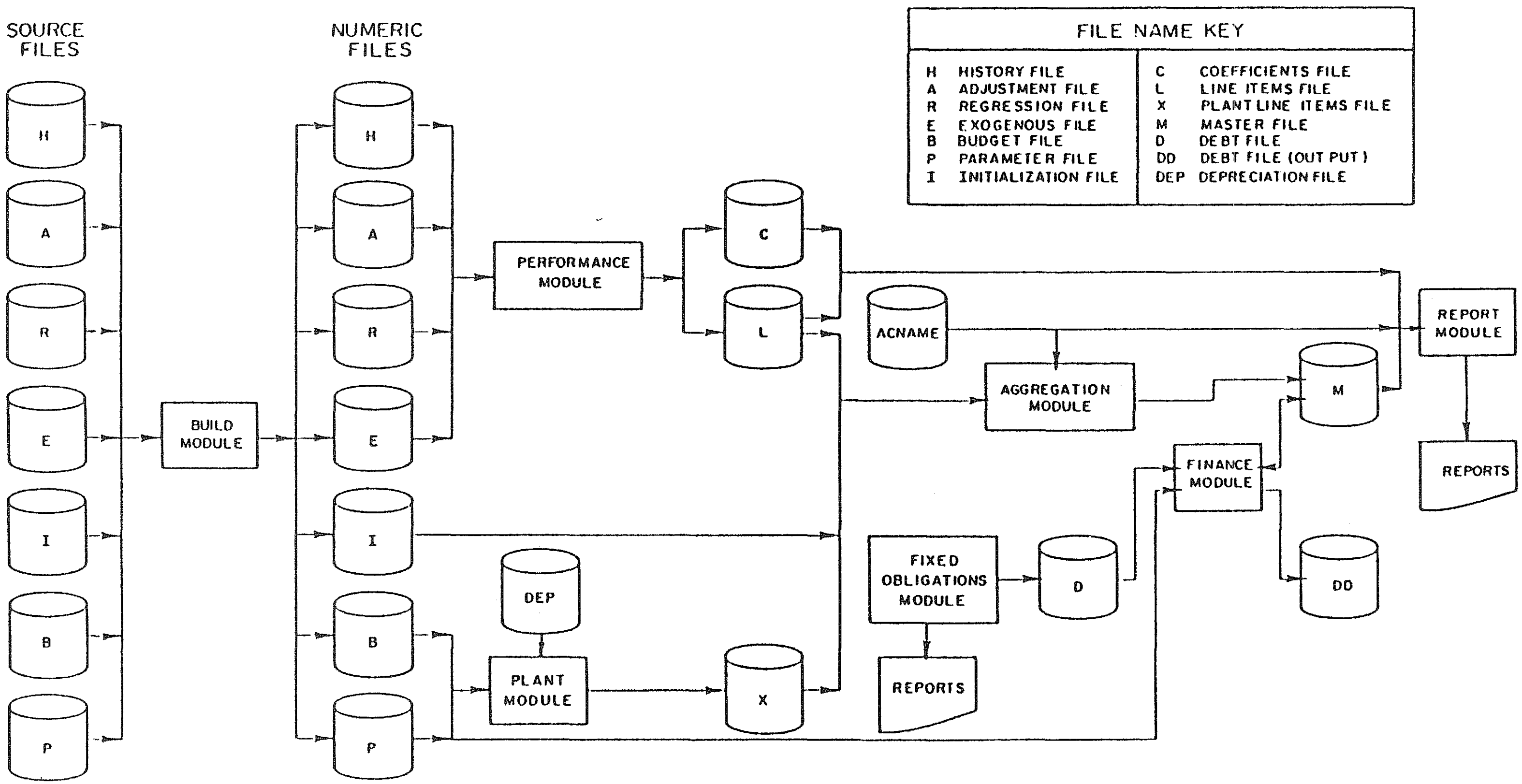
- P Signifies percentage increase over the previous data value. For example, 3 8P is equivalent to 3 3.24.

- I Signifies an additive increase over the previous data value. For example, 10 5I is equivalent to 10 15.

The replication factor (*) can also be used with the additive (I) or percentage (P) increase. For example, 1.0 3*10P is equivalent to 1.0 1.1 1.21 1.331.

EXHIBIT 1

RAMTEL SYSTEM FLOWCHART



History File

The History File contains up to 180 rows.

The first row contains three columns of data (shown above as "value"). The format for the first row is shown in the table below:

Items in Sequence	EDP Description
line sequence number	any integer
row number	1
value 1	4-digit integer
value 2	integer from 1 to 20
value 3	floating point field of any size

Each other row contains up to 45 columns of data (shown above as "value"). The actual number of columns is equal to 5 plus the number of years of input data (entered in row 1 of the History File). The format for each row is shown in the table below.

Items in Sequence	EDP Description
line sequence number	any integer
row number	integer from 2 to 180
value 1	###.##
value 2	integer less than 13
value 3	integer less than 13
value 4	integer less than 13
value 5	integer less than 13
value 6 - (less than 46)	floating point fields of any size

Regression Methods File

The Regression Methods File contains up to 120 rows. Each row contains 13 data values. The format for each row is shown in the table below.

Items in Sequence	EDP Description
line sequence number	any integer
row number	integer from 1 to 120
value 1	3 or 4 digit integer
value 2	one digit integer
value 3-13	floating point fields of any size

Adjustment File

The Adjustment File contains up to 12 rows. Each row has 40 columns of data. The format for each row is shown in the table that follows:

Items in Sequence	EDP Description
line sequence number	any integer
row number	integer from 1 to 12
value 1-40	floating point of any size

Exogenous Variables File

The Exogenous Variables File contains up to 30 rows. Each row contains 41 data values. The format for each row is shown in the table below.

Items in Sequence	EDP Description
line sequence number	any integer
row number	integer from 1 to 30
value 1	4 digit integer
value 2-41	floating point fields of any size

Initialization File

The Initialization File contains 13 rows. Each row contains 29 data values. The format for each row is shown in the table below.

Items in Sequence	EDP Description
line sequence number	any integer
row number	integer from 1 to 13
value 1 to 29	floating point fields of any size

Budget File

The Budget File contains 136 rows. Each row contains 29 columns. The format for each row is shown by the table below:

Items in Sequence	EDP Description
line sequence number	any integer
row number	integer from 1 to 136
value 1 to 29	floating point fields of any size

Parameter File

The Parameter File contains 54 rows. Each row contains 29 columns. The format for each row is shown by the table below.

Items in Sequence	EDP Description
line sequence number	any integer
row number	integer from 1 to 54
value 1 to 29	floating point fields of any size
(Some rows contain no data)	

Debt File

The Debt File is created/revised interactively by running the FIXOBS Module. As such, the user needs to follow the formats displayed by the computer while entering/revising data. After all the necessary data has been entered, they are stored in the Debt File. The Debt Fiel contains up to 218 rows of data (up to 109 rows each of long term debt and preferred stock). Each row has the following format.

Items in Sequence	EDP Description
issue type	single digit integer, 1 or 2
issue number	three digit integer ≤ 109
value 1	up to twenty characters
value 2	three digit integer
value 3	three digit integer
value 4	five digit integer
value 5	five digit integer
value 6	######.#
value 7	######.#
value 8	######.#
value 9	###.###

Account Names File

The Account Names File has up to 31 rows. The first row has a single entry with the format given below.

Items in Sequence	EDP Description
value	four digit integer, ≤ 0031

The remaining rows (2-31) have the following format:

Items in Sequence	EDP Description
value 1	four digit integer ≤ 1000
value 2	three digit integer, 001 or 002
value 3	sixty-eight characters

Depreciation File

This file contains data for tax depreciation calculations in the Plant Module. The data description and format is given in appendix D of Part I.

CHAPTER 3
PROCESSING

Processing of data by RAMTEL is accomplished via a command list (CLIST) and eight Fortran-compiled load modules. The CLIST used by RAMTEL is a partitioned dataset containing eight members, each corresponding to one of the Fortran modules. The purpose of the CLIST members is to prompt the use for input and output file information (such as three-character company codes and two-digit suffixes) and to allocate the appropriate files for use. Fortran programs are called to begin execution by the associated CLIST member. (Detailed information explaining the CLIST commands can be found in the IBM publications TSO Extensions Command Language Reference (SC28-1307-2), September 1986) and TSO/E Clists, Implementation and Reference (SC28-1304-2, September 1986.)

The following sections contain a general description of each module of RAMTEL followed by a list of variables used by the module in its subroutines.

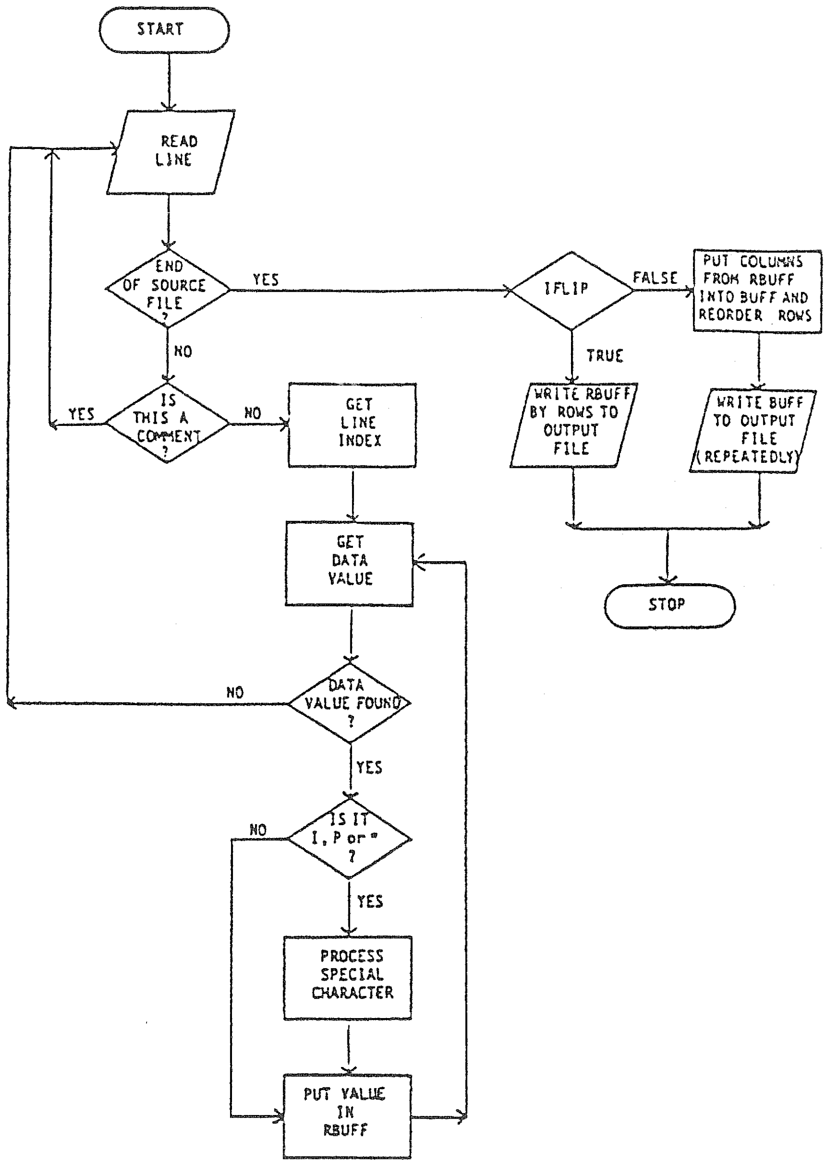
Build Module (BUILD)

General Description

BUILD, shown schematically in exhibit 2, transforms data from an alphanumeric (source) file, which may include comment lines and many user-oriented features, to an intermediate numeric file containing numeric data only. The following table lists the unit numbers and DCB parameters associated with each file either processed or generated by BUILD.

EXHIBIT 2

BUILD MODULE FLOWCHART



UNIT NUMBER	LRECL	BLKSIZE	USAGE
2	80	800	source files
11	255	3060	output file "A"
12	255	3060	output file "B"
13	255	3060	output file "E"
14	255	3060	output file "H"
15	195	1950	output file "I"
16	255	3060	output file "P"
17	195	1950	output file "R"

Physical Layout of Source Code

The module consists of a main program, BUILD, and five subroutines: GETFIUL, NEXTNB, GETNUM, ALPNUM, and ERROR.

Identifying the Files

Subroutine GETFIL is called to read the file type (ADJ, BUD, EXO, etc.) and the three-character company code from the first line of the source file. Once the file types has been identified, the program scans the array "FSIZES" for the maximum number of rows and years and the prefix of the numeric output file.

Reading the Source File

The alphanumeric (source) file is processed line-by-line. Each line is checked to see if it is a comment or a data line. Any line not found to be a comment is assumed to be a data line and examined number-by-number in subroutine GETNUM.

GETNUM is called to read the row identifier and other values from the line. If numbers involve I or P, they are interpreted as absolute or percent increases (respectively) from the last value. An expression such as "5*4" means 5 repetitions of the data value 4. Thus 5 is like the range of the DO variable INDEX.

The sign ">" signifies continuation of a row on the next line.

Each data value is put into the corresponding column of RBUFF as it is read.

Errors

An error subroutine prints the offending line and points to the cause of the error with an arrow. The error diagnostic is also written. Two errors, "TWO FEW VALUES" and "EXTRA VALUES DROPPED," are "not fatal"--the program can be completed even if they occur. Any other error is fatal, but processing is continued until the 16th fatal error occurs or until the alphanumeric file read is completed. The program is then aborted.

Writing Data to Numeric Output File

The rows OF RBUFF are rearranged, using the first column, the row number, as an index. One column at a time is written to the numeric output file.

Flip

Flip means interchanging the rows and columns of the output array. The flip is performed if variable FLIP (in subroutine GETFIL) is set equal to ".FALSE.".

Program Limitations

Since BUILD does not ask if the numeric file should be overwritten, it is possible to unintentionally destroy files by creating new files with the same name.

No more than 46 columns can be stored because of the dimension of RBUFF. This dimension must be increased to read wider files.

No more than 180 rows can be stored because of the dimension of BUFF. This dimension must be increased to read longer files.

Subroutines Used

GETFIL - Reads the first line of the source file, checks for file type, and reads the output file parameters (maximum number of rows and years and output file prefix).

NEXTNB - Next non-blank: scans the line beginning with the current column plus one and returns to MAIN with IPTR equal to the number of the next column containing neither a blank nor a comma.

GETNUM - Gets a number beginning from current position of IPTR. It is returned in RNUM. MODE = 0 means a real number is expected, MODE = 1 means an integer. These assumptions can be overridden by "RE" or "IN" after a number.

ALPNUM - Converts a Hollerith digit identified in GETNUM to an integer.

ERROR - Prints the error message corresponding to the code number which was sent to it. It prints the offending line and an arrow pointing to the cause of the error.

Variables Used in BUILD

The following sections list the variables used in the main program and each subroutine of BUILD.

Main Program

BUFF (180)	- Contains one column of file, in order
CONAME	- Three-character company code
I	- DO index variable
IASTER	- Asterisk character
IC	- Character "C"
ICNT	- Counts fatal error messages
ICONT	- Tells if anything found on input line
IE	- Character "E"
IEQUAL	- Character "="

IERR	-	Error code from MXTBL, NXTNB, and GETNUM
IFLIP	-	Tells whether to flip output array RBUFF
IGT	-	Greater-than character
II	-	Character "I"
INDEX	-	Index of repetition constant appearing before * sign
INPUTS (72)	-	Input line in 72A1
IP	-	Character "P"
IPREFX	-	Prefix of intermediate numeric file
IPTR	-	Pointer to INPUTS
IROW	-	Row identifier
ISEMI	-	Semicolon character
IUF	-	Unit number of intermediate numeric file
IVAL	-	Number of values found on line
J	-	DO index variable
JPTR	-	Pointer to inputs
KIND	-	Expected mode of number of GETNUM
NROWS	-	Maximum number of rows in intermediate numeric file
NYRS	-	Number columns (originally, years) in file
RBUFF (46,180)	-	Contains image of 300 file rows at a time
RECORD	-	Number of records processed
RNUM	-	Number returned by GETNUM
RZERO	-	Character "0" (real)

<u>Subroutine GETFIL</u>

CONAME	-	Three-character company code
FLIP	-	Tells whether to transpose RBUFF array for files

FNAME	-	File name input from terminal
FSIZE (4,7)	-	Array of file parameters
IPREFX	-	Prefix of the intermediate numeric file
IUF	-	Unit to open file on

Subroutine NEXTNB

IBLANK	-	Blank character
ICOMMA	-	Character ","
IERR	-	Error Code (0=no error, -1 = no non-blank found)
INPUT (72)	-	Input line in 72A1 format
IPTR	-	Pointer position to INPUT
JPTR	-	Pointer position to INPUT

Subroutine GETNUM

DEC	-	Number of digits to the right of the decimal point
DIGIT	-	Tells whether valid digits in number
EXPO	-	Tells whether explicit exponent present
IDOT	-	Period character
IE	-	Character "E"
IERR	-	Error code
IEXP	-	One digit of exponent
II	-	Character "I"
IMINUS	-	Character "-"
IN	-	Character "N"
ININE	-	Character "9"
INPUT (72)	-	Input line in 72A1 format
INUM	-	Number to be returned (if integer)

IPLUS	-	Character "+"
IPTR	-	Pointer to INPUT
IR	-	Character "R"
ISIGN	-	Sign of exponent (plus or minus one integer)
IZERO	-	Character "0"
JPTR	-	Pointer to input
M	-	Actual mode of number
MODE	-	Expected mode of number
PNUM	-	One digit of number
RNUM	-	Number to be returned (bit pattern only - whether integer or real)
SIGN	-	Sign of number (plus or minus one - real)
XNUM	-	Number to be returned (if real)

Subroutine ALPNUM

ICHAR	-	Hollerith digit identified in GETNUM
IEXIT	-	Integer digit
NUM	-	Array of integer digits

Subroutine ERROR

I	-	Pointer to INPUT
IARROW	-	Error-pointer
IBLANK	-	Blank character
ICNT	-	Number of fatal errors
ICODE	-	Error code number
ICURSR (72)	-	Places arrow in offending column
INPUT (72)	-	Input line in 72A1 format
IPTR	-	Pointer to INPUT
MAXNB	-	Maximum non-blank position in INPUT

Plant Module (PLANT)

The Plant Module, shown schematically in exhibit 3, performs all computations related to capital asset accounts, such as gross plant value, book and tax depreciation, CWIP and AFDC. The following table lists unit numbers and DCB parameters associated with each file generated by PLANT.

UNIT NUMBER	LRECL	BLKSIZE	USAGE
9	255	3060	output file "X"
12	255	3060	intermediate file "B"
16	255	3060	intermediate file "P"

General Description

Physical Layout of the Source Code

The module consists of a main program, PLANT, and four subroutines: LRSKIP, CAPEXP, AFDFAC, DEPR, and MATR.

Processing

The main program, PLANT, is responsible for obtaining the company name from the terminal and three-character company code and two-digit suffix from the Plan Line Items File (X) trailer. If the X-file exists under the proposed name, the program prompts for permission to write over it.

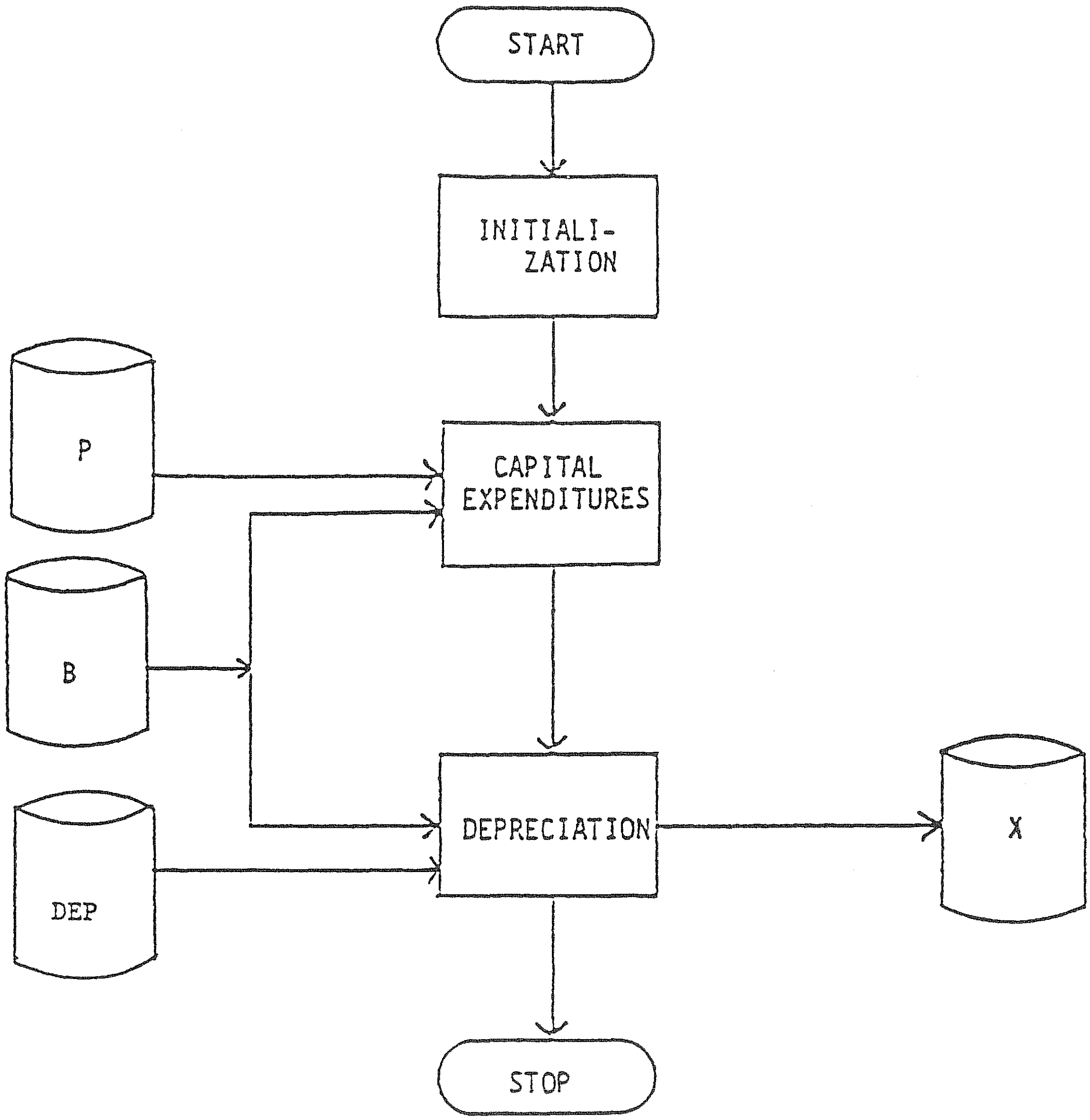
Next, the user is asked if income will be based on net plant value, operating revenues or return on equity.

Subroutine CAPEXP calculates construction expenditures (CE), construction work in progress (CWIP), and allowance for funds during construction (AFDC).

It reads from the B-file starting values for CWIP and AFDC and, for each of ten plant types, yearly values for additions to plant in service (CEP) and CE. It reads factors for computing AFDC on construction expenditures (TV) for AFDC calculations, and the AFDC rate (RATE), from the

EXHIBIT 3

PLANT MODULE FLOWCHART



P-file, unless the user selected "net plant value" in response to the last question printed at the terminal.

Subroutine AFDFAC is called to obtain the AFDC factor from TV and RATE. This factor is used to compute a yearly AFDC series, called AFDC2, which is associated with CEP.

CE is summarized and used to give a yearly CWIP series. This is used in combination with RATE to give another AFDC series, called AFDC1, which is associated with CWIP. If the user selected "N", a fraction, RCWIP, is deducted from CWIP before computing AFDC1.

Over time, AFDC1 and AFDC2 must have the same total. If they do not, AFDC2 is adjusted by the quotient of their sums, called RATIO. Because this adjustment is made, the user must insure that initial CWIP plus all construction expenditures (for all years and plant accounts) exactly equals all capital expenditures (for all years and plant accounts).

Subroutine DEPR calculates three depreciation values: straight-line depreciation of plant-in-service and AFDC; and accelerated (tax) depreciation of plant excluding AFDC. Subroutine MATR is called by DEPR to perform tax depreciation calculations.

For each type of plant, CEP (for future plant) and retirements, RET (for existing plant), by year, are read from the B-file. Existing balances at the start of the model are also read for gross plant value--plant and AFDC (GPE, AFDCEG); net plant value excluding AFDC (straight-line and accelerated) (NPVEB, NPVET); and net plant value--AFDC (AFDCEN). The tax and book depreciation rates (RATET, RATEB) are also read. In the current version of RAMTEL, NPVET and RATET are not used. Zeros should be entered for these values.

Depreciation is calculated separately for existing and future plant in service. For existing plant, a book rate is read for each plant type and applied to gross existing value to obtain yearly book depreciation. The tax depreciation can be calculated according to one of four methods. They are: the linear, the double declining balance, the sum-of-years' digits and a pre-specified schedule. If the fourth option is used, the tax life must be limited to 15 years.

The user has to enter tax life and the depreciation method for each vintage of each existing plant account. For future plants, the beginning year of service, tax life and depreciation method should be entered. More details on these input items are given in Appendix D of Part I.

Retirements are entered either as a percent of the previous year's gross book value of existing plant (keyed by -1 in column 1) or as dollar figures (keyed by 1 in column 1). In either case, they are subtracted from gross plant value and accumulated depreciation each year. Only existing plant can be retired.

Program Limitations

The AFDC calculations could be made more precise if more detailed data were commonly available. This would break down the initial CWIP and yearly CE and CEP by plant type, start year and completion year. In that case, the TV would not be needed.

When RCWIP = 0, the extent to which RATIO departs from 1 measures the error created by this problem. In our test runs, RATIO has varied from 0.99 to 1.12.

No provision is made for retirements of future plant. For relatively short-lived capital items, or very long forecast horizons, this can be changed by redimensioning arrays and DO statements in the program.

The number of new-plant types is limited to 10. This number can be changed by redimensioning arrays and DO statements in the program.

Subroutines Used

LRSKIP - Positions the I/O unit to the desired place on the Parameter file or Budget file (based on the number of logical records to be skipped) in order to read or backspace.

CAPEXP - Capital expenditures. Calculates aggregate construction expenditures (CE) and construction work in progress (CWIP). Calculates allowance for funds during construction (AFDC), associated with CE, CWIP, and capital expenditures (CEP).

AFDFAC - AFDC Factor. Computes AFDC as a fraction of the value of an incoming plant. Uses parameters: AFDC rate, and "Theoretical Vector" showing pattern of construction expenditures in the process of building a single plant.

DEPR	-	Depreciation. Calculates both straight-line (book) and accelerated (tax) depreciation on plant and straight-line depreciation on AFDC. All calculations are done for both existing and future plants.
MATR	-	Depreciation matrices. This subroutine is called by DEPR to calculate tax depreciation only. Depreciation factors are computed in the form of matrix arrays with the beginning year of service and the current year as arguments.

Main Program

ICODE	-	Three-character company code
ICONAME	-	Company name
IDATE	-	Current date
INBASE	-	Method of income calculation (net plant value, operating revenues, or return on equity)
ISUFFIX	-	Two-digit file suffix
LENNEW	-	Number of lines of new account data per group
LENOLD	-	Number of lines of old account data per group
MXNEW	-	Number of groups of new account data
MXOLD	-	Number of groups of old account data
NNEW	-	Number of groups of new account data used
NOLD	-	Number of groups of old account data used
NTRAIL	-	Number of lines of noncyclic data

Subroutine LRSKIP

ENDFIL	-	Logical variable - TRUE when end-of-file is reached
IOUNIT	-	I/O unit being read
LRECLS	-	Number of logical records to be skipped

Subroutine CAPEXP

AFDCP	-	Sum of AFDC2 over all years (unadjusted)
AFDCT	-	Sum of AFDC1 over all years (unadjusted)
AFDCO	-	Incoming AFDC balance sheet entry (net of AFDC)
AFDC1 (29)	-	Allowance for funds during construction (AFDC1) (carried in CWIP) - by year
AFDC2 (10,29)	-	AFDC transfered from CWIP to plant in service by plant type and year
CE (10,29)	-	Construction expenditures - current plant type by year
CEC (29)	-	Construction expenditures - sum of all plant types by year
CEP (10,29)	-	Capital expenditures, plant - up to 10 plant types per year
CEPT	-	Sum of CEP over all types and years
CWIP(29)	-	Construction work in progress - by year - current plant type
CWIPC(29)	-	Cumulative CWIP - by year - sum of all plant types
RCWIP(29)	-	Fraction CWIP in ratebase - by year
CWIPO	-	Incoming CWIP balance sheet entry (net of AFDC)
ENDFIL	-	Logical variable
	-	TRUE when end-of-file is reached
FACTOR (10,29)	-	AFDC factors computed from TV by account and year
INBASE	-	Method of income calculation
INVP	-	Net plant value
IRATE	-	Location of RATE in Parameter File
ITVFST	-	Place where TV entries begin in Parameter File
LENNEW	-	Number of lines of new account data per group
LENOLD	-	Number of lines of old account data per group

MXNEW	-	Number of groups of new account data
MXOLD	-	Number of groups of old account data
NFILL	-	Number of dummy variables to fill out one line
NPARAM	-	Number of items in Parameter File
NTV (10)	-	Number of nonzero entries in the corresponding row in TV
NTRAIL	-	Number of lines of noncyclic data
RATE(29)	-	Rate of AFDC allowed in CWIP - by year
RATIO	-	Amount of AFDC2 must be adjusted (multipled by) to make AFDCP and AFDCT equal
RDATA(29)	-	Budget File data
TV(10,10)	-	Theoretical vectors relating CE to CEP by plant type

<u>Subroutine AFDFAC</u>

AFDFAC	-	Calculated AFDC factor
I	-	Row being examined in TV
LVEC	-	Length of row I in TV
RATE(29)	-	Rate of AFDC allowed on CWIP - by year
TV(10,10)	-	Theoretical vectors relating CE to CEP by plant type

<u>Subroutine DEPR</u>

ACTNUM	-	Account number
AFDCEG	-	AFDC - gross existing
AFDCEN	-	AFDC - net-existing
AFDC1(29)	-	Allowance for funds during construction (AFDC1) (carried in CWIP) - by year
AFDC2(10,29)	-	AFDC2 by year
BASEA	-	Base for calculation of AFDC depreciation

BASEB	-	Base for calculation of book depreciation
BASET	-	Base for calculation of tax depreciation
CEC(29)	-	Construction expenditures - sum of all plant types by year
CEP(29)	-	Capital expenditures, plant - by year
CWIPC(29)	-	CWIP by year - sum of all plant types
DEPEA(29)	-	Book depreciation on existing AFDC - by year
DEPEAC	-	Depreciation - existing plant - AFDC cumulative
DEPEAX	-	Depreciation - existing plant - AFDC per year
DEPEB(29)	-	Book depreciation on existing plant - by year
DEPEBC	-	Book depreciation - existing plant - cumulative
DEPET(29)	-	Tax depreciation - existing plan - by year
DEPFA(29)	-	Book depreciation on future AFDC - by year
DEPFB(29)	-	Tax depreciation on future plant - by year
DEPFT(29)	-	Tax depreciation on future plant - by year
DEPFTC	-	Tax depreciation - future plant - cumulative
DEPTOT	-	Weighted average book depreciation - existing plant
ENDFIL	- -	Logical variable TRUE when end-of-file is reached
GPVE	-	Gross plant value - existing plant
GPVF	-	Gross plant value - future plant
GPVTOT	-	Total existing gross plant - all accounts
IACCT	-	Account number
IBY	-	Beginning year of service
IDEP	-	Depreciation method
IREAD	-	Data option identifier

IRLIFE	-	Remaining tax life of existing plant at the beginning of study period (integer)
IVIN	-	Number of vintages for a given existing plant account
IXLIFE	-	Depreciable life of plant (integer)
IYI, IY2	-	A range of calendar years. Each year in the range represent a beginning year of service
LENNEW	-	Number of lines of new account data per group
LENOLD	-	Number of lines of old account data per group
LIFE	-	Depreciable life of future plant - book
MXNEW	-	Number of groups of new account data
MXOLD	-	Number of groups of old account data
NACCT	-	Account number
NNEW	-	Number of groups of new account data used
NOLD	-	Number of groups of old account data used
NPVEB	-	Net plant value existing - book (initial)
NPVET	-	Net plant value existing - tax
NPVFT	-	Net plant value future - tax
NPVTOT	-	Total existing gross plant - all accounts
PAPV	-	Gross plant value off the vinttage as a percentage of gross of the plant account
RATEA	-	Book depreciation rate - existing AFDC
RATEB	-	Book depreciation rate - existing plant
RATET	-	Tax depreciation rate - existing plant
RDATA(29)	-	Budget File data
RDEP (29)	-	Depreciation rates if method 4 is used
RLIFET	-	Remaining tax life of existing plant at the beginning of study period (real)
SRET	-	Running sum of retirements

XGPV	-	Depreciation base
XLIFEB	-	Depreciable life of future plant - book
XLIFET	-	Depreciable life of future plant - tax

Subroutine MATR

DEPT	-	Depreciation rate
DEPTC	-	Cumulative tax depreciation
FAC (29,29)	-	Depreciation factors (fraction)
FNPV	-	Remaining undepreciated plant as a fraction of beginning total plant
IXLIFE	-	Depreciable tax life of plant
R1	-	Depreciation rate for the double declining balance method
R2	-	Depreciation rate for the linear method
SUM	-	Sum of years' digits
XLIFET	-	Depreciable tax life of existing plant
YY	-	Remaining number of years in the life of the plant

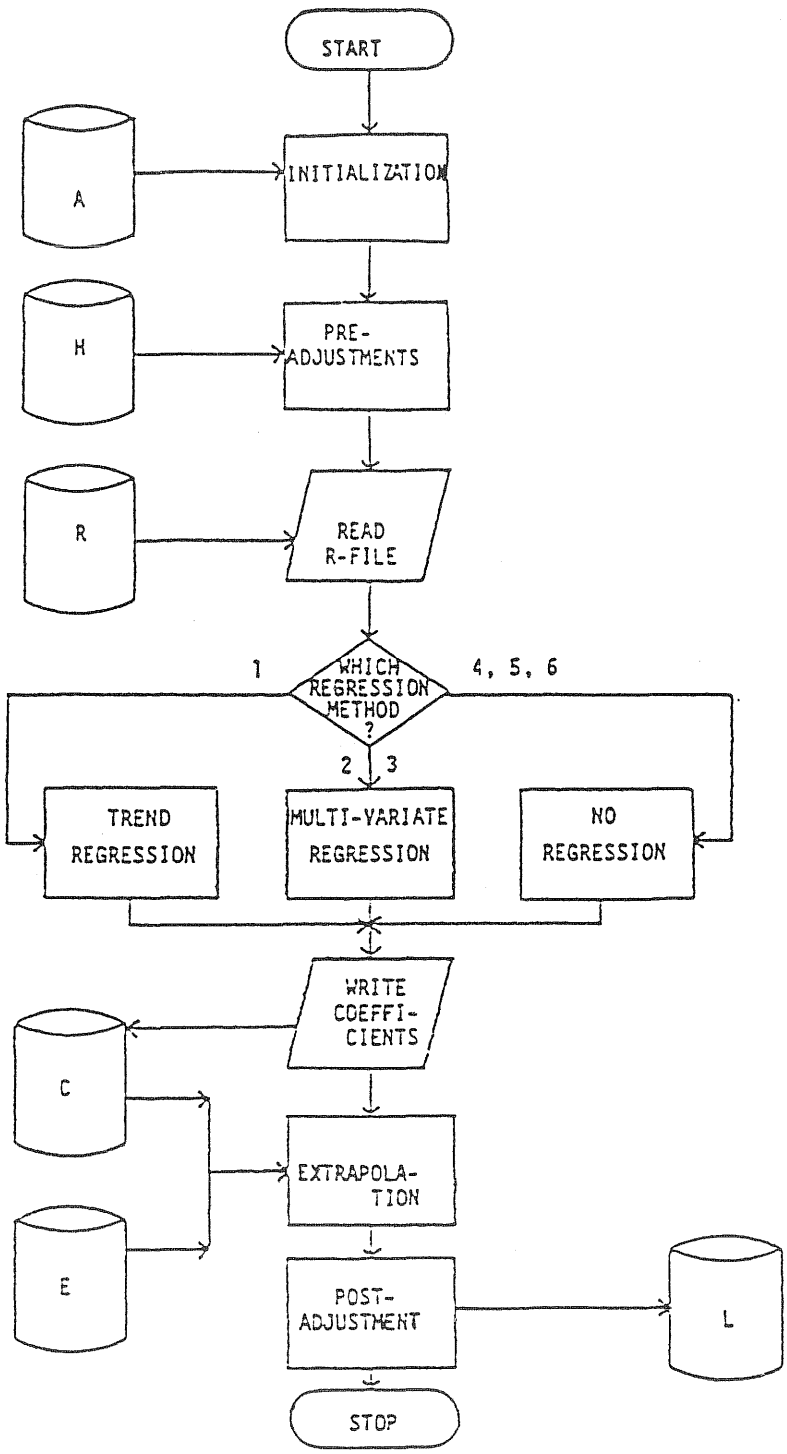
Performance Module (PERFORM)

General Description

PERFORM, shown schematically in exhibit 4, computes the operation and maintenance costs. Output is placed into files for subsequent processing by the Aggregation Module, or for use by the Report Module to produce performance reports. The following table lists unit numbers and DCB parameters assigned to various files and terminals.

EXHIBIT 4

PERFORMANCE MODULE FLOWCHART



UNIT NUMBER	LRECL	BLKSIZE	USAGE
4	133	1330	terminal
7	250	3000	output terminal file "C"
8	255	3060	output file "L"
10	76	760	ACNAMES.DATA
11	255	3060	intermediate file "A"
13	255	3060	intermediate file "E"
14	255	3060	intermediate file "H"
17	195	1950	intermediate file "R"

Physical Layout of Source Code

The module consists of a main program, PERFORM, and eight subroutines: INITAL, ADJUST, REGRES, MULREG, MATINV, NOREG, EXTRAP AND ADJ2.

Pre-Adjustment

Adjustment to historical data contained in the H-file is the first step. Since this step is done before regression, it is called pre-adjustment. The H-file is processed, record-by-record. Each record contains data for one sub-account, and records for sub-accounts that belong to the same main account must have contiguous row numbers in the H-file. The program reads up to 30 sub-accounts into array HISTRY, stopping when a new main account number is found.

ADJUST uses the multiplicative and additive adjustment indices (in the second and third position of each record) to reference records in the FACTOR array. These records are multiplied or added into the HISTRY data. Then all the sub-accounts are aggregated and stored in a row in the HMAINS array which is created for them. Spaces are left in the row for future years.

There must be at least 3 valid historical data per main account (i.e., no sub-account with missing data); otherwise the account is thrown out and an error message is printed.

Regression

The regression process creates an entry in the Coefficients File (c) for each main O&M account. The HMAINS array is scanned by rows. The account number (first column in each row) is used as a key and the

Regression (R) File's image REMETH is searched for a match. The code contained in the matching row of the REMETH array determines the regression method to be used in subsequent steps. If there is no match, regression method 1 is the default. The information following the method number in the REMETH array is assigned to array EXOGEN and passed to the regression subroutine. Subroutine REGRES, MULREG, OR NOREG is called according to the method indicated. The method code and a description of each method is shown below.

Trend Analysis

Least-squares linear trend analysis (method 1) is done by subroutine REGRES. The independent variable is "year number," with the first historical year taking the value 1. The equation is written to the coefficients file. There must be at least 3 valid historical data elements or the regression is not done and an error message is printed.

Multivariate Regression

Multivariate linear (method 2) or log-linear (method 3) regression is done by subroutine MULREG. Up to 5 independent (exogenous) variables may be used.

The number of years with valid data for the dependent and for all independent variables must be 2 greater than the number of independent variables used, or the regression is not done and an error message is printed. Errors also occur if the exogenous variables declared in the R-file do not exist in the E-file or do not have valid data. For log-linear regression, all data must be positive or an error results. Caution: On some computer systems this error will not necessarily interrupt processing. The subroutine MATINV is used to do the matrix inversion.

Bypassing Regression (Methods 4, 5, and 6)

If the R-file contains method 4, 5, or 6 for an account, subroutine NOREG is called. No regression is done. Instead, the data in the REMETH array is copied into the C-file. These data are coefficients for an equation in the same format as the regression equations created by REGRES or MULREG. Methods 4, 5, and 6 correspond to methods 1, 2, and 3 in format, but the user has specified the coefficients.

Extrapolation

Extrapolation of future values for each account is done next, using the equations defined by the coefficients in the C-file. Subroutine EXTRAP is used for this process.

The equation for each account in the C-file uses the appropriate exogenous variable in the E-file (image EXODAT) to calculate projections (extrapolations) of each O&M account. These projections are stored in the HMAINS array.

Post-Adjustment

The subroutine ADJ2 does this process. The 4th and 5th columns of each H-file record are used as division and subtraction adjustment indices to reference rows in the FACTOR array. These rows' elements are divided into or subtracted from the HMAINS data.

If sub-accounts of the same main account do not agree in their 4th and 5th columns, the first sub-account's entries are used and a message is printed.

The results of post-adjustment are written to the L-file.

Finally, the Main program writes the exogenous-variable data (EXODAT) to the end of the L-file for reference by the graphing reports.

Errors

If an error occurred during regression, extrapolation will be bypassed and an error message printed. If the exogenous variables in the equation do not exist or have missing future data, an error message will also result. If the H-file specifies pre- or post-adjustment rows which do exist or do not contain valid data, the account will be ignored and an error message will be printed.

Program Limitations

The number of exogenous variables is limited to 5. To increase the number, the input file (R) must be made with 2 more columns for each. Also the following arrays must be redimensioned: EXOGEN, REMETH, COEFF, CO, EXDATA. NRCOLS and NEXOGN must also be changed.

Additional regression methods can be added by writing new subroutines. EXTRAP must also be changed to take account of the new method codes.

Regression could be done separately for subaccounts by eliminating the sub-account aggregation processing ADJUST.

Subroutines Used

INITAL - Reads company code and file suffix from the L-file's header and asks for permission to overwrite C- and L-files. Reads the base year, number of history years and scale factor from the History File and prompts for the current date.

ADJUST - Uses adjustment entries in Adjustment File (A) to modify the data in the History File (H) and places the results in the HMAINS array.

REGRES - Performs regression method 1 (lease squares linear trend analysis) on historical data for specified O&M accounts.

MULREG - Performs regression methods 2 and 3 (multi-variate linear or log-linear regression) on historical data for specified O&M accounts.

MATINV - Matrix inversion subroutine.

NOREG - Performs regression methods 4, 5, and 6 substitution of substitution of input equation for regression calculation on specified O&M accounts.

EXTRAP - Uses equation in coefficients file produced by REGRES, MULREG, or NOREG, to generate projections for each O&M accounting, using specified exogenous variables from the E- (exogenous variable) file. The projections are stored in the HMAINS array.

ADJ2 - Does post-extrapolation adjustments. Division and subtraction adjustments are read from the 4th and 5th columns of the H-file. They are used to reference lines in array FACTOR which are then applied to the line in the HMAINS array with the same account number as in the H-file.

Variables Used in PERFORM

Main Program

EXODAT(30,41)	-	Exogenous variables
EXOGEN(5)	-	Exogenous variables to regress against (integer representation)
FACTOR(12,40)	-	Adjustment factors
HBASYR	-	Base year from History File
HHSTYR	-	Number of historical years
HISTRY(25,45)	-	History data for one main account.
HMAINS(180,41)	-	Historic and projected data for main accounts
IACTNO	-	Actual main account number
IACTRG	-	Account number for regression
ICODE	-	Three-character company code
ICONAM(8)	-	Company name
IDAT	-	Date of execution
IERROR	-	Error code for subroutines
IROW	-	Row-loop index
ISKIP	-	Number of unregressible main accounts
ISUBAC	-	Sequential subaccount number (DO loop index variable)
ISUFFX	-	Suffix from the L-file's header
IUAD	-	Unit number--adjustments

IUCO	-	Unit number--coefficients
IUEX	-	Unit number--exogenous variables
IUHS	-	Unit number--history
IULN	-	Unit number--line items
IURG	-	Unit number--regression methods
IYRFST	-	First year for regression (year 1 = 1)
IYRLST	-	Last year for regression (year 1 = 1)
JSKIP	-	Counts the years of historical data to be skipped at the beginning of the History File
LASTSB	-	Maximum value of ISUBAC = number of subaccounts in the present main account
LINESC	-	Number of records in the C-file
LINESL	-	Number of records in the L-file
MAINAC	-	Number of regressible main accounts
METHOD	-	Regression method code (1-6, integer)
NACOLS	-	Maximum number of columns--Intermediate Adjustment File
NAROWS	-	Maximum number of rows--Intermediate Adjustment File
NCCOLS	-	Number of columns--Intermediate Coefficient File
NECOLS	-	Maximum number of columns--Intermediate Coefficient File
NEROWS	-	Maximum number of rows--Intermediate Coefficient File
NEWAC	-	New account number (integer portion)
NEXOGN	-	Maximum number of exogenous variables allowed in regression methods files
NFUTUR	-	Number of future years for extrapolation
NHCOLS	-	Maximum number of columns--Intermediate History File
NHSTYR	-	Number of historical years

NHROWS	-	Maximum number of rows--Intermediate History File
NRCOLS	-	Maximum number of columns--Intermediate Regression File
NRROWS	-	Maximum number of rows--Intermediate Regression File
NYRS	-	Number of years--historical plus future
REMETH(120,13)	-	Regression method data
SCALE	-	Scale factor by which line items data must be multiplied to give dollar units
YEAR1	-	First historical year
YEAR2	-	First future year
YEAR3	-	Last historical year

<u>Subroutine INITAL</u>

BASEYR	-	Base year from History File
HBASYR	-	Base year from History File (last year of historical data)
IDATE(3)	-	Current date
IANSWR	-	"Yes" - no overwrite C- and L-files or "No" - do not overwrite
ICODE	-	Three-character company code
ICONAM(8)	-	Company name
IDAT	-	Date found on L-file's header
ISUFFX	-	Two-digits suffix for C- and L-files
NHSTYR	-	Number of historical years
SCALE	-	Scale factor by which line items data must be multipled to give dollar units

<u>Subroutine ADJUST</u>

ADINCR	-	Adjusted value increment (i.e., adjusted value of a subaccount).
ALINE	-	Additive adjustment line

HISTRY(25,45)	-	History data for one main account
HMAINS(180,41)	-	Historic and projected data for main accounts
IERROR	-	Error code
IROW	-	Index to rows in HMAINS
ISKIP	-	Number of unregressible main accounts
ISUBAC	-	Subaccount index (1 to LASTSB)
LASTSB	-	Number of subaccounts to aggregate
MLINE	-	Multiplicative adjustment line
MNVALD	-	Minimum valid adjusted values to write account to Line Items File
NHSTYR	-	Number of historical years
NVALID	-	Number of years valid for all subaccounts

Subroutine REGRES

HMAINS(180,41)	-	Historic and projected data for main accounts
IACTNO	-	Account number
IERROR	-	Error code
IROW	-	Index to rows in HMAINS
IYRFST	-	First year to regress
IYRLST	-	Last year to regress
MAINAC	-	Number of regressible main accounts
MNVALD	-	Minimum valid data to regress
RN, IN	-	Number of valid data (real and integer representation)
RSQ	-	R-squared (measures goodness to fit)
RT, IT	-	Real and integer representation of time
SIGMAY	-	Standard deviation
SLOPE	-	Slope of the linear equation

STDERR (6)	-	Standard error
S1, S2, S3	-	Computational variables
TSQ	-	Sum of squares of time values
TSUM	-	Sum of time values
YSUM	-	Sum of data values
YINCPT	-	Y-intercept of the linear equation
YM, TM	-	Means of data and time, respectively

Subroutine MULREG

Y (2,40)	-	Line 1 - calculated values of historical value Line 2 - error (actual minus calculated)
Z (6,40)	-	Row 1 - dependent variable input data Rows 2-6 - exogenous-variable input data
B(6)	-	Coefficients as calculated
V(5)	-	Dummy argument for call to MATINV
S(6,6)	-	Sum of cross-products of elements in z
T(6,6)	-	Cross-products of elements in z, less the product of their means
W(5,5)	-	T-matrix without its first row and columns
F (6)	-	Elements in 2 averaged across columns
A	-	Intercept of the linear equation
EXODAT(30,41)	-	Exogenous variables
EXOGEN(6)	-	Exogenous account numbers to regress against
EXREAL(6)	-	Real representation of EXOGEN
HMAINS(180,41)	-	Historic and projected data for main accounts
IERROR	-	Error code
IEXACT	-	Account number from Exogenous File
IP	-	Number of years to consider--effective number of columns in Z

IROW	-	Index to rows in HMAINS
ISVALD(40)	-	1 if a year contains valid data--0 if not
IYRFST	-	First year to regress
IYRLST	-	Last year to regress
MAINAC	-	Stores the number of regressible main accounts
METHOD	-	Regression method: 2 - multivariate linear 3 - multivariate log-linear
MNVALD	-	Minimum number of valid years--if less than this number are valid, regression is not performed
N	-	Effective number of rows of Z = number of exogenous variables plus 1 for dependent variables
NB	-	Number of columns in B matrix
NEXT	-	Next available column number in Z
NVALID	-	True number of valid years (= number of 1's in ISVALD)
NVAR	-	Number of exogenous variables for dependent variables
P	-	Real representation of IP
P2	-	Reciprocal of P
RSQ	-	R-squared--index of goodness to fit
SIGMAZ	-	Standard deviation
STDERR (6)	-	Standard error
S7	-	Sum of errors
S8	-	Sum of squared errors
ZSQ	-	The sum of squared Z variables
ZSUM	-	The sum of Z variables
1E + 34	-	Code for missing datum

Subroutine MATINV

A (MA, MA)	-	Two dimensional array to be solved; as output contains A^{-1}
AMAX	-	Maximum element in A
B	-	Two dimensional array (not usually square)--as output contains X, where AX=B
DETERM	-	Determinant of A calculated by MATINV. If the rank of A < NVAR, DETERM will be the determinant calculated for the submatrix of A of rank IRANK.
I	-	Counts columns in INDEX
ICOLUM	-	Pivot column
INDEX(12,2)	-	Remembers order of rows and columns for interchanges
IRANK	-	Rank of A, as computed
IROW	-	Pivot row
J	-	Do index variable
L	-	Do index variable
L1	-	Do index variable
MA	-	Dimension of A in calling program (MA≤ 10)
NB	-	Number of columns in B. If NB = 0 the routine is used only for inversion; if NB > 0, X is also computed and stored in B. Upon return from MATINV, NB will be set to NVAR-R, where R is the rank of A.
NVAR	-	Order of A, 1 ≤ NVAR ≤ MA ≤ 10
PIVOT	-	Pivot element
SWAP	-	Temporary value used in interchanges
T	-	Temporary value used in search for pivot element

Subroutine NOREG

IACTNO	-	Account number
IERROR	-	Error code (always 0)

METHOD	-	Regression method number (4,5 or 6)
N	-	Number of items in REXOGN to be put in C file
REMETH(120,13)	-	Regression method data
SLOPE	-	Slope of input equation (method 4)
YINCPT	-	Y-Intercept of input equation (method 4)

Subroutine EXTRAP

CO (13)	-	Coefficients values and indices to exogenous variables
COEFF (5)	-	Coefficients are calculated (methods 2 and 3)
EX (40)	-	Line items values - historical + future
EXDATA (5,40)	-	Values for up to 5 exogenous variables and up to 40 years
EXODAT (30,41)	-	Exogenous variables
HMAINS(180,41)	-	Historic and projected data for main accounts
IACTNO	-	Account number
IERROR	-	Error code (0 = no error)
INACTIN	-	Independent (exogenous) variable account number in coefficients file
IYR	-	Year (YEAR1 = 1) - integer representation
METHOD	-	Regression method number 1 - linear trend; 4 -linear equation against time 2 - multivariate linear; 5 - additive linear equation 3 - multivariate log-linear; 6 - multiplicative equation
N	-	Number of years on which regression was based
NCO	-	Number of meaningful values in coefficients file for this account beyond the 5 "standard" values which are present for all accounts - IACTNO, METHOD, N, RSQ, and NCO

NEX	-	Number of exogenous variables used in regression
NFUTUR	-	Number of years to extrapolate
NHIST	-	Where to begin extrapolating
RSQ	-	Measure of goodness to fit of regression equation
SLOPE	-	Slope (method 1)
YINCPT	-	Y-intercept (method 1)

Subroutine ADJ2

ACTNO	-	Account number read from History File
DLINE	-	Division line used for adjustment
IACTNO	-	Actual main account number
IACTLN	-	Account number in HMAINS
HMAINS(180,41)	-	Historic and projected data for main accounts
IERROR	-	Error code
MAINAC	-	Stores the number of regressible main accounts
SLINE	-	Subtract line used for adjustment

Aggregation Module (AGGREG)

General Description

The Aggregation Module, shown schematically in Exhibit 5, combines the values of related accounts for subsequent processing by the Finance Module. The following table lists unit numbers and DCB parameters assigned to files used or generated by AGGREG.

UNIT NUMBER	LRECL	BLKSIZE	USAGE
3	255	3060	output file "M"
8	255	3060	output file "L"
9	255	3060	output file "X"
10	76	760	ACNAMES.DATA
15	195	1950	intermediate file "I"

Physical Layout of Source Code

The module consists of a main program, AGGREG, and two subroutines: AGREG1 and AGREG2.

Processing

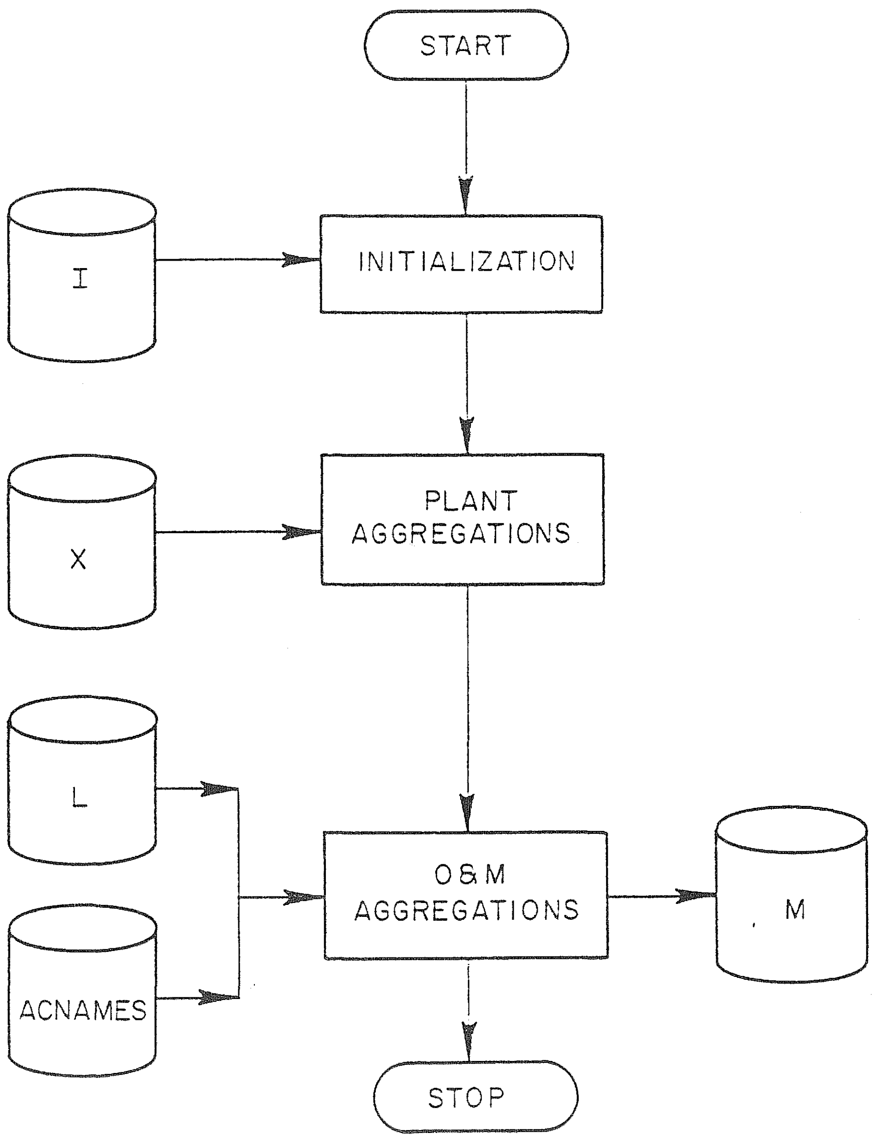
Fourteen yearly values are entered in the M-file using information from the X-file. They are:

1. CE--construction expenditures
2. GPV--gross plant value
3. CEP--capital expenditures
4. RET--retirements
5. CWIP--construction work in progress
6. AFDC1--allowance for funds during construction associated with CWIP
7. AFDC1C--AFDC1 accumulation over time
8. AFDC2--AFDC associated with CEP
9. AFDC2C--AFDC associated with plant in service (AFDC2 accumulated over time)
10. DEP--depreciation expense, straight-line
11. DEPC--accumulation of DEP over time
12. DEPA--depreciation expense--accelerated
13. DEPAFD--depreciation expense--AFDC
14. DEPAFC--accumulation of DEPAFD over time

They are computed account-by-account and added up.

EXHIBIT 5

AGGREGATION MODULE FLOWCHART



Two yearly O&M values are entered in the M-file using information from the L-file. They are:

1. Operation expense
2. Maintenance expense

The program uses an array names BAGS to hold the totals for these four entries by year. Where the BAGS go is indicated by WHREBG, telling which line in the M-file is to be filled in by the corresponding row in BAGS. Array WHCBG tells which bag to put a given L account into. It is created by reading OMNAMES. The program accumulates an array NOBAG as it goes on, which holds all those accounts not listed in WHCHBG and which, therefore, are not reflected in the M-file at all. This array is printed with a warning message.

Program Limitations

If any change is made to other parts of the system, the programmer must be scrupulous to make any necessary changes in AGGREG, since it links together the key system modules.

For more detail in the M-files (and hence in reports), AGGREG can easily be changed to provide this. For example, plant accounts could be broken down by type, or O&M accounts by type of generation.

Subroutines Used

AGREG1 - Aggregates values from Plant Line Items File (X) and puts them in M-file

AGREG2 - Aggregates values from Performance Line Items File (L) and puts them in M-file, using ACNAMES

Variables Used in AGGREG

Main Program

GNPINF(40) - GNP--inflator vector

IDATE(3) - Current date

LINE(12)	-	Lines in Master File for starting values
LINESL	-	Number of lines in the L-file
LYEAR1	-	First year represented in L-file
LYEAR2	-	Second year represented in L-file
MYEAR1	-	First year represented in M-file
NHSTYR	-	Number of historical years
NMDF	-	Number of items per year in Master File
NYRSI	-	Number of years in I-file
NYRSM	-	Number of years in M-file
RCODE	-	Three-character company code read from Master File header
RDAT	-	Date read from Master File header
RDATA(29,70)	-	Data written to M-file
RSUFFX	-	Two-digit suffix read from Master File header
SCALE	-	Scale of O&M data
SKIP	-	Dummy place-holding variable
START(12)	-	Starting values for line numbers in LINE
TOTAS	-	Total assets in base year
TOTLI	-	Total liabilities in base year
XYEAR1	-	First year represented in X-file

Subroutine AGREG1

AFDCEN	-	Net AFDC--existing plant
AFDCEG	-	Gross AFDC--existing plant
AFDC1(29)	-	Allowance for funds during construction associated with CWIP--by year
AFDC1C(29)	-	Amount of AFDC1 in CWIP--cumulative--by year
AFDC2C(29)	-	AFDC2--cumulative--by year

AFDC2J(29)	-	AFDC2--account J from X-file--by year
AFD2JC	-	AFDC2--account J--cumulative over time
CE(29)	-	Cash expenditures by year
CEP(29)	-	Capital expenditures--plant--by year
CEPJ(29)	-	CEP--accounts J--by year
CWIP(29)	-	Construction work in progress--by year
DEP(29)	-	Straight-line depreciation--by year
DEPA(29)	-	Accelerated depreciation--by year
DEPC(29)	-	Cumulative straight-line depreciation
DEPAFC(29)	-	Cumulative AFDC depreciation
DEPAFD(29)	-	AFDC depreciation
DEPAFJ(29)	-	DEPAFD--account J--by year
DEPAJ(29)	-	DEPA--account J--by year
DEPFJC	-	DEPAFD--account J--cumulative over time
DEPJC	-	DEP--account J--cumulative over time
DEPJ(29)	-	DEP--account J--by year
GPV(29)	-	Gross plant value--by year
GPVEJ	-	Gross plant value--existing--account J
HIGH	-	High year for transfer to Master File
LENNEW	-	Number of lines of new account data per group
LENOLD	-	Number of lines of old account data per group
LOW	-	Low year for transfer to Master File
MXNEW	-	Number of groups of new account data
MXOLD	-	Number of groups of old account data
NNEW	-	Number of groups of new account data used
NPVEBJ	-	Net plant value--existing--book-account J
NOLD	-	Number of groups of old account data used

NTRAIL - Number of lines of non-cyclic data

NUMBR - Account number

NXROWS - Number of rows in X-file

NYRSX - Number of years in X-file

RATEB - Book depreciation rate

RDATA(29,70) - Data to be written to the M-file

RET(29) - Retirements--by year

RETJ(29) - Retirements--account J--by year

RETJC - RET--account J--cumulative over time

SKIP - Dummy place-holding variable

XM - Number of years to be shifted between X- and M-files

XYR1 - Base year from X-file

Subroutine AGREG2

BAGS(4,40) - Bags in which O&M data are summarized by year

HIGH - Last year to transfer from L-file to M-file

IACTNO - O&M account number

LEN - Number of lines in account-names file

LM - Number of years to be shifted between L- and M- files

LOW - First year to transfer from L-file to M-file

LYEAR1 - First year in L-file

MYEAR1 - First year in M-file

NBAGS - Number of bags in use

NOBAG(200) - Accounts not put in any bag

NOBGPT - Next available position in NOBAG

NYRSL - Number of years in L-file

NYRSM - Number of years in M-file

RDATA(29,70)	-	Data to be written to the M-file
RLINE (41)	-	Data for one account in L-file
SCALE	-	Scale of O&M data
WHCHBG(2,200)	-	Tells the bag in which to put a given O&M account
WHREBG(5)	-	Tells where to put the bags in the M-file

Fixed Obligations Module (FIXOBS)

The Fixed Obligations Module, shown schematically in exhibit 6, computes interest, preferred dividends, refundings, and sinking fund payments for fixed security obligations. The following table shows the unit number and DCB parameters assigned to the files used and generated by AGGREG. Please note that AGGREG produces an input debt file to generate an output debt file and they have the same set of unit numbers and DCB parameters.

UNIT NUMBER	LRECL	BLKSIZE	USAGE
1	80	800	Debt File

Physical Layout of Source Code

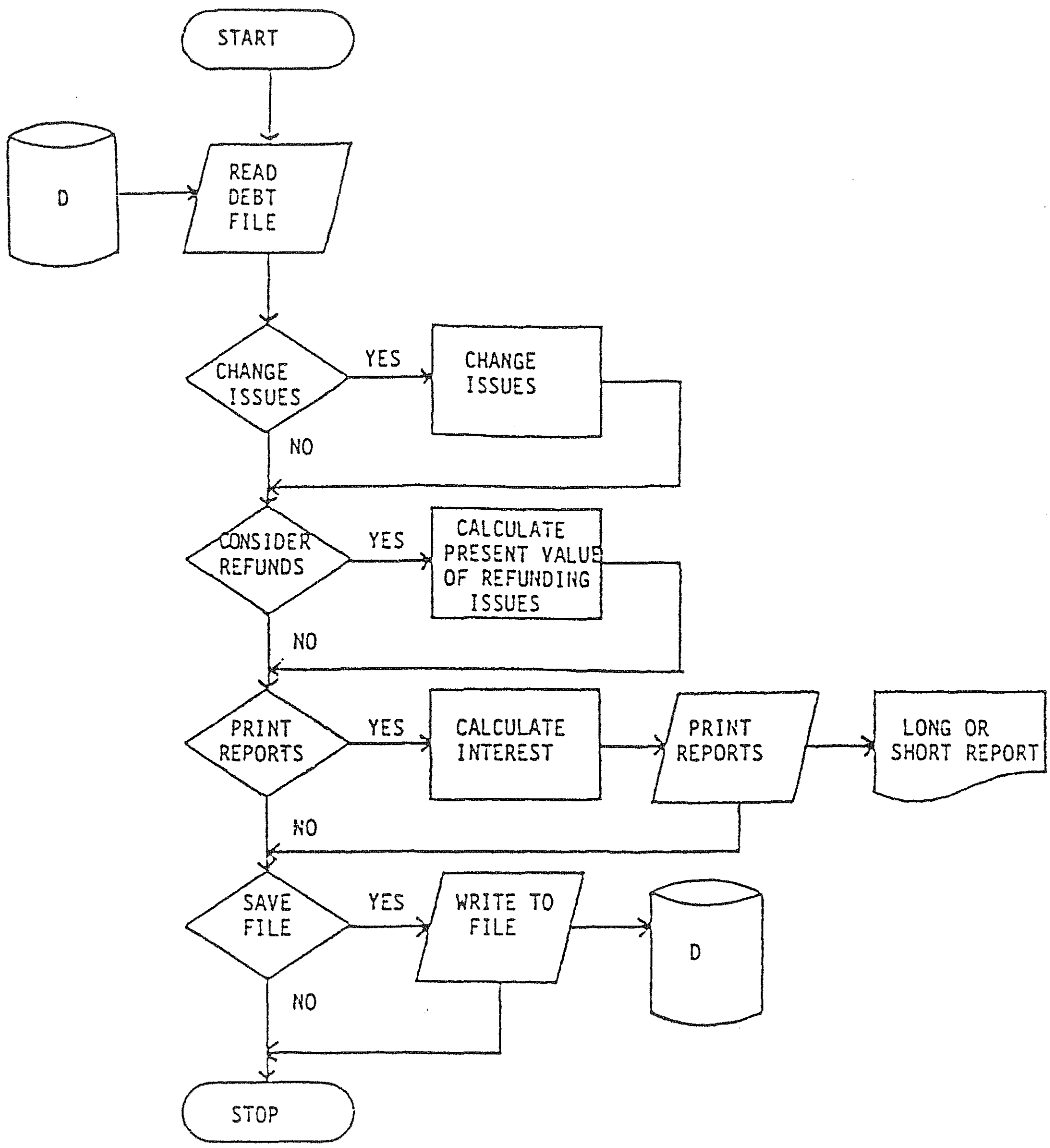
The Fixed Obligations Module consists of a main program, FIXOBS, and six subroutines: FIXREP, SAVE, FIXOB, PARTYR, CHANE, and REFUND.

Identifying the File

The name of the debt file and the company code are read from the terminal. The file type is checked and the data read into arrays ILINE, NISSUE, ISSUE, and XISSUE. If the Debt File does not exist, a new file is created--with no issues in it as yet.

EXHIBIT 6

FIXED OBLIGATIONS MODULE FLOWCHART



Processing

The user is asked if changes are desired. If so, subroutine CHANGE is called, when repeatedly asks, "DELETE, ADD, PRINT or NONE?" Issues can be added or deleted one by one and the whole list can be printed. When the user is satisfied with the file, the answer should be NONE.

The next questions is, "REPORT FORMAT: LONG, SHORT OR NONE?" if reports are desired, the years to be reported on are also terminal input. Subroutine FIXOB is called each year to do the calculations and the results printed by subroutine FIXREP. The short report gives total figures on amount outstanding and total interest expense and rate. The long report breaks this down by individual obligation.

Subroutine FIXOB computes total interest payments and rates on long-term debt and preferred stock. The expense is the amount outstanding times the interest rate, unless the obligation is issued or retired during the current year. In that case, subroutine PARTYR is used to calculate the fraction of the year for which interest should be paid.

Total interest is computed, and divided by total amount outstanding to give average interest rate. Both amounts are passed to FIXREP and included in the reports.

Subroutine SAVE asks whether changes made to the debts should be saved in the Debt File. If the answer is year, the debts held in core are sorted and written to disk, replacing the original Debt File. Note: FIXOBS can be used to create a new Debt File if none already exists.

Program Limitations

FIXOBS does not make sinking fund payments even if they are scheduled.
FIXOBS does not take account of debt discount and issuing expenses.

Subroutines Used

FIXREP - (Fixed Obligations report) - Short report prints total expenses each year, long report itemizes expense by individual debt issue. Prints one year of either report per call.

SAVE	-	Asks whether changes made in CHANGE subroutine should be saved. Writes changes to debt file if answer is yes.
FIXOB	-	Calculates annual interest due on each debt issue and total interest due each year, considering dates of issue and retirement.
PARTYR	-	Calculates portion of year elapsed up to a given month and date. Example: For March 15 of a non-leap year, the answer would 74/365, or .2027.
CHANGE	-	Permits user to add or delete debt issues or print entire set.
REFUND	-	Computes the net present value of recalling issues having coupon rates above the threshold of consideration and reissuing them at lower rates.

Variables Used IN FIXOBS

<u>Main Program</u>

ICHECK (2,109)	-	1 if a debt issue has been deleted in CHANGE
ICO	-	Three-character company code
IFIL	-	File type
ILINE	-	Line numbers - LTD and PST
IPREFX	-	File type
IREPOR	-	Tells what kind of report is wanted
IREVIS	-	Tells whether revisions are wanted
ISSUE (2,109,4)	-	Dates of issue and retirement of debt
ISUFFX	-	Two-digit file suffix
IYEAR	-	Year number (A.D.)
IYRFST	-	First year modeled
IYRLST	-	Last year modeled
LCK (2,109)	-	Used for sorting ILINE
NISSUE (2,109,5)	-	Name of debt issue

NUM(2)	-	Number of extant LTD and PST issues
XISSUE (2,109,4)	-	Amount and rate of debt issue
XPENSE (2,109)	-	Amount of debt interest expense

Subroutine FIXREP

ICHECK (2,109)	-	1 if a debt issue has been deleted in CHANGE
ICO	-	Three-character company code
ILINE (2,109)	-	Line numbers (LTD, PST)
IPAR	-	Indicates new/retired/neither
IREPOR	-	Tells what kind of report is wanted
ISSUE (2,109,4)	-	Dates of issue and retirement of debt
ITYPE(2)	-	Type of debt issue (LTD, PST)
IYEAR	-	Year number (A.D.)
LCK (2,109)	-	Used for sorting debt issues
NISSUE (2,109,5)	-	Name of debt issue
NLINES	-	Number of lines to be skipped
NUM(2)	-	Number of extant LTD and PST issues
TOTAL (2,7)	-	Interest totals
XISSUE (2,109,4)	-	Amount and rate of debt issue
XPENSE (2,109)	-	Amount of debt interest expense

Subroutine SAVE

ICHECK (2,109)	-	1 is a debt issue has been deleted in CHANGE
ISSUE (2,109,4)	-	Dates of issue and retirement of debt
LCK (2,109)	-	Shows the order of the issues
NISSUE (2,109,5)	-	Name of debt issues

NUM(2)	-	Number of preferred issues
RATE	-	Effective interest rate
SFSIGN	-	Sign of sinking-fund payments, negative for artificial compensating issues
TOTAL (2,7)	-	Interest totals
XISSUE (2,109,4)	-	Amount and rate of debt issue
XPENSE (2,109)	-	Amount of debt interest expense

<u>Subroutine PARTYR</u>

FRACTN	-	Fraction of year elapsed at given date
ICLNDR(12)	-	Days elapsed to beginning of month
IDAY	-	Day of month
ILEAP	-	Tells whether year is a leap year
IMON	-	Month number
IYR	-	Year number
JULIAN	-	Days elapsed since beginning of year

<u>Subroutine CHANGE</u>

ICHECK (2,109)	-	Tells whether issue has been deleted
ICLNDR (13)	-	Contains days elapsed to beginning of month
ICOM	-	Command (DELETE,ADD,SORT,PRINT,NONE)
IFEB29	-	=1 if date is Feb. 29
ILEAP	-	=1 if year is a leap year
ILINE (2,109)	-	Line numbers (LTD, PST)
ISSUE (2,109,4)	-	Dates of issue and retirement of debt
ISTEMP (109,3)	-	Temporary location for sorting ILINE
ITEMP1	-	Month bubble-sorting value
ITEMP2	-	Day bubble-sorting value

ITEMP3	-	Year bubble-sorting value
IWRITE	-	Zero if all issues have been deleted
IX	-	Issue to be deleted
LCK (2,109)	-	Tells sorted order of issues
MONTH	-	Month number
NISSUE (2,109,5)	-	Name of debt issue
NUM(2)	-	Number of new preferred issues
RMORIG	-	Original amount of debt
RMOUT	-	Outstanding amount of debt
RMSINK	-	Sinking fund payment to be made
XISSUE (2,109,4)	-	Amount and rate of debt issue

Finance Module (FINANCE)

General Description

The Finance Module, shown schematically in Exhibit 7, combines data from previous programs to produce common financial results of operations. The following table lists unit numbers and DCB parameters associated with each file either processed or generated by FINANCE.

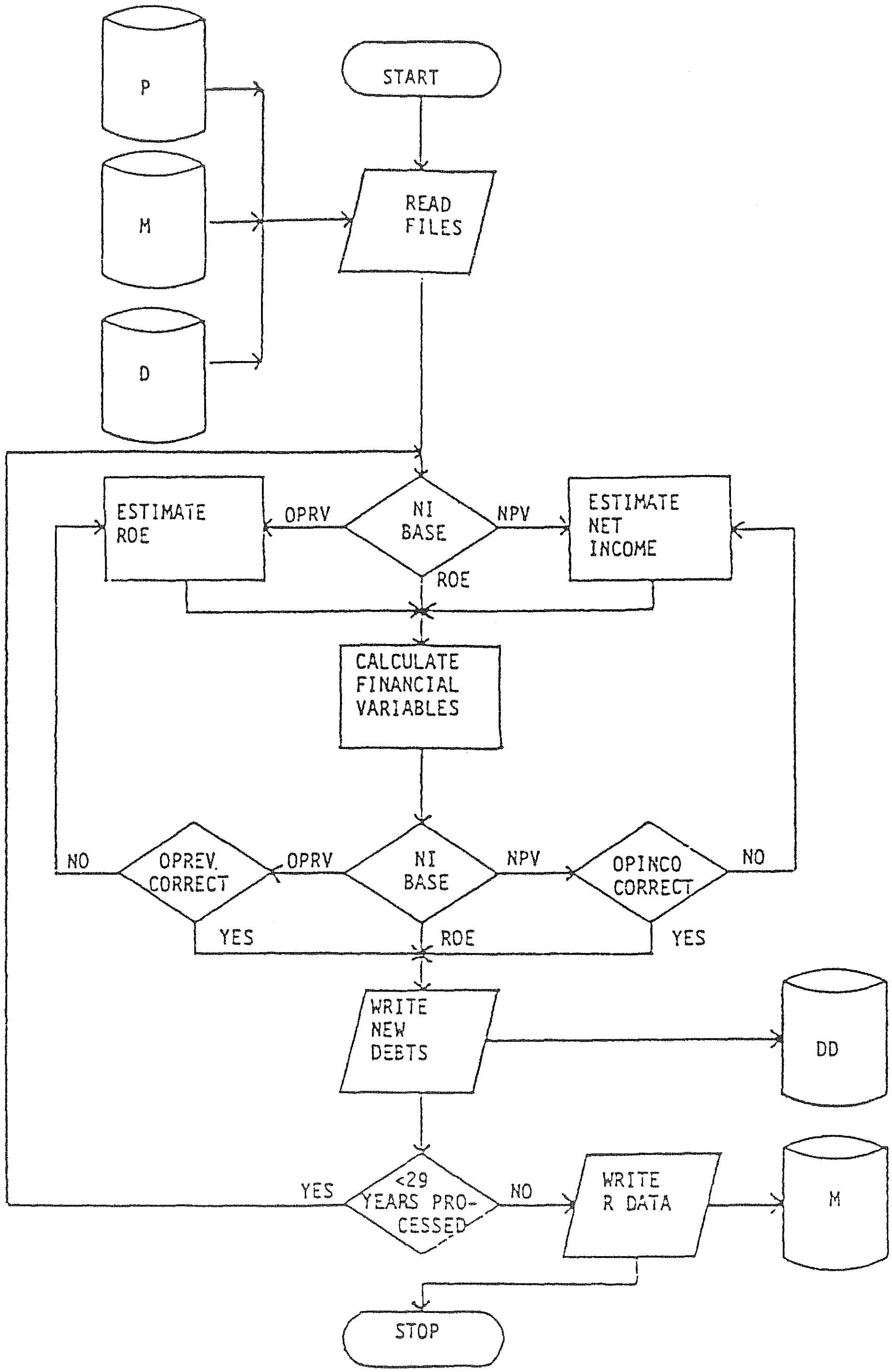
UNIT NUMBER	LRECL	BLKSIZE	USAGE
1	80	800	input file "D"
2	80	800	output file "DD"
3	255	3060	output file "M"
16	255	3060	intermediate file "P"

Physical Layout of Source Code

The Finance Module consists of a main program, FINAN, and eight subroutines: FIN1, FIN2, ROR, FIXOB, PARTYR, STIMAT, STIMOR, and CHKDIV.

EXHIBIT 7

FINANCE MODULE FLOWCHART



Processing Options

The user has specified in a previous run of PLANT, whether operating income is calculated as a fraction of net plant value (NPV), whether operating revenues shall be treated as an exogenous input, or whether net income is based on a return on equity (ROE). The code (NPV, OPRV, or ROE) specifying this choice is read from the M-files. If the code is NPV, the user is asked to specify and "iteration print code" (0, 1, or 2). This code is passed to STIMAT and STIMOR to control diagnostic printing.

The use is also asked to specify either normalized or flow-through accounting, and the method dividend computation as either the dividend payout ratio or dividends per share.

If ROE is specified, subroutines FIN1, FIXOB, and FIN2 are called once per year for 28 years. Each subroutine accesses the data it needs from the array RDATA and stores its output there.

If NPV is specified, the yearly cycle is more complex. Subroutine ROR is called to arrive at the required figure for operating income. An iteration process begins in which STIMAT generates a net income which is used to drive FIN1, FIXOB, and FIN2. If the <u>calculated</u> operating income matches the <u>required</u> value calculated by ROR to within the given tolerance, then FIN1, FIXOB, and FIN2 are called once more in a special mode, in which they store their calculated values in the RDATA array. Otherwise, STIMAT must make a new estimate of net income and the cycle is repeated.

If OPRV is specified, the yearly cycle is started in subroutine STIMOR where ROE estimates are calculated. Should the difference between the calculated (based on ROE) operating revenue and the required operating revenue be less than the given tolerance, FIN1, FIXOB, and FIN2 are called once again to store their calculated values in the RDATA array. If the aforementioned difference is greater than the given tolerance, STIMOR recalculates an ROE estimate and the cycle is repeated.

Processing

Subroutine ROR calculates operating income as a percentage of Net Plant Value (NPV).

Subroutine STIMAT generates estimates of Net Income (NI). On the first call in a year, the estimate is a sum of elements relating net income and operating income. Where the elements are not known, they are taken as 5 percent above the previous year's value.

On the second call in a year, the error in the first estimate is divided by 97 percent. The result is added to the old estimate to get the new estimate. On the third and later calls, the last two estimates are examined and extended to the required level. The rate of change of operating income with a change in net income is assumed to be constant.

Subroutine STIMOR generates estimates of ROR in order to approximate OPREV. On the first call in a year, the ROE estimate and target operating revenues for each model year are read from the Parameter File.

On the second iteration in a year, the first ROE estimate is used with the intercept (80% of OPREV) in order to determine a second ROE estimate. On the third or later calls, the latest estimate is examined against the previous estimate to insure improving results.

Subroutine FIN1 does the bulk of the Finance Module's work. The first time it is called, it reads the entire debt file into core-arrays ILINE, NISSUE, ISSUE, and XISSUE--where it remains until the end of the program's execution.

FIN1 checks the debt file for scheduled retirements and sinking fund payments, and changes XISSUE if necessary to reflect the balance outstanding in each issue.

Note that amounts in XISSUE, as in the D-file, are in thousands of dollars, while those in other program variables are in millions of dollars.

Investment tax credits, tax deferrals, property taxes, and net working capital are computed. Variable TSTD ("temporary short-term debt") represents the amount of funds needed. It will be broken down into long-term debt (DEBTER), short-term debt (STD), preferred and common stock (PFER and EQER), retained earnings (REA), and changes in net working capital (NWC). There are two options on how this is done, depending whether NPV or ROE was specified.

All external financing is done with short-term debt unless it would exceed a given maximum (MXSTD). If it would, STDC is reduced to a given minimum (MNSTD) and the remainder distributed among LTD, PST, and CS according to the ratios REC (ratio of common equity to total capitalization) and RET (ratio of total equity to total capitalization). In either case, retained earnings and common dividends are determined as a fraction of common equity when in the payout-ratio mode, or else as constrained by the dividends-per-share parameter. In the latter mode, subroutine CHKDIV is called at every iteration of the intra-year cycle to compare the calculated dividends-per-share with the target value; a large discrepancy causes the cycle to be reiterated.

If NPV is specified, NI has already been computed in STIMAT (i.e., net income is "given"). An iterative solution is used for PFER which would preserve the proper relationship among PFER, DIVP, and REA.

Subroutine FIXOB computes total interest payments and rates on long-term debt and preferred stock. The expense is the amount outstanding times the interest rate, unless the obligation is issued or retired during the current year. In the case, subroutine PARTYR is used to calculate the fraction of year for which interest should be paid.

Total interest is computed and divided by total amount outstanding to give average interest rate.

Subroutine FIN2 calculates common dividends, federal and state income taxes, operating revenues, and short-term debt interest.

Program Limitations

A number of empty rows have been provided in the M- and P-files in case it is desired to add variables.

Subroutines Used

FIN1	-	Calculates financial transactions: tax credit, deferrals, property tax, net working capital, short- and long-term debt, preferred and common stock, operating revenue.
FIN2	-	Calculates common dividends, income taxes, operating revenue taxes, and short-term debt interest and final figure for operating revenues.
ROR	-	Calculates rate of return on net plant value based on a fraction (RNPV).
FIXOB	-	Calculates interest due on long-term debts and preferred stock issues for a given year.

CHKDIV - Causes reiteration of the loop for a single year whenever calculated dividends-per-share fails to match the specified parameter.

PARTYR - Calculates the fraction of a year elapsed up to a given month and date, e.g., for March 15 of a non-leap year, the answer would be 74/365 or .2027 (used in calculating interest).

STIMAT - Computes an estimate of NI to attempt to match operating income, as calculated by ROR.

STIMOR - Computes an estimate of ROR in an attempt to match required and calculated OPREV.

Variables Used in FINANCE

General Naming Conventions

1. a) Variables which represent Master File entries have mnemonic names (examples: STD--short-term debt, PF--preferred stock, TXPF--taxes paid, federal).

   b) Where a "C" is the last letter it usually means "cumulative." For example, STDC is short-term debt-cumulative while STD is the short-term debt issued (or bought back, if negative) in one year.

   c) Where the program uses the values of a variables for last year and this year, they are designated with the suffixes "1" and "2" respectively. For example, STDC1 is the short-term debt outstanding on 12/31 of last year, and STDC2 is the value on 12/31 of this year.

2. Variables which represent Parameter (P) File entries also have mnemonic names.

3. Debt File values are carried in arrays ILINE, NISSUE, ISSUE, and XISSUE. For the first subscript, 1 = long-term debt; 2 = preferred.

Main Program

ACMETH - Accounting method used (FLOW or NORM)

DCMETH - Dividend computation method used (DPR or DPS)

ICODE - Three-character company code

IDATE	-	Current date
INBASE	-	Income calculation method (net plant value, operating revenue or return on equity)
INFORM	-	Iteration print-level code (low to high: 0, 1 or 2)
INITYR	-	First year to be modeled
ISDONE	-	On NPV and OPREV, tells whether convergence has been reached
ISUFFX	-	Two-digit file suffix
ITER	-	Iteration count
IYEAR	-	Current year number
IYRFST	-	First year number to be modeled
IYRLST	-	Last year number to be modeled
NYRS	-	Number of years in M- and P-file
PARAMS (54,29)	-	Parameter File data
RADATA (29,70)	-	Master File data
RDPR	-	Dividend-payout ratio method
RDPS	-	Dividends-per-share method
RFLOW	-	Flow-through accounting method
RNETPV	-	Net plant value income base
RNORM	-	Normalized accounting method
ROPREV	-	Operating revenue income base
RRETOE	-	Return on equity income base

<u>Subroutine FIN1</u>

ACMETH	-	Accounting method (FLOW or NORM)
ADDCAS	-	Additional current assets
ADDCLI	-	Additional current liabilities
AFDC1	-	Allowance for funds during construction 1 (CEP)

AFDC2	-	Allowance for funds during construction 2 (CEP)
AFDC2C	-	Allowance for funds during construction 2 cumulative. (GPV)
CAPT1	-	Capitalization--previous year
CE	-	Cash expenditures (capital items)
CEP	-	Cash expenditures--value of plant entering service
CS1	-	Common stock--previous year
CS2	-	Common stock--this year
CURAS1	-	Current assets--previous year
CURAS2	-	Current assets--this year
CURLI1	-	Current liabilities--previous year
CURLI2	-	Current liabilities--this year
DCMETH	-	Dividend computation method used
DEBT1	-	Long-term debt--previous year
DEBT2	-	Long-term debt--this year
DEBTER	-	Long-term debt--external required
DEF	-	Income tax deferrals
DEFC1	-	Income tax deferrals, cumulative--previous year
DEFC2	-	Income tax deferrals, cumulative--this year
DEP	-	Straight-line depreciation
DEPA	-	Accelerated depreciation
DEPAFC	-	Depreciation--AFDC--cumulative
DEPAFD	-	Depreciation--AFDC--this year
DEPN	-	Time for amortization of ITC
DIVP1	-	Dividends-preferred stock-previous year
DIVP2	-	Dividends-preferred stock-this year
DPR	-	Dividend payout ratio

DPS	-	Dividends per share
ELEC	-	Fraction of company which is electric
EQ1	-	Common equity-previous year
EQ2	-	Common equity-this year
EQER	-	Common equity-external required
FORCAS	-	Fraction of OPREV1 allocated to current assets
FORCLI	-	Fraction of OPREV1 allocated to current liabilities
FNPCAS	-	Fraction of PLANT allocated to current assets
FNPCLI	-	Fraction of PLANT allocated to current liabilities
FRACTN	-	Percent of year for interest calculation
FUEL	-	Fuel expenses
GNP	-	GNP inflation factor--this year
GNP1	-	GNP inflation factor--last year
GPV1	-	Gross plant value (in service)--last year
GPV2	-	Gross plant value (in service)--this year
ICLNDR(12)	-	Days elapsed to beginning of month
ILINE (2,109)	-	Line number (LTD, PST)
IBASE	-	Income calculation method
INITYR	-	First year in M-file
ISDONE	-	Tells whether convergence has been reached
ISER	-	Series letter for new preferred stock issue
ISSUE (2,109,4)	-	Dates of issue and retirement of debt
ITC	-	Investment tax credit
ITCAM	-	ITC amortization
ITCC1	-	Investment tax credit--deferred (cumulative)--previous year

ITCC2	-	Investment tax credit--deferred (cumulative)--this year
ITER	-	Iteration number
IYEAR	-	Year number (A.D.)
IYR	-	Year number (1st column in MDF=1)
IYRFRST	-	First year modeled
IYRMAT	-	Year of long-term debt maturity
MAINT	-	Maintenance expense
MNCST	-	Minimum common stock issues
MNLTD	-	Minimum long-term debt issue
MNPST	-	Minimum short-term debt issue
MNSTD	-	Minimum short-term debt
MXCST	-	Maximum long-term debt issue
MXLTD	-	Maximum long-term debt issue
MXPST	-	Maximum preferred-stock issue
MXSTD	-	Maximum short-term debt
NI	-	Net income
NISSUE (2,109,5)	-	Name of debt issues
NUM(2)	-	Number of new preferred issues
NUMO(2)	-	Position of new debt issue at start of year
NUMP1	-	Position of new debt issue
NWC	-	Net working capital change
NWCC1	-	Net working capital cumulative--last year
NWCC2	-	Net working capital cumulative--this year
NYRS	-	Number of years in the M-file
OINCOM	-	Other income
OPER	-	Operation expense

OPREV1	-	Operating revenues--last year
OPREV	-	Operating revenues--this year (known components)
PARAMS (54,29)	-	Parameter file data
PE	-	Fraction of plant eligible for investment tax credit
PF1	-	Preferred stock--last year
PF2	-	Preferred stock--this year
PFER	-	Preferred stock--external required this year
PFER1	-	Preferred stock--external required last year
PLANET	-	Net value of utility plant
PURPOW	-	Purchased power expense
RDATA (29,70)	-	Master File data
REA	-	Retained earnings generated this year
REAC1	-	Retained earnings cumulative last year
REC	-	Ratio of common equity to total capitalization
RET	-	Ratio of total equity to total capitalization
RFD	-	Refundings this year
RINT	-	Rate of interest--new long-term debt
RITC	-	Rate of investment tax credit
RMAT	-	Long-term debt maturity time
RPF	-	Rate of interest--new preferred stock--this year
RPF1	-	Rate of interest--new preferred stock--last year
SFP	-	Sinking fund--preferred
SFPAY(2)	-	Sinking fund LTD and PST
SFPINT	-	Interest saved by making sinking fund payment
STD	-	Short-term debt change

STDC1	-	Short-term debt cumulative--last year
TFED	-	Tax rate--Federal
TIMES	-	Retained-earnings loop counter
TPROP	-	Tax rate--property
TSL	-	Tax rate--state and local
TSTD	-	Temporary short-term debt
TXCR	-	Tax credit
TXPROP	-	Property tax
UNCST	-	Unit of common stock issue
UNLTD	-	Unit of long-term debt issue
UNPST	-	Unit of preferred stock issue
XISSUE (2,109,4)	-	Amount and rate of debt issue

Subroutine FIN2

ACMETH	-	Accounting method (FLOW or NORM)
AFDC1	-	Allowance for funds during construction 1 (CEP)
BVCOM1	-	Book value per share common--previous year
BVCOM2	-	Book value per share common--this year
CS1	-	Common stock--previous year
DMETH	-	Dividend computation method
DEF	-	Income tax deferrals
DEP	-	Straight-line depreciation
DEPA	-	Accelerated depreciation
DEPAFD	-	Depreciation--AFDC--this year
DIVC	-	Dividends paid--common
DIVP	-	Dividends paid--preferred
DPR	-	Dividend payout ratio--this year

DPR1	-	Dividend payout ratio--last year
EQ1	-	Common equity--last year
EQ2	-	Common equity--this year
FRBOOK	-	Market-to-book ratio
INBASE	-	Income calculation method
INITYR	-	First year in M-file
INTSTD	-	Interest on short-term debt
ISDONE	-	Tells whether convergence has been reached
ISTD	-	Rate of interest--short term debt
ITC	-	Investment tax credit
ITCAM	-	Amortization of investment tax credit
ITER	-	Iteration number
IYEAR	-	Year number number (A.D.)
NI	-	Net income
NSH1	-	Number of common shares--last year
NSH2	-	Number of common shares--this year
OPREVB	-	Operating revenues not including operating revenue tax
PARAMS (54,29)	-	Parameter file data
PDPR1	-	Dividend payout ratio--base year
REAC1	-	Retained earnings cumulative--last year
STDC1	-	Short-term debt--cumulative--last year
TFED	-	Tax rate--federal
TIF	-	Taxable income--federal
TIS	-	Taxable income--state
TOPREV	-	Tax rate--operating revenues
TSL	-	Tax rate--state and local

TXOREV	-	Tax paid--operating revenues
TXPF	-	Tax paid--federal
TXPS	-	Tax paid--state and local

Subroutine ROR

ACMETH	-	Accounting method (FLOW or NORM)
AFDC1	-	Allowance for funds during construction 1 (CEP)
AFDC2	-	Allowance for funds during construction 2 (CEP)
AFD1C1	-	AFDC1, cumulative, last year
AFC1C2	-	AFDC1, cumulative, this year
AFDC2C	-	Allowance for funds during construction 2 cumulative (GPV)
CE	-	Cash expenditures (capital items)
CEP	-	Capital expenditures--value of plant entering service
CWIP1	-	Construction work in progress--end of last year
CWIP2	-	Construction work in progress--end of this year
DEF	-	Income tax deferrals
DEFC1	-	Income tax deferrals, cumulative previous year
DEP	-	Straight-line depreciation
DEPA	-	Accelerated depreciation
DEPAFC	-	Depreciation--AFDC--cumulative
DEPAFD	-	Depreciation--AFDC--this year
DEPC1	-	Cumulative straight-line depreciation--last year
DEPN	-	Time for amortization of ITC
GPV1	-	Gross plant value (in service)--last year
INITYR	-	First year in M-file
INTLD1	-	Interest on long-term debt--last year

INTSD1	-	Interest on short-term debt--last year
ITCAM	-	Investment tax credit amortization
ITCC1	-	Investment tax credit--deferred (cumulative)--last year
ITCC2	-	Investment tax credit--deferred (cumulative)--this year
IYEAR	-	Year number (A.D.)
NPV	-	Net plant value--in service
OINCOM	-	Other income
PARAMS (54,29)	-	Parameter file data
PE	-	Fraction of plant eligible for investment tax credit
RATBAS	-	Ratebase
RBNWC	-	Net working capital in ratebase
RCWIP	-	Fraction of CWIP included in ratebase
RDEFC	-	Fraction of DEFC deducted from ratebase
RNPV	-	Rate of return on ratebase
TFED	-	Federal tax rate
TSL	-	State and local tax rate
Y1INT1	-	Estimate of long-term debt interest--year 1
Y1INTS	-	Estimate of short-term debt interest--year 1

Subroutine FIXOB

DCMETH	-	Dividend computation method
DIVP	-	Dividends paid--preferred
FRACTN	-	Fraction of year for income calculation
INBASE	-	Income calculation method
INCLNDR (12)	-	Days elapsed to beginning of month
INITYR	-	First year in M-file

INTLTD - Interest on long-term debt

ISDONE - Tells whether convergence has been reached

ISSUE (2,109,4) - Dates of issue and retirement of debt

IYEAR - Year number (A.D.)

NUM(2) - Number of new preferred issues

RATE - Effective interest rate

RDATA (29,70) - M-file data

TOTAL (2,7) - Interest totals

XISSUE (2,109,4) - Amount and rate of debt issue

XPENSE (2,109) - Amount of debt interest expense

NUM(2) - Number of new preferred issues

RATE - Effective interest rate

RDATA (29,70) - M-file data

TOTAL (2,7) - Interest totals

XISSUE (2,109,4) - Amount and rate of debt issue

XPENSE (2,109) - Amount of debt interest expense

<u>Subroutine PARTYR</u>

FRACN - Fraction of year elapsed at given date

ICLNDR - Same as in FIN1

IDAY - Day of month

ILEAP - Tells whether year is a leap year

IMON - Month number

IYR - Year number

JULIAN - Days elapsed since beginning of year

Subroutine STIMAT

AFDC1	-	Allowance for funds during construction 1 (CEP)
ESLOPE	-	Estimate of slope
GROINT	-	Estimate of interest growth rate
INFORM	-	Iteration print-level code (low to high: 0, 1 or 2)
INTLD1	-	Interest on long-term debt--last year
ISDONE	-	Tells whether convergence has been reached
ITER	-	Iteration number
IYR	-	Year number
MXITER	-	Maximum iterations per year
NI	-	New NI guess to be used by FIN1, FIXOB, and FIN2
NONCON	-	Number of consecutive estimates which are successively "worse"
OINCOM	-	Other income
ONI	-	Old NI
OPINCC	-	Current iteration's estimate of OPINCO
OPINCO	-	Target operating income, calculated on basis of this NI estimate
SLOPE	-	Slope of last two estimates
TOLER	-	Tolerance for convergence criterion

Subroutine STIMOR

EROE	-	Calculated estimate of ROE to be used by FIN1
ESTINT	-	Estimated zero-ROE intercept, yearly
ESTROE(29)	-	Estimated ROE, yearly
INFORM	-	Iteration print-level code (low to high: 0, 1, or 2)
ISONE	-	Tells whether convergence has been reached

ITER	-	Iteration number
IYR	-	Year number
MXITER	-	Maximum iterations per year
OOPRVC	-	Last iteration's OPREVC
OPREV(29)	-	Operating revenue, yearly
OPREVC	-	Calculated operating revenue
OROE	-	Last iteration's EROE
PARAMS (54,29)	-	Parameter File data
SLOPE	-	Slope of last two estimates
TOLER	-	Tolerance for convergence criterion

Subroutine CHKDIV

CDPS	-	Dividends per share--calculated value
DIVC	-	Dividends paid--common
DPS	-	Dividends per share--target value
INBASE	-	Income calculation method
ISDONE	-	Tells whether convergence has been reached
ITER	-	Iteration number
IYR	-	Year number
MXITER	-	Maximum iterations per year
NSH1	-	Number of common shares--previous year
NSH2	-	Number of common shares--this year
TOLER	-	Tolerance for convergence criterion

CHAPTER 4

RAMTEL OUTPUT FILES AND REPORTS

RAMTEL produces output from four files, the Master File, the Debt File, the Performance Line-Items File, and the Performance Coefficients File, FIXOBS produces reports from the Debt File.

Performance reports are produced from the Performance Line-Items and Coefficients Files. Financial statement reports are produced from the Master File. These reports are issued by the Report Module.

Master File

The Master File, designated M, is produced by the Finance Module. It contains the financial results of operations for all future years for which RAMTEL has been run. It must be cautioned, however, that some of these data may not be valid. The Master File includes 29 years of data, including the base year. If more than 12 years of historical data are supplied in the History File, then less than 29 years of forecast operations and maintenance expenses will be transferred from the L-file to the Master File. Reports should only be required for valid years; the number of valid year is equal to 41 minus the number of years of historical data.

Although the numeric Master File is actually a formatted string, it can be conceptualized as a matrix whose columns have been strung out one after another. There are 70 rows and 29 columns in the file, corresponding to 70 data elements and 29 years. The elements are identified in Exhibit 8. Each element's source, either a file or module, is also identified.

EXHIBIT 8

MASTER FILE

Row Number	Description	SOURCE History Year COLUMN 1	SOURCE Future Years COLUMNS 2-29
1	ALPHABETIC INFO	-	FINANCE & AGGREG
2	ALPHABETIC INFO	-	PLANT & FINANCE
3	GNP INDEX	AGGREG - L FILE	AGGREG - L FILE
4	GROSS PLANT VALUE	AGGREG - X FILE	AGGREG - X FILE
5	CONSTRUCTION WORK IN PROGRESS	"	"
6	DEPREC.-CUMUL.	"	"
7	DEPREC.-CUMUL.	"	"
8	NET WORK. CAP. CUM.	AGGREG - I FILE	FINANCE
9	COMMON STOCK	"	"
10	COMMON STOCK REQUIRED	-	"
11	RET. EARN. CUMUL.	AGGREG - I FILE	"
12	RET. EARN. THIS PERIOD	-	"
13	PREFERRED STOCK	AGGREG - I FILE	"
14	PREF. STOCK REQUIRED	-	"
15	LONG-TERM DEBT	AGGREG - I FILE	"
16	LTD REQUIRED	-	"
17	LTD REFUNDED	-	"
18	SHORT-TERM DEBT	AGGREG - I FILE	"
19	STD CHANGE	-	"

EXHIBIT 8--continued
MASTER FILE

Row Number	Description	SOURCE History Year COLUMN 1	 Future Years COLUMNS 2-29
20	INC. TAX DEFERRED-CUMUL.	AGGREG - I FILE	"
21	INC. TAX DEFERRED-THIS PERIOD	-	"
22	AFDC CAPITALIZED-CUMUL	AGGREG - X FILE	AGGREG - X FILE
23	AFDC CAPITALIZED-THIS PERIOD	-	"
24	OPERATING REVENUES	AGGREG - I FILE	FINANCE
25	NOT USED	-	AGGREG - L FILE
26	NOT USED	-	"
27	OPERATION EXP.	-	"
28	MAINTENANCE EXP.	-	AGGREG - L FILE
29	DEPRECIATION EXP.	-	AGGREG - X FILE
30	TAX PAID-STATE	-	FINANCE
31	TAX PAID-FEDERAL	-	"
32	OTHER TAX	-	"
33	OTHER INCOME	-	AGGREG - I FILE
34	AFDC	-	AGGREG - X FILE
35	LTD INTEREST	-	FINANCE
36	LTD INTEREST RATE AVG.	-	"
37	LTD INTEREST RATE END	-	"
38	PREFERRED DIVIDENDS	-	"

EXHIBIT 8--continued
MASTER FILE

Row Number	Description	SOURCE History Year COLUMN 1	SOURCE Future Years COLUMNS 2-29
39	PREFERRED DIVIDENDS RATE AVG.	-	"
40	PREFERRED DIVIDENDS RATE END PERIOD	-	"
41	STD INTEREST	-	"
42	FRACTION ITC EXCLUDED FROM RATEBASE	-	P FILE
43	COMMON DIVIDENDS	-	FINANCE
44	RETIREMENTS	-	AGGREG - X FILE
45	FRACTION OF CWIP IN RATEBASE	-	P FILE
46	FRACTION DEFERRALS NOT IN RATEBASE	-	P FILE
47	NET INCOME	-	FINANCE
48	INVEST. TAX CREDIT	-	"
49	ITC AMORTIZATION	-	"
50	CAPITAL EXPEND.	-	AGGREG - X FILE
51	SINKING FUND PAYMENT	-	FINANCE
52	CONSTRUCTION EXPEND.	-	AGGREG - X FILE
53	NET WORK	-	FINANCE
	CAP. INCREMENT		
54	ACCUM. DEPREC.-AFDC	AGGREG - X FILE	AGGREG - X FILE
55	ITC-CUMULATIVE	AGGREG - I FILE	FINANCE

EXHIBIT 8--continued
MASTER FILE

Row Number	Description	SOURCE History Year COLUMN 1	SOURCE Future Years COLUMNS 2-29
56	ITC DEFERRED	-	"
57	AFDC IN CWIP	AGGREG - X FILE	AGGREG - X FILE
58	AFDC DEPRECIATION	"	"
59	RATEBASE	-	FINANCE
60	NET WORKING CAPITAL IN RATE BASE	-	P FILE
61	PROPERTY TAXES	-	FINANCE
62	MAXIMUM SHORT-TERM DEBT	-	FINANCE
63	BOOK VALUE PER SHARE COMMON	-	FINANCE
64	NUMBER OF SHARES COMMON	-	FINANCE
65	DIVIDEND PAYOUT RATIO	-	FINANCE
66	MARKET-TO-BOOK RATIO	-	P FILE
67	CURRENT LIABILITIES	-	FINANCE
68	TAXABLE INCOME--FEDERAL	-	FINANCE
69	TAXABLE INCOME--STATE	-	FINANCE
70	NOT USED	-	-

Performance Line-Items File

The Performance Line-Items File, designated L, is produced by the Performance Module. It contains operations and maintenance costs for historical and future years--40 years in all. The number of historical years is specified in the History File.

The Line-Items File can be conceptualized as a matrix with 41 columns and up to 206 rows whose rows have been strung out one after another (See Exhibit 9).

The first two rows are not accounts. They contain alphabetic information and GNP inflation factors, respectively. (The GNP series comes from row 1 of the Adjustment File.) Following these two header rows are up to 180 rows of operations and maintenance expenses in current dollars. Immediately following the O&M expense rows are up to 24 rows containing "exogeneous variable" accounts.

Performance Coefficients File

The Performance Coefficients File, designated C, is produced by the Performance Module. It contains regression methods, regression coefficients, and measures of goodness of fit, for all O&M accounts.

The first row, containing only alphabetic data, is followed by up to 180 rows--one for each O&M account. The length of each row is equal to 8 plus 2 times the number of exogeneous variables allowed (currently 5). The items in each row are identified in Exhibit 10.

Plant Line-Items File

The Plant Line-Items File, designated X, is produced by the Plant Module. It contains capital costs, plant in service, CWIP, AFDC, and depreciation for each RAm has been run.

The Plant Line-Items File can be conceptualized as a matrix with 29 columns and up to 136 rows whose rows have been strung out one after another. Each column refers to a year; the base year is column 1. The rows are identified in Exhibit 11.

EXHIBIT 9

PERFORMANCE LINE-ITEMS FILE (L)

ROW NUMBER	DESCRIPTION	
	COLUMN 1	COLUMNS 2-41
1	FILE NAME AND SUFFIX	ALPHABETIC INFORMATION
2	BLANK	GNP SERIES
3	O&M ACCOUNT NUMBER	HISTORICAL AND FUTURE EXPENSES
.	.	.
.	.	.
.	.	.
X (LESS THAN 184)	EXOGENOUS VARIABLE ACCOUNT NUMBER	HISTORICAL AND FUTURE VALUES FOR THE EXOGENOUS VARIABLE
.	.	.
.	.	.
.	.	.

EXHIBIT 10

PERFORMANCE COEFFICIENTS FILE (C)

COLUMN	DESCRIPTION
1	O&M ACCOUNT NUMBER
2	REGRESSION METHOD
3	NUMBER OF VALID HISTORIC YEARS USED IN REGRESSION
4	NUMBER OF REGRESSION COEFFICIENTS
5	R^2 CORRELATION COEFFICIENT SQUARED
6	COEFFICIENTS AND EXOGENOUS VARIABLES
.	.
.	.
.	.
16	STANDARD DEVIATION
17	STANDARD ERRORS
.	.
.	.
.	.
22	

EXHIBIT 11

PLANT LINE-ITEMS FILE

	Row	Description
	1	FUTURE PLANT ACCOUNT NUMBER; BOOK LIFE; TAX LIFE
UP	2	CAPITAL EXPENDITURES (VALUE OF PLANT ENTERING SERVICE)
TO	3	CONSTRUCTION EXPENDITURES
10	4	AFDC CAPITALIZED--(AFDC2)
SETS	5	BOOK DEPRECIATION--FUTURE PLANT
	6	TAX DEPRECIATION--FUTURE PLANT
	7	AFDC DEPRECIATION--FUTURE PLANT
	-	
	-	
	-	
UP	71	EXISTING PLANT ACCOUNT NUMBER; GPV; BOOK NPV; BOOK DEPRECIATION
TO	72	±1; EXISTING PLANT RETIREMENTS (MILLIONS OF DOLLARS)
15	73	BOOK DEPRECIATION--EXISTING PLANT
SETS	74	AFDC DEPRECIATION--EXISTING PLANT
	-	
	-	
	-	
	131	CWIP (EXCLUDING AFDC)--TOTAL FOR ALL ACCOUNTS
	132	CONSTRUCTION EXPENDITURES--TOTAL FOR ALL ACCOUNTS
	133	AFDC ASSOCIATED WITH CWIP (AFDC1)--TOTAL FOR ALL ACCOUNTS
	134	TAX LIFE; TAX DEPRECIATION RATE; BASE YEAR TAX DEPRECIATION TAX NET PLANT VALUE
	135	TAX DEPRECIATION--EXISTING PLANT
	136	FILE NAME AND SIZE PARAMETERS

Report Module (REPORT)

The Report Module is intended to allow for quick selection of a few standard reports and for easy preparation of more specialized reports. The program repeatedly prompts the user to select a report or graph and stores the selections until the user chooses to begin printing. The program then loops through the selected reports and prints each in turn. When printing is finished, the user can select an additional set of records. The following table lists the unit numbers and DCB parameters for various files processed and generated by REPORT.

UNIT NUMBER	LRECL	BLKSIZE	USAGE
3	255	3060	output file "M"
4	133	1330	output option
7	250	3000	output file "C"
8	255	3060	output file "L"
10	76	760	ACNAMES.DATA
19	160	160	work file

Physical Layout of Source Code

Report Module consists of a main program, REPORT, and twenty subroutines:

NLIST, SPLIT, MREAD, CONST, NSCALE, FHEADR, TITLES, FBODY1, FBODY2, FBODY3, FBODY4, FDOBY5, EJECT, LREAD, GRAPHS, IBASE, GHEADR, LEGEND and GDATA.

Processing

The Report CLIST is used to prompt for input and output file information as noted previously. The Report Module's option, OUTFILE, is dependent upon the CLIST question "WILL ANY REPORTS BE WRITTEN TO A DISK FILE (YES OR NO)..." If NO is answered to this question, OUTFILE is no longer an available option because the associated file has not been allocated for use. If YES is answered, the user may specify the dataset name to be associated with this file when it is allocated. Hence, the OUTFILE option is effective, producing a cataloged dataset.

Report selection, the major pivotal point of the program, is the prompt "WHICH REPORT?". As each entry is made, the first word is checked for validity. NONE, OPTIONS, RETAIN, CANCEL and HELP are simple operations which are looked for first.

If they are found, the operations are performed and "WHICH REPORT?" is again asked (except following NONE). Otherwise, the first word is checked against valid report names. If a match is not made, the rest of the line is ignored and "WHICH REPORT?" is repeated. If a report is recognized, a flag is set to that report and the rest of the input line is examined.

Report Specifications

Parameters controlling report specifications are set to default values which cannot be altered without recompiling the program. These are contained in the DEFALT array. When a report is recognized, the DEFALT array is copied to the SPECS array which contains the specifications actually used to print the report. If in examining the remainder of the input line, a valid option is found, the corresponding specification in the SPECS array is altered to override the DEFALT value. If an entry on the input line is not recognized as a valid option, only it is ignored--the other entries are still used.

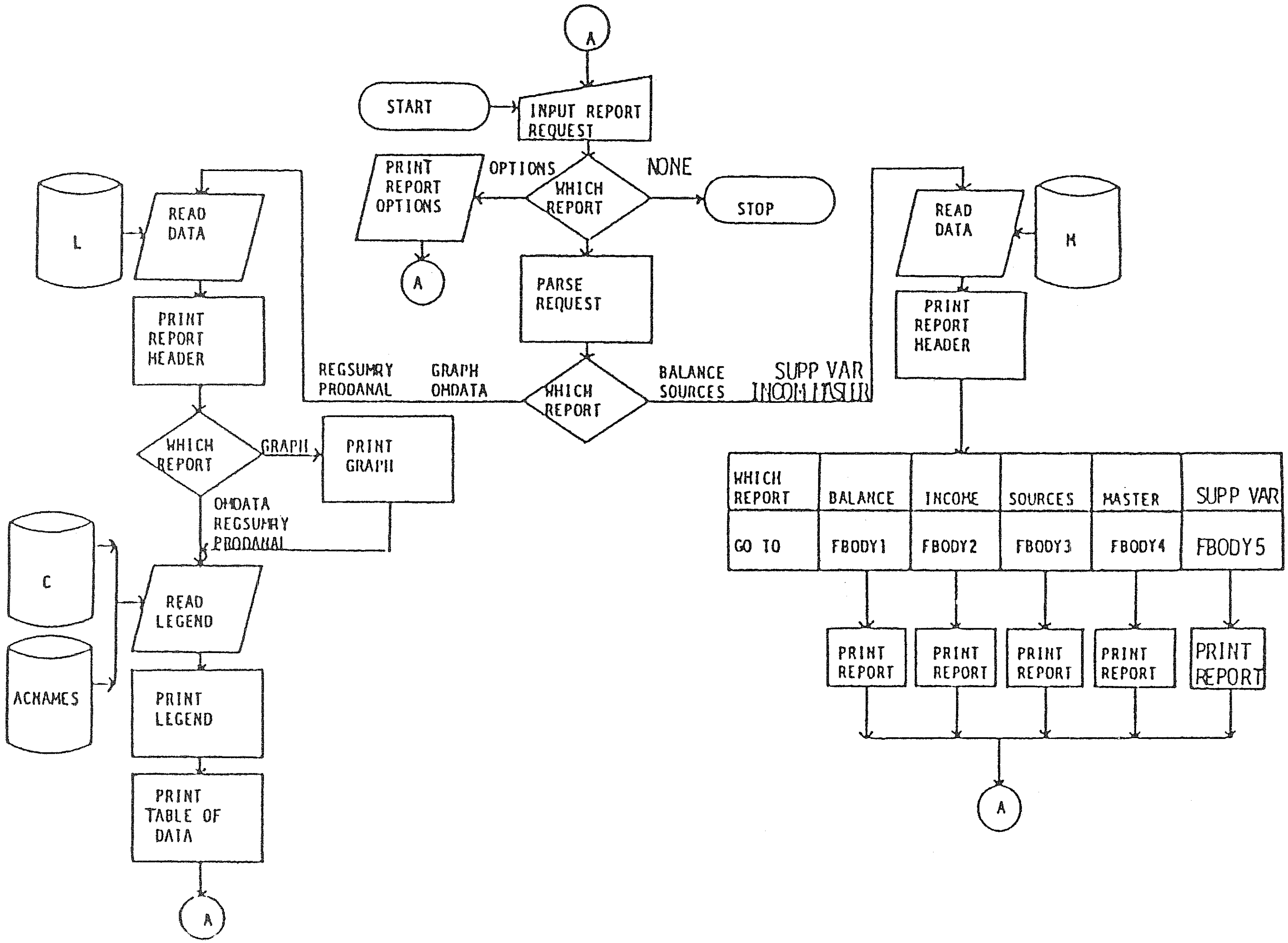
After each entry on the input line is examined, the SPECS array is scanned to determine if all specifications are in order. This is because a default value can be set which will force the user to select a specific item at execution time. This is in effect a "no default" situation. If a SPECS value indicates that more information is needed, it is requested interactively from the terminal.

Printing

After the last report is specified, the program loops through the number of reports which were selected and prints each in turn. Here the data are read from the input file and the body of the report is written

EXHIBIT 12

REPORT MODULE FLOWCHART



using multiple pages if necessary. When printing is finished, the program returns to the "WHICH REPORT?" prompt, retaining the specifications for the last report in case the user gives the RETAIN command.

Program Limitations

Presently, the Report Module contains nine report formats. New reports may be easily added, however. To add a report which reads the Master File, for example, the following steps should be followed:

- ROWS must be changed to include the rows to print from the DATA array.
- DEFALT must be changed to include the specifications for the new reports, and NR must be increased.
- READ must be changed to branch to a new section of code which would calculate the values to be printed in the report and store them in the rows of DATA references by ROWS.
- A subroutine must be written, similar to FBODY1, to print the body of the report.
- The main program must be changed to call the new subroutine within the DO 1170 loop after label 1040.
- The name of the new report must be entered in REPORTS.

Only five O&M accounts may be printed on a single table or graph in the OMDATA and GRAPH report.

Subroutines Used

NLIST - Similar to SPLIT except it returns an array of integers which is a full, expanded numeric list of the items entered. NLIST is only used for numeric lists. For example, if the following were input:

1, 5-9, 15, 16

Then "LIST" would contain:

1 5 6 7 8 9 15 16

and COUNT would = 8.

SPLIT - Interprets a 72A1 line under free-format rules and returns a list of alphabetic items found in the line. For example, if "LINE" contained the following string "ONE, TWO, THREE, 4, FIVE, ETC." then the following would be returned:

LIST(1) = "ONE"
LIST(2) = "TWO"
LIST(3) = "THREE"
LIST(4) = "4"
LIST(5) = "FIVE"
LIST(6) = "ETC."

- MAXCH indicates how many characters per item found in "LINE" to copy to "LIST"; MAXLIN is the characcter position of the last character in "LINE" to SCAN.

MREAD - Gets the data from the M-file and puts it in array RDATA, Rows 1-70. It also performs aggregations of these values, using ROws 71-90, if reports 1-5 have been specified.

CONST - Converts data to constant dollars using GNP inflation factors in Row 2 of the M-file or Row 2 of the L-file.

NSCALE - Multiplies the RDATA array by a scale factor (conversion to thousands of millions of dollars).

FHEADR - Writes the header for the BALANCE, INCOME, SOURCES, and MASTER reports.

TITLES - Prints the year numbers as column titles.

FBODY1
FBODY2
FBODY3
FBODY4
FBODY5 - Prints the body of the balance, income, sources, supp var, and master reports. FBODY1-FBODY5 use array ROWS to tell which M-file row to put in which report row, except FBODY4, which prints all rows.

SKIP - This subroutine writes the number of blank lines specified to unit IUPR.

EJECT - Prints a page eject-symbolized by the character "1" appearing first in a record in a report.

LREAD - Reads the data for the graphing routine. Alphabetic data goes to IGRAPH, deflation factors to DEF, and data go to GRAPH. If IACC is returned as -1, none of the requested accounts was found. If SPECS (2, NREPS) = "ALL", LREAD is called again and again, for each account, and IACTNO returns the account number.

GRAPHS - This subroutine initializes an array to all blanks, determines the range of data in "GRAPH", figures out intervals based on a Y-axis 50 points high and prints the graph based on an X-axis of 32 points on a narrow carriage terminal, 40 on a wide.

IBASE - Determines the two digit year number from a L-file column number. For example, if the first column in the L-file represents 1965, IBASE (10) = 74.

GHEADR - Writes the header for the GRAPH and OMDATA reports.

LEGEND - Prints the legend for graphs, using IGRAPH and the C-file entry for each account, as well as the O&M names files, ACNAMES.

GDATA - Prints a tables of the data for one to five O&M accounts for a given set of years.

Variables Used IN REPORT

IGRAPH (41,5) - Assorted data for up to five accounts

1. Company code
2. File suffix
3. Creation date
4-11. Company name
12. YEAR1 (first historic)
13. YEAR2 (first projected)
14. YEAR3 (last projected)
15. NYRS
16. NLROWS
17. NCROWS
18. NCCOLS
19. SCALE factor

GRAPH (41,5) - Yearly O&M data for up to five accounts

DEF(41) - GNP deflation factors

LINE(72) - Used for inputting data

DEFALT (12,9) - Defaults may be set to blanks)" ") before running the program if users must supply responses. Exceptions to this are:

Report Name
Maximum number of rows--activated by ROWS option
Maximum row number
Report number
Base year--received through data files for graphs

Defaults are in sets of 12 for each report:

1. Report name
2. Maximum number of rows
3. Maximum number of columns (yrs)
4. Maximum width of output
5. Constant/current $ flag
6. Scale factor 1 = Data shown in millions, 1,000 = thousands
7. Maximum row number
8. Input file name
9. Output choice (6, 4, or " ")
10. Output file name (see CLIST)
11. Report number (used as flag)
12. Base year

In the graphing report, all defaults are used in the same way except:

2) number of accounts to print

6) scale factor not available--determined automatically

In any default is set to a blank, then a request for that item will be made at the terminal.

LIST(20) - "Decoded" list of words from terminal input

REPRTS (2,15)- Data for HELP in choosing reports

NREPS - Number of reports to be printed or number of current reports. GRAPH counts as 2--one line for DEFALTS, the other for up to 5 accounts.

OPTION (2,10)- Valid qualifiers following the report-name

SPECS (12,11)- May hold up to 10 reports or 5 graphs or a combination thereof. Choices are stored here (from DEFALT) until report or graph is ready to be printed. Each line is taken directly from the DEFALT line and modified according to options entered.

RTP (69,10) - "ROWS TO PRINT" array. For each report, initialized to 1-maximum number of rows. If the ROWS option is taken, RTP is changed to row numbers to be printed.

CTP (40,10) - "COLUMNS TO PRINT" array. Similar to RTP but for columns.

RDATA (90,29)- Retains data for reports. Data is in form:

ROWS - Tells which items of data file should be printed for each report. Zeros are repeated as a filler.

RTP2	-	If ROWS option is used, desired row numbers are temporarily stored here before going into RTP array
CTP2	-	Similar to RTP2, but for columns instead of rows