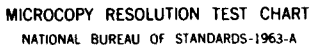


PROJECT SCHEDULING USING CRITICAL PATH METHOD AND
CHARTING TECHNIQUES FOR..(U) CORPS OF ENGINEERS ST PAUL
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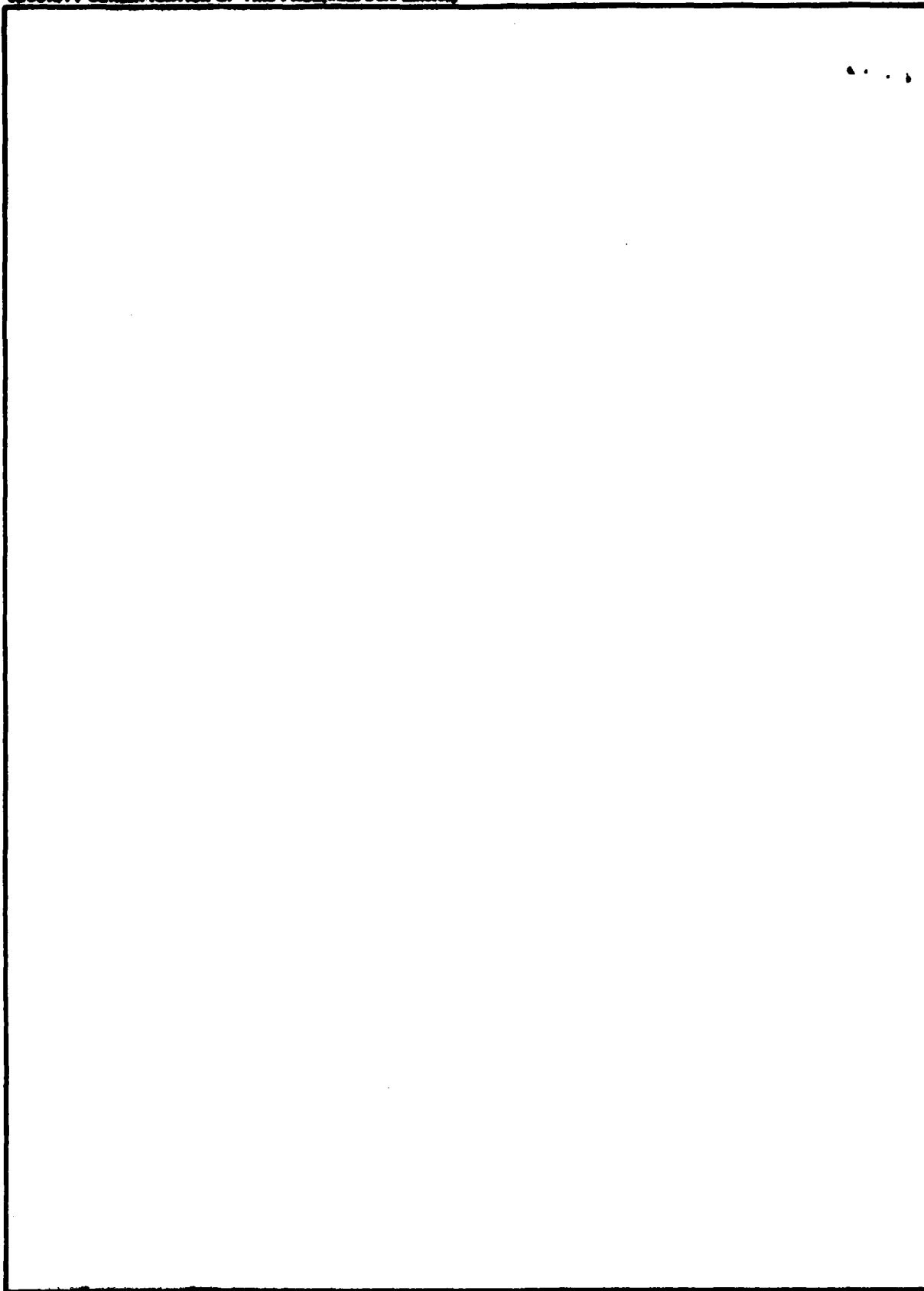


MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

ADA 129688

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USER'S MANUAL

*CPM

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Appendix A - User's Guide - CRT Displays and Answers

ELECTRONIC COMPUTER PROGRAM ABSTRACT

TITLE OF PROGRAM *CPM		PROGRAM NO.	
PREPARING AGENCY St. Paul District (See remarks)			
AUTHOR(S) CPT Douglas D. Gransberg Robert C. Stackowiak (See remarks)		DATE PROGRAM COMPLETED 9 May 1983	STATUS OF PROGRAM PHASE STAGE
A. PURPOSE OF PROGRAM To perform Critical Path Method (CPM) calculations and provide an automated system for integrated multiple project scheduling and resource evaluation.			
B. PROGRAM SPECIFICATIONS This is an interactive program.			
C. METHODS The program computes all CPM start and finish time, slack, activity costs, and resource requirements. When used in conjunction with an external heuristic program, resource leveling can be accomplished.			
D. EQUIPMENT DETAILS Harris Version, Tektronix Graphics			
E. INPUT-OUTPUT Input entered interactively. Output directly on CRT, or stored in file and listed later.			
F. ADDITIONAL REMARKS This program is based on programs developed by Messrs. Noullet and Lambrecht of Pittsburgh and Mobile Districts, respectively. Modifications were added by Mr. Stackowiak from theory developed by CPT. Gransberg.			

SECTION 1. GENERAL

1.1 Purpose

The objective of this user's manual for the *CPM system is to provide non-ADP personnel with the information necessary to use the system effectively. Although section 3 of the manual contains a brief overview of critical path method (CPM) theory and illustrates the computations made by the program, it is assumed that the user has a reasonable knowledge of CPM.

1.2 Origin of the Program

The program was originally written in 1971 by Mr. Noullet of Pittsburgh District. In 1980, additions were made by Mr. Lambrecht of the Mobile District. In January 1983, CPT Douglas D. Gransberg of the St. Paul District was assigned the project of developing an automated system to simultaneously schedule multiple projects. At that time, he and Mr. Robert Stackowiak incorporated modifications and additions to the program.

1.3 References

a. Network analysis systems in general and their particular applicability to the work of the Corps of Engineers are explained in ER 1-1-11, 1 March 1973.

b. The technical report "Integrated Multiple Project Scheduling System" by CPT Gransberg explains the use of the program with multiple projects. The report has been filed with and is available through the Defense Technology Information Center.

c. The following is a list of suggested references for those who wish to learn more about CPM:

(1) Department of the Army, 1982. Network Analysis Systems Course, Corps of Engineers Training Center, Huntsville, Alabama.

(2) Hoare, H.R., 1973. Project Management Using Network Analysis, McGraw-Hill, New York.

(3) Meredith, D.D., et al., 1973. Design and Planning of Engineering Systems, Prentice-Hall, Englewood Cliffs, N.J.

(4) Rekow, E.D., 1982. Project Management Guidelines, St. Paul District, St. Paul, MN.

(5) Riggs, J.L., 1976. Production System: Planning Analysis and Control, John Wiley and Sons.

(6) Shaffer, L.R., et al., 1965. The Critical Path Method, McGraw Hill, New York.

(7) Wiest, J.D. and F.K. Levy, 1977. A Management Guide to PERT/CPM, Prentice-Hall, Engelwood Cliffs, N.J.

1.4 Limitations of the Program

Program capacity limitations are shown below. These limitations will probably not constrain the analysis of a single project. However, the user must be very careful to ensure that the limitations are not exceeded when using the program in a multi-project mode.

- a. The maximum number of activities is 3,000. This includes dummies.
- b. Every activity must have a unique I-J (event) number. Therefore, projects with a great number of parallel paths will have a large number of dummies, which may reduce the total usable capacity for real activities. The J number of an activity must always be greater than its I number.
- c. The program can only calculate closed networks. Therefore, individual project networks must be linked together at the beginning and end by dummies for multiple project analysis. This creates false start and stop events and makes output interpretation on a project-by-project basis somewhat tricky. However, some familiarity with the output makes accurate analysis possible. Use of the project sort can expedite this process.
- d. Assembly of a large initial calendar file is required to ensure that the available "time window" is great enough for the network to occupy. The calendar file can be reduced after the initial run.
- e. Strict coding of activity descriptions is required to allow project and organizational sorting. The project code and organization code must each have three digits, and they must appear as the first item of the activity description (i.e., ABC-FE1, Interior Drainage).
- f. Activity durations must be in calendar days.
- g. The amount of output requires a 132-character display. However, a cathode ray tube (CRT) can usually only display 80 characters per line. This causes the output to be "wrapped" on the screen, making data interpretation on the CRT tedious.
- h. The search option can search for a maximum of 10 codes through a maximum of 1,250 activities.

1.5 Definitions and Abbreviations

Algorithm: A set of rules for solving a problem in a finite number of steps.

AS: Actual start date - the date an activity is actually started.

Bar Chart: A scaled, graphical representation of a schedule.

CPM: Critical path method.

CRT: Cathode ray tube.

Dummy Arrow: An activity shown by a dotted line used to establish a technological precedence relationship which has no duration or cost.

EF: Early finish - the earliest time an activity can be completed.

ES: Early start - the earliest time an activity can be started.

Gantt Chart: A bar chart which shows slack.

Heuristics: A set of rules which serve to indicate the arrival at a desired solution.

Histogram: A graph of frequency distribution.

I Number: The event number at the tail of an activity arrow.

J Number: The event number at the head of an activity arrow.

LF: Late start - the latest time an activity can be finished.

LS: Late start - the latest time an activity can be started.

MS: Milestone - the date on which an activity must be completed.

Precedence Networking: A system of networking, similar to CPM, which allows activities to overlap.

RA/PM: Resource Allocation/Project Management.

RS: Remaining slack - the amount of slack remaining in an activity after it has actually been started.

Sort: An organization of data in a specific format.

TS: Total slack, the difference between the LF and EF of an activity.

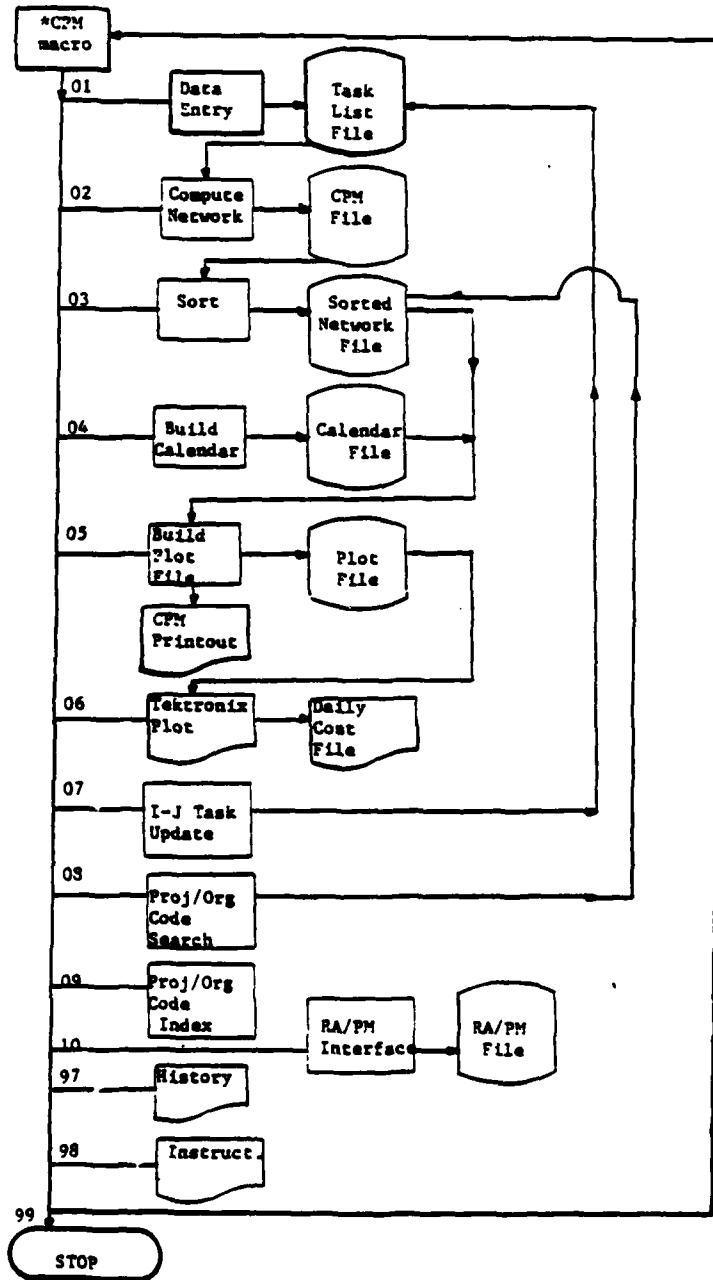
SECTION 2. SUMMARY

2.1 System Application

The CPM system enables the user to run network analyses and trace the critical path with a Harris minicomputer. The programs in the system are interactive and prompt the user for data entries, file names, etc.

2.2 System Operation

The following chart illustrates the system's basic operations and relationships.



2.3 Configuration

All programs in the system are run on a Harris minicomputer. Plots are done on a Tektronix plotter.

2.4 Organization

The system comprises the three following major elements:

a. The CPM Macro. This macro controls the execution of the programs in the system. It displays a menu of options from which the terminal operator may select any of ten programs or view a brief history of this CPM or instructions on its use.

b. Options.

- 01 Data Entry Program: prompts the user to enter I-J numbers, descriptions, cost, duration, etc., and builds the task list file which becomes input to the next program.
- 02 Compute CPM Network: computes the network and critical path. If the program should abort (e.g., because it discovered a loop in the network), it prints error messages. It builds the CPM file.
- 03 Sort CPM File: sorts the CPM file into I-J order, late start order, early start order, etc. It produces the sorted CPM file.
- 04 Calendar Program: prompts the user to enter the project starting date ("NTP ACK DATE") and builds a project calendar which begins with this date. All subsequent dates (e.g., late start, early finish), are based on this date, and the actual dates (as opposed to the formula "starting date + duration =...") are extracted from the calendar file.
- 05 Print Program and Plot File Builder: prints the sorted CPM file and creates the plot file.
- 06 Activity/Cost Tektronix Plot Program: plots activity versus date and average daily cost versus date. The user may also generate a file containing average daily costs. Note: this option must be run on a device with Tektronix graphics capability.
- 07 Update Task List: offers the user the opportunity to update the task list file. It prompts for the file name, for an indication of whether the updating action is to be an addition, change, or deletion, and for the new data when appropriate. This option may be used to add actual start date,

percent complete, or milestone date. The updated task list file may then be entered as input to option 02, thus creating a new network.

- 08 Search for Organization/Project Codes: writes selected tasks from the sorted CPM network file (option 03) into a new file which may then be used as input to the print program (option 05).
- 09 Organization/Project Codes: Index: allows the user to create a new file of codes and their descriptions, search an existing index file for organization and/or project codes, or add codes and their descriptions to an existing index file.
- 10 CPM-RA/PM Interface Program: allows the user to convert a CPM sorted network file (option 03) into RA/PM input.
- 97 CPM History: provides the user with the names of CPM source program files, where and when they were developed, and the language they are written in.
- 98 CPM Instructions: provides the user with brief instructions on how to use the options.
- 99 Terminate CPM: returns the user to job control.

c. Files.

The system uses the following files:

- (1) Task list file - I-J nodes, duration, cost, etc.
- (2) CPM file - the network, unsorted and without dates.
- (3) Sorted CPM file - sorted in the following orders:
 - I-J SORT
 - LATE START SORT
 - EARLY START SORT
 - EARLY FINISH SORT
 - LATE FINISH SORT
 - TOTAL SLACK SORT
- (4) Calendar file - starting date to ending + 15%.
- (5) Plot file - the CPM data and calendar files formatted for input to the activity/cost Tektronix plot program.
- (6) RA/PM file - sorted network file formatted for input to RA/PM.

2.5 Performance

The CPM system interactively performs fast and accurate network analyses, plots the activities and costs, and updates its files.

2.6 General description

- a. Input. Input to the programs comes from the operator's responses to prompts and from files built by other programs.
- b. Processing. The CPM data are processed by both FORTRAN and COBOL programs.
- c. Output. Sorted network lists, daily costs, Tektronix plots of activities and daily costs, and RA/PM input.

SECTION 3. STAFF FUNCTIONS

3.1 Initiation

After normal sign-on procedures, the user enters *CPM and depresses the ENTER or RETURN (depending on the type of terminal) key. The CPM macro then takes control and displays a menu of options and the numeric codes which must be entered to execute them.

3.2 Staff Input Requirements

All input requirements are controlled by the system. The CPM macro displays a menu of programs, and the programs guide the user's entries by prompting and by error messages when appropriate.

3.2.1 Input Formats

The system displays all formats required for data entry.

3.3 Output Requirements

Output files may be printed in ADP by entering CO, file name, :6,NC. Plotting is done on the Tektronix.

SECTION 4. CPM THEORY

4.1 General

This section provides a brief review of CPM theory, highlighting the important areas for use in the *CPM program. It is assumed that the user is generally familiar with CPM and its uses. If this is not the case, the user should refer to the literature cited in paragraph 1.3.

4.2 Network Development

The program is designed to be used with an "Activity on the Arrow" network such as that shown in figure 4.2-1. To assemble such a network, the user must first list all activities required for project completion. These activities must be shown on the network on the basis of their technological precedence. CPM requires that one activity end before another can begin. Therefore, the possibility of overlapping technologically related activities is eliminated.

Dummy arrows are used to show technological precedence relationships where an activity's completion relates to the start of two or more activities on parallel paths. Because each activity must have a unique I-J number, dummies are also used when two or more activities start and end on the same nodes. Additionally, dummies are required to connect the initial and final nodes of each project to a common start and finish node to use the program for multi-project analysis.

4.3 CPM Computations

Once the network has been drawn, computations can be made to determine the critical path through the network. The critical path algorithm is based on a series of computations made using the durations of the activities. It follows each possible path through the network. The algorithm follows (definitions and abbreviations are found in paragraph 1.5).

a. Make a forward pass through the network from beginning to end computing the ES and EF times of each activity. The EF of an activity (x) equals its ES time plus its duration (d) or

$$EF_{(x)} = ES_{(x)} + d_{(x)} \dots \dots \dots \text{Equation 1.}$$

The ES of all activities emanating from a node equals the greatest EF of all activities terminating at that node. For example, if an activity is the initial activity in the network and has a duration of 12 calendar days, its ES would equal 0, its EF would equal 12, and the ES of all activities which emanate from its ending node would be 12.

b. Make a backward pass through the network from end to beginning, using the greatest EF time for any activity terminating at the final node as the LF time at that node. Compute the LF and LS times for each activity using the following equation:

$$LS_{(x)} = LF_{(x)} - d_{(x)} \dots \dots \dots \text{Equation 2.}$$

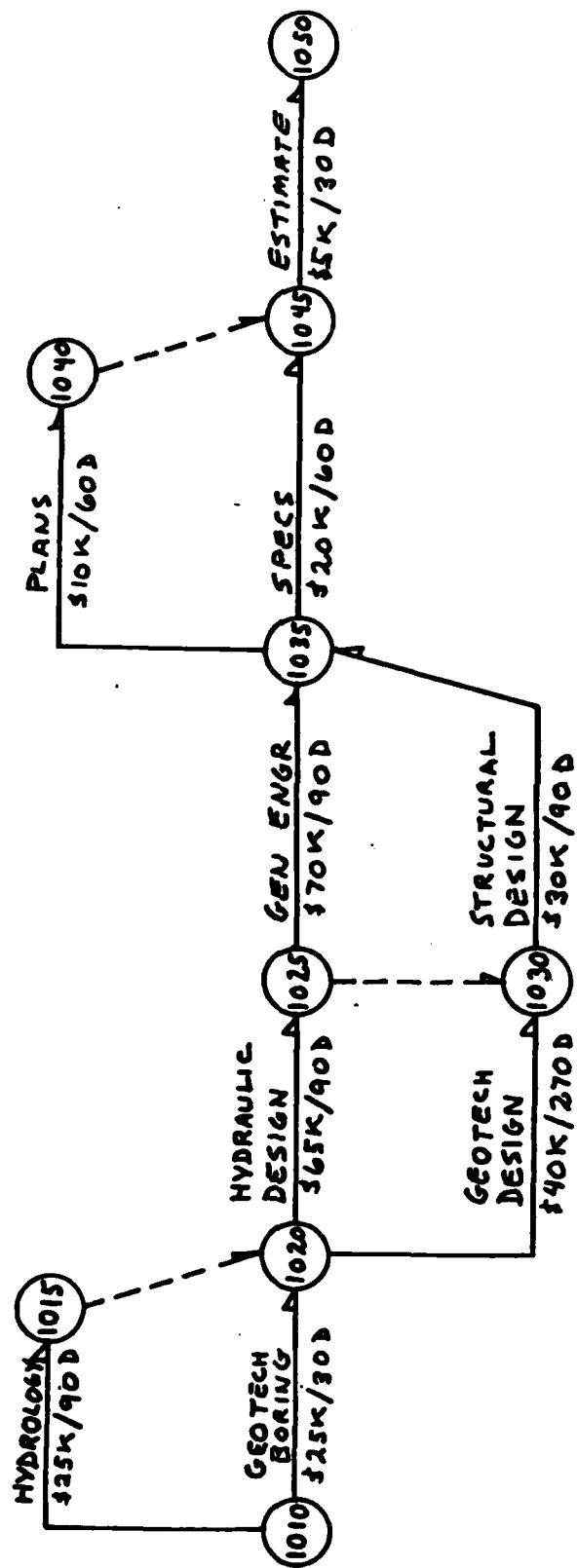


Figure 4.2-1: Activity on the arrow network for Project AAA.

c. Compute the total slack (TS) for each activity using Equation 3 or 4.

$$TS_{(x)} = LF_{(x)} - EF_{(x)} \dots \dots \dots \text{Equation 3.}$$

$$TS_{(x)} = LS_{(x)} - ES_{(x)} \dots \dots \dots \text{Equation 4.}$$

d. Those activities whose $TS = 0$ are on the critical path.

*CPM has the ability to constrain the theoretical network to reality through the use of actual start dates (AS) and milestone (MS) dates. This requires a slight divergence from classical CPM theory. Generally, when a network is constrained by start and finish dates, the slack computations must be revised to give an accurate picture of which activities are truly critical. The concept of remaining slack (RS) must therefore be introduced.

$$RS_{(x)} = LS_{(x)} - AS_{(x)} \dots \dots \dots \text{Equation 5.}$$

If an activity has an AS, the program will replace its ES with the AS. (Note: Students of CPM should not confuse this concept with the theoretical concepts of free slack or interfering slack. The program does not make these computations.)

Additionally, the input of an MS also affects the activity's slack. If an activity has an MS, the program will replace the LF of the activity with the MS and recompute the TS.

$$TS_{(x)} = MS_{(x)} - EF_{(x)} \dots \dots \dots \text{Equation 6.}$$

It is entirely possible to get a negative number for either RS or TS. If RS is negative, the activity was started after its late start date. If TS is negative, the activity cannot be finished before its milestone date. It is obvious that the appearance of negative slack in a network can give a project manager some very valuable information about the status of his project.

4.4 Resource Leveling Computations

To allow resource leveling decisions to be made, the program converts the CPM network into a Gantt Chart and vertically sums the resource requirement of each activity that occurs on a given day. Those total daily costs are then plotted as a histogram. The goal of this exercise is to distribute the total workload as evenly as possible across the selected period of time. This is done by comparing the ES and LF resource histograms with the ES bar chart. Before this operation can be explained in detail, the comparison criteria must be understood. The resource requirement is measured in dollars per day and is determined for an individual activity by dividing

the activity's total cost (the organization's project budget) by its duration. This operation assumes that the money allocated for a single activity is uniformly expended throughout its duration. Consequently, the total resource requirement for any one day will be the sum of the individual activity resource requirements that are scheduled for that day. That sum can then be compared to the maximum amount of dollars that the parent organization can expend on any given day to determine if the parent organization will be over or under committed on that particular day. For purposes of this report, parent organization is defined as the aggregate of functional elements over which it has control. This theory can be reduced to the following equations:

$$r_x = \frac{c_x}{d_x} \dots \dots \dots \text{Equation 7.}$$

$$R_i = \sum_{x=1}^n r_x(i) \dots \dots \dots \text{Equation 8.}$$

Where: r_x = Resource requirement for activity "x" (\$/day)

c_x = Total cost for activity "x" (\$)

d_x = Duration of activity "x" (Days)

And: R_i = Total resource requirement on day "i" (\$)

i = Day

$R_{\max}$ = Maximum daily resource capacity for parent organization

Therefore:

If: $R_{\max} < R_i \dots \dots \dots \text{Equation 9.}$

Then: The parent organization is over committed

If: $R_{\max} = R_i \dots \dots \dots \text{Equation 10.}$

Then: The parent organization is fully committed

If: $R_{\max} > R_i \dots \dots \dots \text{Equation 11.}$

Then: The parent organization is under committed

Resource leveling can now begin, using this theory and the updating option of *CPM. A simple heuristic program is used iteratively until a satisfactory solution is reached. The program is based on four rules (heuristics):

- a. Allocate resources serially in time (i.e., start with ES schedule).
- b. Give preference to activities with the least slack.
- c. Reschedule non-critical activities to free resources for critical activities.
- d. If using the program for multi-project analysis, schedule activities by project priority as determined by executive group.

The heuristic program is applied using the following sequence of events:

- a. Locate times in which $R_i > R_{max}$ on ES resource histogram.
- b. Check corresponding times on ES Gantt Chart to determine which activities have slack and which activities do not (i.e., critical activities).
- c. Add the resource requirement for those activities with no slack. If this amount is greater than R_{max} , the parent organization will be over committed unless a means to shorten the duration of critical activities can be found.
- d. Attempt to schedule activities with slack at a point between their ES and LS date where $R_i < R_{max}$. Call these dates tentative actual start dates.
- e. Using the LF Gantt Chart, the LF resource histogram and the TS sort, identify which milestones are most heavily limiting the overall system. Select tentative new milestones, if possible, for super-critical activities. A super-critical activity is defined as one which cannot meet its milestone.
- f. Update the master file with newly determined tentative actual start dates, tentative new milestones, revised durations, and other changes.
- g. Run newest update. Analyze that output and repeat the process until a satisfactory solution is reached.

It is doubtful that a level resource histogram can be derived. Therefore, the best possible solution will contain times when the parent organization is both over committed and under committed.

SECTION 5. INPUT DEVELOPMENT

5.1 General

The input for the program comes directly off the network diagram. A form listing the pertinent information for each activity in the following order would be helpful:

- a. I number.
- b. J number.
- c. Cost (\$).
- d. Duration (calendar days).
- e. Three-digit project code; three-digit organization code.
- f. Activity description.
- g. Milestone date (month, day, year).
- h. Actual start date (month, day year).
- i. Percentage of completion.

Examples of how input is developed for both single and multiple project analysis are shown in the following paragraphs.

5.2 Single Project Example

The network shown in figure 4.2-1 will be analyzed in this example. Figure 5.2-1 is a copy of the input file created in option 1 of *CPM. Figure 5.2-2 is the print program input file created in option 3. Figure 5.2-3 is the calendar file created by option 4. It should be noted that when creating the calendar file, the user should input the day before the first day of the time period to be analyzed. For example, if the user wanted to analyze FY 84, the proper response to the prompt "NTP ACK DATE (MDDYY)?" would be "093083" (30 September 1983). This would make the first day of the calendar file 1 October 1983.

5.3 Multiple Project Example

Developing input for multiple project analysis is generally the same as for single project analysis. However, because the program and CPM theory are designed to analyze one network at a time, multiple projects must be tied together at the beginning and end with dummies. This example will add two networks to the one shown in figure 4.2-1. These are pictured in figures 5.3-1 and 5.3-2. Figure 5.3-3 shows how they are tied together. The input file created in option 1 is shown in figure 5.3-4. The same calendar file will be used.

```

EXAMPLE FOR *CPM
USERS MANUAL OF A SINGLE
PROJECT/NETWORK AND ITS INPUT AND OUTPUT FILES

1010 1015 90      25000.AAA-EHO HYDROLOGY
1010 1020 30      25000.AAA-EGB GEOTECH BORINGS
1015 1020 0        0.DUMMY
1020 1025 90      65000.AAA-EHA HYDRAULIC DES
1020 1030270      40000.AAA-EGD GEOTECH DES
1025 1030 0        0.DUMMY
1025 1035 90      70000.AAA-EGE GENERAL ENGR
1030 1035 90      30000.AAA-ED5 STRUCTURAL DES
1035 1040 60      10000.AAA-EDD PLANS
1035 1045 60      20000.AAA-ESP SPECIFICATIONS
1040 1045 0        0.DUMMY
1045 1050 30      5000.AAA-EDE ESTIMATE
-999 -999

EOT..

```

Figure 5.2-1: Input file created by option 1.

[illegible]

TOTAL SLACK SORT	1		
001010001015 90 0	25000.AAA-EHD HYDROLOGY	0000000000000009000000090	0 0
001015001020 0 0	0.DUMMY	0000000000090009000900090	0 0
001020001030270 0	40000.AAA-EGD GEOTECH DES	0000000000090036000900360	0 0
001030001035 90 0	30000.AAA-EDS STRUCTURAL DES	00000000000360045003600450	0 0
001035001040 60 0	10000.AAA-EDD PLANS	00000000000450051004500510	0 0
001035001045 60 0	20000.AAA-ESP SPECIFICATIONS	00000000000450051004500510	0 0
001040001045 0 0	0.DUMMY	00000000000510051005100510	0 0
001045001050 30 0	5000.AAA-EDE ESTIMATE	00000000000510054005100540	0 0
001010001020 30 0	25000.AAA-EGB GEOTECH BORINGS	0000000000000003000600090	60 60
001020001025 90 0	65000.AAA-EHA HYDRAULIC DES	0000000000090018002700360	180 180
001025001030 0 0	0.DUMMY	00000000000180018003600360	180 180
001025001035 90 0	70000.AAA-EGE GENERAL ENGR	00000000000180027003600450	180 180
-999000000			

EDF..
EDF..
EDT..

Figure 5.2-2: Print program input file created by option 3 (continued).

```

1 10 183 10 283 10 383 10 483 10 583 10 683 10 783 10 883 10 983 101083
11 101183 101283 101383 101483 101583 101683 101783 101883 101983 102083
21 102183 102283 102383 102483 102583 102683 102783 102883 102983 103083
31 103183 11 183 11 283 11 383 11 483 11 583 11 683 11 783 11 883 11 983
41 111083 111183 111283 111383 111483 111583 111683 111783 111883 111983
51 112083 112183 112283 112383 112483 112583 112683 112783 112883 112983
61 113083 12 183 12 283 12 383 12 483 12 583 12 683 12 783 12 883 12 983
71 121083 121183 121283 121383 121483 121583 121683 121783 121883 121983
81 122083 122183 122283 122383 122483 122583 122683 122783 122883 122983
91 123083 123183 1 184 1 284 1 384 1 484 1 584 1 684 1 784 1 884
101 1 984 11084 11184 11284 11384 11484 11584 11684 11784 11884
111 11984 12084 12184 12284 12384 12484 12584 12684 12784 12884
121 12984 13084 13184 2 184 2 284 2 384 2 484 2 584 2 684 2 784
131 2 984 21084 21184 21284 21384 21484 21584 21684 21784
141 21884 21984 22084 22184 22284 22384 22484 22584 22684 22784
151 22884 22984 3 184 3 284 3 384 3 484 3 584 3 684 3 784 3 884
161 3 984 31084 31184 31284 31384 31484 31584 31684 31784 31884
171 31984 32084 32184 32284 32384 32484 32584 32684 32784 32884
181 32984 33084 33184 4 184 4 284 4 384 4 484 4 584 4 684 4 784
191 4 984 4 984 41084 41184 41284 41384 41484 41584 41684 41784
201 41884 41984 42084 42184 42284 42384 42484 42584 42684 42784
211 42884 42984 43084 5 184 5 284 5 384 5 484 5 584 5 684 5 784
221 5 884 5 984 51084 51184 51284 51384 51484 51584 51684 51784
231 51884 51984 52084 52184 52284 52384 52484 52584 52684 52784
241 52884 52984 53084 53184 6 184 6 284 6 384 6 484 6 584 6 684
251 6 784 6 884 6 984 61084 61184 61284 61384 61484 61584 61684
261 61784 61884 61984 62084 62184 62284 62384 62484 62584 62684
271 62784 62884 62984 63084 7 184 7 284 7 384 7 484 7 584 7 684
281 7 784 7 884 7 984 71084 71184 71284 71384 71484 71584 71684
291 71784 71884 71984 72084 72184 72284 72384 72484 72584 72684
301 72784 72884 72984 73084 73184 8 184 8 284 8 384 8 484 8 584
311 8 684 8 784 8 884 8 984 81084 81184 81284 81384 81484 81584
321 81684 81784 81884 81984 82084 82184 82284 82384 82484 82584
331 82684 82784 82884 82984 83084 83184 9 184 9 284 9 384 9 484
341 9 584 9 684 9 784 9 884 9 984 91084 91184 91284 91384 91484
351 91584 91684 91784 91884 91984 92084 92184 92284 92384 92484
361 92584 92684 92784 92884 92984 93084 10 184 10 284 10 384 10 484
371 10 584 10 684 10 784 10 884 10 984 101084 101184 101284 101384 101484
381 101584 101684 101784 101884 101984 102084 102184 102284 102384 102484
391 102584 102684 102784 102884 102984 103084 103184 11 184 11 284 11 384
401 11 484 11 584 11 684 11 784 11 884 11 984 111084 111184 111284 111384
411 111484 111584 111684 111784 111884 111984 112084 112184 112284 112384
421 112484 112584 112684 112784 112884 112984 113084 12 184 12 284 12 384
431 12 484 12 584 12 684 12 784 12 884 12 984 121084 121184 121284 121384
441 121484 121584 121684 121784 121884 121984 122084 122184 122284 122384
451 122484 122584 122684 122784 122884 122984 123084 123184 1 185 1 285
461 1 385 1 485 1 585 1 685 1 785 1 885 1 985 11085 11185 11285
471 11385 11485 11585 11685 11785 11885 11985 12085 12185 12285
481 12385 12485 12585 12685 12785 12885 12985 13085 13185 2 185
491 2 285 2 385 2 485 2 585 2 685 2 785 2 885 2 985 21085 21185
501 21285 21385 21485 21585 21685 21785 21885 21985 22085 22185
511 22285 22385 22485 22585 22685 22785 22885 22985 3 185 3 285 3 385
521 3 485 3 585 3 685 3 785 3 885 3 985 31085 31185 31285 31385
531 31485 31585 31685 31785 31885 31985 32085 32185 32285 32385
541 32485 32585 32685 32785 32885 32985 33085 33185 4 185 4 285
551 4 385 4 485 4 585 4 685 4 785 4 885 4 985 41085 41185 41285
561 41385 41485 41585 41685 41785 41885 41985 42085 42185 42285
571 42385 42485 42585 42685 42785 42885 42985 43085 5 185 5 285
581 5 385 5 485 5 585 5 685 5 785 5 885 5 985 51085 51185 51285
591 51385 51485 51585 51685 51785 51885 51985 52085 52185 52285
601 52385 52485 52585 52685 52785 52885 52985 53085 53185 0 0 0

```

--999
CALENDAR FOR
SINGLE PROJECT EXAMPLE
*CPM USERS MANUAL
EOT
EOT

Figure 5.2-3: Calendar file created by option 4.

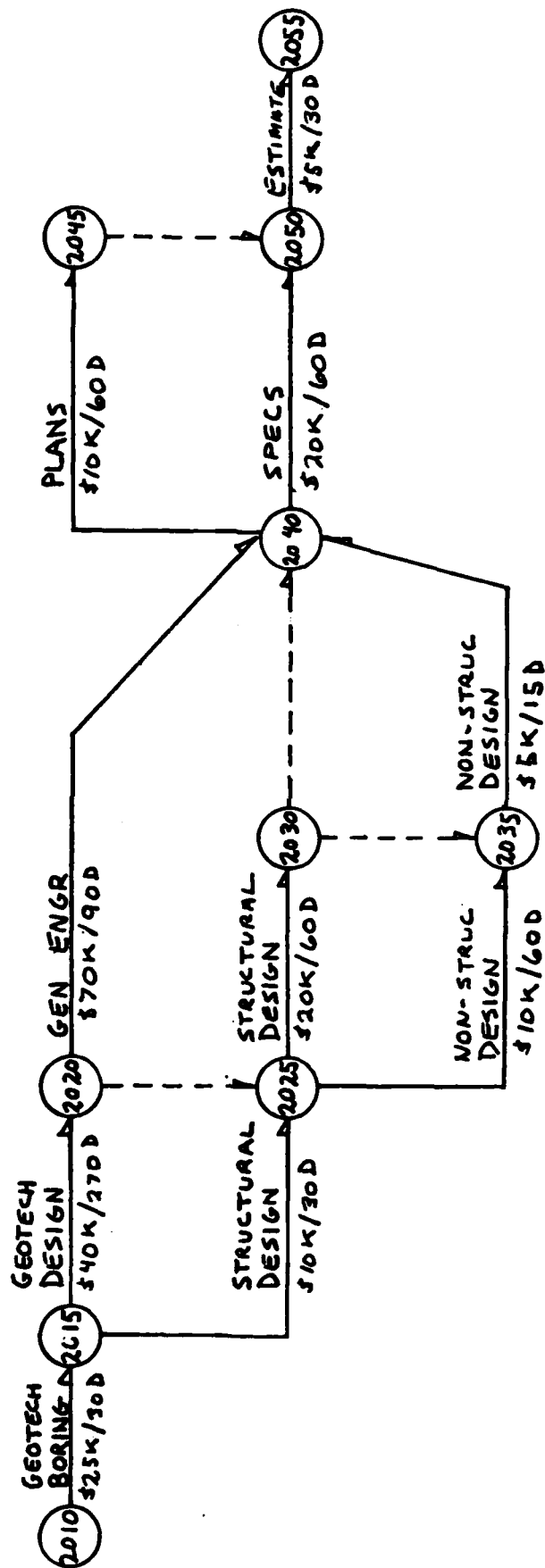


Figure 5.3-1: Network for Project BBB.

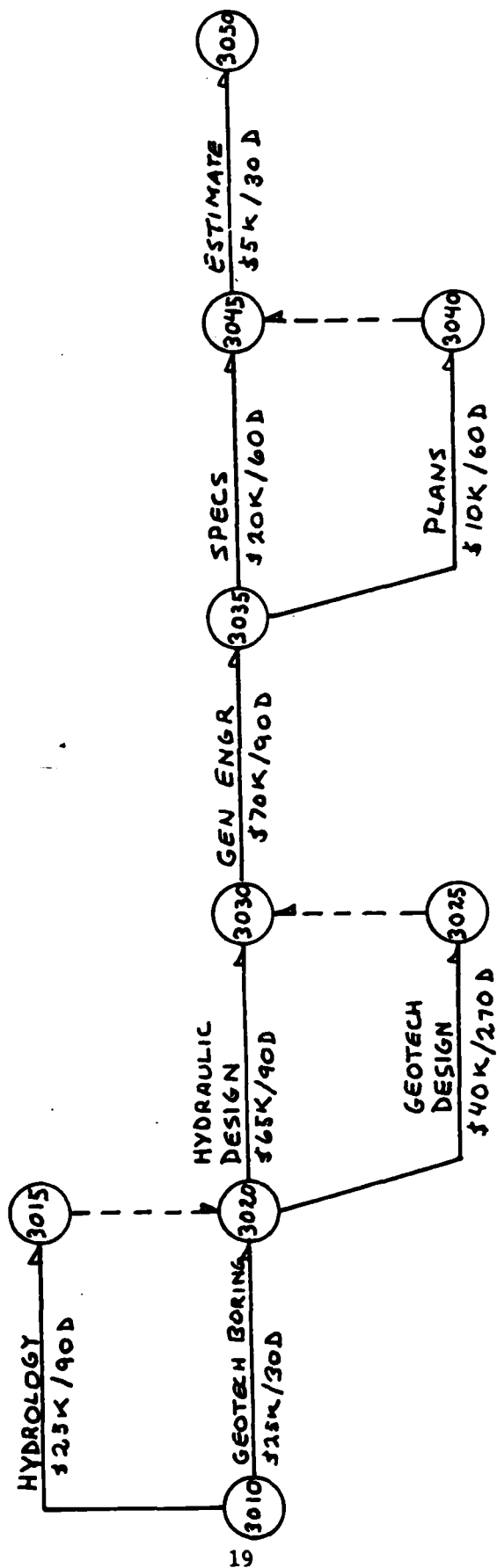


Figure 5.3-2: Network for Project CCC.

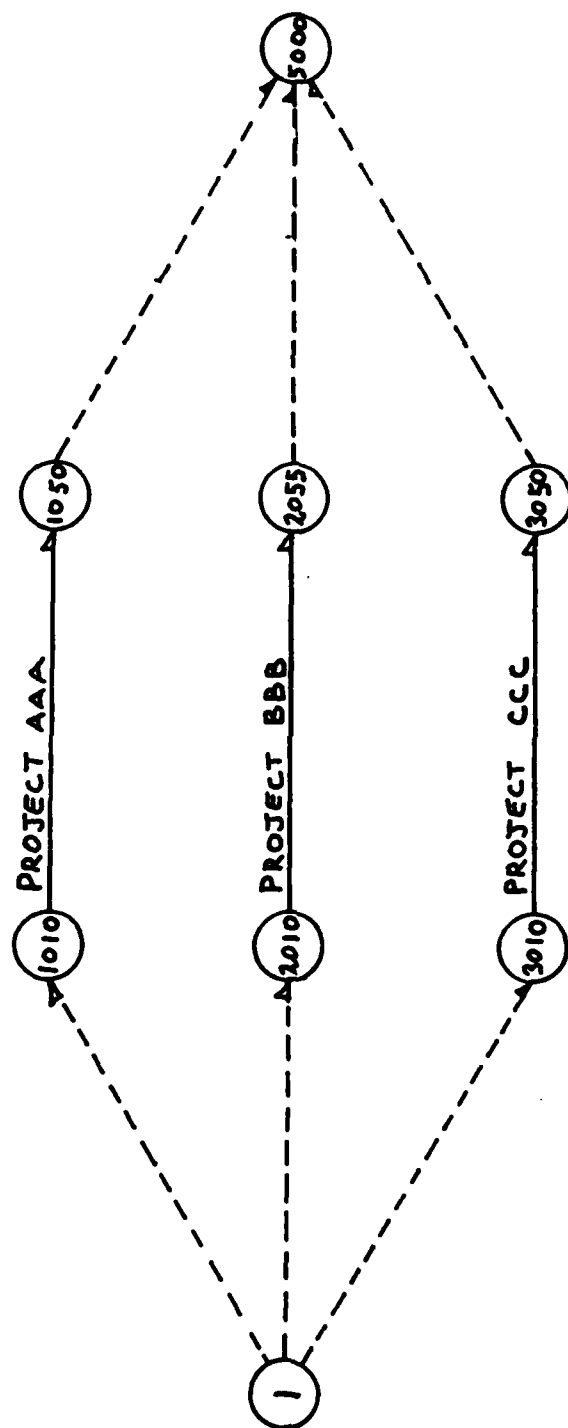


Figure 5.3-3: Combined networks for multiple project analysis.

LINE NO.	DATE	DESCRIPTION	AMOUNT	DATE	DESCRIPTION	AMOUNT
1	1010	0	0. DUMMY			
1	2010	0	0. DUMMY			
1	3010	0	0. DUMMY			
1010	1015	90	25000. AAA-EHO	HYDROLOGY		
1010	1020	30	25000. AAA-EGB	GEOTECH BORING		
1015	1020	0	0. DUMMY			
1020	1025	90	65000. AAA-EHA	HYDRAULIC DESIGN		
1020	1030	270	40000. AAA-EGD	GEOTECH DESIGN		
1025	1030	0	0. DUMMY			
1025	1035	90	70000. AAA-EGE	GENERAL ENGR		
1030	1035	90	30000. AAA-ED5	STRUCTURAL DESIGN		
1035	1040	60	10000. AAA-EOD	PLANS		
1035	1045	60	20000. AAA-ESP	SPECIFICATIONS		
1040	1045	0	0. DUMMY			
1045	1050	30	5000. ESTIMATE			
1050	5000	0	0. DUMMY			
2010	2015	30	25000. BBB-EGB	GEOTECH BORING		
2015	2020	270	40000. BBB-EGD	GEOTECH DESIGN		
2015	2025	30	10000. BBB-ED5	STRUCTURAL DESIGN		
2020	2025	0	0. DUMMY			
2020	2040	90	70000. BBB-EGE	GENERAL ENGR		
2025	2030	60	20000. BBB-ED5	STRUCTURAL DESIGN		
2025	2035	60	10000. BBB-EDN	NON-STRUCTURAL DESIGN		
2030	2035	0	0. DUMMY			
2030	2040	0	0. DUMMY			
2035	2040	15	5000. BBB-EDN	NON-STRUCTURAL DESIGN		
2040	2045	60	10000. BBB-EOD	PLANS		
2040	2050	60	20000. BBB-ESP	SPECIFICATIONS		
2045	2050	0	0. DUMMY			
2050	2055	30	5000. BBB-EDE	ESTIMATE		
2055	5000	0	0. DUMMY			
3010	3015	90	25000. CCC-EHO	HYDROLOGY		
3010	3020	30	25000. CCC-EGB	GEOTECH BORING		
3015	3020	0	0. DUMMY			
3020	3025	270	40000. CCC-EGD	GEOTECH DESIGN		
3020	3030	90	65000. CCC-EHA	HYDRAULIC DESIGN		
3025	3030	0	0. DUMMY			
3030	3035	90	70000. CCC-EGE	GENERAL ENGR		
3035	3040	60	10000. CCC-EOD	PLANS		
3035	3045	60	20000. CCC-ESP	SPECIFICATIONS		
3040	3045	0	0. DUMMY			
3045	3050	30	5000. CCC-EDE	ESTIMATE		
3050	5000	0	0. DUMMY			
-999	-999					

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SECTION 6. OUTPUT DISPLAYS

6.1 General

The output from *CPM consists of sorted CPM computations, Gantt Charts, a resource histogram based on the Gantt Chart, and an accumulated daily cost curve based on the resource histogram. *CPM will compute the following elements from the network input data:

- a. Early start date (ES).
- b. Early finish date (EF).
- c. Late start date (LS).
- d. Late finish date (LF).
- e. Total slack (TS).
- f. Remaining slack (RS).
- g. Total project cost.

From updated input data, the program can perform the following functions:

- a. Compute total cost to date for each project activity and show total project cost to date.
- b. Show percentage of completion for each project activity.
- c. Replace ES and LS dates with actual start date and alter slack calculations to show how critical the activities are.
- d. Replace LF date with milestone date, alter slack calculations, and determine if milestone can be met.
- e. If a milestone cannot be met, a warning statement is printed, and TS is shown as a negative number which indicates the number of days that the activity will be late if neither the duration nor the milestone is changed.

The program has the ability to sort the output and list it in several orders. The various sorts and their management uses are as follows:

- a. I-J Sort - Activities are listed in numerical order of their I-J (event) numbers. Analysis of this sort allows the logic of the total network to be checked and the level of input accuracy to be quickly determined.

b. Early Start Sort - Activities are listed in chronological order by their ES dates. This sort shows which activities can be started chronologically if resources are available.

c. Early Finish Sort - Activities are listed chronologically by their EF dates. This sort shows how soon activities can be finished if resources are available.

d. Late Start Sort - Activities are listed chronologically by their LS dates. This sort shows when activities must be started to remain on schedule.

e. Late Finish Sort - Activities are listed chronologically by their LF date. This is one of the most important sorts from a management standpoint. It shows which activities must be completed to avoid missing milestones. In the final output, the LF dates will be replaced by the activity milestone date. Therefore, this sort could be labeled the milestone sort.

f. Total Slack Sort - Activities are listed in ascending numerical order by their amounts of total slack. This is the most important management sort because it shows the critical activities and near-critical activities.

g. Project Sort - Activities are listed in the order specified by any of the above five basic sorts for one specific project. This allows project managers to get information on a particular project.

h. Organization Sort - All the activities of a specific organization are listed in the order specified by any of the six basic sorts. This provides specific information on the work schedule of a particular organization to allow evaluation of bottlenecks and analysis of staffing levels.

6.2 Single Project Example

Figure 6.2-1 shows the output generated by option 5 sorted in the six basic sorts discussed above. Figure 6.2-2 is the plot file developed in option 5. Figure 6.2-3 is the Gantt Chart generated in option 6 from the option 5 plot file. A daily cost file is created in option 6 (figure 6.2-4), and these data are used to generate a resource histogram (figure 6.2-5) and an accumulated daily cost curve (figure 6.2-6). The resource histogram shows two situations:

a. The resource requirement if every activity is scheduled to begin on its ES date (shown by a solid line).

b. The resource requirement if every activity is scheduled to begin on its LS date (shown by a dashed line). The accumulated daily cost curve shows the same two situations.

I-J SORT

1 UPDATE AS OF 10 583

EXAMPLE FOR RCPH

6 MAY 83

USERS MANUAL OF A SINGLE
PROJECT/NETWORK AND ITS INPUT AND OUTPUT FILES

0	EVENT I	DUR J	ATION	ACTIVITY DESCRIPTION	TOTAL COST	CURRENT COST	PCT COMP	EARLIEST START	FINISH	LATEST START	FINISH	SLACK TOT	REM
	1010	1015	90	AAA-EHD HYDROLOGY	25000.	0.	0	10CT83	30DEC83	10CT83	30DEC83	0	0
	1010	1020	30	AAA-ECB GEOTECH BORINGS	25000.	0.	0	10CT83	31OCT83	30NOV83	30DEC83	60	60
	1015	1020	0	DUMMY	0.	0.	0	30DEC83	30DEC83	30DEC83	30DEC83	0	0
	1020	1025	90	AAA-EHA HYDRAULIC DES	65000.	0.	0	30DEC83	29MAR84	27JUN84	25SEP84	180	180
	1020	1030	270	AAA-EGD GEOTECH DES	40000.	0.	0	30DEC83	25SEP84	30DEC83	25SEP84	0	0
	1025	1030	0	DUMMY	0.	0.	0	29MAR84	29MAR84	25SEP84	25SEP84	180	180
	1025	1035	90	AAA-EGE GENERAL ENGR	70000.	0.	0	29MAR84	27JUN84	25SEP84	24DEC84	180	180
	1030	1035	90	AAA-EDS STRUCTURAL DES	30000.	0.	0	25SEP84	24DEC84	25SEP84	24DEC84	0	0
	1035	1040	60	AAA-EDD PLANS	10000.	0.	0	24DEC84	22FEB85	24DEC84	22FEB85	0	0
	1035	1045	60	AAA-ESP SPECIFICATIONS	20000.	0.	0	24DEC84	22FEB85	24DEC84	22FEB85	0	0
	1040	1045	0	DUMMY	0.	0.	0	22FEB85	22FEB85	22FEB85	22FEB85	0	0
	1045	1050	30	AAA-EDE ESTIMATE	5000.	0.	0	22FEB85	24MAR85	22FEB85	24MAR85	0	0

TOTAL COST OF WORK: 290000.

TOTAL COST OF WORK COMPLETED: 0.

* INDICATES ACTUAL START

** INDICATES MILESTONE DATE

1 LATE START SORT

1 UPDATE AS OF

EXAMPLE FOR RCPH

6 MAY 83

USERS MANUAL OF A SINGLE
PROJECT/NETWORK AND ITS INPUT AND OUTPUT FILES

0	EVENT I	DUR J	ATION	ACTIVITY DESCRIPTION	TOTAL COST	CURRENT COST	PCT COMP	EARLIEST START	FINISH	LATEST START	FINISH	SLACK TOT	REM
	1010	1015	90	AAA-EHD HYDROLOGY	25000.	0.	0	10CT83	30DEC83	10CT83	30DEC83	0	0
	1010	1020	30	AAA-ECB GEOTECH BORINGS	25000.	0.	0	10CT83	31OCT83	30NOV83	30DEC83	60	60
	1015	1020	0	DUMMY	0.	0.	0	30DEC83	30DEC83	30DEC83	30DEC83	0	0
	1020	1030	270	AAA-EGD GEOTECH DES	40000.	0.	0	30DEC83	25SEP84	30DEC83	25SEP84	0	0
	1020	1025	90	AAA-EHA HYDRAULIC DES	65000.	0.	0	30DEC83	29MAR84	27JUN84	25SEP84	180	180
	1025	1030	0	DUMMY	0.	0.	0	29MAR84	29MAR84	25SEP84	25SEP84	180	180
	1025	1035	90	AAA-EGE GENERAL ENGR	70000.	0.	0	29MAR84	27JUN84	25SEP84	24DEC84	180	180
	1030	1035	90	AAA-EDS STRUCTURAL DES	30000.	0.	0	25SEP84	24DEC84	25SEP84	24DEC84	0	0
	1035	1040	60	AAA-EDD PLANS	10000.	0.	0	24DEC84	22FEB85	24DEC84	22FEB85	0	0
	1035	1045	60	AAA-ESP SPECIFICATIONS	20000.	0.	0	24DEC84	22FEB85	24DEC84	22FEB85	0	0
	1040	1045	0	DUMMY	0.	0.	0	22FEB85	22FEB85	22FEB85	22FEB85	0	0
	1045	1050	30	AAA-EDE ESTIMATE	5000.	0.	0	22FEB85	24MAR85	22FEB85	24MAR85	0	0

TOTAL COST OF WORK: 290000.

TOTAL COST OF WORK COMPLETED: 0.

* INDICATES ACTUAL START

** INDICATES MILESTONE DATE

Figure 6.2-1: CPM printed output file generated by option 5.

EARLY START SORT
1 UPDATE AS OF

0

EXAMPLE FOR 8CPH 6 MAY 83
USERS MANUAL OF A SINGLE
PROJECT/NETWORK AND ITS INPUT AND OUTPUT FILES

0	EVENT I	DUR J	ATION	ACTIVITY DESCRIPTION	TOTAL COST	CURRENT COST	PCT COMP	EARLIEST START	FINISH	LATEST START	FINISH	SLACK TOT	REM
	1010	1015	90	AAA-EHD HYDROLOGY	25000.	0.	0	10CT83	30DEC83	10CT83	30DEC83	0	0
	1010	1020	30	AAA-EG8 GEOTECH BORINGS	25000.	0.	0	10CT83	310CT83	30NOV83	30DEC83	60	60
	1015	1020	0	DUMMY	0.	0.	0	30DEC83	30DEC83	30DEC83	30DEC83	0	0
	1020	1025	90	AAA-EHA HYDRAULIC DES	65000.	0.	0	30DEC83	29MAR84	27JUN84	25SEP84	180	180
	1020	1030	270	AAA-EG0 GEOTECH DES	40000.	0.	0	30DEC83	25SEP84	30DEC83	25SEP84	0	0
	1025	1030	0	DUMMY	0.	0.	0	29MAR84	29MAR84	25SEP84	25SEP84	180	180
	1025	1035	90	AAA-EGE GENERAL ENGR	70000.	0.	0	29MAR84	27JUN84	25SEP84	24DEC84	180	180
	1030	1035	90	AAA-ED5 STRUCTURAL DES	30000.	0.	0	25SEP84	24DEC84	25SEP84	24DEC84	0	0
	1035	1040	60	AAA-ED0 PLANS	10000.	0.	0	24DEC84	22FEB85	24DEC84	22FEB85	0	0
	1035	1045	60	AAA-ESP SPECIFICATIONS	20000.	0.	0	24DEC84	22FEB85	24DEC84	22FEB85	0	0
	1040	1045	0	DUMMY	0.	0.	0	22FEB85	22FEB85	22FEB85	22FEB85	0	0
	1045	1050	30	AAA-EDE ESTIMATE	5000.	0.	0	22FEB85	24MAR85	22FEB85	24MAR85	0	0

TOTAL COST OF WORK: 290000.
TOTAL COST OF WORK COMPLETED: 0.

* INDICATES ACTUAL START
** INDICATES MILESTONE DATE

1
EARLY FINISH SORT
1 UPDATE AS OF

0

EXAMPLE FOR 8CPH 6 MAY 83
USERS MANUAL OF A SINGLE
PROJECT/NETWORK AND ITS INPUT AND OUTPUT FILES

0	EVENT I	DUR J	ATION	ACTIVITY DESCRIPTION	TOTAL COST	CURRENT COST	PCT COMP	EARLIEST START	FINISH	LATEST START	FINISH	SLACK TOT	REM
	1010	1020	30	AAA-EG8 GEOTECH BORINGS	25000.	0.	0	10CT83	310CT83	30NOV83	30DEC83	60	60
	1010	1015	90	AAA-EHD HYDROLOGY	25000.	0.	0	10CT83	30DEC83	10CT83	30DEC83	0	0
	1015	1020	0	DUMMY	0.	0.	0	30DEC83	30DEC83	30DEC83	30DEC83	0	0
	1020	1025	90	AAA-EHA HYDRAULIC DES	65000.	0.	0	30DEC83	29MAR84	27JUN84	25SEP84	180	180
	1025	1030	0	DUMMY	0.	0.	0	29MAR84	29MAR84	25SEP84	25SEP84	180	180
	1025	1035	90	AAA-EGE GENERAL ENGR	70000.	0.	0	29MAR84	27JUN84	25SEP84	24DEC84	180	180
	1020	1030	270	AAA-EG0 GEOTECH DES	40000.	0.	0	30DEC83	25SEP84	30DEC83	25SEP84	0	0
	1030	1035	90	AAA-ED5 STRUCTURAL DES	30000.	0.	0	25SEP84	24DEC84	25SEP84	24DEC84	0	0
	1035	1040	60	AAA-ED0 PLANS	10000.	0.	0	24DEC84	22FEB85	24DEC84	22FEB85	0	0
	1035	1045	60	AAA-ESP SPECIFICATIONS	20000.	0.	0	24DEC84	22FEB85	24DEC84	22FEB85	0	0
	1040	1045	0	DUMMY	0.	0.	0	22FEB85	22FEB85	22FEB85	22FEB85	0	0
	1045	1050	30	AAA-EDE ESTIMATE	5000.	0.	0	22FEB85	24MAR85	22FEB85	24MAR85	0	0

TOTAL COST OF WORK: 290000.
TOTAL COST OF WORK COMPLETED: 0.

* INDICATES ACTUAL START
** INDICATES MILESTONE DATE

1

Figure 6.2-1: CPM printed output file generated by option 5 (continued).

LATE FINISH SORT
1 UPDATE AS OF

EXAMPLE FOR RCPH 6 MAY 83
USERS MANUAL OF A SINGLE
PROJECT/NETWORK AND ITS INPUT AND OUTPUT FILES

0	EVENT I	DUR J	ACTIVITY DESCRIPTION	TOTAL COST	CURRENT COST	PCT CMP	EARLIEST START	FINISH	LATEST START	FINISH	SLACK TOT	REM
	1010	1015	90 AAA-EHD HYDROLOGY	25000.	0.	0	10CT83	30DEC83	10CT83	30DEC83	0	0
	1010	1020	30 AAA-ECB GEOTECH BORINGS	25000.	0.	0	10CT83	31OCT83	30NOV83	30DEC83	60	60
	1015	1020	0 DUMMY	0.	0.	0	30DEC83	30DEC83	30DEC83	30DEC83	0	0
	1020	1025	90 AAA-EHA HYDRAULIC DES	65000.	0.	0	30DEC83	29MAR84	27JUN84	25SEP84	180	180
	1020	1030	270 AAA-EGD GEOTECH DES	40000.	0.	0	30DEC83	25SEP84	30DEC83	25SEP84	0	0
	1025	1030	0 DUMMY	0.	0.	0	29MAR84	29MAR84	25SEP84	25SEP84	180	180
	1025	1035	90 AAA-EGE GENERAL ENGR	70000.	0.	0	29MAR84	27JUN84	25SEP84	24DEC84	180	180
	1030	1035	90 AAA-EDS STRUCTURAL DES	30000.	0.	0	25SEP84	24DEC84	25SEP84	24DEC84	0	0
	1035	1040	60 AAA-EDD PLANS	10000.	0.	0	24DEC84	22FEB85	24DEC84	22FEB85	0	0
	1035	1045	60 AAA-ESP SPECIFICATIONS	20000.	0.	0	24DEC84	22FEB85	24DEC84	22FEB85	0	0
	1040	1045	0 DUMMY	0.	0.	0	22FEB85	22FEB85	22FEB85	22FEB85	0	0
	1045	1050	30 AAA-EDE ESTIMATE	5000.	0.	0	22FEB85	24MAR85	22FEB85	24MAR85	0	0

TOTAL COST OF WORK: 290000.
TOTAL COST OF WORK COMPLETED: 0.

* INDICATES ACTUAL START
** INDICATES MILESTONE DATE

1 TOTAL SLACK SORT
1 UPDATE AS OF

EXAMPLE FOR RCPH 6 MAY 83
USERS MANUAL OF A SINGLE
PROJECT/NETWORK AND ITS INPUT AND OUTPUT FILES

0	EVENT I	DUR J	ACTIVITY DESCRIPTION	TOTAL COST	CURRENT COST	PCT CMP	EARLIEST START	FINISH	LATEST START	FINISH	SLACK TOT	REM
	1010	1015	90 AAA-EHD HYDROLOGY	25000.	0.	0	10CT83	30DEC83	10CT83	30DEC83	0	0
	1015	1020	0 DUMMY	0.	0.	0	30DEC83	30DEC83	30DEC83	30DEC83	0	0
	1020	1030	270 AAA-EGD GEOTECH DES	40000.	0.	0	30DEC83	25SEP84	30DEC83	25SEP84	0	0
	1030	1035	90 AAA-EDS STRUCTURAL DES	30000.	0.	0	25SEP84	24DEC84	25SEP84	24DEC84	0	0
	1035	1040	60 AAA-EDD PLANS	10000.	0.	0	24DEC84	22FEB85	24DEC84	22FEB85	0	0
	1035	1045	60 AAA-ESP SPECIFICATIONS	20000.	0.	0	24DEC84	22FEB85	24DEC84	22FEB85	0	0
	1040	1045	0 DUMMY	0.	0.	0	22FEB85	22FEB85	22FEB85	22FEB85	0	0
	1045	1050	30 AAA-EDE ESTIMATE	5000.	0.	0	22FEB85	24MAR85	22FEB85	24MAR85	0	0
	1010	1020	30 AAA-ECB GEOTECH BORINGS	25000.	0.	0	10CT83	31OCT83	30NOV83	30DEC83	60	60
	1020	1025	90 AAA-EHA HYDRAULIC DES	65000.	0.	0	30DEC83	29MAR84	27JUN84	25SEP84	180	180
	1025	1030	0 DUMMY	0.	0.	0	29MAR84	29MAR84	25SEP84	25SEP84	180	180
	1025	1035	90 AAA-EGE GENERAL ENGR	70000.	0.	0	29MAR84	27JUN84	25SEP84	24DEC84	180	180

TOTAL COST OF WORK: 290000.
TOTAL COST OF WORK COMPLETED: 0.

* INDICATES ACTUAL START
** INDICATES MILESTONE DATE

EDT..

Figure 6.2-1: CPM printed output file generated by option 5 (continued).

EXAMPLE FOR *CPM		6 MAY 83	
USERS MANUAL OF A SINGLE			
PROJECT/NETWORK AND ITS INPUT AND OUTPUT FILES			
AAA-EHD HYDROLOGY	10 18312308310 183123083		25000.
AAA-EGB GEOTECH BORINGS	10 183103183113083123083		25000.
DUMMY	123083123083123083123083		0.
AAA-EHA HYDRAULIC DES.	123083 32984 62784 92584		65000.
AAA-EGD GEOTECH DES	123083 92584123083 92584		40000.
DUMMY	32984 32984 92584 92584		0.
AAA-EGE GENERAL ENGR	32984 62784 92584122484		70000.
AAA-EDS STRUCTURAL DES	92584122484 92584122484		30000.
AAA-EDD PLANS	122484 22285122484 22285		10000.
AAA-ESP SPECIFICATIONS	122484 22285122484 22285		20000.
DUMMY	22285 22285 22285 22285		0.
AAA-EDE ESTIMATE	22285 32485 22285 32485		5000.
EOT..			

Figure 6.2-2: Plot file developed in option 5 for single project example.

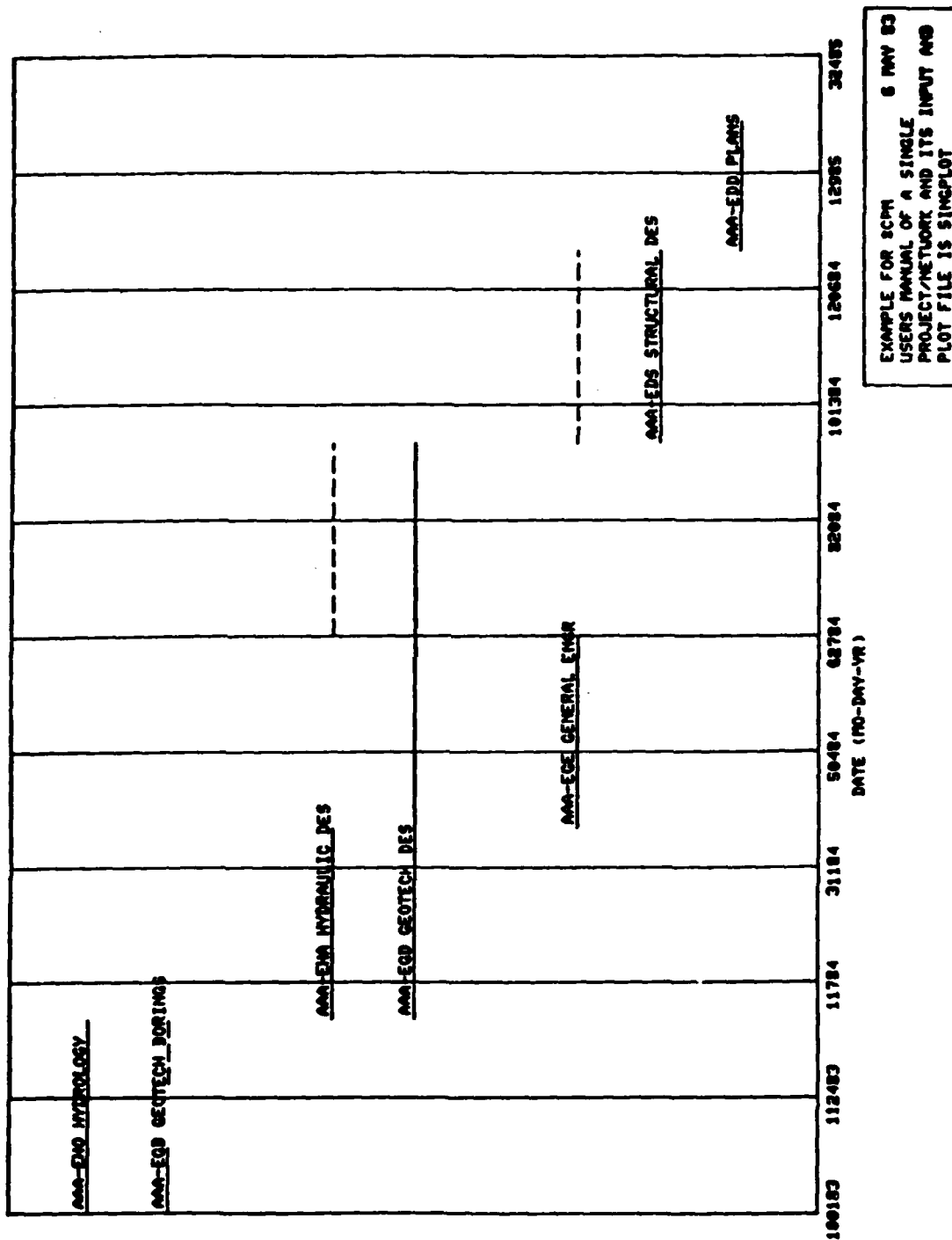


Figure 6.2-3: Single project Gantt Chart.

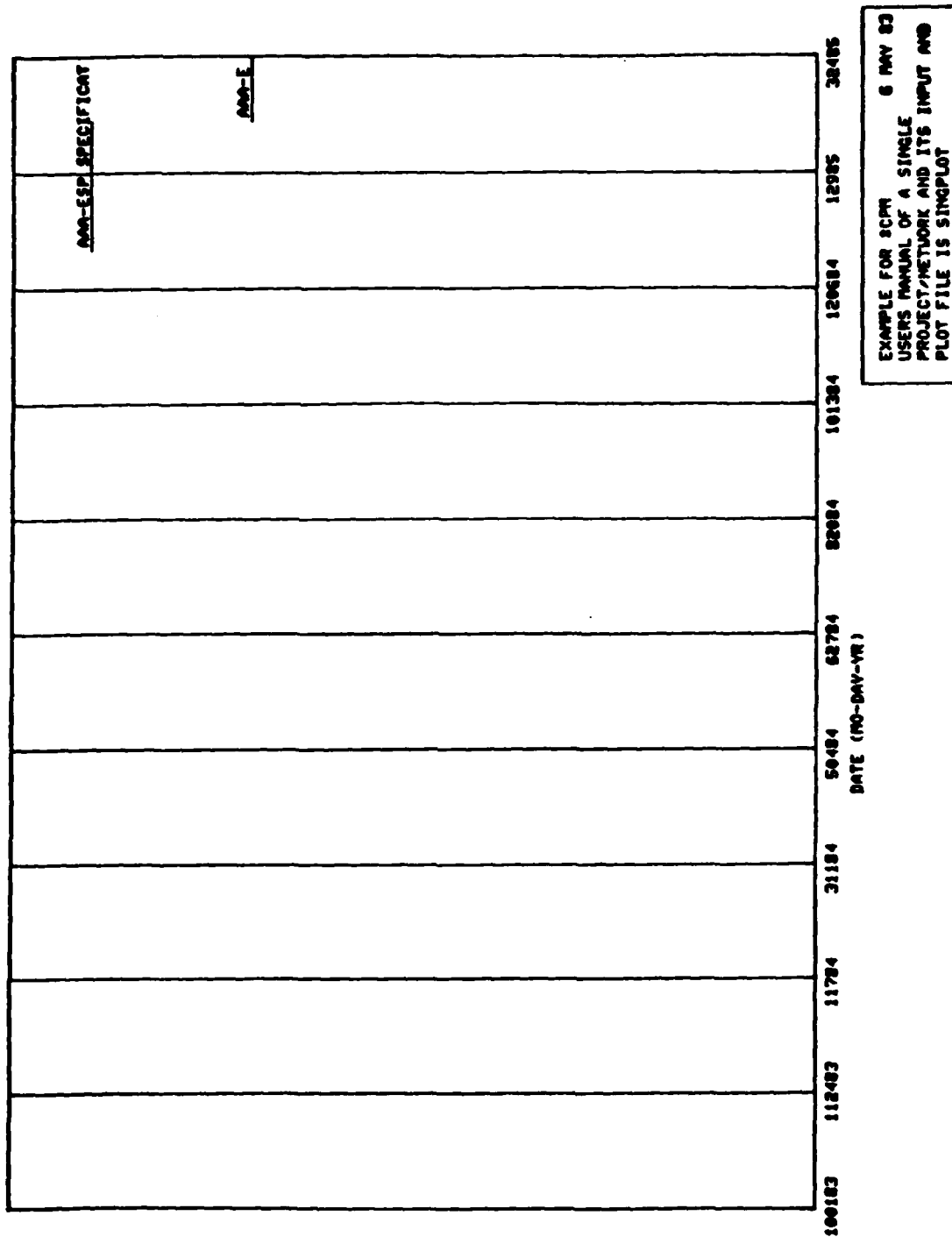


Figure 6.2-3: Single project Gantt Chart (continued).

6 MAY 83

AVERAGE DAILY COST SUMMARY

DATE	EARLY START/FINISH COST	LATE START/FINISH COST
100189	1111.	278.
100289	1111.	278.
100389	1111.	278.
100489	1111.	278.
100589	1111.	278.
100689	1111.	278.
100789	1111.	278.
100889	1111.	278.
100989	1111.	278.
101089	1111.	278.
101189	1111.	278.
101289	1111.	278.
101389	1111.	278.
101489	1111.	278.
101589	1111.	278.
101689	1111.	278.
101789	1111.	278.
101889	1111.	278.
101989	1111.	278.
102089	1111.	278.
102189	1111.	278.
102289	1111.	278.
102389	1111.	278.
102489	1111.	278.
102509	1111.	278.
102689	1111.	278.
102789	1111.	278.
102889	1111.	278.
102989	1111.	278.
103089	1111.	278.
103189	278.	
110189	278.	
110289	278.	
110389		
110409		
110589		167.
110689		167.
110789		167.
110889		167.
110989		167.
111089		167.
111189		167.
111289		167.
111389		167.
111489		167.
111589		167.
111689		167.
111789		167.
111889		167.
111989		167.
112089		167.
112189		167.
112289		167.
112389		167.
112489		167.
112509		167.
112689		167.
112789		167.
112889		167.
112989		167.
113089		167.
113189		167.
113289		167.
113389		167.
113489		167.
113589		167.
113689		167.
113789		167.
113889		167.
113989		167.
114089		167.
114189		167.
114289		167.
114389		167.
114489		167.
114589		167.
114689		167.
114789		167.
114889		167.
114989		167.
115089		167.
115189		167.
115289		167.
115389		167.
115489		167.
115589		167.
115689		167.
115789		167.
115889		167.
115989		167.
116089		167.
116189		167.
116289		167.
116389		167.
116489		167.
116589		167.
116689		167.
116789		167.
116889		167.
116989		167.
117089		167.
117189		167.
117289		167.
117389		167.
117489		167.
117589		167.
117689		167.
117789		167.
117889		167.
117989		167.
118089		167.
118189		167.
118289		167.
118389		167.
118489		167.
118589		167.
118689		167.
118789		167.
118889		167.
118989		167.
119089		167.
119189		167.
119289		167.
119389		167.
119489		167.
119589		167.
119689		167.
119789		167.
119889		167.
119989		167.
120089		167.
120189		167.
120289		167.
120389		167.
120489		167.
120509		167.
120689		167.
120789		167.
120889		167.

MAXIMUM DAILY EARLY START/FINISH COST IS \$ 1111. ON 100183.

MAXIMUM DAILY LATE START/FINISH COST IS \$ 1111. ON 113083.

Figure 6.2-4: Daily cost file created in option 6 for single project example (partial listing).

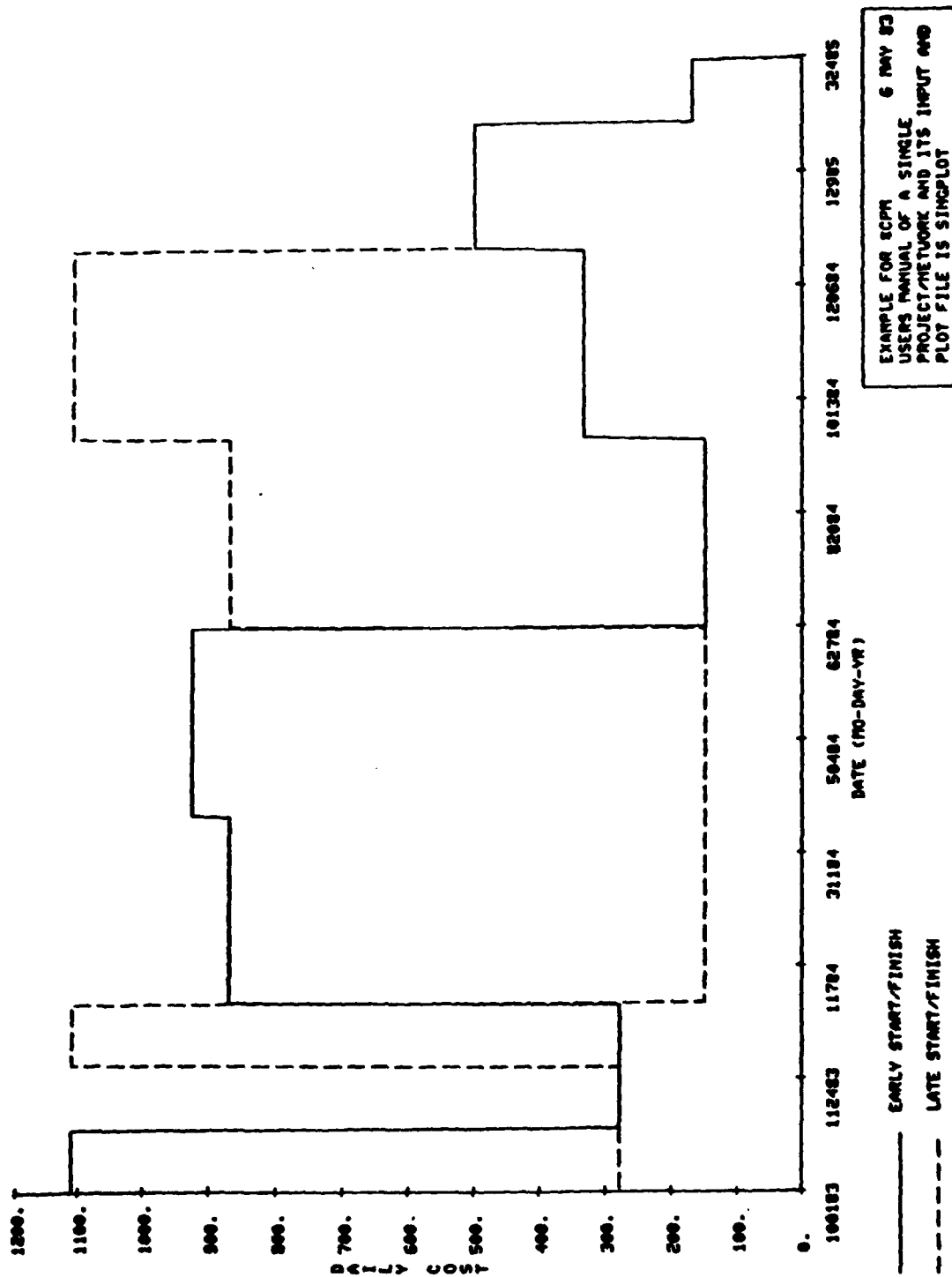


Figure 6.2-5: Single project resource histogram.

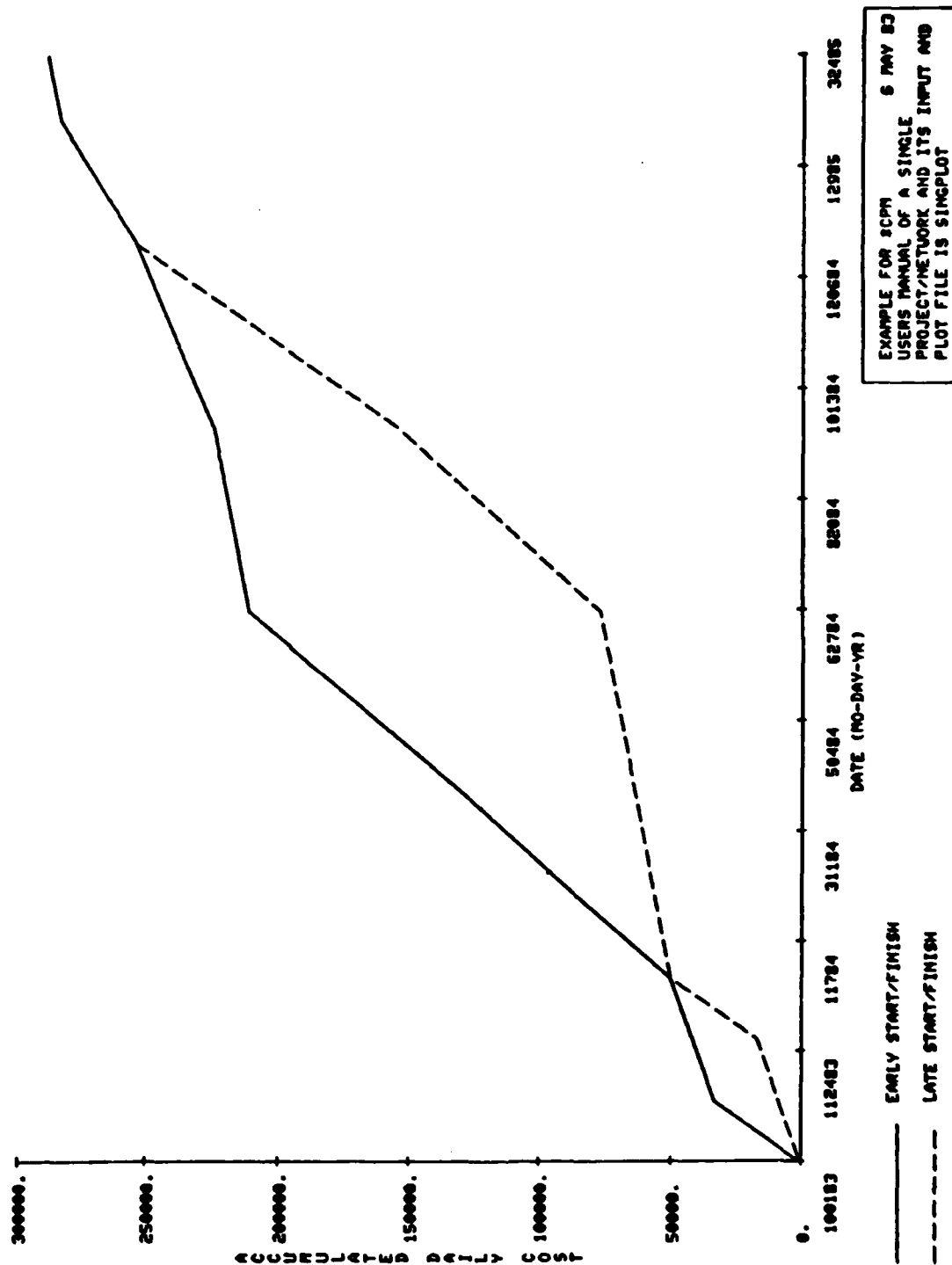


Figure 6.2-6: Accumulated daily cost curve for single project example.

Resources are leveled by iterating through options 2, 3, 5, 6, and 7 and assigning actual start dates and changing milestones to move activities back and forth through time.

6.3 Multiple Project Example

Figure 6.3-1 shows the I-J sort of the CPM printed output file generated by option 5. Figure 6.3-2 is the plot file created in option 5. Figures 6.3-3, 6.3-4, and 6.3-5 are all generated using option 6.

SECTION 7. RA/PM INTERFACE

To avoid maintaining two separate data bases for the same information, option 10 of the *CPM (an interface program) takes the option 3 output file and reconfigures its format to create a RA/PM input file. To do this, the user must use option 8 in the project code search mode and create an individual input file for each project. These files are then run through option 3 to create an output file, and this file is run through option 10, where additional administrative input is added and the file's format is reconfigured. Once this has been done, the option 10 output file can be used for input directly into the RA/PM system.

1
I-J SORT

1 UPDATE AS OF 10 583

5

I-J SORT

EXAMPLE OF MULTIPLE
PROJECT ANALYSIS FOR #CPM
USERS MANUAL

6 MAY 83

0	EVENT	DUR	ACTIVITY DESCRIPTION	TOTAL	CURRENT	PCT	EARLIEST	LATEST	SLACK	
	I	J	ATION	COST	COST	COMP	START	FINISH	TOT	REM
	1	1010	0 DUMMY	0.	0.	0	10CT83	10CT83	0	0
	1	2010	0 DUMMY	0.	0.	0	10CT83	10CT83	60	60
	1	3010	0 DUMMY	0.	0.	0	10CT83	10CT83	0	0
	1010	1015	90 AAA-EHD HYDROLOGY	25000.	0.	0	10CT83	30DEC83	0	0
	1010	1020	30 AAA-EG8 GEOTECH BORING	25000.	0.	0	10CT83	31OCT83	60	60
	1015	1020	0 DUMMY	0.	0.	0	30DEC83	30DEC83	0	0
	1020	1025	90 AAA-EHA HYDRAULIC DESIGN	65000.	0.	0	30DEC83	29MAR84	180	180
	1020	1030	270 AAA-EGD GEOTECH DESIGN	40000.	0.	0	30DEC83	25SEP84	0	0
	1025	1030	0 DUMMY	0.	0.	0	29MAR84	29MAR84	180	180
	1025	1035	90 AAA-EGE GENERAL ENGR	70000.	0.	0	29MAR84	27JUN84	180	180
	1030	1035	90 AAA-ED5 STRUCTURAL DESIGN	30000.	0.	0	25SEP84	24DEC84	0	0
	1035	1040	60 AAA-EDD PLANS	10000.	0.	0	24DEC84	22FEB85	0	0
	1035	1045	60 AAA-ESP SPECIFICATIONS	20000.	0.	0	24DEC84	22FEB85	0	0
	1040	1045	0 DUMMY	0.	0.	0	22FEB85	22FEB85	0	0
	1045	1050	30 ESTIMATE	5000.	0.	0	22FEB85	24MAR85	0	0
	1050	5000	0 DUMMY	0.	0.	0	24MAR85	24MAR85	0	0
	2010	2015	30 BBB-EG8 GEOTECH BORING	25000.	0.	0	10CT83	31OCT83	60	60
	2015	2020	270 BBB-EGD GEOTECH DESIGN	40000.	0.	0	31OCT83	27JUL84	60	60
	2015	2025	30 BBB-ED5 STRUCTURAL DESIGN	10000.	0.	0	31OCT83	30NOV83	315	315
	2020	2025	0 DUMMY	0.	0.	0	27JUL84	27JUL84	75	75
	2020	2040	90 BBB-EGE GENERAL ENGR	70000.	0.	0	27JUL84	25OCT84	60	60
	2025	2030	60 BBB-ED5 STRUCTURAL DESIGN	20000.	0.	0	27JUL84	25SEP84	75	75
	2025	2035	60 BBB-EDN NON-STRUCTURAL DESIGN	10000.	0.	0	27JUL84	25SEP84	75	75
	2030	2035	0 DUMMY	0.	0.	0	25SEP84	25SEP84	75	75
	2030	2040	0 DUMMY	0.	0.	0	25SEP84	25SEP84	90	90
	2035	2040	15 BBB-EDN NON-STRUCTURAL DESIGN	5000.	0.	0	25SEP84	10OCT84	75	75
	2040	2045	60 BBB-EDD PLANS	10000.	0.	0	25OCT84	24DEC84	60	60
	2040	2050	60 BBB-ESP SPECIFICATIONS	20000.	0.	0	25OCT84	24DEC84	60	60
	2045	2050	0 DUMMY	0.	0.	0	24DEC84	24DEC84	60	60
	2050	2055	30 BBB-EDE ESTIMATE	5000.	0.	0	24DEC84	23JAN85	60	60
	2055	5000	0 DUMMY	0.	0.	0	23JAN85	23JAN85	60	60
	3010	3015	90 CCC-EHD HYDROLOGY	25000.	0.	0	10CT83	30DEC83	0	0
	3010	3020	30 CCC-EG8 GEOTECH BORING	25000.	0.	0	10CT83	31OCT83	60	60
	3015	3020	0 DUMMY	0.	0.	0	30DEC83	30DEC83	0	0
	3020	3025	270 CCC-EGD GEOTECH DESIGN	40000.	0.	0	30DEC83	25SEP84	0	0
	3020	3030	90 CCC-EHA HYDRAULIC DESIGN	65000.	0.	0	30DEC83	29MAR84	180	180
	3025	3030	0 DUMMY	0.	0.	0	25SEP84	25SEP84	0	0
	3030	3035	90 CCC-EGE GENERAL ENGR	70000.	0.	0	25SEP84	24DEC84	0	0
	3035	3040	60 CCC-EDD PLANS	10000.	0.	0	24DEC84	22FEB85	0	0
	3035	3045	60 CCC-ESP SPECIFICATIONS	20000.	0.	0	24DEC84	22FEB85	0	0
	3040	3045	0 DUMMY	0.	0.	0	22FEB85	22FEB85	0	0
	3045	3050	30 CCC-EDE ESTIMATE	5000.	0.	0	22FEB85	24MAR85	0	0
	3050	5000	0 DUMMY	0.	0.	0	24MAR85	24MAR85	0	0

TOTAL COST OF WORK: 765000.

TOTAL COST OF WORK COMPLETED: 0.

* INDICATES ACTUAL START

** INDICATES MILESTONE DATE

Figure 6.3-1: Option 5 CPM printed output file
for multiple project example.

EXAMPLE OF MULTIPLE PROJECT ANALYSIS FOR *CPH 6 MAY 83

USERS MANUAL

DUMMY	10 18310 18310 18310 183	0.
DUMMY	10 18310 183113083113083	0.
DUMMY	10 18310 18310 18310 183	0.
AAA-EHO HYDROLOGY	10 18312308310 183123083	25000.
AAA-EGB GEOTECH BORING	10 183103183113083123083	25000.
DUMMY	123083123083123083123083	0.
AAA-EHA HYDRAULIC DESIGN	123083 32984 62784 92584	65000.
AAA-EGD GEOTECH DESIGN	123083 92584123083 92584	40000.
DUMMY	32984 32984 92584 92584	0.
AAA-EGE GENERAL ENGR	32984 62784 92584122484	70000.
AAA-EDS STRUCTURAL DESIGN	92584122484 92584122484	30000.
AAA-EDU PLANS	122484 22285122484 22285	10000.
AAA-ESP SPECIFICATIONS	122484 22285122484 22285	20000.
DUMMY	22285 22285 22285 22285	0.
ESTIMATE	22285 32485 22285 32485	5000.
DUMMY	32485 32485 32485 32485	0.
BBB-EGB GEOTECH BORING	10 183103183113083123083	25000.
BBB-EGD GEOTECH DESIGN	103183 72784123083 92584	40000.
BBB-EDS STRUCTURAL DESIGN	103183113083 91084101084	10000.
DUMMY	72784 72784101084101084	0.
BBB-EGE GENERAL ENGR	72784102584 92584122484	70000.
BBB-EDS STRUCTURAL DESIGN	72784 9258410108412 984	20000.
BBB-EDN NON-STRUCTURAL DESIGN	72784 9258410108412 984	10000.
DUMMY	92584 9258412 98412 984	0.
DUMMY	92584 92584122484122484	0.
BBB-EDN NON-STRUCTURAL DESIGN	9258410108412 984122484	5000.
BBB-EDD PLANS	102584122484122484 22285	10000.
BBB-ESP SPECIFICATIONS	102584122484122484 22285	20000.
DUMMY	122484122484 22285 22285	0.
BBB-EDE ESTIMATE	122484 12385 22285 32485	5000.
DUMMY	12385 12385 32485 32485	0.
CCC-EHO HYDROLOGY	10 18312308310 183123083	25000.
CCC-EGB GEOTECH BORING	10 183103183113083123083	25000.
DUMMY	123083123083123083123083	0.
CCC-EGD GEOTECH DESIGN	123083 92584123083 92584	40000.
CCC-EHA HYDRAULIC DESIGN	123083 32984 62784 92584	65000.
DUMMY	92584 92584 92584 92584	0.
CCC-EGE GENERAL ENGR	92584122484 92584122484	70000.
CCC-EDD PLANS	122484 22285122484 22285	10000.
CCC-ESP SPECIFICATIONS	122484 22285122484 22285	20000.
DUMMY	22285 22285 22285 22285	0.
CCC-EDE ESTIMATE	22285 32485 22285 32485	5000.
DUMMY	32485 32485 32485 32485	0.
EOT..		

Figure 6.3-2: Option 5 plot file for multiple project example.

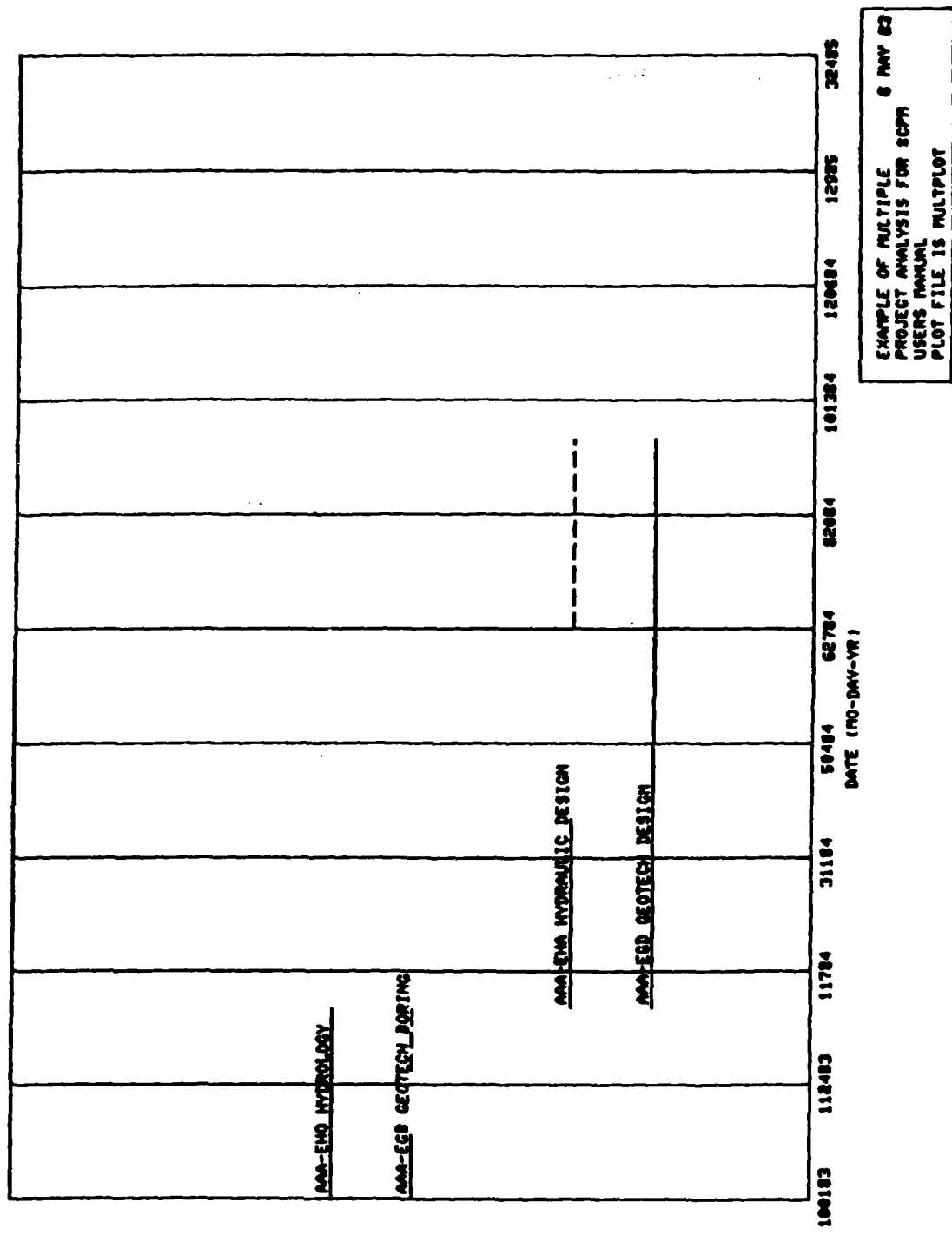


Figure 6.3-3: Option 6 Gantt Chart for multiple project example.

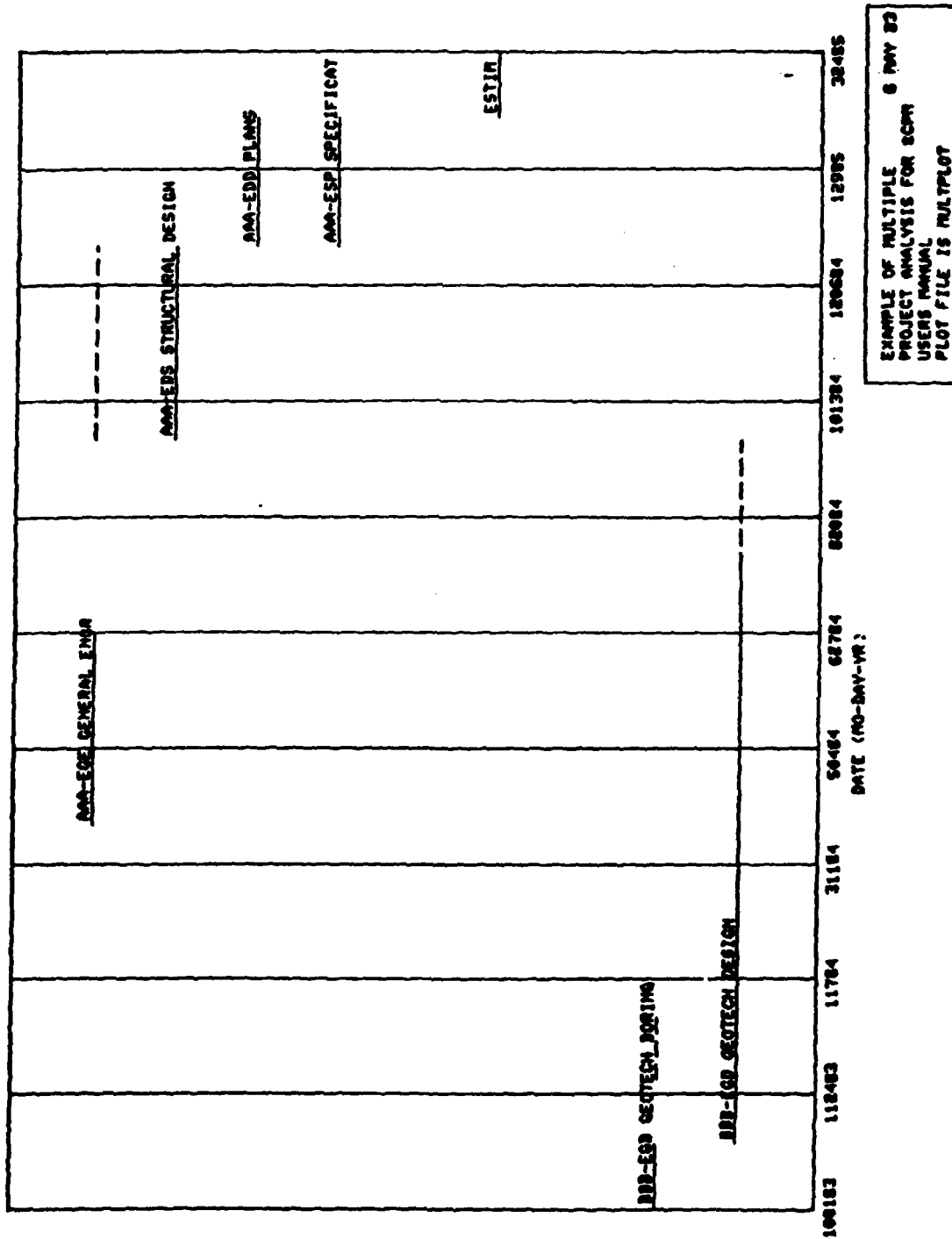


Figure 6.3-3: Option 6 Gantt Chart for multiple project example (continued).

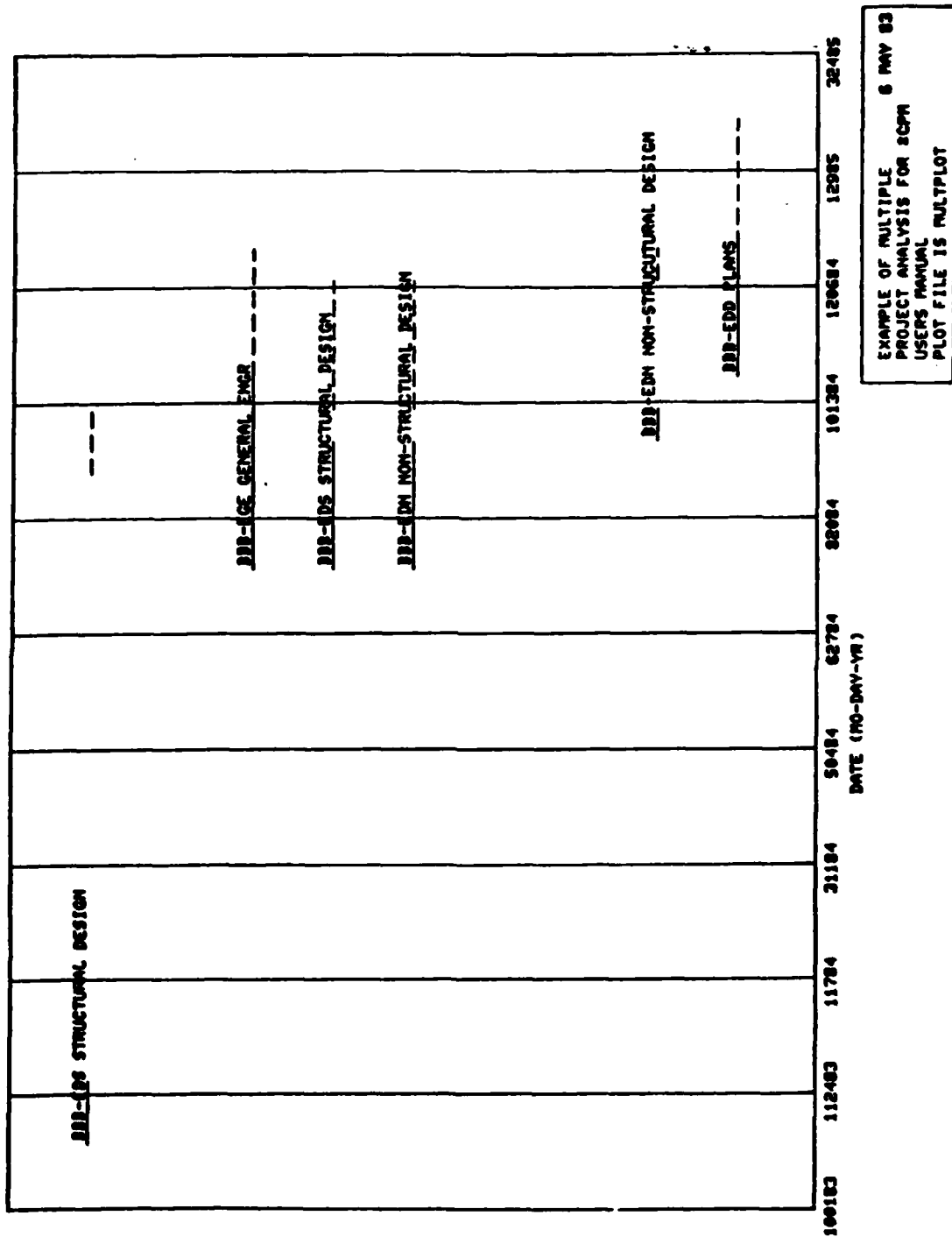


Figure 6.3-3: Option 6 Gantt Chart for multiple project example (continued).

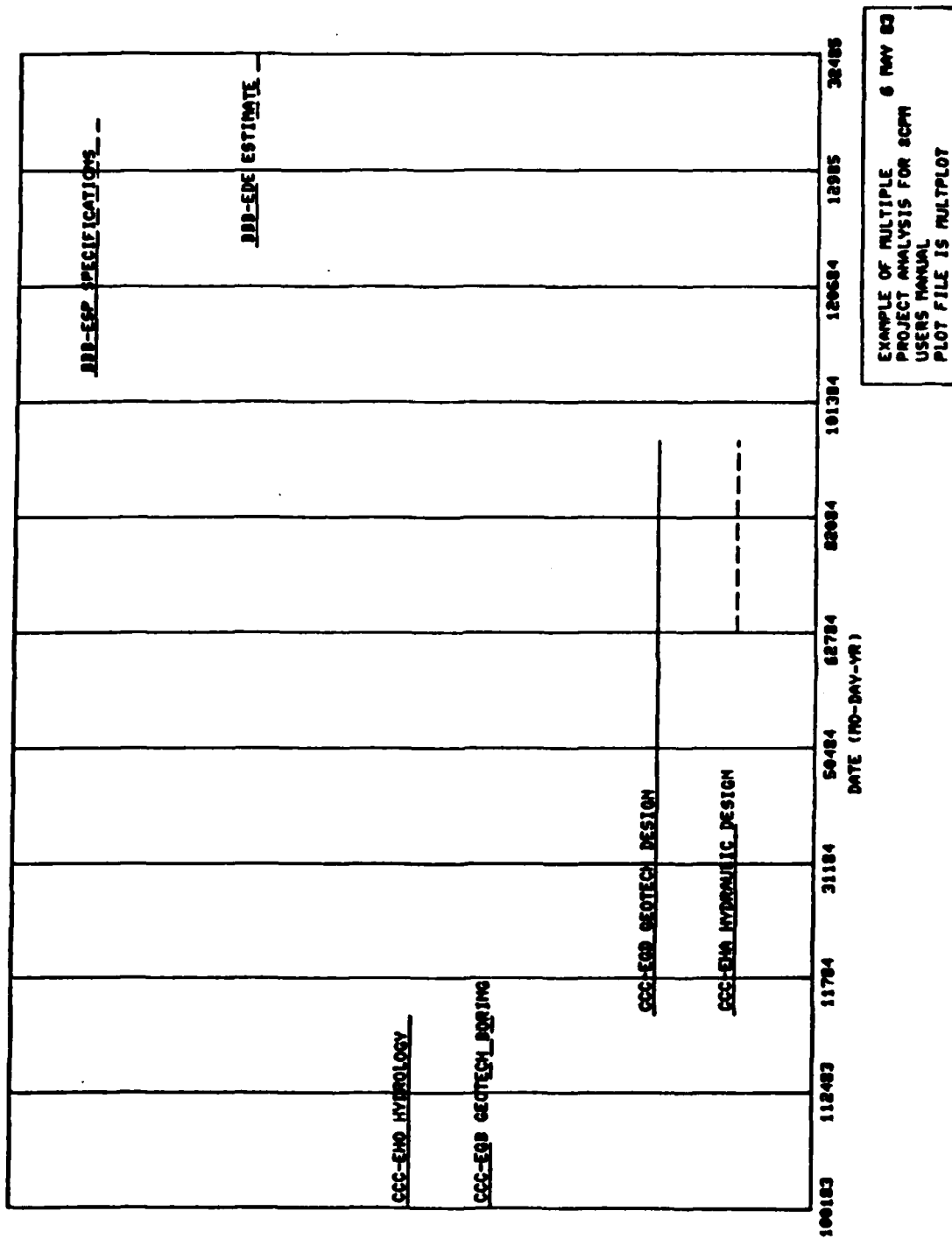


Figure 6.3-3: Option 6 Gantt Chart for multiple project example (continued).

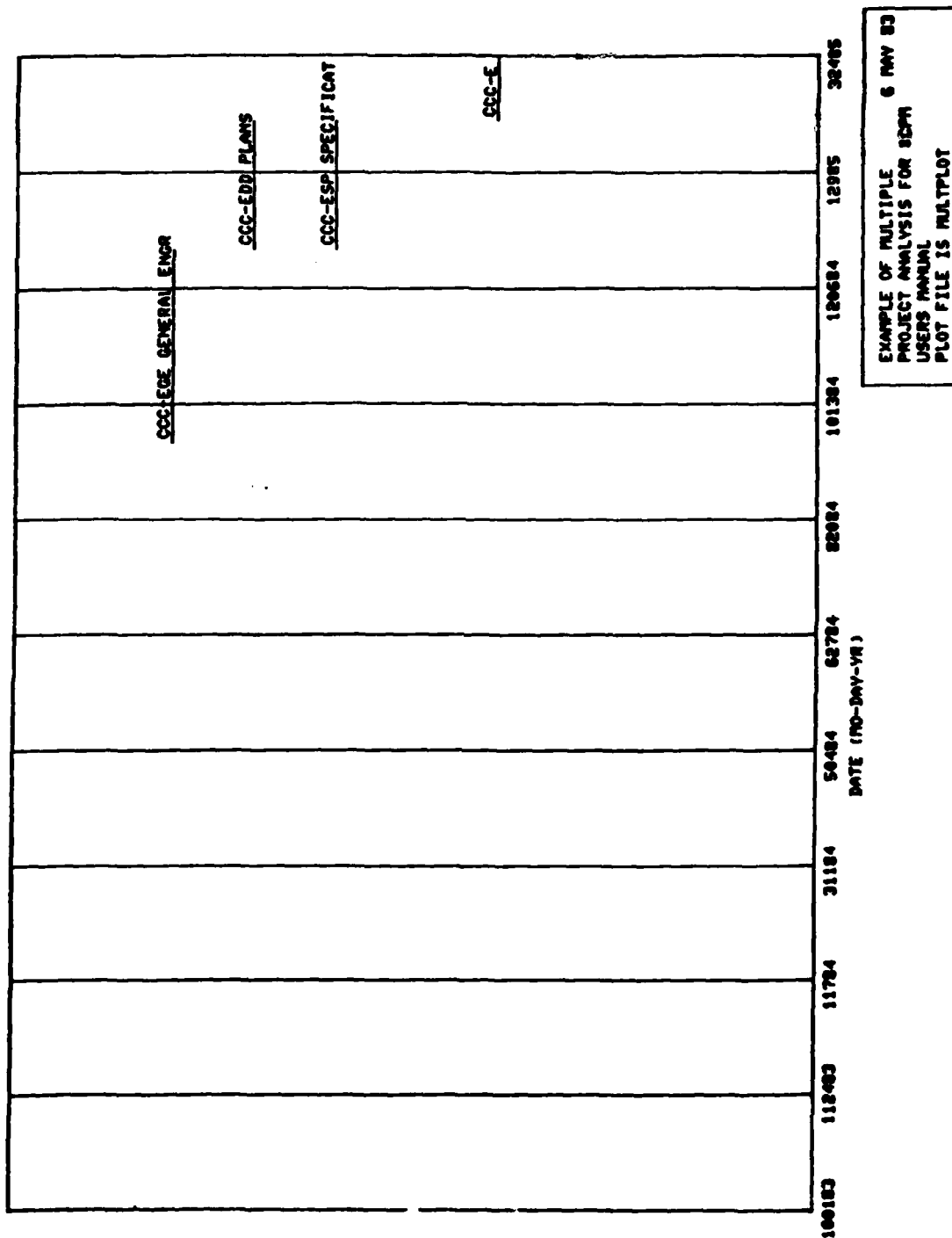


Figure 6.3-3: Option 6 Gantt Chart for multiple project example (continued).

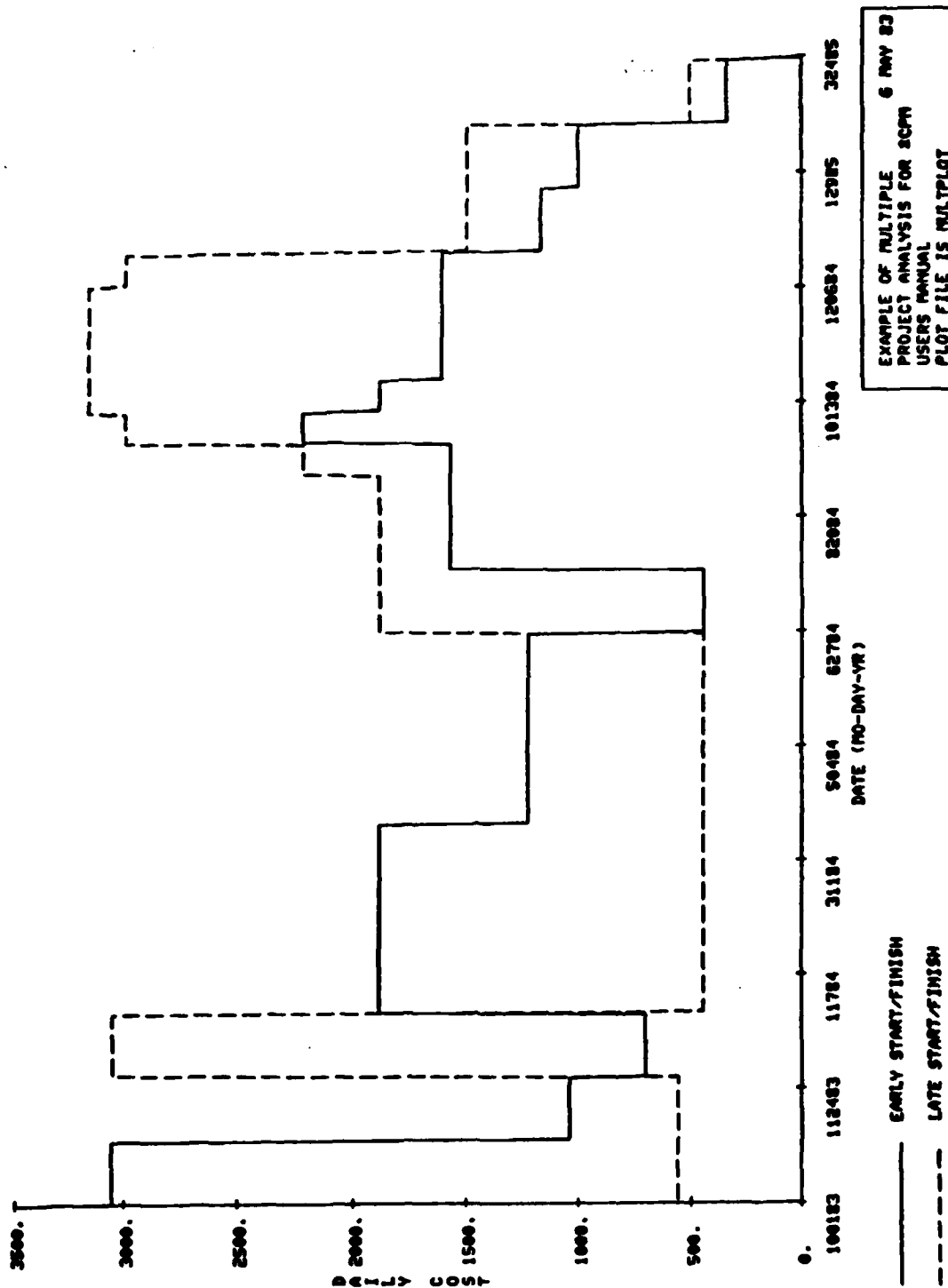


Figure 6.3-4: Option 6 resource histogram for multiple project example.

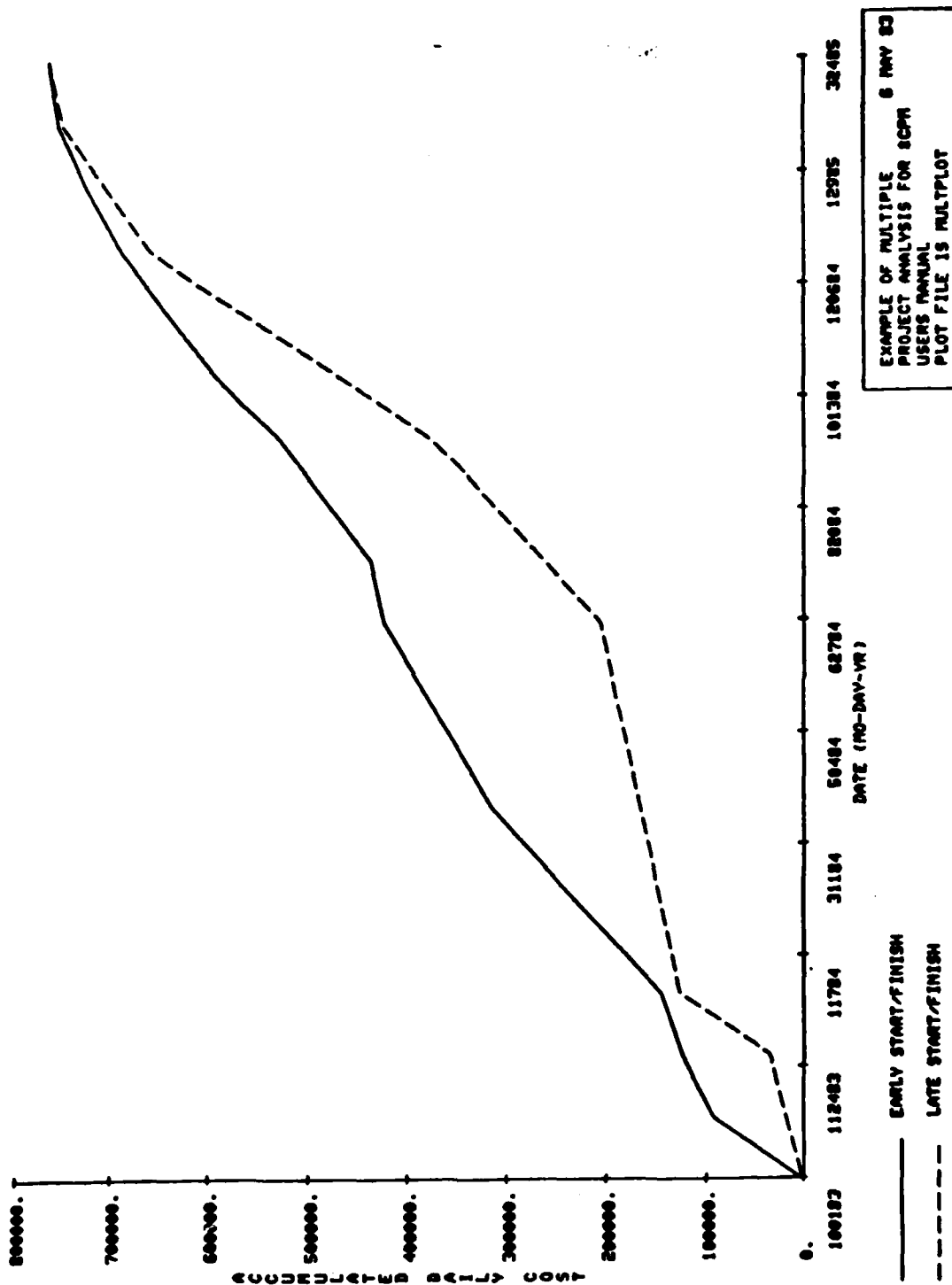


Figure 6.3-5: Accumulated daily cost curve for multiple project example.

APPENDIX A

TERMINAL USER'S GUIDE

INTRODUCTION

This appendix shows how to use *CPM and all its options. Each option on the *CPM macro menu and its variations are shown on the following pages. Items which appear in quotation marks (i.e., "1,2") are examples of input. Please note the punctuation or lack thereof within the quotation marks to avoid input interpretation errors.

Option 00 - CRT Display

*CPM

WELCOME TO THE NETWORK ANALYSIS SYSTEM (CPM)

ENTER THE PROCESSING OPTION NUMBER TO BE EXECUTED
(ENTER 00 TO GET A LIST OF PROCESSING OPTIONS):

00

PROCESSING OPTION

NUMBER

LIST CPM PROCESSING OPTIONS.....	00
CPM DATA ENTRY PROGRAM.....	01
CPM PROGRAM COMPUTES CPM NETWORK--I-J ORDER.....	02
CPM SORTS CPM FILE CREATING PRINT PROGRAM INPUT FILE..	03
CPM PROGRAM TO WRITE CALENDAR FILE FOR PRINT PROGRAM..	04
CPM PRINT PROGRAM AND PLOT FILE BUILDER.....	05
CPM ACTIVITY/COST TEKTRONIX PLOT PROGRAM.....	06
CPM UPDATE OF TASK LIST FILE FROM OPTION 03.....	07
(USE FOR INPUT OF ACTUAL START DATE, % COMPLETE, MILESTONE DATE)	
CPM SEARCH FOR ORGANIZATION/PROJECT CODES.....	08
CPM ORGANIZATION/PROJECT CODES INDEX.....	09
CPM-RA/PM INTERFACE PROGRAM.....	10
CPM HISTORY.....	97
CPM INSTRUCTIONS.....	98
TERMINATE CPM.....	99

This screen appears after you sign on and enter *CPM.
Select the task you want to perform and enter its number.
(Remember that two digits are required.) The CPM system
will execute the function you have chosen and return to
the task number prompt shown at the top of the screen when
the task you have selected is finished. Enter 00 if you
do not remember the task number, and *CPM macro menu will
be displayed as shown above.

Option 01 - Initial Run CRT Display

ENTER THE PROCESSING OPTION NUMBER TO BE EXECUTED
(ENTER 00 TO GET A LIST OF PROCESSING OPTIONS):
01

1. CONTINUATION OR INITIAL RUN?
I

2. FILE NAME:

JOB IDENT LINE LIMITS ARE FLAGGED BY A COLON (:))

3. IDENTIFICATION LINE 1?

IDENTIFICATION LINE 2?

IDENTIFICATION LINE 3?

4. I,J (0,0 FOR END):

5. COST?

6. DURATION?

7. DESCRIPTION?

I,J (0,0 FOR END):
0,0

8. ARE YOU GOING TO CONTINUE LATER?

STOP

1. Enter "C" or "I"; if "I" is entered, the above prompts will be displayed.
2. Enter your CPM input file name: "PROJ1".
3. These three identification lines will appear in the heading of all output. Suggest Line 1 = Project Name; Line 2 = Project Location; Line 3 = User Name.
4. Enter I J number for activity: "1,2".
5. Enter cost of activity (\$): "25000".
6. Enter activity's duration (calendar days): "30".
7. Enter activity's description: "AAA-FE1 Draft Preliminary Plans".
8. Enter "Y" or "N": If you enter "Y", the program will not run your file through the remaining options. You must enter "N" to compute this file.

Option 01 - Continuation CRT Display

ENTER THE PROCESSING OPTION NUMBER TO BE EXECUTED
(ENTER 00 TO GET A LIST OF PROCESSING OPTIONS):
01

1. CONTINUATION OR INITIAL RUN?
C

2. FILE NAME:

3. LAST RECORD ENTERED:
I = J = DURATION = COST =

4. I, J (0.0 FOR END):

5. ARE YOU GOING TO CONTINUE LATER?
STOP

1. Enter "C" or "I"; if "C" is entered, the above prompts will be displayed.

2. Enter file name from previous option 1 input: "PROJ1".

3. The computer will display the information for the last activity in the file.

4. Enter I, J number for next activity: "10, 12".

5. Enter "Y" or "N"; you must enter "N" if you want to compute from the contents of this file.

Option 02 - CRT Display

ENTER THE PROCESSING OPTION NUMBER TO BE EXECUTED
(ENTER 00 TO GET A LIST OF PROCESSING OPTIONS):
02

1. ENTER DATA FILE NAME FROM OPTION 01 OR 07:

AFTER STMT 590
STOP

1. Enter the file name from either option 01 or the name of the updated file created in option 07. The program will now conduct the CPM calculations.

Option 03 - CRT Display

ENTER THE PROCESSING OPTION NUMBER TO BE EXECUTED
(ENTER 00 TO GET A LIST OF PROCESSING OPTIONS):
03

1. WHAT DO YOU WANT TO CALL THE PRINT PROGRAM INPUT FILE?
2. FILE GENERATED

1. Enter the file name for print program input: "PROJ2".
2. The program will sort the option 2 output, read it into the new file, and display this statement when the file has been generated.

Option 04 - CRT Display

ENTER THE PROCESSING OPTION NUMBER TO BE EXECUTED
(ENTER 00 TO GET A LIST OF PROCESSING OPTIONS):
04

1. NTP ACK DATE (MMDDYY) ?
2. END DATE (CONTRACT DAYS + 15%) MMDDYY?
3. ENTER IDENT LINE:

ENTER IDENT LINE:

ENTER IDENT LINE:

JER =
STOP

1. Enter the day before the initial day of the period under analysis. For example, if you want the analysis to begin on 1 October 83, enter 30 September 83: "093083".
2. Enter the last day of the period under analysis: "093085".
3. Enter three identification lines to identify this calendar file.

Option 05 - CRT Display

ENTER THE PROCESSING OPTION NUMBER TO BE EXECUTED
(ENTER 00 TO GET A LIST OF PROCESSING OPTIONS):
05

1. ENTER FILE NAME FOR INPUT (OPTION 03 OR 08 OUTPUT).
 2. WHAT DO YOU WANT TO CALL YOUR CPM PRINTED OUTPUT FILE?
 3. SUPPRESS DUMMY (0=NO,1=YES)?
 4. I-J SORT, LATE START SORT,
EARLY START SORT, EARLY FINISH SORT, LATE FINISH SORT
TOTAL SLACK SORT, OR END?
I-J SORT
 5. WANT TO PLOT THESE COSTS/ACTIVITIES ON THE TEKTRONIX? (Y OR N)
Y
 6. WHAT DO YOU WANT TO CALL YOUR PLOT FILE?
I-J SORT, LATE START SORT,
EARLY START SORT, EARLY FINISH SORT, LATE FINISH SORT
TOTAL SLACK SORT, OR END?
END
STOP
 7. WANT CPM PRINT FILE COPIED TO PRINTER? (Y OR N)
-
1. Enter the name of the file created in option 03 or option 08: "PROJ1".
 2. Enter the file name for the output created by this option: "PROJ3".
 3. Enter "0" or "1". If "1" is entered, all dummy activities in network will not be printed into output if the first three characters of the activity description are "DUM".
 4. Enter the name of the sort you want exactly as shown on display: "I-J SORT". If you want several sorts or all sorts, you must enter the names in the same order as shown in prompt - one sort per prompt.
 5. Enter "Y" or "N".
 6. Enter name for plot file: "PROJPLOT".
 7. Enter "Y" or "N"; if "Y", output will be copied on main printer.

Option 06 - CRT Display

ENTER THE PROCESSING OPTION NUMBER TO BE EXECUTED
(ENTER 00 TO GET A LIST OF PROCESSING OPTIONS):
06

1. WHAT IS THE NAME OF YOUR PLOT FILE
GENERATED BY OPTION 05?
 2. CHOOSE (1) ACTIVITIES PLOT ONLY, (2) COST PLOTS ONLY
OR (3) BOTH PLOTS.
3
 3. DO YOU WANT TO SPECIFY STARTING AND ENDING DATES?
(Y OR N)
Y
 4. ENTER YOUR STARTING DATE IN 312 FORMAT (MMDDYY):
 5. ENTER YOUR ENDING DATE IN 312 FORMAT (MMDDYY):
 6. DO YOU WANT COST GRAPH TO HAVE GRIDS? (Y OR N)
N
 7. DO YOU WANT TO CREATE A FILE CONTAINING DAILY COSTS?
(Y OR N)
Y
 8. WHAT DO YOU WANT TO CALL THE DAILY COST FILE?
 - 9.
-
1. Enter plot file name created in option 05: "PROJPLOT".
 2. Enter "1", "2", or "3": "1" will create a Gantt Chart from CPM network; "2" will create a resource histogram; "3" will create both.
 3. Enter "Y" or "N"; "Y" allows you to only graph a selected portion of data; "N" will graph all data.
 4. Enter starting date for selected period: "100183".
 5. Enter ending date for selected period: "093084".
 6. Enter "Y" or "N".
 7. Enter "Y" or "N" if you want the daily cost computations written into a file.
 8. Enter file name for cost file: "PROJCOST".
 9. The graphics selected in item 2 will now be displayed on the Tektronix plotter.

Option 07 - Additional CRT Display

ENTER THE PROCESSING OPTION NUMBER TO BE EXECUTED
(ENTER 00 TO GET A LIST OF PROCESSING OPTIONS):
07

1. YOU HAVE SELECTED THE CPM FILE UPDATE PROGRAM
ENTER THE NAME OF THE DATA FILE GENERATED BY OPTION 03.
 2. WHAT DO YOU WANT TO CALL THE UPDATED FILE?
 3. STOP
FILE NAME:
ACTION(?),ADD(A),CHANGE(C),DELETE(D),STOP(S) *
A
 4. IMODE (?) *****
JMODE (?) *****
 1. DESCRIPTION *****
 2. COST *****
 3. DURATION ***
-
1. Enter file name created in option 3: "PROJ2".
 2. Enter name for updated file: "PROJUP".
 3. Enter "A", "C", "D" or "S": if "A" is entered, the prompts shown above will be displayed.
 4. Enter information on activity to be added to network:
"4"
"5"
"AAA-FE1 DRAINAGE"
"25000"
"30"

Option 07 - Change CPT Display

FILE NAME:
1. ACTION(7),ADD(A),CHANGE(C),DELETE(D),STOP(S) *
C
2. I MODE (?) *****
3. J MODE (?) *****
4. 1. DESCRIPTION *****
2. COST *****
3. DURATION ***
4. START DATE *****
(MMDDYY)
5. % COMPLETE ****
6. MILESTONE *****
(MMDDYY)
5. ENTER 1,2,3,4,5,6 OR (S)STOP =
S

1. Enter "A", "C", "D" or "S": if "C" is entered, the prompts shown above will be displayed.
2. Enter I number of activity to be changed (updated): "2".
3. Enter J number of activity to be changed (updated): "5".
4. Program will display current information on requested activity.
5. Enter "1", "2", "3", "4", "5", "6" or "S": program will display selected item. Enter updated information.

Option 07 - Delete CRT Display

- FILE NAME:
1. ACTION(?),ADD(A),CHANGE(C),DELETE(D),STOP(S) *
0
2. IMODE (?) *****
3. JMODE (?) *****
4. 1. DESCRIPTION *****
2. COST *****
3. DURATION ***
4. START DATE *****
(MMDDYY)
5. % COMPLETE ****
6. MILESTONE *****
(MMDDYY)
5. IS THIS THE RECORD TO DELETE(Y OR N)? *
Y
FILE NAME:
6. ACTION(?),ADD(A),CHANGE(C),DELETE(D),STOP(S) *
5

CPM FILE UPDATE COMPLETE.

RETURN TO OPTION 02 AND 03 TO CREATE A NEW PRINT PROGRAM
INPUT FILE.
(MAKE SURE YOUR CALENDAR FILE IS STILL VALID FOR NEW DATES)

1. Enter "A", "C", "D" or "S": if "D" is entered, the prompts shown above will be displayed.
2. Enter I number of activity to be deleted: "2".
3. Enter J number of activity to be deleted: "5".
4. Program will display current information on requested information.
5. Enter "Y" or "N".
6. When update is complete, enter "S".

Option 08 - CRT Display

ENTER THE PROCESSING OPTION NUMBER TO BE EXECUTED
(ENTER 00 TO GET A LIST OF PROCESSING OPTIONS):
08

1. WHAT IS THE NAME OF THE FILE YOU WANT TO SEARCH?
2. WHAT DO YOU WANT TO CALL YOUR NEW PRINT PROGRAM
INPUT FILE?
3. DO YOU WANT TO SEARCH FOR AN ORGANIZATION CODE, A
PROJECT NAME CODE, OR BOTH? (ENTER OC, PNC, OR BOTH)
BOTH
4. ENTER THE ORGANIZATION CODE YOU WISH TO SEARCH FOR:
5. ENTER THE PROJECT NAME CODE YOU WISH TO SEARCH FOR:
6. SEARCH COMPLETE...WANT TO PERFORM ANOTHER SEARCH?
(Y OR N)
N
STOP

OPTION 08 COMPLETE.
ENTER OPTION 05 TO PRINT FILE AND CREATE NEW PLOT FILE.

1. Enter the file name for the file created in option 3: "PROJ2".
2. Enter the new file name: "PROJ5".
3. Enter "OC", "PNC", or "BOTH": if "BOTH" is entered, the prompts shown
above will be displayed.
4. Enter the three-digit organization code: "FE1".
5. Enter the three-digit project code: "AAA".
6. Enter "Y" or "N".

NOTE: This option can be used only if the first seven digits of every
activity description are the project code, a dash, and the organi-
zation code: "AAA-FE1".

Option 09 - Organization Code Search CRT Display

ENTER THE PROCESSING OPTION NUMBER TO BE EXECUTED
(ENTER 00 TO GET A LIST OF PROCESSING OPTIONS):
09

1. ENTER: 1 TO SEARCH FOR ORGANIZATION CODE
 2 TO SEARCH FOR PROJECT CODE
 3 TO SEARCH FOR PROJECT AND ORGANIZATION
 4 TO ADD A PROJECT/ORGANIZATION
 99 TO STOP
1
2. ENTER THE NAME OF YOUR PROJECT/ORG CODE FILE:
3. WANT TO SEND SEARCH RESULT TO A FILE? (Y OR N)
Y
4. WHAT DO YOU WANT TO NAME THE FILE?
5. WHAT ORGANIZATION CODE DO YOU WISH TO SEARCH FOR?
6. WANT TO SEARCH FOR ANOTHER ORGANIZATION? (Y OR N)
N
ENTER: 1 TO SEARCH FOR ORGANIZATION CODE
 2 TO SEARCH FOR PROJECT CODE
 3 TO SEARCH FOR PROJECT AND ORGANIZATION
 4 TO ADD A PROJECT/ORGANIZATION
 99 TO STOP

NOTE: Option 09 is not a functional option. Its purpose is to create and access a file containing all codes and their meanings.

1. Enter "1", "2", "3", "4" or "99": if "1" is entered, the prompts shown above will be displayed.
2. Enter the name of the file created in "4" of this option: "PROJCODE".
3. Enter "Y" or "N".
4. If "Y", enter file name: "CODE1".
5. Enter desired organization code: "FE1". The program will display all entries in file with "FE1".
6. Enter "Y" or "N".

Option 09 - Project Code Search CRT Display

1. ENTER: 1 TO SEARCH FOR ORGANIZATION CODE
 2 TO SEARCH FOR PROJECT CODE
 3 TO SEARCH FOR PROJECT AND ORGANIZATION
 4 TO ADD A PROJECT/ORGANIZATION
 99 TO STOP

2

2. ENTER THE NAME OF YOUR PROJECT/ORG CODE FILE:
3. WANT TO SEND SEARCH RESULT TO A FILE? (Y OR N)
Y
4. WHAT DO YOU WANT TO NAME THE FILE?
5. WHAT PROJECT CODE DO YOU WISH TO SEARCH FOR?

1. through 4. Same as page A-14.

5. Enter project code: "AAA". Program will display all entries containing this project code.

Option 09 - Project and Organization Code Search CRT Display

ENTER: 1 TO SEARCH FOR ORGANIZATION CODE
2 TO SEARCH FOR PROJECT CODE
3 TO SEARCH FOR PROJECT AND ORGANIZATION
4 TO ADD A PROJECT/ORGANIZATION
99 TO STOP

3

ENTER THE NAME OF YOUR PROJECT/ORG CODE FILE:

WANT TO SEND SEARCH RESULT TO A FILE? (Y OR N)

N

WHAT ORGANIZATION CODE DO YOU WISH TO SEARCH FOR?

WHAT PROJECT CODE DO YOU WISH TO SEARCH FOR?

WANT TO SEARCH FOR ANOTHER PROJECT/ORGANIZATION?

(Y OR N)

N

Self-explanatory - combines previous two pages.

Option 09 - Project/Organization Code File CRT Display

1. ENTER: 1 TO SEARCH FOR ORGANIZATION CODE
 2 TO SEARCH FOR PROJECT CODE
 3 TO SEARCH FOR PROJECT AND ORGANIZATION
 4 TO ADD A PROJECT/ORGANIZATION
 ?? TO STOP
 4
2. ENTER THE NAME OF YOUR PROJECT/ORG CODE FILE:
3. WHAT DO YOU WANT TO CALL YOUR NEW PROJECT CODE FILE?
4. ENTER THE PROJECT CODE (3 CHARACTERS OR LESS):
5. ENTER THE ORGANIZATION CODE (3 CHARACTERS OR LESS):
6. ENTER DESCRIPTION OF WORK (70 CHARACTERS MAXIMUM):
7. WANT TO ADD ANOTHER PROJECT/ORGANIZATION? (Y OR N)
 N

1. Enter "4".
2. Enter name of previous code file if applicable: "CODE".
3. Enter new code file name: "PROJCODE".
4. Enter first project code: "AAA".
5. Enter first organization code: "FE1".
6. Enter description: "INTERIOR DRAINAGE".
7. Enter "Y" or "N".

Option 10 - CRT Display

ENTER THE PROCESSING OPTION NUMBER TO BE EXECUTED
(ENTER 00 TO GET A LIST OF PROCESSING OPTIONS)
10

1. WHAT IS THE NAME OF YOUR OPTION 05 INPUT FILE?
 2. WHAT DO YOU WANT TO CALL YOUR FY1 RA/PM FILE?
 3. ENTER THE PROJECT CODE (3 CHAR):
 4. ENTER THE FIRST LINE OF THE PROJECT DESCRIPTION
(20 CHAR):
 5. ENTER THE SECOND LINE OF THE PROJECT DESCRIPTION
(8 CHAR):
 6. ENTER THE APPROPRIATION CODE (2 CHAR):
 7. ENTER THE FA PROJECT CODE (3 CHAR):
 8. ENTER THE ADP WORK CODE FOR INTERIOR DRAINS
FISCAL YEAR = 84. CODE SHOULD HAVE 12 CHARACTERS.
ENTER 0 IF CODE IS SAME AS FOR PREVIOUS ACTIVITY DURING SAME YEAR.
-
1. Enter the name of the file created in option 03: "PROJ2".
 2. Enter file name: "PROJX1".
 - 3-8. Make required entries.

Option 97 - CRT Display

ENTER THE PROCESSING OPTION NUMBER TO BE EXECUTED
(ENTER 00 TO GET A LIST OF PROCESSING OPTIONS):
97

CPM PROGRAM HISTORY

OPTION	SOURCE (SOURC*)	DATE WRITTEN	AUTHOR	DIST.	LANGUAGE
01	560102A	4 AUG 80	LAMBRECHT	MOBILE	FORTRAN
02	560102B	71	NOULLET	PTSBGH	FORTRAN
03	560102C	18 OCT 72	NOULLET	PTSBGH	COBOL
04	560102G	6 NOV 73	--	PTSBGH	FORTRAN
05	560102D	71	NOULLET	PTSBGH	FORTRAN
06	560102H	MAR 83	STACKOWIAK	ST PAUL	FORTRAN (GCS)
07	560102F	JUN 82	--	MOBILE	COBOL
08	560102I	MAR 83	STACKOWIAK	ST PAUL	FORTRAN
09	560102J	APR 83	STACKOWIAK	ST PAUL	FORTRAN
10	560102P	MAY 83	STACKOWIAK	ST PAUL	FORTRAN

CONTACTS: MOBILE DISTRICT - GEORGE VELLA FTS 597-3330
 ST PAUL DISTRICT- ROBERT STACKOWIAK FTS 725-7761

HIT RETURN TO CONTINUE...

Option 98 - CRT Display

ENTER THE PROCESSING OPTION NUMBER TO BE EXECUTED
(ENTER 00 TO GET A LIST OF PROCESSING OPTIONS):
98

CPM INSTRUCTIONS

THIS PROGRAM USES THE CRITICAL PATH METHOD (CPM) TO ANALYZE NETWORKS. THE USER SHOULD BECOME FAMILIAR WITH THIS METHOD BEFORE USING THIS PROGRAM.

USE OPTION 01 TO INTERACTIVELY INPUT 3 PROJECT IDENTIFICATION LINES AND ACTIVITY I AND J NODES, COSTS, DURATIONS, AND DESCRIPTIONS. THE FIRST 7 CHARACTERS OF EACH DESCRIPTION SHOULD CONTAIN A PROJECT NAME (3 CHARACTERS) FOLLOWED BY A - FOLLOWED BY AN ORGANIZATION CODE (3 CHARACTERS). FOR EXAMPLE:
CHA-FE1 CHASKA HYDRAULICS STUDY
(NOTE: IF THE ACTIVITY IS A DUMMY, THE PROJECT NAME SHOULD BE DUM.)

AFTER YOU HAVE COMPLETED INPUT USING OPTION 01, USE OPTION 02 TO COMPUTE THE I-J ORDER. THEN USE OPTION 03 TO CREATE AN INPUT FILE FOR THE PRINT PROGRAM (OPTION 05). PRIOR TO RUNNING OPTION 05, YOU MUST ALSO RUN OPTION 04 TO CREATE A CALENDAR FILE CONTAINING THE DATES DURING WHICH THE PROJECT(S) WILL TAKE PLACE. A PERMANENT FILE NAMED CALENDAR WILL BE CREATED ON YOUR QUALIFIER.

HIT RETURN TO CONTINUE....

CPM INSTRUCTIONS CONTINUED

YOU MAY ADD ACTUAL START DATES, PERCENT COMPLETE, MILESTONE DATES, AND ADD, CHANGE, OR DELETE NODES FROM YOUR OPTION 03 PRINT PROGRAM INPUT FILE BY USING OPTION 07. OPTION 08 ALLOWS YOU TO SELECT PROJECT NAME AND/OR ORGANIZATION CODES FROM THE OPTION 03 PRINT PROGRAM INPUT FILE AND CREATE A NEW INPUT FILE.

OPTION 05 GENERATES A TABLE OF CPM ACTIVITIES, ACCUMULATED COSTS, AND COMPUTED EARLY AND LATE START/FINISH DATES AND SLACKS. IT MAY BE USED TO CREATE AN INPUT PLOT FILE FOR OPTION 06.

OPTION 06 IS A TEKTRONIX PLOT PROGRAM WHICH MAY BE USED TO GRAPHICALLY DISPLAY ACTIVITIES ALONG A DATE LINE AND/OR DAILY COST VERSUS DATE. IT CAN ALSO BE USED TO GENERATE AN AVERAGE DAILY COST SUMMARY TABLE.

OPTION 09 IS USED TO CREATE/MODIFY AN INDEX OF PROJECT AND ORGANIZATION CODES.

OPTION 10 IS USED TO CONVERT CPM PRINT PROGRAM INPUT INTO RA/PM INPUT.

THIS CONCLUDES THE INSTRUCTIONS. HIT RETURN TO CONTINUE.

Option 99 - CRT Display

ENTER THE PROCESSING OPTION NUMBER TO BE EXECUTED
(ENTER 00 TO GET A LIST OF PROCESSING OPTIONS):
99

YOU HAVE LEFT THE CPM MACRO AND ARE NOW BACK AT
JOB CONTROL.

ATE
LMED
-8