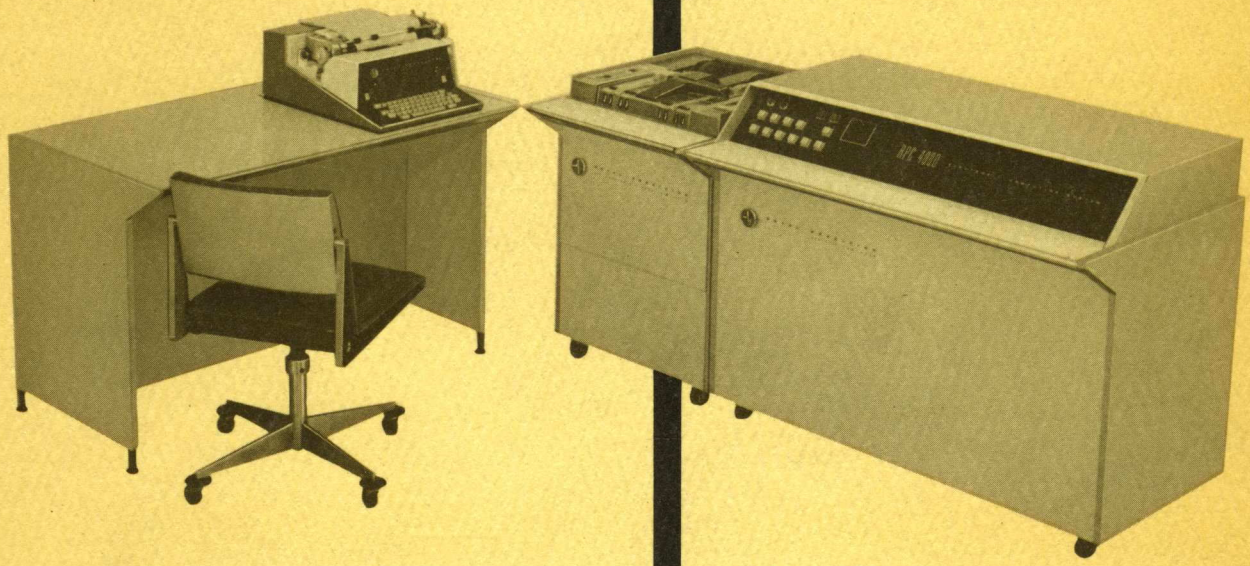
RPC 4000

11-02.0



PERT 2 programming manual

GENERAL PRECISION, INC.
Commercial Computer Division

PERT 2

PROGRAM EVALUATION REVIEW TECHNIQUE

for the **RPC 4000** General Precision Electronic Computer

PROGRAM NO. 11-02.0

"PERT 2" is an RPC-4000 program which was written by Test Division, Chemical Research and Development Laboratories, U. S. Army Chemical Center. While it has been tested and is believed to be correct, the authors and General Precision, Inc., bear no responsibility for errors resulting from its use.

NOTE: Under no circumstances is the Army Chemical Center to be contacted with questions relating to the coding or operation of this program. Such questions should be directed to the local office of General Precision, Inc., Commercial Computer Division.

"PERT 2" requires the MPT octal-binary shift modification specified in the Service Department Field Information Notice No. 420-1.

CONTENTS

ILLUSTRATIONS

1 INTRODUCTION

PERT — Program Evaluation and Review Technique — is a computer program which was developed by the U. S. Navy as a means of planning and managing large projects such as the Polaris Fleet Ballistic Missile Program.

The first PERT program was designed to provide and evaluate the initial data on a project. These data are plotted as a network of activities and events which lead toward achievement of certain objectives. On the basis of such network, PERT can evaluate various plans of operation and select the most effective one, as well as provide management with the necessary information to act upon changes in conditions which may affect completion of the project. PERT has proven to be highly effective in reducing project costs and reporting expenses, even though it involves more detailed planning than other management procedures.

PERT 2, program I1-02.0 for the RPC-4000 is a follow-up program — also U. S. Navy developed — which enables management to evaluate the current validity of approved plans and schedules, progress to date, and outlook for completing objectives on time. In addition, like PERT 1, it permits management to simulate the effect of alternate decisions under consideration and to study their effect upon the project deadlines, prior to implementation.

The PERT programming technique — properly operated and integrated with other management planning and control tools — can be a valuable management aid which is only limited by the accuracy of the information provided by the project planners.

GENERAL DEFINITIONS

The PERT system elements discussed here are general features of all PERT programs. Terms which apply specifically to "PERT 2" will be explained as they are encountered.

Network

A network consists of the events and activities required to accomplish an objective. It is based on the results of a detailed analysis of project requirements, including its overall scope and the extent to which a job should be broken down into events and activities. The latter elements are arranged in order of their sequence of completion, with an indication of their interdependencies.

PERT Chart

A PERT chart is the graphical representation of the network. It records and displays related events and activities in terms of their dependency relationships. The events are indicated by circles or ellipses on the PERT chart; the activities by straight lines which connect the events. Each activity line terminates in an arrowhead which indicates direction of flow. Time estimates for the activities are usually stated along the activity lines. Event dependency exists when an event can not be completed until other events have been completed; this dependency is depicted by the activity lines.

Event

An event occurs at a discrete point in time and is the start or completion of an activity or group of activities, not the actual performance of an activity. As

the event can be the result of several activities, it can not be considered complete until all activities leading to it are completed.

Event Describer

An event describer is a clear and complete statement of the nomenclature of an event. It must include all information necessary to discriminate that event from all other events.

Event Identifier

An event identifier is an arbitrary number assigned to an event in accordance with a numbering scheme agreed upon by the network users.

Event Code Letter

An event code letter identifies the type of event; that is, it denotes whether the event is the initiating point or the terminating point of an activity. The letters used are arbitrary and depend upon prior agreement of the users of the network.

Dummy Event

A dummy event is introduced when needed to cause a PERT network to conform to the limits of a particular PERT program. A dummy event is not an actual time point and does not require an event describer. Dummy events are illustrated in the PERT chart in the same manner as real events.

Event List

An event list consists of the event identifier, the event code letter, and the event describer.

Key Event

Key events or milestones are important bench marks of a project which may be used to judge the progress and performance of a program.

Activity

An activity is a time-consuming element of a network. Each activity must have a specific initiating (predecessor) event and a specific terminating (successor) event. While a PERT network requires that the predecessor event for an activity be completed before that activity can be started, the nature of an activity may be such that it can actually be started at any point in time at the discretion of the program manager.

Activity Describer

An activity describer is a clear definition of an activity. Activity describers denote action, so they must not be confused with event describers. The activity describers will usually not appear on the PERT chart.

Activity Identifier

An activity identifier consists of a combination of the predecessor event number and the successor event number for that activity. An activity identifier is not

designated as such on the PERT chart, but is included in the input data for the PERT program.

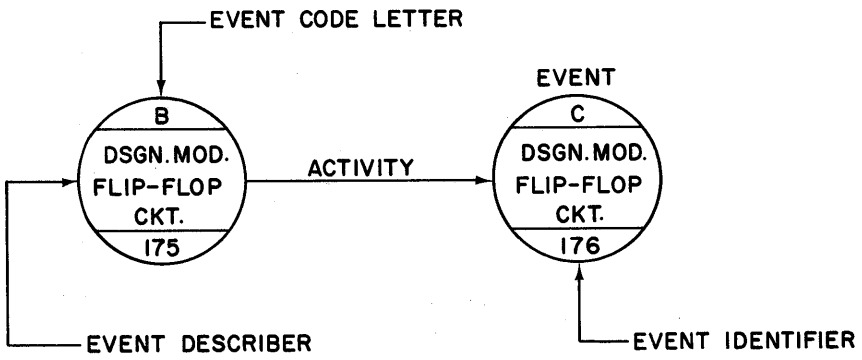
Dummy Activity

A dummy activity is introduced when actual activities can not be otherwise legally expressed in the PERT network. Dummy activities do not require the performance of a task nor do they take time. They do not require activity describers. Dummy activities are illustrated in the PERT chart like real activities.

Activity List

An activity list is comprised of the activity identifier and the activity describer. An organization number may also be stated before the predecessor event number.

The event-activity relationships discussed above are illustrated in Figure 1.



EVENT LIST

175 B DESIGN MODIFICATION FOR FLIP-FLOP CIRCUIT
176 C DESIGN MODIFICATION FOR FLIP-FLOP CIRCUIT

ACTIVITY LIST

10-175B 176C DESIGNING MODIFICATION FOR FLIP-FLOP CIRCUIT

ACTIVITY IDENTIFIER

ACTIVITY DESCRIBER

ORGANIZATION NUMBER

FIGURE 1 Event-Activity Relationship

ORGANIZATIONAL RESPONSIBILITY

A program manager must be cognizant of the division of responsibility to supervise his organization properly. In the development of a network, he must realize that a line manager is generally able to provide adequate planning information only for his own area of responsibility. That is, he should be able to identify events immediately preceding and succeeding his area, but will not be aware of events not connected directly with his department.

The network technique can provide quick identification of organizational responsibility. After assigning areas of responsibility to the appropriate departments, the PERT chart can be drawn in such a manner that each area or department is grouped separately and then connected to the total plan at the appropriate point. During the monitoring of a program, each department manager can be provided with a separate listing for the area with which he is particularly concerned.

An organization code number is used to distinguish one area from another and should precede the activity identifier in the activity list. Certain identical activities could be assigned to different departments, in which case these activities may connect the same two events. However, as each activity is defined by its organization number, it is considered not to be identical to the other activities joining the two events.

TIME ESTIMATES

The PERT technique allows three time estimates for each activity — an optimistic estimate, a most likely estimate, and a pessimistic estimate. The activity times are estimates of the time necessary to complete an activity in a specified manner. These three estimates are then reconciled by the computer to express a most probable time or expected duration for each activity. These times should not be chosen to show a preconceived average; rather they should be the honest estimates of the departments and personnel responsible for the individual tasks. The success of PERT depends upon realistic time estimates. The same basic unit of time must be used throughout the network.

Optimistic Time

The optimistic time estimate is the shortest time for completing an activity under unusually favorable circumstances. The probability that this time could be shorter than the estimate stated should be 1 out of 100.

Most Likely Time

The most likely time estimate is the reasonable expectancy for normal completion of activity.

Pessimistic Time

The pessimistic time estimate is the longest time for completing an activity if unusual difficulties are experienced. The probability that the time could be even longer than the estimate given should be 1 in 100 or less.

Duration Time

A single time estimate, duration time, may be used in the PERT network if the program planner can calculate a close approximation of the definite time required for an activity.

CRITICAL PATH

A critical path is the sequence of interconnected events and activities in a network, between the start of the program and its completion, which comprises the most rigorous time constraints in the accomplishment of the end event.

Critical Neighbor

The critical neighbor is an event immediately preceding the event under consideration. It is located on the critical, or most time-consuming path leading to that event.

Slack and Slack Paths

Slack paths are sequences of activities which would take more or less time than the critical path. Slack denotes the time difference between the latest and expected dates, and may exist in varying amounts indicating scheduling flexibility within the network. It is positive when its expected date is earlier than its latest date and negative when its expected date is later than its latest date.

EVENT/ACTIVITY DEPENDENCIES

Constraint

Dependency relationships between events and activities in a PERT network are also known as constraints. A certain activity may be a constraint upon the start of several other activities and on the completion of an event.

Parallel Construction

A parallel construction (Figure 2) occurs when two or more concurrent activities are a constraint upon a common subsequent event.

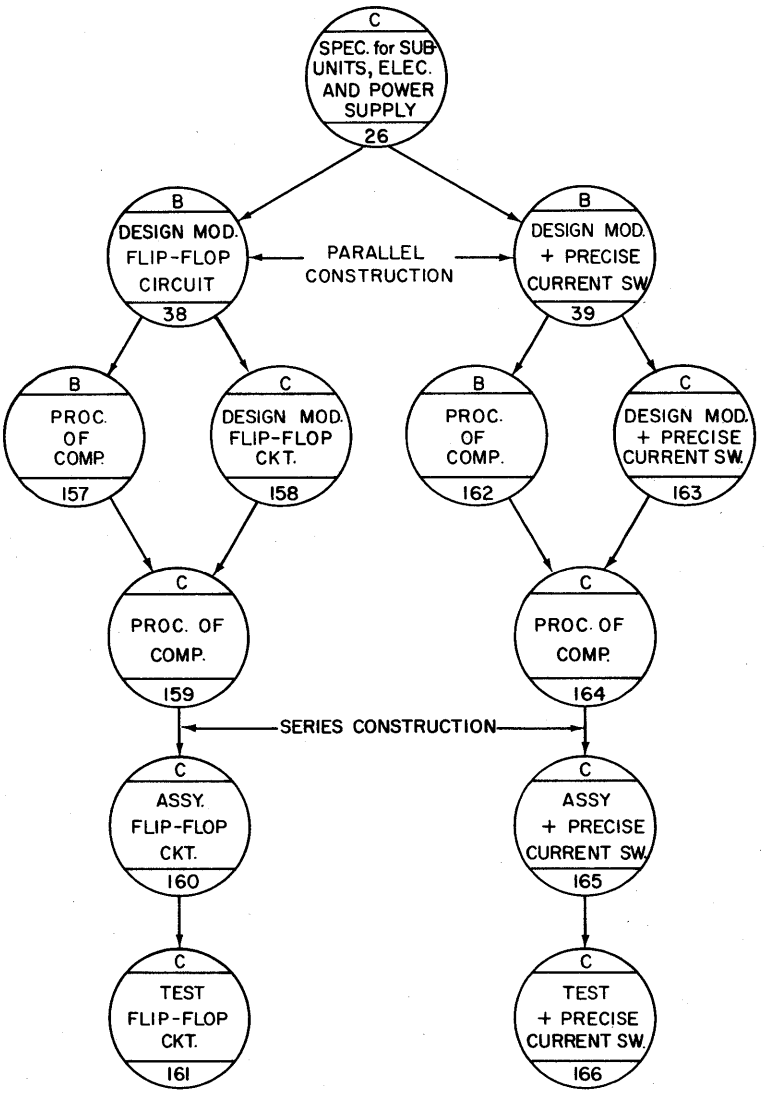


FIGURE 2 Parallel and Series Construction

Series Construction

A series construction of events and activities is essentially the same as a parallel construction (Figure 2). It is used when the dependencies form a progressive or additive chain.

Burst

A burst (Figure 3) occurs when several events are constrained by a previous single event. Dummy activities are used to connect the one predecessor event with the burst when no time is required to go from one to the other.

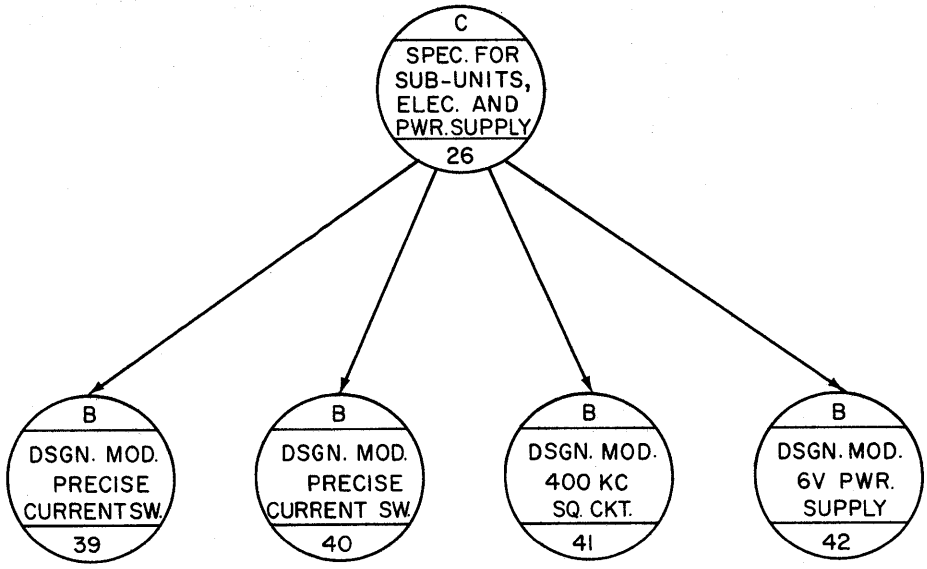


FIGURE 3 Burst Construction

Merge

A merge (Figure 4) exists when a single event is constrained by several preceding events. Again, dummy activities may be used to connect the merge with the one successor event if there is no time involved.

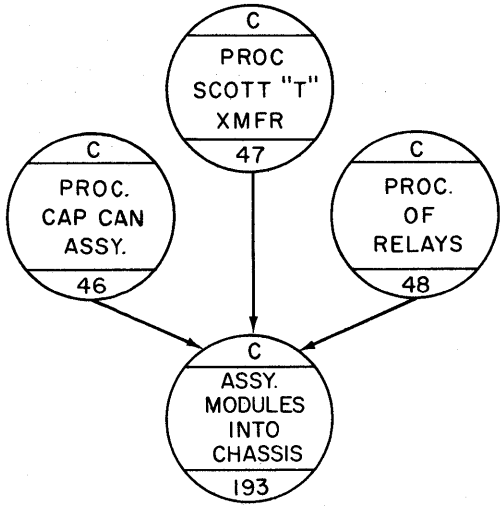


FIGURE 4 Merge Construction

NETWORK RULES AND RESTRICTIONS

The following statements define the conditions of any PERT network and show how certain cases may be illustrated on the PERT chart.

1. No activity can have a negative time estimate, nor can there be any loops in the network.

2. There can be no isolated events in the network. All events except the start event must have a preceding activity, and all events but the final event must have a succeeding activity.

3. There can be only one start event and one final event in a network. If there are actually multiple start or final events in the project, they must be connected by dummy activities going from or into a single dummy event.

4. Two events can be joined by one activity only, except in certain cases described under "ORGANIZATIONAL RESPONSIBILITY".

5. Two or more activities which are performed concurrently cannot be represented by the same activity line in the PERT chart. In this case, dummy activities must be introduced (Figure 5).

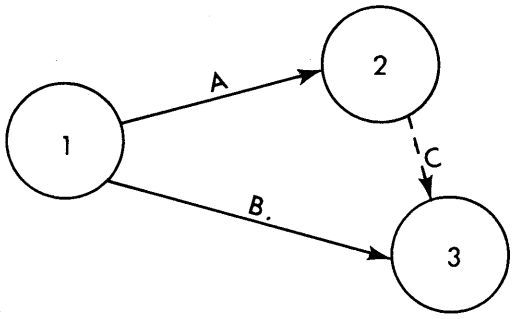


FIGURE 5 Concurrent Activities Requiring Dummy Activity

In the illustration above, activities A and B are performed concurrently. Since they cannot be represented by the same activity line in the PERT chart, a dummy activity, C, is introduced which requires no time to complete.

6. When an activity is dependent upon two concurrent preceding activities and its concurrent activity is only dependent upon one of those preceding activities, a dummy activity must be introduced (Figure 6).

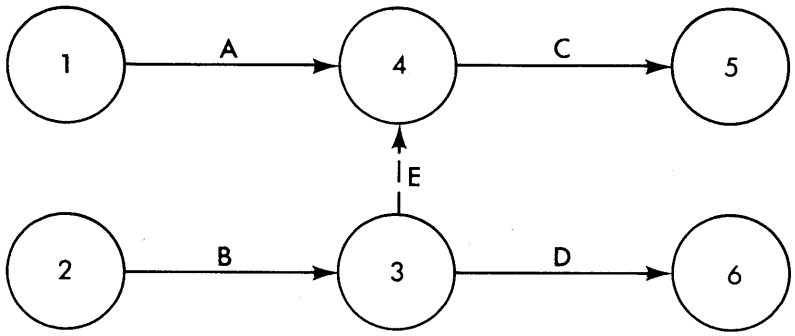


FIGURE 6 Concurrent Activities with Varying Dependencies

Activity A and B must be completed before activity C can begin. Activity B must be completed before activity D can begin. A dummy activity, E, is introduced to show that activity C is dependent upon both activity A and B.

7. In some cases, both the start event and complete event for an activity must be shown if the activity need not be completed before succeeding activities can begin. For example, an activity may start before a preceding activity is completed, but its completion can not occur until the preceding activity is finished, as in Figure 7. Dummy activities must be used to illustrate the actual dependencies, and both start and complete events must be used.

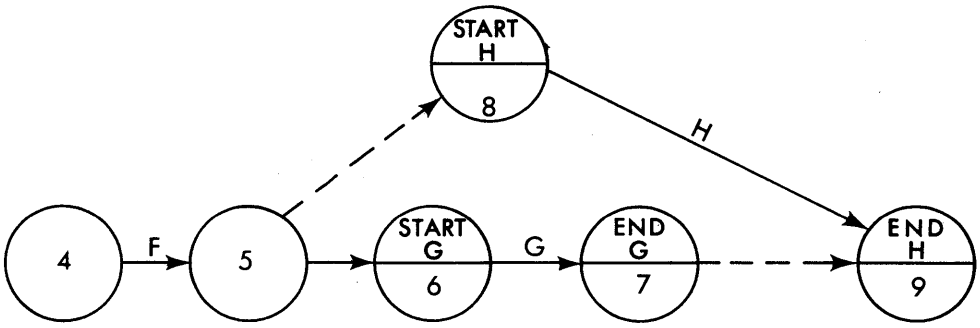


FIGURE 7 Clarification of Actual Dependency

8. Events and activities which depict already established dependencies should not be introduced as they will only clutter the PERT chart visually and slow the network processing speed in the computer.

INPUT DATA

"PERT 2" accepts data from the typewriter or from a previously prepared data tape. The data must conform to the format and sequence of entry described in this section. Each item must be followed by a carriage return.

Table of Organization

The first group of data expected by "PERT 2" consists of the table of organization; that is, the list of all department numbers used in describing the activities in the network to be processed. The department numbers must be entered in the order in which they are to be output. (See "DEPARTMENT" under the discussion of output options.)

A maximum of 31 department numbers can be used, each to be stated as two decimal digits within the range $01 \leq N \leq 99$ and followed by a stop code. The entry of 0* signifies the end of the table, or the fact that no department numbers are being used. If a department number greater than 99 is read only the last two digits will be stored in memory.

Activity List

The second group of input data consists of the descriptions of the activities in the network to be processed. The format of an activity description is as follows:

Department-Predecessor Event*-Successor Event* Time Estimate*

Department Number

The department number need be included only when the output will be by departments. (See "DEPARTMENT" under the discussion of output options.) The number must consist of two decimal digits in the range $01 \leq N \leq 99$. The department number is immediately followed by the predecessor event name.

Predecessor Event

The predecessor event numbers consist of a dash and four characters. The digits 0 through 9 and the letters A through F may be used. The dash must be included in every case, and each number must be followed by a stop code. The event number may not be blank or all zeros. Typical examples would be:

-123A* and -0017*

Successor Event

The successor event number is composed of a dash and four characters. The digits 0 through 9 and the letters A through F may be used. The dash must be included in every case, and each number must be followed by a stop code. The event number may not be blank or all zeros. (See "Predecessor Events" for typical examples).

Time Estimate

Each time estimate is composed of three parts: optimistic time, most likely time, and pessimistic time. Each value must be an integer in the range $0 \leq E \leq 511$, expressing the estimated number of time units that will be requir-

ed to accomplish the activity. (The maximum time for a network may not exceed 1023 time units.) Each value must be followed by a stop code. The relationship between the three values must be: Optimistic $\leq$ Most Likely $\leq$ Pessimistic.

When all time values for an activity are equal, a single value followed by an "E" may be entered. For example, a time estimate may be stated

20*20*20* or 20E*

A zero time estimate indicates a dummy activity.

Activity Limits

The number of events must be in the range $2 \leq N \leq 1023$. The number of activities may not exceed 2048. The activity list is terminated by entry of a 0* code after the last activity. Identical activities can not be used, but activities are considered to be identical only if the department number, predecessor event, and successor event are the same.

Scheduled Events

Following the activity list, "PERT 2" will accept any scheduled events. This is a list of events with a definite schedule of completion dates. These entries will indicate the relationship between the estimated completion dates for the activities and the computer completion dates.

Each entry in this list is stated as

Event number*Scheduled date*

The event number is stated as a dash, four characters, and a stop code. The date is stated as month, day, and year, separated by dashes; each consisting of two digits with leading zeros where necessary. The list is terminated by a 0* code. For example,

-0017*01-04-66*

Indicates that event 0017 is scheduled for completion on January 4, 1966.

Key Events

The list of key event numbers is entered after the list of scheduled events. Each key event number consists of four characters preceded by a dash and followed by a stop code. The digits 0 through 9 and the letters A through F may be used. The list is terminated by a 0* code. (See "Predecessor Event" for typical examples).

Special Input

To facilitate updating of the input data, correction of the data, identification of activities that have been completed, and/or deletion of unnecessary activities, the following special input formats have been provided.

Completion

An activity may be identified as having been completed by entering the activity identifier, the letters "DONE", and either the starting and completion dates of the activity or the duration of the activity. Dates are expressed as month-day-

year, and duration is expressed as an integer. The following statements illustrate the two acceptable methods of expressing completion:

09-0001*-0050*DONE*2*

09-0001*-0050*DONE*07-08-62*08-16-62*

The first example indicates that the activity took 2 time units to complete. The second example states that the activity was begun July 8, 1962 and completed August 16, 1962.

Deletion

An activity may be deleted from memory by entering the activity identifier followed by the word "DELETE". For example, to delete activity 09-0001*-0002* enter

09-0001*-0002*DELETE*

Sequential Deletion

A group of activities may be deleted by entering the code "BACKxx*" where xx is the number of activities. This code may be used following a Type 1 error printout (see "PROGRAM OPERATION"), and will cause the preceding xx activities to be ignored.

Scheduled Event Deletion

To remove events from the Scheduled Events List, enter the event number and the word "DELETE", each followed by a stop code. For example, to delete event 0020, enter

0020*DELETE*

This may be done following input of the Scheduled Events List, either from the keyboard or by entering a new tape containing all deletions for this list.

Key Event Deletion

To delete an event from the Key Events List, precede the event number to be removed with the letter "D". For example, to delete key event 0035, enter

D-0035*

This may be done following input of the Key Events List, either from the keyboard or by entering a new tape containing all deletions for this list.

Preliminary Data

Prior to accepting the input data (see "OPERATING PROCEDURE"), the computer will request entry of preliminary data through the typewriter. The statements are listed and the required responses explained below.

ENTER NO DAYS IN TIME UNIT, TO 1/4 DAY

Following this printout the computer will return the typewriter carriage and wait for input of the number of working days (8 hours to a day) as a time unit, followed by a stop code. Type the value as a decimal number, accurate to 1/4 day. The number must be in the range $.25 \leq N \leq 511.75$.

For example:

1* = 1 day (time estimates are in 1 day units, or eight hours)
5* = 5 days (time estimates are in 5 day units, or 40 hours)
.25* = 1/4 day (time estimates are in 2 hour units)
.50* = 1/2 day (time estimates are in 4 hour units)
5.25* = 5-1/4 days (time estimates are in 42 hour units).

ENTER NO DAYS IN WEEK, TO 1/4 DAY

Following this printout the computer will again return the typewriter carriage and pause for entry of the number of calendar days worked in one week, followed by a stop code. Type the value as a decimal number, accurate to 1/4 day. If the actual number of working days in a week exceed 7 (for example, in a two-shift operation), the time unit must nevertheless be stated as 7 working days/week, due to the limitations of this program. These two values — number of days in time unit, and number of days per week — will establish the number of working hours in a week. The number of days worked in a week must be in the range $.25 \leq N \leq 7$.

For example:

5* = 5 working days in one week.
4.5* = 4-1/2 working days in one week.

DATE OF START [MONDAY]

Following this printout the computer will return the typewriter carriage and pause for entry of the start date for the project, followed by a stop code. The date must be stated as month, day, and year, separated by dashes and each consisting of two digits with leading zero when necessary. The project start date entered must be a Monday, and not necessarily the actual start date of the project.

For example:

01-02-61* = Monday, January 2, 1961.

05-13-63* = Monday, May 13, 1963

START EVENT NAME

Following this printout the computer will return the typewriter carriage and pause for entry of the number of the start event for the network, followed by a stop code. The number must consist of a dash and four characters. The digits 0 through 9 and the letters A through F may be used. The number may not be blank or contain all zeros.

Some typical numbers could be:

-0001*

-FF00*

FINAL EVENT NAME

Following this printout the computer will return the typewriter carriage and pause for entry of the number of the final event in the network, followed by a stop code. This number must be stated in the same manner as the start event number (above).

READ TABLE OF ORGANIZATIONS

Following this printout the computer will select the reader and accept the organization and activity data for the project.

INPUT SCHEDULED EVENTS

Following this printout the computer will select the reader and accept the scheduled events list.

INPUT KEY EVENTS

Following this printout the computer will select the reader and accept the key events list.

3 DATA OUTPUT

GENERAL

"PERT 2" lists the computed data in columns according to the logical or specified order of activities or events. A number of options are available, which determine the type of output that will be obtained. The three conventions of identifying output data, shown below, apply to every type of output chosen:

1. Each date that was entered as a scheduled date will be followed by the letter "S" where it is output as the latest date allowable for completion of an activity or event.

2. Each activity and event that was identified as being completed will have a "C" after the date in the expected completion date column to show that this is the actual completion date.

3. Each activity that was identified as being completed will have an "A" after the expected duration to indicate that the value is the actual duration of the activity.

When the computer halts after printing "WHEN TYPEWRITER LIGHT COMES ON, SELECT OUTPUT UNITS AND ENTER RUN DESIRED-", enter the title of the selected output option, followed by a stop code. Next, the desired output devices are manually selected. Then the computer commences output (see "OPERATING PROCEDURE").

Each date output will be stated as month-day-year (values separated by dashes). Slack time is stated in weeks (preceded by a minus sign for a negative value), rounded to the nearest whole week. The probability for completing an event or activity on time will be stated accurate to two decimal places. The expected duration of an activity will be stated in whole weeks.

An automatic return to an input instruction will result after completion of each output option except PUNCH, which requires a depression of the START COMPUTE switch.

OUTPUT OPTIONS

Activity

The activity output option will cause "PERT 2" to print the latest allowable or scheduled date, the expected or actual completion date, the slack time, the probability of meeting the latest allowable or scheduled date, and the expected duration of each activity in the network.

The activity option is selected by typing ACTIVITY in response to the computer statement. Following entry of the option title, the computer will return the typewriter carriage and print "BY ACTIVITY, LOGICAL ORDER" to indicate the sequence of output of the activities. Logical order means that the data for an activity will be output as soon as all constraining activities are completed, beginning with all activities initiated by the start event.

For example, in the following list of activities, event 0001 constrains the completion of events 0002 and 0003, and is the start event for the network. Event 0003 constrains the accomplishment of event 0002. Therefore, activities initiated by event 0003 are listed before activities initiated by event 0002.

PREDECESSOR EVENT	SUCCESSOR EVENT
0001	0002
0001	0003
0003	0002
0003	0005
0003	0016
0002	0005
0002	0004

In the illustrated sequence of activities, "PERT 2" will next examine event 0005 for any remaining constraint, then event 0016, then 0004; and it will list the remainder of the network in the order of the completed successor events.

Activity data are listed in eight columns, each with a heading as follows:

Heading	Meaning
PREDECESSOR EVENT	The name of the initiating event for the activity being considered.
SUCCESSOR EVENT	The name of the completing event for the activity being considered.
DEPT	The optional department number for the activity being considered. If no department numbers are entered, this column is blank but the heading is always printed.
ALLOW-SCHED DATE	The latest date allowable for completion of the activity so the project may be finished on schedule, or the scheduled completion date that was input for this activity. All scheduled dates will be followed by an "S".
EXPD-COMP DATE	The expected date of activity completion based on activity time estimates, or the actual date entered as the completion date of the activity. All completion dates will be followed by a "C".
SLACK	The difference in weeks between the allowed or scheduled date and the expected date for completion of the activity. No slack time is computed for activities that are designated as completed.
PROB	The probability of meeting the allowed or scheduled date for completion of an activity, based on the activity time estimates.
EXPT DURA	The computed time estimate, in case multiple estimates were entered, or the input time estimate for each activity, stated as the number of weeks.

Critical Path

The critical path output option will cause "PERT 2" to print the latest allowable or scheduled time, the expected or completion time, the probability of meeting the latest allowable or scheduled date, and the expected duration for each activity in the network. Output begins with the critical path through the network and continues until the final activity is reached, or thirty activities have been printed. The computer will then continue with the rest of the network in ascending order of slack.

The critical path option is selected by typing CRITICAL PATH in response to the computer statement. Following entry of the option title, the computer will return the typewriter carriage and print "BY CRITICAL PATH, COMPLETE NETWORK" to indicate the sequence of output of the activities. The activities are listed as groups according to slack time, in ascending order of slack.

For example, all activities having a slack time of -2 would be printed before activities having a slack time of -1; all activities whose slack is -1 would be printed before those whose slack is 0; all whose slack is 0 would be printed before those whose slack is 1; etc.

Critical path, like activity data, is printed in eight columns.

Department

The department option is selected by typing DEPARTMENT in response to the computer statement. Following entry of the option title, the computer will return the typewriter carriage and print "BY DEPARTMENT" to indicate the order of output of the activities. This option may be used only if department numbers are included in the activity descriptions. The activities in each department will be grouped in logical order, and the listing will be by department in the order in which the department numbers were entered during input (see "INPUT DATA"). Only the departments in the organization list will be printed.

For example, if the department numbers 01*02*04*03* were entered in this order, output by departments would be in the order of all activities preceded by department number 01 in logical order, then 02 in logical order, then 04, and last 03.

Department data are printed in eight columns.

Full

The full option is selected by typing a space and FULL in response to the computer statement. The space is required because five characters must be entered. Following entry of the option title, the computer will return the typewriter carriage and print "BY MAJOR EVENT" to indicate the order of output.

This option directs "PERT 2" to list the events in the network in the order in which they are encountered during input. The events designated as start and final by the programmer will always be the first and second output respectively.

The data are listed in four columns with these headings:

Heading	Meaning of Data
EVENT NUMBER	The name of the event, stated as four characters (consisting of the numbers 0 through 9 and/or the letters A through F), exactly as input.
ALLOW-SCHED DATE	The latest date allowable for completion of the event so the project may be completed on schedule, or the scheduled completion date that was input for this event. All scheduled dates will be followed by an "S".
EXPD-COMP DATE	The expected date of event completion based on activity time estimates, or the actual date entered as the completion date of the event. The event will be indicated as completed only if all its constraining activities are indicated as completed. All completion dates will be followed by a "C".

Heading	Meaning of Data
SLACK	The difference in weeks between the allowed or scheduled date and the expected date for completion of the event. No slack time is computed for activities that are designated as completed.
PROB	The probability of meeting the allowed or scheduled date for the event, based on activity time estimates.

Key Event

The key event option is selected by typing KEY EVENT in response to the computer statement. Following entry of the option title, the computer will return the typewriter carriage and print "BY MAJOR EVENT" to indicate the order of output. This option directs "PERT 2" to print the data for the key events only. The data will be printed in the same order and manner as for the FULL option.

Restricted

The restricted critical path option is selected by typing RESTRICTED in response to the computer statement. Following entry of the option title, the computer will return the typewriter carriage and print "BY CRITICAL PATH" to indicate the order of output. This option directs "PERT 2" to print only the data for activities with negative or zero slack time in the same order and manner as for the CRITICAL PATH option.

Time

The time option is entered by typing a space and TIME. The preceding space is required because five characters must be entered. Following entry of the option title, the computer will return the typewriter carriage and pause for entry of the limiting date and a stop code. This is the latest expected completion date desired for output. The date is entered as month-day-year, each with two digits. Following entry of the date, the computer will list all activities whose expected completion date is prior to the stated limiting date. The activity data will be printed in the order and manner described under "ACTIVITY".

Punch

The punch output option will cause "PERT 2" to punch a Hexadecimal tape containing all program data in memory. These data are partially processed so the output tape is only acceptable for re-entry when SENSE SWITCH 2 is used (see "OPERATING PROCEDURE"). This option should be used if future program runs with the same data are planned.

Recall

The recall option is employed in the same manner as the previous output options, that is, RECALL is typed in response to the computer statement. However, this is not an output option, but can be used when program data in memory is to be modified. To do so, reload phase 1 of the subject program after the option title has been entered (see "OPERATING PROCEDURE"). When this portion of the subject program has been loaded, the computer will immediately transfer control to the update subroutine, and corrections to the data in memory may be entered. When all changes have been input, load phase 2 of subject program, and "PERT 2" will be ready to accept designation of the desired output option. The update subroutine is discussed under "OPERATING PROCEDURE."

4 OPERATING PROCEDURES

PROGRAM TAPE

The subject program is contained on the program tape in two sections: Phase 1 and Phase 2, in this order. The program tape is in hexadecimal format with bootstrap for Phase 1. When Phase 1 is loaded, it will have stored the bootstrap for Phase 2. The Phase 1 portion ends with a transfer to the beginning of "PERT 2." The Phase 2 portion ends with a transfer to the selection of the output option subroutine.

BOOTSTRAP PROCEDURE

The procedure for loading Phase 1 of the "PERT 2" program tape is as follows (using the basic RPC-4000 input/output system):

1. Place the tape in the reader.
2. De-select all off-line units.
3. Depress MASTER RESET to de-select all on-line units.
4. Select READER TO COMPUTER.
5. Depress ONE OPERATION.
6. Depress SET INPUT MODE.
7. Depress EXECUTE LOWER ACCUMULATOR.
8. Depress START COMPUTE. Wait for reader to stop.
9. Depress START COMPUTE.
10. Raise EXECUTE LOWER ACCUMULATOR.
11. Depress SET INPUT MODE.
12. Raise ONE OPERATION.
13. Depress START COMPUTE. The bootstrap will now read in and load Phase 1 without stopping.

After Phase 1 is stored in memory, the computer will halt. This halt occurs before the transfer code is executed to facilitate placement of the data tape in the reader. This must be read and stored before Phase 2 is loaded. At this time set the tab stops for the printout. Begin at the left margin and proceed in increments of 3, 13, 10, 8, 13, 8, 4, 8, and 7 spaces. Depressing START COMPUTE will cause the transfer code to be executed, and "PERT 2" will type requests for information prior to reading data. When a printout of input data is desired, copy mode must be selected by the operator.

Manual Transfer to Phase 1

If Phase 1 is already in memory, the following procedure may be used to transfer control to the beginning location:

1. Select TYPEWRITER TO COMPUTER.
2. Depress ONE OPERATION.
3. Depress SET INPUT MODE.
4. Depress EXECUTE LOWER ACCUMULATOR.
5. Depress START READ (on-line).
6. Type 00000002*
7. Raise EXECUTE LOWER ACCUMULATOR.
8. Raise ONE OPERATION.
9. Depress START COMPUTE. Computer control will be transferred to a Halt instruction.
10. Depress START COMPUTE. The initial requests for information will be printed.

DATA LOADING PROCEDURE

The preliminary data requests and the required responses are explained under "DATA INPUT." After the computer has typed "READ TABLE OF ORGANIZATIONS," it will immediately accept input. After the activity list has been loaded, the computer will type "INPUT SCHEDULED EVENTS" and immediately accept the scheduled event list. When this list has been read, the computer will print "INPUT KEY EVENTS" and immediately accept the key event list. All data will load with no intervention required by the operator. Any incorrect data will cause an error printout and halt. See discussion of error stops under "ERROR PRINTOUTS" later in this section.

Phase 2 Loading Procedure

When the data are loaded correctly, the computer will de-select the input device and pause on an input command, ready to accept Phase 2 of "PERT 2." The procedure for loading Phase 2 is as follows:

1. Place the Phase 2 tape in the reader.
2. Depress READER TO COMPUTER. The Phase 2 tape will load.

After Phase 2 is loaded correctly, the typewriter will print "WHEN TYPEWRITER LIGHT COMES ON, SELECT OUTPUT UNITS AND ENTER RUN DESIRED-" and pause for selection of the output option. (See "DATA OUTPUT.")

Manual Transfer to Output Option Selection

When Phase 2 is in memory, the operator may manually transfer at any time to the selection of output option portion of the program through the following procedure:

1. Depress MASTER RESET.
2. Select TYPEWRITER TO COMPUTER.
3. Depress ONE OPERATION.
4. Depress SET INPUT MODE.
5. Depress EXECUTE LOWER ACCUMULATOR.
6. Depress START READ (on-line).
7. Type 000004CE*
8. Raise EXECUTE LOWER ACCUMULATOR.
9. Raise ONE OPERATION.
10. Depress START COMPUTE. Control will be transferred to the output option selection portion of the program.

AUTOMATIC LOADING PROCEDURE

Using both the basic reader and a high-speed reader, the entire program tape and the data tape can be loaded without intervention by the operator, except to answer the printed computer queries (see above). For this procedure, both Phases 1 and 2 of the program should be combined on a single tape. The following procedure describes the use of the high-speed reader in reel mode. (To employ strip mode, depress STRIP after step 10).

1. Depress STANDBY on high-speed reader.
2. Load program tape so it will read forward.
3. Depress FORWARD.
4. Raise STANDBY. When light under this button goes off, the reader is ready to operate.
5. Place data tape in basic reader.
6. Depress MASTER RESET to deselect all on-line units.
7. Deselect all off-line units.
8. Depress ONE OPERATION.
9. Depress SET INPUT MODE.
10. Depress EXECUTE LOWER ACCUMULATOR.

11. Depress START COMPUTE.
12. Depress SELECT on high-speed reader. Wait for reader to stop.
13. Depress START COMPUTE.
14. Raise EXECUTE LOWER ACCUMULATOR.
15. Depress SET INPUT MODE.
16. Raise ONE OPERATION.
17. Depress START COMPUTE. The bootstrap will now read in and load Phase 1 without stopping.
18. Depress SENSE SWITCH 1 anytime while Phase 1 is loading. The computer will type requests for information automatically when Phase 1 is loaded.
19. Type responses to computer queries. The data will load automatically, followed by Phase 2, when the last response is completed. The computer will type output option selection direction and pause, ready for operation.

UPDATE PROCEDURES

"PERT 2" contains an update subroutine that can be used to enter changes to data that are in memory. The subroutine may be entered immediately after the data are loaded by employing Sense Switch options during input of Phase 1 of the program tape; it may be entered immediately after any output option is completed by typing the title RECALL; or it may be entered by a manual transfer.

The computer will type two requests for information when the update subroutine is entered, as follows:

Query	Response
ENTER START EVENT	Type a dash, the four-character start event number, and a stop code. The start event entered may be the same as or different than the preceding entry.
ENTER FINAL EVENT	Type a dash, the final event number, and a stop code. The final event entered may be the same as or different than the previous entry.

The computer will then pause for entry of data modifications. The order is the same as that for initial data input, except the organization list is omitted; namely the activity list changes, the scheduled event list changes, and the key event list changes are entered in this order. Each set of changes is terminated by 0*, which may also be used alone to indicate no changes for a list.

Update with Decimal Data Tape

The original decimal data tape may be loaded and changes to activities entered immediately. However, any changes to the organization list, scheduled event list, or key event list require that a new tape be punched containing the changes. The new tape is then used for data input. (Note: deletions in the scheduled event and key event lists may be made when the respective lists are input initially, as described in Chapter 2).

To input changes to activities or a new tape with changes for the lists given above, the following procedure will transfer control to the update subroutine immediately after the activity list is read:

1. Depress SENSE SWITCH 1 while Phase 1 of the program is being read.
2. Type data requested (start event and final event).
3. Raise SENSE SWITCH 1.
4. Type modifications to activity list followed by 0*. Reader must be selected manually if modifications are on tape.
5. Enter scheduled event list.
6. Enter key event list.
7. Load Phase 2 of the program and operate in normal manner.

Update with Hexadecimal Tape

The hexadecimal tape produced by the PUNCH output option (see "DATA OUTPUT") may be used as the data input tape and the update subroutine entered, if the following procedure is followed:

1. Depress SENSE SWITCH 2 while Phase 1 of the program is being read.
2. Depress START COMPUTE. Data will start reading if the automatic loading procedure is being used.
3. Depress START COMPUTE again if the automatic loading procedure is not being used.
4. Type response to computer queries.
5. Enter modifications to activity list, enter scheduled event list, and enter key event list.
6. Load Phase 2 of the program.

Update with Recall Option

Data already in memory may be altered through use of the RECALL option as explained under "DATA OUTPUT." After RECALL has been typed in response to the computer statement, follow this procedure:

1. Place Phase 1 in the reader, past the bootstrap.
2. Select the desired reader.
3. Enter the responses to the computer queries.
4. Enter the changes to the activity list, scheduled event list, and key event list.
5. Load Phase 2 of the program.

Manual Transfer to Update Subroutine

At any time after Phase 1 of the program is in memory, control may be transferred to the update subroutine through the following procedure:

1. Depress MASTER RESET.
2. Select TYPEWRITER TO COMPUTER.
3. Depress ONE OPERATION.
4. Depress SET INPUT MODE.
5. Depress EXECUTE LOWER ACCUMULATOR.
6. Depress START READ (on-line).
7. Type 00000006*
8. Raise EXECUTE LOWER ACCUMULATOR.
9. Raise ONE OPERATION.
10. Depress START COMPUTE. Computer control will be transferred to update subroutine.
11. Respond to computer queries.
12. Enter modifications to activity list, scheduled event list, key event list.
13. Load Phase 2 of program.
14. Respond to computer statement in normal manner.

SENSE SWITCH OPTIONS

Various options for input are available through Sense Switch settings:

Sense Switch	Use When Depressed
1	Transfer to update subroutine when the decimal data activity list is read.
2	Enter hexadecimal data tape and transfer to update subroutine.
8	Load program automatically. That is, the START COMPUTE switch is not used during input. Two input devices are required for this option.

ERROR PRINTOUTS

When "PERT 2" detects an error in the input data, it will type an error identification and halt. Below is a list of the various error printouts, and an explanation of their meaning to facilitate error recovery (see "ERROR RECOVERY"):

Printout	Meaning	Type
E0 ORG FULL	More than 31 department numbers are contained in the organization list.	1
E1 TOO MANY ACTIVITIES INPUT	The activity list contains more than 2048 entries.	1
E2 TOO MANY EVENTS INPUT	More than 1023 event numbers are contained in the activity list.	1
E3 TIME ESTIMATE TOO BIG ( )	No activity may use more than 511 time units. The predecessor event number for the activity is printed below the error designation.	1
E4 TIME ESTIMATES INCONSISTENT ( )	The activity time estimates are stated incorrectly. The predecessor event number is printed below the error designation.	1
E5 START EVENT NOT USED	The event designated as the start event during input of data is not connected to the network.	2
E6 INTL EVENT HAS BACK BRANCH	The event designated as the start event during input has a constraining activity.	2
E7 FINAL EVENT NOT USED	The event designated as the final event during input is not connected to the network.	2
E8 FINAL EVENT HAS FWD BRANCH	The event designated as the final event during input is a constraint on an activity.	2
E9 NO PATH TO EVENT ( )	The event stated has no constraining activity and is not the start event.	2
E10 NO PATH FROM EVENT ( )	The event stated is not a constraint on any activity and is not the final event.	2
E11 EVENT IN WRONG FORM ( )	The last event number read was composed incorrectly. The assumed correct form for the event is also printed.	1
E15 EVENTS ( ) ( ) ARE IN OR ARE BLOCKED BY A LOOP	The events whose numbers are listed are constrained by or contained in an ambiguous loop.	2
E16 SCHEDULED EVENT NOT IN NETWORK ( )	The event stated is contained in the scheduled event list but not in the activity list.	3
E17 DATE IN WRONG FORM ( )	The scheduled date for the event stated is in the wrong form.	3
E18 SCHEDULED DATE TOO REMOTE ( )	The date scheduled for the event stated is too remote.	3
E19 KEY EVENT NOT IN NETWORK	An event is in the key event list but not in the activity list.	3

Note: Errors number E12, E13, and E14 are not used by "PERT 2."

ERROR RECOVERY

As shown in the preceding list, there are three types of errors that can occur during entry and arrangement of data for a program run: errors detected during input of organization and activity data; errors detected after activity is stored; and errors detected during input of scheduled event and key event data.

TYPE 1 ERRORS When an error is discovered while the organization or activity list is being read, "PERT 2" types an indication of the error and halts with no further input of data taking place. Depressing the START COMPUTE switch will either return computer control to the beginning of Phase 1 for complete re-entry of data in the case of errors E0, E1, and E2, or will cause the computer to select the typewriter for entry of the correct data in the case of the other errors of this type.

TYPE 2 ERRORS When an error is discovered after all activity data have been stored and the complete network has been tested, "PERT 2" will print all error indications and halt without reading the scheduled event or key event lists. Depressing the START COMPUTE switch will cause control to be transferred to the update subroutine where corrections may be made. (See discussion of update subroutine above.)

TYPE 3 ERRORS When an error is discovered during entry of the scheduled event list or the key event list, "PERT 2" prints an error indication and halts without reading the rest of the lists. Depressing the START COMPUTE switch will cause the computer to select the typewriter for entry of any required correction. The reader must be manually selected if data input is to continue from tape.

STORAGE REQUIREMENTS

"PERT 2" uses the entire memory for storage of program, tables, and data.

Phase 1 is stored in Tracks 00 through 26, and it stores the bootstrap for Phase 2 in Track 123.

Phase 2 is stored in Tracks 00 through 20 and in 124, and uses Tracks 21 through 26 from Phase 1.

Data is stored and processed in the remaining memory area.

APPENDIX

SAMPLE PROGRAMS

This section contains sample program runs which illustrate the composition of the input data, the statements that will be made by the computer, the responses required, and the format and contents of the information obtained from the various output options.

SAMPLE PROGRAM NO. 1

DATA FOR SAMPLE PROGRAM NO. 1

```
0*
-0001*-0002*1E*
-0001*-0003*3*8*10*
-0002*-0004*DONE*2*
-0002*-0005*DONE*10*
-0003*-0002*9E*
-0003*0*
-0001*-0002*1E*
-0001*-0003*3*8*10*
-0002*-0004*DONE*2*
-0002*-0005*DONE*10*
-0003*-0002*9E*
-0003*-0005*DONE*9*
-0003*-0016*18*18*35*
-0004*-0005*DONE*12*
-0004*-0007*3E*
-0005*-0006*14E*
-0007*-0008*4E*
-0005*-0007*DONE*13*
-0005*-0012*17E*
-0006*-0007*15*15*26*
-0006*-0011*13*16*28*
-0007*-0011*10*19*30*
-0008*-0009*DONE*5*
-0008*-0010*21E*
-0008*-0011*20E*
-0009*-0010*22E*
-0009*-0013*6E*
-0010*-0012*24E*
-0011*-0012*DONE*DONE*19*26*
-0012*-0014*31E*
-0012*-0015*27E*
-0013*-0014*7E*
-0014*-0015*4*29*56*
-0014*-0017*10*30*70*
-0015*-0017*12*28*52*
-0016*-0012*16*25*38*
-0016*-0017*16E*
0*
```

ORGANIZATION LIST

```
-0017*01-04-66*
0*
-0004*-0009*-0012*-0017*
0*
```

SCHEDULED EVENT

KEY EVENTS

SAMPLE PROGRAM 1, cont'd.

PROGRAM RUN

```
ENTER # DAYS IN TIME UNIT, TO 1/4 DAY
5*
ENTER # WORKING DAYS IN WEEK, TO 1/4 DAY
5*
DATE OF START [MONDAY]
05-13-63*
START EVENT NAME
-0001*
FINAL EVENT NAME
-0017*
READ TABLE OF ORGANIZATIONS


INPUT SCHEDULED EVENTS
INPUT KEY EVENTS

WHEN TYPEWRITER LIGHT COMES ON, SELECT OUTPUT UNITS AND ENTER RUN DESIRED-ACTIVITY*
BY ACTIVITY, LOGICAL ORDER
```

PREDECESSOR EVENT	SUCCESSOR EVENT	DEPT	ALLOW-SCHED DATE	EXPD-COMP DATE	SLACK	PROB	EXPT DURA
0001	0002		05-28-62	05-20-63	-51	0.00	1
0001	0003		03-26-62	07-08-63	-67	0.00	8
0003	0002		05-28-62	09-09-63	-67	0.00	9
0003	0005		09-03-62	09-09-63	-53	0.00	9
0003	0016		10-28-63	12-02-63	-5	0.03	21
0002	0005		09-03-62	11-18-63	-63	0.00	10
0002	0004		06-11-62	09-23-63	-67	0.00	2
0004	0005		09-03-62	12-16-63	-67	0.00	12
0004	0007		04-08-63	10-14-63	-27	0.00	3
0005	0006		12-10-62	03-24-64	-67	0.00	14
0005	0007		04-08-63	03-17-64	-49	0.00	13
0005	0012		04-28-64	04-14-64	2	0.97	17
0015	0012		04-28-64	06-02-64	-5	0.13	26
0016	0017		01-04-66s	03-24-64	93	1.00	16
0006	0007		04-08-63	07-21-64	-67	0.00	17
0006	0011		10-28-63	07-28-64	-39	0.00	18
0007	0008		05-06-63	08-18-64	-67	0.00	4
0007	0011		10-28-63	12-01-64	-57	0.00	19
0008	0011		10-28-63	01-05-65	-62	0.00	20
0008	0009		06-10-63	09-22-64	-67	0.00	5
0008	0010		11-11-63	01-12-65	-61	0.00	21
0011	0012		04-28-64	07-06-65	-62	0.00	26
0009	0010		11-11-63	02-23-65	-67	0.00	22
0009	0013		10-13-64	11-03-64	-3	0.05	6
0010	0012		04-28-64	08-10-65	-67	0.00	24
0012	0015		06-22-65	02-15-66	-34	0.00	27
0012	0014		12-01-64	03-15-66	-67	0.00	31
0013	0014		12-01-64	12-22-64	-3	0.05	7
0014	0017		01-04-66s	11-01-66	-43	0.00	33
0014	0015		06-22-65	10-04-66	-67	0.00	29
0015	0017		01-04-66s	04-18-67	-67	0.00	28

SAMPLE PROGRAM 1, cont'd.

```
WHEN TYPEWRITER LIGHT COMES ON, SELECT OUTPUT UNITS AND ENTER RUN DESIRED- FULL*

BY MAJOR EVENT

 EVENT        ALLOW-SCHED      EXPD-COMP
 NUMBER          DATE            DATE          SLACK    PROB

 0001         01-29-62        05-13-63c
 0017         01-04-66s       04-18-67          -67     0.00
 0002         05-28-62        09-09-63          -67     0.00
 0003         03-26-62        07-08-63          -67     0.00
 0004         06-11-62        09-23-63          -67     0.00
 0005         09-03-62        12-16-63          -67     0.00
 0016         10-28-63        12-02-63           -5     0.03
 0007         04-08-63        07-21-64          -67     0.00
 0006         12-10-62        03-24-64          -67     0.00
 0012         04-28-64        08-10-65          -67     0.00
 0011         10-28-63        01-05-65          -62     0.00
 0008         05-06-63        08-18-64          -67     0.00
 0009         06-10-63        09-22-64          -67     0.00
 0010         11-11-63        02-23-65          -67     0.00
 0013         10-13-64        11-03-64           -3     0.05
 0014         12-01-64        03-15-66          -67     0.00
 0015         06-22-65        10-04-66          -67     0.00
```

SAMPLE PROGRAM 1, cont'd.

WHEN TYPEWRITER LIGHT COMES ON, SELECT OUTPUT UNITS AND ENTER RUN DESIRED-RESTRICTED* BY CRITICAL PATH

PREDECESSOR EVENT	SUCCESSOR EVENT	DEPT	ALLOW-SCHED DATE	EXPD-COMP DATE	SLACK	PROB	EXPT DURA
0001	0003		03-26-62	07-08-63	-67	0.00	8
0003	0002		05-28-62	09-09-63	-67	0.00	9
0002	0004		06-11-62	09-23-63	-67	0.00	2
0004	0005		09-03-62	12-16-63	-67	0.00	12
0005	0006		12-10-62	03-24-64	-67	0.00	14
0006	0007		04-08-63	07-21-64	-67	0.00	17
0007	0008		05-06-63	08-18-64	-67	0.00	4
0008	0009		06-10-63	09-22-64	-67	0.00	5
0009	0010		11-11-63	02-23-65	-67	0.00	22
0010	0012		04-28-64	08-10-65	-67	0.00	24
0012	0014		12-01-64	03-15-66	-67	0.00	31
0014	0015		06-22-65	10-04-66	-67	0.00	29
0015	0017		01-04-66s	04-18-67	-67	0.00	28
0002	0005		09-03-62	11-18-63	-63	0.00	10
0008	0011		10-28-63	01-05-65	-62	0.00	20
0011	0012		04-28-64	07-06-65	-62	0.00	26
0008	0010		11-11-63	01-12-65	-61	0.00	21
0007	0011		10-28-63	12-01-64	-57	0.00	19
0003	0005		09-03-62	09-09-63	-53	0.00	9
0001	0002		05-28-62	05-20-63	-51	0.00	1
0005	0007		04-08-63	03-17-64	-49	0.00	13
0014	0017		01-04-66s	11-01-66	-43	0.00	33
0006	0011		10-28-63	07-28-64	-39	0.00	18
0012	0015		06-22-65	02-15-66	-34	0.00	27
0004	0007		04-08-63	10-14-63	-27	0.00	3
0003	0016		10-28-63	12-02-63	-5	0.03	21
0016	0012		04-28-64	06-02-64	-5	0.13	26
0009	0013		10-13-64	11-03-64	-3	0.05	6
0013	0014		12-01-64	12-22-64	-3	0.05	7

SAMPLE PROGRAM 1, cont'd.

WHEN TYPEWRITER LIGHT COMES ON, SELECT OUTPUT UNITS AND ENTER RUN DESIRED-KEY EVENT*

BY MAJOR EVENT

EVENT NUMBER	ALLOW-SCHED DATE	EXPD-COMP DATE	SLACK	PROB
0017	01-04-66s	04-18-67	-67	0.00
0012	04-28-64	08-10-65	-67	0.00

WHEN TYPEWRITER LIGHT COMES ON, SELECT OUTPUT UNITS AND ENTER RUN DESIRED-CRITICAL PATH*
BY CRITICAL PATH, COMPLETE NETWORK

PREDECESSOR EVENT	SUCCESSOR EVENT	DEPT	ALLOW-SCHED DATE	EXPD-COMP DATE	SLACK	PROB	EXPT DURA
0001	0003		03-26-62	07-08-63	-67	0.00	8
0003	0002		05-28-62	09-09-63	-67	0.00	9
0002	0004		06-11-62	09-23-63	-67	0.00	2
0004	0005		09-03-62	12-16-63	-67	0.00	12
0005	0006		12-10-62	03-24-64	-67	0.00	14
0006	0007		04-08-63	07-21-64	-67	0.00	17
0007	0008		05-06-63	08-18-64	-67	0.00	4
0008	0009		06-10-63	09-22-64	-67	0.00	5
0009	0010		11-11-63	02-23-65	-67	0.00	22
0010	0012		04-28-64	08-10-65	-67	0.00	24
0012	0014		12-01-64	03-15-66	-67	0.00	31
0014	0015		06-22-65	10-04-66	-67	0.00	29
0015	0017		01-04-66s	04-18-67	-67	0.00	28
0002	0005		09-03-62	11-18-63	-63	0.00	10
0008	0011		10-28-63	01-05-65	-62	0.00	20
0011	0012		04-28-64	07-06-65	-62	0.00	26
0008	0010		11-11-63	01-12-65	-61	0.00	21
0007	0011		10-28-63	12-01-64	-57	0.00	19
0003	0005		09-03-62	09-09-63	-53	0.00	9
0001	0002		05-28-62	05-20-63	-51	0.00	1
0005	0007		04-08-63	03-17-64	-49	0.00	13
0014	0017		01-04-66s	11-01-66	-43	0.00	33
0006	0011		10-28-63	07-28-64	-39	0.00	18
0012	0015		06-22-65	02-15-66	-34	0.00	27
0004	0007		04-08-63	10-14-63	-27	0.00	3
0003	0016		10-28-63	12-02-63	-5	0.03	21
0016	0012		04-28-64	06-02-64	-5	0.13	26
0009	0013		10-13-64	11-03-64	-3	0.05	6
0013	0014		12-01-64	12-22-64	-3	0.05	7
0005	0012		04-28-64	04-14-64	2	0.97	17
0016	0017		01-04-66s	03-24-64	93	1.00	16

SAMPLE PROGRAM 1, cont'd.

```
WHEN TYPEWRITER LIGHT COMES ON, SELECT OUTPUT UNITS AND ENTER RUN DESIRED- TIME*
09-09-63*
```

PREDECESSOR EVENT	SUCCESSOR EVENT	DEPT	ALLOW-SCHED DATE	EXPD-COMP DATE	SLACK	PROB	EXPT DURA
0001	0002		05-28-62	05-20-63	-51	0.00	1
0001	0003		03-26-62	07-08-63	-67	0.00	8
0003	0002		05-28-62	09-09-63	-67	0.00	9
0003	0005		09-03-62	09-09-63	-53	0.00	9

```
WHEN TYPEWRITER LIGHT COMES ON, SELECT OUTPUT UNITS AND ENTER RUN DESIRED-RECALL*

ENTER START EVENT
-0001*
ENTER FINAL EVENT
*-0017*0*
E11 EVENT IN WRONG FORM
 -0017
00000006*

ENTER START EVENT
-0001*
ENTER FINAL EVENT
-0017*0*
E7 FINAL EVENT NOT USED

E10 NO PATH FROM EVENT -0000
00000006*

ENTER START EVENT
-0001*
ENTER FINAL EVENT
-0017*
E7 FINAL EVENT NOT USED

E10 NO PATH FROM EVENT -0000
00000006*

ENTER START EVENT
-0001*
ENTER FINAL EVENT
-0017*
E10 NO PATH FROM EVENT -0000

ENTER START EVENT
-0001*
ENTER FINAL EVENT
-0017*
-0000*
E10 NO PATH FROM EVENT -0000

ENTER START EVENT
-0001*
ENTER FINAL EVENT
-0017*
E11 EVENT IN WRONG FORM
 -FFF0

0*
E10 NO PATH FROM EVENT -0000
```

SAMPLE PROGRAM 1, cont'd.

```
ENTER START EVENT
-0001*
ENTER FINAL EVENT
-0017*
E10 NO PATH FROM EVENT -0000


ENTER START EVENT
-0001*
ENTER FINAL EVENT
-0017*
E10 NO PATH FROM EVENT -0000


ENTER START EVENT
-0000*
ENTER FINAL EVENT
-0017*D-0000*
E5 START EVENT NOT USED

E10 NO PATH FROM EVENT -0000
E9 NO PATH TO EVENT -0001


ENTER START EVENT
-0001*
ENTER FINAL EVENT
-0017*-0000*
E5 START EVENT NOT USED

E10 NO PATH FROM EVENT -0000
E9 NO PATH TO EVENT -0001


ENTER START EVENT
-0000*
ENTER FINAL EVENT
-0000*0*
E5 START EVENT NOT USED

E7 FINAL EVENT NOT USED

E10 NO PATH FROM EVENT -0000
E9 NO PATH TO EVENT -0001
E10 NO PATH FROM EVENT -0017


ENTER START EVENT
-0017*
ENTER FINAL EVENT
-0000*0*
E5 START EVENT NOT USED

E7 FINAL EVENT NOT USED

E10 NO PATH FROM EVENT -0000
E9 NO PATH TO EVENT -0001
E10 NO PATH FROM EVENT -0017

ENTER START EVENT
-0001*
ENTER FINAL EVENT
-0002*0*
E5 START EVENT NOT USED

E7 FINAL EVENT NOT USED
```

SAMPLE PROGRAM 1, cont'd.

```
E10 NO PATH FROM EVENT -0000
E9 NO PATH TO EVENT -0001
E10 NO PATH FROM EVENT -0017
```

SAMPLE PROGRAM NO. 2
(Using same data as Sample Program No. 1)

```
ENTER # DAYS IN TIME UNIT, TO 1/4 DAY
5*
ENTER # WORKING DAYS IN WEEK, TO 1/4 DAY
5*
DATE OF START [MONDAY]
01-02-61*
START EVENT NAME
-0001*
FINAL EVENT NAME
-0017*
READ TABLE OF ORGANIZATIONS


INPUT SCHEDULED EVENTS
INPUT KEY EVENTS

WHEN TYPEWRITER LIGHT COMES ON, SELECT OUTPUT UNITS AND ENTER RUN DESIRED-ACTIVITY*
BY ACTIVITY, LOGICAL ORDER
```

PREDECESSOR EVENT	SUCCESSOR EVENT	DEPT	ALLOW-SCHED DATE	EXPD-COMP DATE	SLACK	PROB	EXPT DURA
0001	0002		05-28-62	01-09-61	72	1.00	1
0001	0003		03-26-62	02-27-61	56	1.00	8
0003	0002		05-28-62	05-01-61	56	1.00	9
0003	0005		09-03-62	05-01-61	70	1.00	9
0003	0016		10-28-63	07-24-61	118	1.00	21
0002	0005		09-03-62	07-10-61	60	1.00	10
0002	0004		06-11-62	05-15-61	56	1.00	2
0004	0005		09-03-62	08-07-61	56	1.00	12
0004	0007		04-08-63	06-05-61	96	1.00	3
0005	0006		12-10-62	11-13-61	56	1.00	14
0005	0007		04-08-63	11-06-61	74	1.00	13
0005	0012		04-28-64	12-04-61	125	1.00	17
0016	0012		04-28-64	01-22-62	118	1.00	26
0016	0017		01-04-66s	11-13-61	216	1.00	16
0006	0007		04-08-63	03-12-62	56	1.00	17
0006	0011		10-28-63	03-19-62	84	1.00	18
0007	0008		05-06-63	04-09-62	56	1.00	4
0007	0011		10-28-63	07-23-62	68	1.00	19
0008	0011		10-28-63	08-27-62	61	1.00	20
0008	0009		06-10-63	05-14-62	56	1.00	5
0008	0010		11-11-63	09-03-62	62	1.00	21
0011	0012		04-28-64	02-25-63	61	1.00	26
0009	0010		11-11-63	10-15-62	56	1.00	22
0009	0013		10-13-64	06-25-62	120	1.00	6
0010	0012		04-28-64	04-01-63	56	1.00	24
0012	0015		06-22-65	10-07-63	89	1.00	27
0012	0014		12-01-64	11-04-63	56	1.00	31
0013	0014		12-01-64	08-13-62	120	1.00	7
0014	0017		01-04-66s	06-23-64	80	1.00	33
0014	0015		06-22-65	05-26-64	56	1.00	29
0015	0017		01-04-66s	12-08-64	56	1.00	28

SAMPLE PROGRAM 2, cont'd.

```
WHEN TYPEWRITER LIGHT COMES ON, SELECT OUTPUT UNITS AND ENTER RUN DESIRED-CRITICAL PATH*
BY CRITICAL PATH, COMPLETE NETWORK
```

PREDECESSOR EVENT	SUCCESSOR EVENT	DEPT	ALLOW-SCHED DATE	EXPD-COMP DATE	SLACK	PROB	EXPT DURA
0001	0003		03-26-62	02-27-61	56	1.00	8
0003	0002		05-28-62	05-01-61	56	1.00	9
0002	0004		06-11-62	05-15-61	56	1.00	2
0004	0005		09-03-62	08-07-61	56	1.00	12
0005	0006		12-10-62	11-13-61	56	1.00	14
0006	0007		04-08-63	03-12-62	56	1.00	17
0007	0008		05-06-63	04-09-62	56	1.00	4
0008	0009		06-10-63	05-14-62	56	1.00	5
0009	0010		11-11-63	10-15-62	56	1.00	22
0010	0012		04-28-64	04-01-63	56	1.00	24
0012	0014		12-01-64	11-04-63	56	1.00	31
0014	0015		06-22-65	05-26-64	56	1.00	29
0015	0017		01-04-66s	12-08-64	56	1.00	28
0002	0005		09-03-62	07-10-61	60	1.00	10
0008	0011		10-28-63	08-27-62	61	1.00	20
0011	0012		04-28-64	02-25-63	61	1.00	26
0008	0010		11-11-63	09-03-62	62	1.00	21
0007	0011		10-28-63	07-23-62	66	1.00	19
0003	0005		09-03-62	05-01-61	70	1.00	9
0001	0002		05-28-62	01-09-61	72	1.00	1
0005	0007		04-08-63	11-06-61	74	1.00	13
0014	0017		01-04-66s	06-23-64	80	1.00	33
0006	0011		10-28-63	03-19-62	84	1.00	18
0012	0015		06-22-65	10-07-63	89	1.00	27
0004	0007		04-08-63	06-05-61	96	1.00	3
0003	0016		10-28-63	07-24-61	118	1.00	21
0016	0012		04-28-64	01-22-62	118	1.00	26
0009	0013		10-13-64	06-25-62	120	1.00	6
0013	0014		12-01-64	08-13-62	120	1.00	7
0005	0012		04-28-64	12-04-61	125	1.00	17
0016	0017		01-04-66s	11-13-61	216	1.00	16

```
WHEN TYPEWRITER LIGHT COMES ON, SELECT OUTPUT UNITS AND ENTER RUN DESIRED-PUNCH*
WHEN TYPEWRITER LIGHT COMES ON, SELECT OUTPUT UNITS AND ENTER RUN DESIRED-RECALL*RECALL*
```

SAM PLE PROGRAM NO. 3

DATA FOR SAMPLE PROGRAM NO. 3

```
01*03*05*02*04*06*
0*
01-0001*-0002*1E*
01-0001*-0003*3*8*10*01-0002*-0004*2E*
01-0002*-0005*10E*
01-0003*-0002*9E*
01-0003*-0005*1*11*11*
01-0003*-0016*18*18*35*
02-0004*-0005*12E*
02-0004*-0007*3E*
03-0005*-0006*14E*
03-0005*-0007*13E*
03-0005*-0012*17E*
03-0006*-0011*13*16*28*
03-0006*-0007*15*15*26*
03-0007*-0008*4E*
03-0007*-0011*10*19*30*
04-0008*-0009*5E*
04-0008*-0010*21E*
04-0008*-0011*20E
*
04-0009*-0010*22E*
04-0009*-0013*6E*
05-0010*-0012*24E*
05-0011*-0012*03*23*63*
05-0012*-0014*31E*
05-0012*-0015*27E*
06-0013*-0014*7E*
06-0014*-0015*4*29*56*
06-0014*-0017*10*30*70*
06-0015*-0017*12*28*42*
06-0016*-0012*16*25*38*
06-0016*-0017*16E*
0*
-0017*01-04-66*
0*
-0012*-0014*-0017*
0*
```

SAMPLE PROGRAM 3, cont'd.

PROGRAM RUN

```
ENTER # DAYS IN TIME UNIT, TO 1/4 DAY
5.00*
ENTER # WORKING DAYS IN WEEK, TO 1/4 DAY
5*
DATE OF START [MONDAY]
05-13-63*
START EVENT NAME
-0001*
FINAL EVENT NAME
-0017*
READ TABLE OF ORGANIZATIONS


INPUT SCHEDULED EVENTS
INPUT KEY EVENTS

WHEN TYPEWRITER LIGHT COMES ON, SELECT OUTPUT UNITS AND ENTER RUN DESIRED-ACTIVITY*
BY ACTIVITY, LOGICAL ORDER
```

PREDECESSOR EVENT	SUCCESSOR EVENT	DEPT	ALLOW-SCHED DATE	EXPD-COMP DATE	SLACK	PPOB	EXPT DURA
0001	0002	01	05-20-62	05-20-63	-51	0.00	1
0001	0003	01	03-26-62	07-08-63	-67	0.00	8
0003	0002	01	05-28-62	09-09-63	-67	0.00	9
0003	0005	01	09-03-62	09-09-63	-53	0.00	9
0003	0016	01	10-28-63	12-02-63	-5	0.03	21
0002	0005	01	09-03-62	11-18-63	-63	0.00	10
0002	0004	01	06-11-62	09-23-63	-67	0.00	2
0004	0005	02	09-03-62	12-16-63	-67	0.00	12
0004	0007	02	04-08-63	10-14-63	-27	0.00	3
0005	0006	03	12-10-62	03-24-64	-67	0.00	14
0005	0007	03	04-08-63	03-17-64	-49	0.00	13
0005	0012	03	04-28-64	04-14-64	2	0.97	17
0016	0012	06	04-28-64	06-02-64	-5	0.13	26
0016	0017	06	01-04-66s	03-24-64	93	1.00	16
0006	0011	03	10-28-63	07-28-64	-39	0.00	18
0006	0007	03	04-08-63	07-21-64	-67	0.00	17
0007	0008	03	05-06-63	08-18-64	-67	0.00	4
0007	0011	03	10-28-63	12-01-64	-57	0.00	19
0008	0011	04	10-28-63	01-05-65	-62	0.00	20
0008	0009	04	06-10-63	09-22-64	-67	0.00	5
0008	0010	04	11-11-63	01-12-65	-61	0.00	21
0011	0012	05	04-28-64	07-06-65	-62	0.00	26
0009	0010	04	11-11-63	02-23-65	-67	0.00	22
0009	0013	04	10-13-64	11-03-64	-3	0.05	6
0010	0012	05	04-28-64	08-10-65	-67	0.00	24
0012	0015	05	06-22-65	02-15-66	-34	0.00	27
0012	0014	05	12-01-64	03-15-66	-67	0.00	31
0013	0014	06	12-01-64	12-22-64	-3	0.05	7
0014	0017	06	01-04-66s	11-01-66	-43	0.00	33
0014	0015	06	06-22-65	10-04-66	-67	0.00	29
0015	0017	06	01-04-66s	04-18-67	-67	0.00	28

SAMPLE PROGRAM 3, cont'd.

WHEN TYPEWRITER LIGHT COMES ON, SELECT OUTPUT UNITS AND ENTER RUN DESIRED-DEPARTMENT*

BY DEPARTMENT

PREDECESSOR EVENT	SUCCESSOR EVENT	DEPT	ALLOW-SCHED DATE	EXPD-COMP DATE	SLACK	PROB	EXPT DURA
0001	0002	01	05-28-62	05-20-63	-51	0.00	1
0001	0003	01	03-26-62	07-08-63	-67	0.00	8
0003	0002	01	05-28-62	09-09-63	-67	0.00	9
0003	0005	01	09-03-62	09-09-63	-53	0.00	9
0003	0016	01	10-28-63	12-02-63	-5	0.03	21
0002	0005	01	09-03-62	11-18-63	-63	0.00	10
0002	0004	01	06-11-62	09-23-63	-67	0.00	2
0005	0006	03	12-10-62	03-24-64	-67	0.00	14
0005	0007	03	04-08-63	03-17-64	-49	0.00	13
0005	0012	03	04-28-64	04-14-64	2	0.97	17
0006	0011	03	10-28-63	07-23-64	-39	0.00	13
0006	0007	03	04-08-63	07-21-64	-67	0.00	17
0007	0008	03	05-06-63	08-18-64	-67	0.00	4
0007	0011	03	10-28-63	12-01-64	-57	0.00	19
0011	0012	05	04-28-64	07-06-65	-62	0.00	26
0010	0012	05	04-28-64	08-10-65	-67	0.00	24
0012	0015	05	06-22-65	02-15-66	-34	0.00	27
0012	0014	05	12-01-64	03-15-66	-67	0.00	31
0004	0005	02	09-03-62	12-16-63	-67	0.00	12
0004	0007	02	04-08-63	10-14-63	-27	0.00	3
0008	0011	04	10-28-63	01-05-65	-62	0.00	20
0008	0009	04	06-10-63	09-22-64	-67	0.00	5
0008	0010	04	11-11-63	01-12-65	-61	0.00	21
0009	0010	04	11-11-63	02-23-65	-67	0.00	22
0009	0013	04	10-13-64	11-03-64	-3	0.05	6
0016	0012	06	04-28-64	06-02-64	-5	0.13	26
0016	0017	06	01-04-66s	03-24-64	93	1.00	16
0013	0014	06	12-01-64	12-22-64	-3	0.05	7
0014	0017	06	01-04-66s	11-01-66	-43	0.00	33
0014	0015	06	06-22-65	10-04-66	-67	0.00	29
0015	0017	06	01-04-66s	04-18-67	-67	0.00	28

SAMPLE PROGRAM 3, cont'd.

WHEN TYPEWRITER LIGHT COMES ON, SELECT OUTPUT UNITS AND ENTER RUN DESIRED- FULL*

BY MAJOR EVENT

EVENT NUMBER	ALLOW-SCHED DATE	EXPD-COMP DATE	SLACK	PROB
0001	01-29-62	05-13-63c		
0017	01-04-66s	04-18-67	-67	0.00
0002	05-28-62	09-09-63	-67	0.00
0003	03-26-62	07-08-63	-67	0.00
0004	06-11-62	09-23-63	-67	0.00
0005	09-03-62	12-16-63	-67	0.00
0016	10-28-63	12-02-63	-5	0.03
0007	04-08-63	07-21-64	-67	0.00
0006	12-10-62	03-24-64	-67	0.00
0012	04-28-64	08-10-65	-67	0.00
0011	10-28-63	01-05-65	-62	0.00
0008	05-06-63	08-18-64	-67	0.00
0009	06-10-63	09-22-64	-67	0.00
0010	11-11-63	02-23-65	-67	0.00
0013	10-13-64	11-03-64	-3	0.05
0014	12-01-64	03-15-66	-67	0.00
0015	06-22-65	10-04-66	-67	0.00

SAMPLE PROGRAM 3, cont'd.

WHEN TYPEWRITER LIGHT COMES ON, SELECT OUTPUT UNITS AND ENTER RUN DESIRED-CRITICAL PATH* BY CRITICAL PATH, COMPLETE NETWORK

PREDECESSOR EVENT	SUCCESSOR EVENT	DEPT	ALLOW-SCHED DATE	EXPD-COMP DATE	SLACK	PROB	EXPT DURA
0001	0003	01	03-26-62	07-08-63	-67	0.00	8
0003	0002	01	05-28-62	09-09-63	-67	0.00	9
0002	0004	01	06-11-62	09-23-63	-67	0.00	2
0004	0005	02	09-03-62	12-16-63	-67	0.00	12
0005	0006	03	12-10-62	03-24-64	-67	0.00	14
0006	0007	03	04-08-63	07-21-64	-67	0.00	17
0007	0008	03	05-06-63	08-18-64	-67	0.00	4
0008	0009	04	06-10-63	09-22-64	-67	0.00	5
0009	0010	04	11-11-63	02-23-65	-67	0.00	22
0010	0012	05	04-28-64	08-10-65	-67	0.00	24
0012	0014	05	12-01-64	03-15-66	-67	0.00	31
0014	0015	06	06-22-65	10-04-66	-67	0.00	29
0015	0017	06	01-04-66s	04-18-67	-67	0.00	23
0002	0005	01	09-03-62	11-18-63	-63	0.00	10
0008	0011	04	10-28-63	01-05-65	-62	0.00	20
0011	0012	05	04-28-64	07-06-65	-62	0.00	26
0008	0010	04	11-11-63	01-12-65	-61	0.00	21
0007	0011	03	10-28-63	12-01-64	-57	0.00	19
0003	0005	01	09-03-62	09-09-63	-53	0.00	9
0001	0002	01	05-28-62	05-20-63	-51	0.00	1
0005	0007	03	04-08-63	03-17-64	-49	0.00	13
0014	0017	06	01-04-66s	11-01-66	-43	0.00	33
0006	0011	03	10-28-63	07-28-64	-39	0.00	18
0012	0015	05	06-22-65	02-15-66	-34	0.00	27
0004	0007	02	04-08-63	10-14-63	-27	0.00	3
0003	0016	01	10-28-63	12-02-63	-5	0.03	21
0016	0012	06	04-28-64	06-02-64	-5	0.13	26
0009	0013	04	10-13-64	11-03-64	-3	0.05	6
0013	0014	06	12-01-64	12-22-64	-3	0.05	7
0005	0012	03	04-28-64	04-14-64	2	0.97	17
0016	0017	06	01-04-66s	03-24-64	93	1.00	16

SAMPLE PROGRAM 3, cont'd.

WHEN TYPEWRITER LIGHT COMES ON, SELECT OUTPUT UNITS AND ENTER RUN DESIRED-RESTRICTED* BY CRITICAL PATH

PREDECESSOR EVENT	SUCCESSOR EVENT	DEPT	ALLOW-SCHED DATE	EXPD-COMP DATE	SLACK	PROB	EXPT DURA
0001	0003	01	03-26-62	07-08-63	-67	0.00	8
0003	0002	01	05-28-62	09-09-63	-67	0.00	9
0002	0004	01	06-11-62	09-23-63	-67	0.00	2
0004	0005	02	09-03-62	12-16-63	-67	0.00	12
0005	0006	03	12-10-62	03-24-64	-67	0.00	14
0006	0007	03	04-08-63	07-21-64	-67	0.00	17
0007	0008	03	05-06-63	08-18-64	-67	0.00	4
0008	0009	04	06-10-63	09-22-64	-67	0.00	5
0009	0010	04	11-11-63	02-23-65	-67	0.00	22
0010	0012	05	04-28-64	08-10-65	-67	0.00	24
0012	0014	05	12-01-64	03-15-66	-67	0.00	31
0014	0015	06	06-22-65	10-04-66	-67	0.00	29
0015	0017	06	01-04-66s	04-18-67	-67	0.00	28
0002	0005	01	09-03-62	11-18-63	-63	0.00	10
0008	0011	04	10-28-63	01-05-65	-62	0.00	20
0011	0012	05	04-28-64	07-06-65	-62	0.00	26
0008	0010	04	11-11-63	01-12-65	-61	0.00	21
0007	0011	03	10-28-63	12-01-64	-57	0.00	19
0003	0005	01	09-03-62	09-09-63	-53	0.00	9
0001	0002	01	05-28-62	05-20-63	-51	0.00	1
0005	0007	03	04-08-63	03-17-64	-49	0.00	13
0014	0017	06	01-04-66s	11-01-66	-43	0.00	33
0006	0011	03	10-28-63	07-28-64	-39	0.00	18
0012	0015	05	06-22-65	02-15-66	-34	0.00	27
0004	0007	02	04-08-63	10-14-63	-27	0.00	3
0003	0016	01	10-28-63	12-02-63	-5	0.03	21
0016	0012	06	04-28-64	06-02-64	-5	0.13	26
0009	0013	04	10-13-64	11-03-64	-3	0.05	6
0013	0014	06	12-01-64	12-22-64	-3	0.05	7

SAMPLE PROGRAM 3, cont'd.

```
WHEN TYPEWRITER LIGHT COMES ON, SELECT OUTPUT UNITS AND ENTER RUN DESIRED- TIME*
12-01-64*
```

PREDECESSOR EVENT	SUCCESSOR EVENT	DEPT	ALLOW-SCHED DATE	EXPD-COMP DATE	SLACK	PROB	EXPT DURA
0001	0002	01	05-28-62	05-20-63	-51	0.00	1
0001	0003	01	03-26-62	07-08-63	-67	0.00	8
0003	0002	01	05-28-62	09-09-63	-67	0.00	9
0003	0005	01	09-03-62	09-09-63	-53	0.00	9
0003	0016	01	10-28-63	12-02-63	-5	0.03	21
0002	0005	01	09-03-62	11-18-63	-63	0.00	10
0002	0004	01	06-11-62	09-23-63	-67	0.00	2
0004	0005	02	09-03-62	12-16-63	-67	0.00	12
0004	0007	02	04-08-63	10-14-63	-27	0.00	3
0005	0006	03	12-10-62	03-24-64	-67	0.00	14
0005	0007	03	04-08-63	03-17-64	-49	0.00	13
0005	0012	03	04-28-64	04-14-64	2	0.97	17
0016	0012	06	04-28-64	06-02-64	-5	0.13	26
0016	0017	06	01-04-66s	03-24-64	93	1.00	16
0006	0011	03	10-28-63	07-28-64	-39	0.00	18
0006	0007	03	04-08-63	07-21-64	-67	0.00	17
0007	0008	03	05-06-63	08-18-64	-67	0.00	4
0007	0011	03	10-28-63	12-01-64	-57	0.00	19
0008	0009	04	06-10-63	09-22-64	-67	0.00	5
0009	0013	04	10-13-64	11-03-64	-3	0.05	6

```
WHEN TYPEWRITER LIGHT COMES ON, SELECT OUTPUT UNITS AND ENTER RUN DESIRED-RECALL*

ENTER START EVENT
-0001*
ENTER FINAL EVENT
-0017*
01-0003*-0002*DONE*09-09-63*
02-0004*-0005*
02-0004*
E15 EVENTS
 -0001
 -0002
ARE IN OR ARE BLOCKED BY A LOOP

ENTER START EVENT
-0001*
ENTER FINAL EVENT
-0017*
01-0001*-0002*DONE*05-20-63*
02-0004*-0005*
E15 EVENTS
 -0001
 -0003
 -0002
ARE IN OR ARE BLOCKED BY A LOOP

ENTER START EVENT
-0004*
ENTER FINAL EVENT
-0017*
0*
E6 INTL EVENT HAS BACK BRANCH

E7 FINAL EVENT NOT USED
```

SAMPLE PROGRAM 3, cont'd.

```
E10 NO PATH FROM EVENT -0002
E10 NO PATH FROM EVENT -0003
E9 NO PATH TO EVENT -0001


ENTER START EVENT
-0001*
ENTER FINAL EVENT
-0017*0*
E6 INTL EVENT HAS BACK BRANCH

E7 FINAL EVENT NOT USED

E10 NO PATH FROM EVENT -0002
E10 NO PATH FROM EVENT -0003
E9 NO PATH TO EVENT -0001


ENTER START EVENT
-0001*
ENTER FINAL EVENT
-0017*
0*
E6 INTL EVENT HAS BACK BRANCH

E7 FINAL EVENT NOT USED

E10 NO PATH FROM EVENT -0002
E10 NO PATH FROM EVENT -0003
E9 NO PATH TO EVENT -0001


ENTER START EVENT
-0001*
ENTER FINAL EVENT
-0017*
0*
E6 INTL EVENT HAS BACK BRANCH

E7 FINAL EVENT NOT USED

E10 NO PATH FROM EVENT -0002
E10 NO PATH FROM EVENT -0003
E9 NO PATH TO EVENT -0001




0*01*03*05*02*04*06*
0*
01-0001*-0002*1E*
01-0001*-0003*3*8*10*01-0002*-0004*2E*
```

COMMERCIAL COMPUTER DIVISION

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