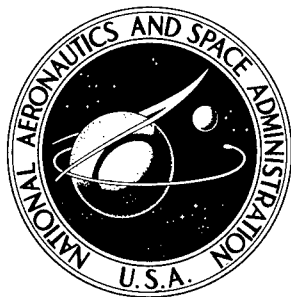


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**MAPS - A COMPUTERIZED MANAGEMENT
ANALYSIS AND PLANNING SYSTEM**

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16. Abstract MAPS provides managers of large technical projects with a fast and economical information system for planning and controlling their projects. The program in the simplest terms is a computerized bar-chart schedule-reporting system in which project elements at all levels can be listed. MAPS has been specifically designed for planning and scheduling engineering project work; however, its flexible format capability permits a variety of other uses such as parts lists, configuration control, drawing lists, manpower and budget planning, and organization charts. MAPS utilizes a computer; however, it is not essential for the user to know computer programming in order to operate MAPS. An annotated listing of the FORTRAN program is included as an appendix.			
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CONTENTS

	Page
SUMMARY	1
INTRODUCTION	1
DESCRIPTION OF THE PROGRAM AS USED FOR PLANNING AND SCHEDULING	3
COMPOSITION OF INPUT DATA DECK	4
Control and Format Cards	4
ID Deck Cards	6
Schedule Deck Cards	7
Status Deck Cards	8
By-Man Deck Cards.	10
WORK SHEET FORMS.	10
SPECIAL OUTPUT FOR THE PROGRAM OPERATOR.	11
OPERATION ROUTINE	11
ADDITIONAL PROGRAM OPTIONS	12
1. Running with Multiple Program Decks	12
2. More Than 1000 Cards in ID Deck	13
3. Selective Printout by Flagging	13
4. Summary Output	15
5. Blanking of Hierarchy Numbers in Output Listing	15
6. Preventing the Slash Overprint on Individual Item Schedules	16
7. Need Date Overprint	16
8. Status Input From the ID Card	16
9. Other Forms of Hierarch Numbering	16
10. Hierarchy Error Message Blankout	17
SHIFTING THE CALENDAR	17
OTHER PROGRAM USES	18
EXPERIENCE WITH MAPS	18
APPENDIX - MAPS FORTRAN PROGRAM LISTING	19

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SUMMARY

MAPS provides managers of large technical projects with a fast and economical information system for planning and controlling their projects. The program is written in FORTRAN IV language and is currently being run on an IBM 7094 computer. Input information on schedules and status is simultaneously submitted at all project levels and is automatically collated by the program, resulting in an easy-to-understand output.

Many optional features allow the operator to tailor the program output to local preferences. Legends are completely arbitrary as are schedule calendar formats. Special line items may be selected to print out only on limited listings. Key information may be automatically summarized. Excerpted listings of responsibilities by individuals or organizational segments may be generated.

The program is versatile and can be used for other listings such as parts lists, records of test hours, glossaries, engineering work-order records, etc. The program data can be effectively managed with one part-time operator. An annotated listing of the computer program is included as an appendix.

INTRODUCTION

MAPS, a computerized Management Analysis and Planning System was developed at the NASA Lewis Research Center to provide project managers of large technical projects with a fast and economical information system for planning and controlling their projects. The program was developed after finding that the planning, scheduling, and status updating by the use of other systems on a Lewis project were cumbersome and time consuming, especially when handling large quantities of information. The MAPS

program was specifically designed to be a management tool which could readily communicate with all project levels, which would be a ready reference of up-to-date project information, and which would require a minimum of manpower for its maintenance.

The MAPS program is in essence a computerized bar-chart schedule reporting system in which the work structure of a project can be listed at all levels. This system integrates an item of work, its schedule, its status against the schedule, the responsible individual, and brief explanatory comments about the item. In addition, the relation of any single item to other items in the project is clearly shown by a hierarchy form of program organization. The structure of the MAPS program promotes a natural organization of all project work elements and can be used to control down to any level of detail desired.

A key feature of the MAPS program is that each project work element can be keyed to a responsible individual. This is true at all levels of the work structure. The program can give each individual a condensed listing on an item-by-item basis of the project work elements in his area of the project; thus, each individual can see exactly what his project role is and what schedule demands he is working against. This listing is also helpful to management in reviewing manpower requirements and loading.

Another key feature is that the MAPS system is written for fast updating. Thus, management review can always be conducted with up-to-date information. The program has been found most effective when used in conjunction with a biweekly (every 2 weeks) management review meeting. In the meeting the printouts serve as both information and as a format from which to conduct the meeting. In the printouts, all new or updated information is identified as a change from the previous plan or schedule which can be used by management as an exception reporting system. The information on the progress of each project element can be maintained on an exception reporting basis by individuals who are responsible for each work element listed.

Finally, the MAPS program is a resource saving tool. Experience to date has shown that the system for a project involving 100 professional personnel can be maintained by an operator utilizing about one-fourth his time. The MAPS program is written so that no prior computer experience is required for an operator to effectively implement and maintain project computerized outputs.

In addition to its use in scheduling and review, the program can be used to collate and list various types of information. It has been used for drawing lists, parts lists, documentation of test data, engineering work orders, and others.

This report is intended to show the project manager the general utility of this system for his application, to provide the operator with complete information on how to effectively utilize the program including all its optional features, and to provide those who wish to install its use in their own computer facility an annotated listing of the FORTRAN IV program.

DESCRIPTION OF THE PROGRAM AS USED FOR PLANNING AND SCHEDULING

The MAPS program provides a bar-chart output for project review. The format is composed in a form for convenient reading for the user. Figure 1 illustrates a typical page of MAPS scheduler output which contains five major column headings. Reading from left to right a line of output identifies the item scheduled, the planned calendar schedule applicable to that item, the status of the item against the planned schedule, a comment, and the person directly responsible for the item.

The organization of the work elements is according to a hierarchal structure. This permits an automatic recognition of both the physical organization of the project (e.g., part A is an element of subassembly B, which is in turn an element of subsystem C, etc.) as well as the line of responsibility. For convenience each item is assigned an arbitrary hierarchy number. As an example of the organization implied by this numbering system, item 41D41 BEARING implies that it is an element of item 41D WHEEL (PRIMARY), which in turn is an element of item 41 COMPONENTS. Likewise, it implies that LENTZ is responsible for BEARINGS to JOULE, who is in turn responsible for the WHEEL (PRIMARY) to NURTZ, who has overall responsibility for COMPONENTS.

The calendar schedule is centrally located on the page. The user can vary the format of the calendar according to his needs. The example shown in this figure has been found most useful for regular detailed project review of current status and for near-term planning. The format preserves the events of the past 6-month period summarized by month. The present 6-month period and the following 6-month period are shown by quarter months (approximate weeks) which has been found to be adequate detail for near-term project control. Events of 1 year hence are carried by month to permit some longer range perspective on the impact of present status.

In order to keep the scheduler information in a compact form the various activities are coded according to the legend printed at the bottom of the page. This allows the main flow of activities to be listed on a single line, thereby conserving the physical length of the printout. The legend used is arbitrary and may be varied to suit the individual project. In addition to actual calendar schedules, the schedule format area may also be used for appropriate messages such as the one shown on item 21B.

As a visual aid to reviewing the schedule status, a cursor line of asterisks is positioned in the schedule to show the data of the project schedule review. In figure 1 the asterisk cursor is located under the first quarter of December 1970. Status of each schedule line is then measured relative to the position of the asterisk cursor. The status of each scheduled line is visually presented by overprinting a diagonal slash mark across all completed work. The position of the rightmost slash relative to the asterisk cursor is then a visual indication of actual status against planned schedule.

To the right of the schedule is the COMMENT column (see fig. 1) which is used to report numerically the actual status of the item against the planned schedule. The number indicates the columns of slack (in this case interpreted as weeks) plus or minus relative to the report review data. A brief six-character comment can accompany the numerical status report. This comment may also carry any other information such as total running hours to data, completion dates, etc.

The rightmost column on the page is the person responsible for the item on that line. Identifying each person in this way clearly delineates work areas and responsibilities, and can be further used to automatically summarize total work load for any or all individuals listed.

COMPOSITION OF INPUT DATA DECK

This section describes the preparation of the input data deck in sufficient detail for the beginning user to produce a useful scheduler output. Additional program options and uses are discussed later. It is suggested that the user become thoroughly familiar and reasonably proficient with these initial concepts before attempting to use the full complement of options. As mentioned earlier, however, the MAPS operator is not required to know computer programming and can therefore proceed to use MAPS immediately.

The program deck comprises five major sections: control and format deck, identification deck, scheduler deck, status deck, and by-man deck as shown in figure 2. Figure 3 shows the areas on the output page where the information from these input cards is printed.

The following is a card-by-card description of the program deck and instructions on its use. Illustrative examples are included. Reference to figures 1 to 4 will aid in understanding this section. Figure 4 shows a detailed listing of each card that produced the printout in figures 1 and 3. Table I is a condensed list of instructions for punching each of the input cards. This table will be helpful to the operator after becoming familiar with the details of this report. In the following sections the card numbers accompanying the card titles correspond to the card numbers in figures 2 and 4 and table I.

Control and Format Cards

Program message card (card 1). - This card is used to print a message at the top of every page. Beginning with column 1, all 80 spaces of the card can be used to show, for example, the title of the program, the latest revision date, and the date of the review.

Control card (card 2). - The control card is used to select various options within the program. The options of immediate interest are described subsequently and additional options are discussed later. For ready reference all options are summarized in table I.

(1) Asterisk cursor in the calendar field - This option positions the asterisk cursor in the calendar field to indicate the date of the schedule review meeting. The calendar field is 66 columns wide. The desired cursor position is indicated by the column number in this field (01 to 66). This number is punched in card columns 1 and 2. If both columns 1 and 2 are blank the cursor will not be printed.

(2) Slash overprint indicating completed work - As a visual aid in reviewing progress, slashes will normally overprint on the schedule field legend marks indicating completed work. As an option, if no slash is desired, a 1 would be punched in card column 6.

(3) New program deck punchout - For the convenience of the program operator, the program can automatically punch a new program deck in correct sorted order and purge any incorrect or obsolete cards. In normal biweekly update, the operator may use this option to call for a new program deck after updating the previous deck. To obtain a new deck a 1 should be punched in card column 35.

Calendar heading cards (cards 3, 4, 5). - Three cards are used for the calendar heading. The first 66 columns on each card are available to compose the format. Normally column 1 is not used in order to reserve it for a program feature which will be explained later.

The first card (card 3) is used to specify the annual calendar and to locate the dots that separate years. The second card (card 4) is used to specify the monthly calendar, with the separating dots spaced semi-annually and matching the yearly separating dots on the previous card. The second card also prints at the bottom of the page. The third calendar heading card (card 5) produces the remainder of the vertical separating dots, which should be matched with those on the previous cards.

The format of these cards is completely optional with one exception. The character used to generate vertical columns may only be a period (.). In some applications of MAPS the user may want the calendar heading to be blank. In this case there must be three blank heading cards in the deck to maintain the proper card sequence.

Legend cards (cards 6, 7, 8). - The MAPS program automatically provides space at the bottom of each page of the printout for a two-line legend. Each printed line is 120 character positions long, and three cards are required to print the two line legend. The first card (card 6) using all 80 columns prints in the first 80 spaces of the top line of legend. The first 40 columns on the second card (card 7) prints out on the last 40 spaces of the top line of legend. The last 40 columns of the second card (card 7) print on the first 40 spaces of the bottom line. The third card (card 8) prints out on the last 80 spaces of the bottom line.

The legend characters are entirely optional with one exception: the character used to indicate a dormant period of no activity between two other activities must be either a dash or blank. The overprint slash which indicates completed work will not overprint either a dash or a blank. In general, the symbols period (.), asterisk (*), and zero (0) should not be a part of the legend repertoire since they have special program meaning. All other symbols may be used. If the legend is not used, three blank cards must be inserted in the deck to maintain the proper card sequence.

ID Deck Cards

Identification or "ID" cards (cards 9). - The ID cards are used to identify or describe the program tasks and the responsible organizations, departments, or personnel. An ID card must always have an "S" in column 1. This is used for card-type recognition to minimize inadvertent input errors from appearing in the printout.

As previously mentioned, each item is assigned a hierarchy number. Columns 3 to 11 are used for this hierarchy number which must always begin in column 3. The hierarchy numbering system is the organizing mechanism used by the program to structure the printout. The program provides for up to six levels of hierarchy. The system of hierarchy identification is a mixture of two digit numbers and single letters in the sequence number-letter-number-letter-number-letter. The leftmost position (number) is the most significant, and the rightmost position (letter) the least significant. The two digit numbers range from 00 to 99. The letters cover the 26 letters A to Z. The MAPS program will accept more than one ID card with the same hierarchy number; however, this feature normally receives only limited use since it confuses the implications of hierarchy for the reader.

A hierarchy number may be assigned at random. The numbers and letters need not be assigned consecutively. For example, a program with five major categories might select the numbers 08, 21, 37, 63, and 92. An advantage of such a selection is that if a sixth major category should be needed at a later date, it can be easily fit into the existing numbering sequence by selecting one of the many unused numbers, say 45. This same reasoning applies to both alphabetic and numeric selections at all hierarchy levels (e.g., see fig. 1).

In selecting a hierarchy structure each level of hierarchy must be filled down to the least significant level chosen. For example, a hierarchy number such as 41D21J21K implies that there must be additional ID cards with the numbers 41D21J21, 41D21J, 41D21, 41D, and 41. Hierarchy levels may not be skipped. The program automatically checks for missing hierarchy levels and prints an error message where the error exists. The hierarchy error shown between items 41L and 41P15 in figure 1 indicates that

hierarchy number 41P is missing. Columns 13 to 42 on the ID card are used to print the description of the task, end items, function, etc. This field is always 30 characters long with the indentation on the printout automatically performed by the program according to the hierarchy level. This 30-column field may contain any key-punch character or blanks.

Card columns 44 to 49 are used to name the person or organization responsible for the item described. Although the program will function if these six columns are left blank, it is important to the successful use of this program that an individual person (but at least an organizational segment) be identified as responsible on each ID card. This is important for management in order to pinpoint responsibility. In addition, by using these names, a program option (discussed later) automatically extracts a condensed list of project work elements in each persons area. Names longer than the six allowed character spaces must always be abbreviated in exactly the same way in order to obtain this complete condensed listing.

The special name, TITLE, is inserted in card columns 44 to 48 to create a major title within the output. The lines

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in figure 1 are an example of such a major title. A major title always skips to a new page. This special card should be assigned a two digit hierarchy number in the hierarchy number series which then places it in its desired location in the output listing. The title desired is punched in columns 13 to 42.

New or updated ID cards are inserted into the ID deck manually. Replaced or outdated ID cards are removed from the ID deck manually. For ease of locating old ID cards, it has been found good practice to always insert ID cards in their proper hierarchy position in the deck. This is not essential, however, since the program contains an automatic sorting routine.

Asterisk card (cards 10, 14, 18, 20). - Asterisk cards are used to signal the end of different segments of the input data deck. These cards simply have an asterisk (*) punched in card column 1. The remainder of the card is left blank. Each time the new program deck punch option on the control card is utilized, the date on which the deck is punched will appear on the asterisk cards (except on card 20) in columns 7 to 25. All asterisk cards must be inserted as shown in figure 2 for the program to run even if sections beyond the ID deck are not used.

Schedule Deck Cards

Schedule cards (cards 11). - Each schedule card must agree in format with the calendar heading cards described earlier. Schedule card columns 1 to 66 are used for the

legend characters or general messages which will appear in the schedule field. As mentioned, periods (.) on the calendar heading card (card 5) supercede any legend characters punched in the same calendar columns. Schedule card columns 70 to 78 must contain the hierarchy number exactly as it is punched in card columns 3 to 11 on the companion ID card. Schedule cards may be inserted in any hierarchy order.

Slash cards (cards 12, 16). - Two slash cards are used in the input data deck, one in the schedule deck and the other in the status deck to be discussed next. The function of this card is to separate previous schedule or status cards from new or updated cards. Like the asterisk card, a slash card has only one character, a slash in column 1. Omission of one or both slash cards will not prevent the program from running but the update indicator of the cards that follow the slash card will not be printed.

Schedule update cards (cards 13). - The schedule update cards are identical in format to the schedule cards in the schedule deck. When the user wishes to update or revise a schedule, he prepares a new card that represents his new schedule, but he retains the same hierarchy number as the old schedule. The updated schedule cards are placed in the deck immediately following the slash card. Each schedule card when located after the slash card will cause an asterisk (*) to print in column 1 of the calendar field, thus marking it as a new or changed input. Four of these asterisks may be seen in figure 1 on items 41D21J21B, 41D21J21K, 41D31, and 41D41. Schedule update cards may be inserted in any hierarchy order. The program automatically uses the last input schedule or schedule update card of any given hierarchy number. A schedule update card will automatically cause any previous status (slack) as indicated on a status card to be blanked out. The output listing will show that the status has been changed and is now reported as being on schedule. Status reported on status update cards will not be changed.

The user need not manually remove previous schedule cards. The computer automatically ignores them and discards them during the punch out of the new deck and the printing of the output.

Asterisk card (card 14). - An asterisk card is located at this position to signal the end of the schedule deck.

Status Deck Cards

Status cards are used to show schedule status with respect to the planned schedule. Status is displayed in two ways, with slashes over completed work (legend characters) and/or as a number in the COMMENT column. The status card is also used for making a brief comment which appears in the COMMENT column. As a matter of practice it has been found advantageous to maintain fixed schedules until the programmatic situation changes sufficiently to warrant a change of schedule projection. In this way it is readily

apparent to a manager when progress is other than planned, thereby allowing his assessment of its impact on the overall program. The operator should be alert to persons who tend to change schedules at each update, rather than reporting status against planned schedules.

Status cards (cards 15). - No status card is required for items on schedule, that is, where present activity is correctly indicated by the asterisk cursor line. With the use of the calendar in the example, status can be thought of as weeks of slack (+ or -). The program uses the status number (weeks) to count calendar columns right or left from the asterisk cursor. This positions the slash overprints to strike out completed work only. The slash (/) will not overprint a blank (), period (.), dash (-), asterisk (*), or zero (0) due to their special format meaning. In counting columns to determine slash overprint position from the asterisk cursor, the program does not count any column containing a period. This is to allow vertical separator lines through the calendar using periods.

Status card columns 1 to 9 are used for the hierarchy number. The hierarchy number must always begin in column 1 and must be identical to the hierarchy number of the companion ID and schedule cards. Columns 15, 16, and 17 are used for schedule status. A two digit number is always used (e.g., 01, 12) preceded by the sign of the number (+ or -). Columns 23 to 28 may be used for any cryptic comments relevant to the line item. Either the status number (weeks) or the comment may be left blank. Status cards may be inserted in any hierarchy order.

Slash card (card 16). - A slash card is located in the deck at this position to separate prior status cards from status update cards.

Status update cards (cards 17). - The status update cards are identical in format to the status cards. Like the schedule update cards they provide a means of updating status without the necessity of manually removing obsolete cards from the deck. It is only necessary to add an updated status card when there is an actual change in status or comment. An activity which was, for example, 5 weeks behind (-05 status) in the last reporting period and is still 5 weeks behind during the current reporting period requires no update.

The status update cards should immediately follow the slash card. Any status card located in this position in the deck will cause an asterisk (*) to print in the COMMENT column thereby marking the status as new or changed. Two of these asterisks can be seen in figure 1 on items 41B and 41D31. Status update cards may be inserted in any hierarchy order. The program automatically uses the last inputted status or status update card of any given hierarchy number.

Asterisk card (card 18). - An asterisk card is located at this position to signal the end of the status deck.

By-Man Deck Cards

By-man cards (cards 19). - One of the communication features of this program is to be able to generate for each individual a listing of his responsibilities and assignments. This is accomplished by an automatic search through the program deck for all items which show him as being directly responsible, which are his responsibility as implied by hierarchy, or which are higher levels of hierarchy to which he is responsible. As an example, figure 5 shows a by-man listing for BELL. This list is an excerpt from the list in figure 1. In figure 5, the hierarchy organization is meant to imply that the RIM and FRICTION SURFACE are parts of the RING for which BELL is responsible. In the same manner it can also be seen that the RING is a part of the OUTER STRUCTURE which is a part of the HOOP which is in turn a part of the WHEEL (PRIMARY) which is a COMPONENT of SUN DIAL I. The hierarchy organization is also meant to imply that technically, BELL becomes responsible for LENZ's work as well as his own. In addition, BELL must be responsive to EPDERM who must be responsive to SINGER who must be responsive to JOULE who must finally be responsive to HOOKE. Thus, work elements of both higher and lower hierarchy are listed so that BELL may view his jobs and responsibilities in context.

These listings are obtained by inserting cards in the by-man deck, one card for each man. A blank by-man card may be used to obtain a list of all items of unassigned responsibility. The use of by-man cards is optional.

The format of a by-man card is simply the man or organization name punched in card columns 8 to 13, and spelled or abbreviated exactly as in the ID deck.

Asterisk card (card 20). - An asterisk card is located at this position to signal the end of the program deck.

This concludes the description of a complete program deck sufficient to run a basic MAPS listing. The features already described are ample to get a new project organized and the regular review process underway.

WORK SHEET FORMS

As an aid to the program operator in preparing inputs and updates, a set of work sheets have been prepared for the ID, schedule, and status cards. Normally these work sheets are filled out by the responsible persons in each area, approved by their immediate supervisor, and given to the program operator for subsequent updating of the program deck. The work sheets are laid out to correspond directly to the input card column requirements. Master copies of these work sheets are located at the end of this report following figure 8. These may be photocopied for mass reproduction after filling in

specific project information such as project name and calendar headings.

SPECIAL OUTPUT FOR PROGRAM OPERATOR

Each time the MAPS program is run, an additional page of information useful to the operator is printed as the first page of the listing. An example of such a printout is shown in figure 6. The brackets in figure 6 are keyed by letters to the headings in this section. The description of this special output follows.

Control Card (bracket A): All program control card inputs are listed for reference. Each option is briefly described.

Error Cards (bracket B): Cards in error from the ID, schedule, and status decks are all listed. An ID card is in error if an S is not punched in column 1. Schedule and status cards are in error if no ID card can be located with an identical hierarchy number. Any cards appearing under this heading are not listed in the printout and are automatically purged from the new program deck if it is selected to be punched.

Flagged ID Cards (bracket C): This is a list of all flagged ID cards and shows the specific flag configuration for each card. Flagged ID cards are discussed later.

Responsible Person List (bracket D): This is a complete list of all the individual names of responsible persons as read from ID cards. It is useful to detect different spellings or abbreviations of a given individual, or to select names for by-man listings.

Valid ID Cards (bracket E): The MAPS program as written is limited in any single program deck to a maximum of 1000 ID cards (line items). This special output gives the total number of valid ID cards inputted. ID cards in error are not included in this total. If more than 1000 valid ID cards are inadvertently inputted, the program processes the first 1000 normally, totally ignores the excess over 1000, and prints an error message to warn the operator.

Hierarchy Errors (bracket F): The number of hierarchy errors found by the program are listed. The location in the deck of such errors may be quickly found by scanning the printout for a break in the vertical lines of dots or asterisks. An example is shown in figure 1.

OPERATION ROUTINE

It has been found convenient to use the following routine in gathering information, processing, and distributing MAPS to management and individuals.

Four Working Days Prior to the Review Meeting: - All new inputs are due to the operator at this time. Inputs are written on specially prepared input work sheets (shown

following fig. 8). Each individual is responsible to update his own area of responsibility.

Two Working Days Prior to the Review Meeting: - All inputs are entered into the deck. The program is run for a single proof copy.

One Working Day Prior to the Review Meeting: - A run is made for multiple copies, one copy for each attendee at the review meeting.

Review Meeting Day: - The operator attends the review meeting making notes of changes, corrections, and decisions which reflect adjustments to the schedules. Following the meeting, the operator incorporates the changes from the meeting and runs by-man copies at the same time calling for a new program deck to be punched to be used for the next update.

One Working Day Following Review Meeting Day: - The operator passes out a by-man copy to all individuals with an additional copy of each by-man listing to the individual's supervisor.

The cycle repeats. A 2-week review cycle has been found to be optimum for a project-wide review.

ADDITIONAL PROGRAM OPTIONS

This section describes 10 additional program options which may be used individually or in any combination.

1. Running with Multiple Program Decks

It has been common practice with the writers to include several program decks in one program execution in order to disseminate a variety of information in one document. An example of a typical run includes (1) an overall project master schedule covering a 7-year period, (2) the project detailed schedule covering 6 months of history and 18 months of projection, (3) a glossary of project abbreviation, and (4) a listing of test hours on all components. So that this printout is continuous in its reader information, a program feature allows suppression of the special operator information printout between program decks. This is accomplished by punching a 1 in column 37 of the control card of the first program deck only. Any ID, schedule, or status card error messages, or hierarchy error count will continue to print between program deck listings. This feature is normally used only for runs which are for distribution. Proof copy runs are normally run with all special operator information printing. Multiple deck setup is shown in figure 7. When no by-man cards are used, care should be taken to ensure that there are two asterisk cards between the status deck of one program and the first heading card of the following program.

2. More Than 1000 Cards in ID Deck

The program is limited by core storage of the NASA Lewis Research Center computer to a maximum of 1000 ID cards (item lines). Each ID card may, of course, optionally have a schedule and status card. If it is necessary to utilize more than 1000 ID cards (item lines), two or more program decks may be run simultaneously as described previously. The printout gives a continuous appearance to the reader. A caution should be observed in running in this multiple deck mode. Each program deck is run by the computer as a separate entity. There is no cross referencing from program deck to program deck. Therefore, a summary output (option 4, described subsequently) will only have access to cards in its immediate program deck. Also by-man listings will likewise only have access to cards in the immediate program deck in which the by-man request cards are located.

The control card in the first program deck should be punched with a 1 in column 37. This will blank out operator information between decks (except error cards) which will make the output appear as one continuous listing.

3. Selective Printout by Flagging

The MAPS program can produce three different types of output listings; total, by-man, and summary. Total and by-man listings have already been discussed. Summary listing is described in the next section. A flag option is programmed to allow any item to print or not to print on any listing or combination of listings. Although an item may be flagged for selective printout, the printing will not actually occur unless that form of listing has been requested when the program is run. The total listing is automatically printed every time the program is run. A by-man listing is requested by inserting one or more by-man cards in the program deck. A summary listing is requested by punching a one (1) in control card column 4.

When there is no flag the item will always print on total and by-man listings and never print on the summary listing. When there is a flag, the item will print on the listing(s) specified in table II. The flag (number) is punched in ID card column 51. For example, if an item is to be printed on the by-man and summary listings but not on the total listing, a 5 would be punched in ID card column 51.

At times it may be advantageous to be able to select various groups of items to be listed, for example, there may be different groupings of items to be printed as summaries. The MAPS program permits up to four such groupings by utilizing ID card columns 51, 52, 53, and 54 independently and in exactly the same way as described previously for column 51. Each time the program is run, a different ID card column can be chosen as the basis for selective printout of items. Thus, column 51 can be used to flag grouping number 1, column 52 can be used to flag grouping number 2, etc. When the program is run, the ID card flag column chosen for selective printout (i.e., 51, 52, 53, 54) should be punched in control card columns 10 and 11. If control card columns 10 and 11 are

blank the program will automatically assume column 51 is to be chosen. Only one ID card flag column may be selected each time the program is run.

The explanation thus far of selective printout by flagging is sufficient to allow a wide flexibility of its use. The more experienced operator may wish to continue reading at this point to obtain a deeper understanding of the programming details in order to use the option to its fullest advantage. To avoid confusion, it is suggested that the novice operator skip directly to option 4 (summary output).

The flag procedure as described previously is based on a preprogrammed set of printout selection masks, one for each of the three listing types. The program uses these masks to decide whether or not a flagged item is to be printed. This is done by comparing bit by bit the binary representation of the flag with the binary representation of the appropriate mask. The decision to print occurs whenever both binary representations have a 1 bit in at least one of the three bit positions. The binary representations are as follows:

Decimal number	Binary representation
0	000
1	001
2	010
3	011
4	100
5	101
6	110
7	111

The three preprogrammed masks have the decimal values as follows: by-man = 1, total = 2, and summary = 4. Referring to the previous chart shows that a decimal 1 is represented by a 1 in the right bit position, a decimal 2 by a 1 in the middle bit position, and a decimal 4 by a 1 in the left bit position.

As an example of how the comparison is done, when a 5 flag punch is compared to the three preprogrammed masks one at a time as shown in the following chart, a match of bits is found in the left bit position for the summary mask, in the right bit position for the by-man mask, but no match is found for the total mask; thus, this item would print on summary and by-man listings but not on the total listing.

5 Flag on ID card	Binary representation		
	1	0	1
By-man mask(1)	0	0	1
Total mask (2)	0	1	0
Summary mask (4)	1	0	0

Normally, the three preassigned mask values will be adequate to accomplish the selective printouts desired. Occasionally there may be need to change the built-in values to accomplish a special function. The most likely need would be to print a total listing of every item in the program deck whether flagged or not. This can be accomplished by changing the total mask from the preprogrammed value of 2 to a value of 7 (the 7 is represented by a 1 bit in every bit position which assures a match with any flag).

Any of the three mask preprogrammed values can be changed by punching the desired value into the following: summary mask in control card column 22, total mask in control card column 8, and by-man into by-man card column 1. If any of these is left blank the program will automatically assign the mask values by-man = 1, total = 2, and summary = 4 to only the blank mask(s). When the program is run, the actual mask value used along with the ID flag column selected can be found in the printout. The total and summary masks are found in the special operator output, and the by-man mask is found at the top of each by-man page.

4. Summary Output

If the masking feature described previously is used, the program can produce a listing of only flagged items as a summary output that appears ahead of the total output. This summary output is called for by punching a 1 in column 4 of the control card. Since the lines of the summary output may be excerpted from any point in the program and at any hierarchy level, the arrangement in the summary output may appear somewhat disorganized. It may therefore be desirable when using the summary output to insert ID cards which will produce extra item headings to help organize the summary information and which only print out in the summary listing.

5. Blanking of Hierarchy Numbers in Output Listing

It is occasionally desirable to blank out hierarchy numbers on summary and total printouts. An example of this is shown in figure 8(a). This can be readily accomplished by punching in control card columns 32 and 33 the highest hierarchy number which is to be blanked out to the printout. All hierarchy numbers less than or equal to the punched number and all its sublevels will then not appear on the summary and total printouts. This feature will not blank out hierarchy numbers on the by-man output.

6. Preventing the Slash Overprint on Individual Item Schedules

Within the program printout it is convenient to interject notes and comments in the schedule field in place of a normal schedule. For ease of reading, it is desirable to prevent normal overprinting with status slashes on individual item lines where notes are to appear. This prevention of slashes can be accomplished by punching a period (.) in status update card column 15. This period will appear in the printout under COMMENT as in item number 21B in figure 1.

7. Need Date Overprint

In scheduling important items which interface with other items on the project it may be desirable to establish a demand or needed completion date. This date may be earlier or later than a planned expected completion date. In order that this need date may be held fixed and independent of any schedule changes, a feature is available in the program which overprints a special character in the same manner as status slashes. The special character takes precedence over a slash in the same position and will overprint the legend character.

The symbol to be overprinted at the need date may be selected by the operator. The symbol desired should be punched in column 7 of the control card. If column 7 is blank, the symbol $\frac{1}{2}$ (colon on the key punch) will automatically be used.

If the need-date overprint is desired for a given item, the schedule field column number (01 to 66) in which the character is to appear, is punched on the schedule card for that item in columns 67 and 68 (the column numbers zero to 9 must appear as two digits 01, 02, --, 09).

If the slash overprint is suppressed with a 1 in column 6 of the control card, the need date symbol is also suppressed.

8. Status Input From the ID Card

Status information may be added to the program from either the status card or from the ID card. Columns 56, 57, and 58 on the ID card serve exactly the same function as columns 15, 16, and 17 on the status card. Likewise columns 60 to 65 on the ID card serve exactly the same function as columns 23 to 28 on the status card. Status from the ID card should be used only when there is no status card in the deck with the same hierarchy number; otherwise, the status card information will take precedence over the ID card. Whenever a new program deck is punched, the status information added by means of an ID card will automatically be transferred to a new status card and not punch out on the new ID card.

9. Other Forms of Hierarchy Numbering

The normal form for hierarchy numbering is NN, L, NN, L, NN, L (N = numeral, L = letter). Automatic indentation of the descriptions occur based on these six hierarchy levels. Within the program these hierarchy characters are all treated alike as alpha-numeric symbols: thus, any alpha-numeric symbol may be used in any hierarchy

character position. These symbols are sorted in the order of precedence of the normal FORTRAN IV ordering. This ordering is as follows:

0, 1, 2, ..., 9, =, A, B, ..., R, blank, S, T, ..., Z

This option can be useful in organizing dictionaries where the hierarchy word can be the exact word to be sorted. Examples of this use are shown in figures 8(h) and (j). This option requires the use of the hierarchy error message blankout described next. In addition, if it is desired to blank out the hierarchy numbers themselves on the output listing, two characters may be punched into control card columns 32 and 33 as described in option 5. The characters can be numerals, letters, or equal sign (=), and they will serve to blank all hierarchy numbers of lower precedence (00 is lowest precedence and ZZ is highest).

10. Hierarchy Error Message Blankout

As mentioned earlier, the program requires levels of hierarchy to be continuous down to the lowest one used. The program automatically checks for this and prints an error message within the output text at any hierarchy error location. When using the program for special applications, such as glossary, parts list, engineering order list, etc., hierarchy characters can be the significant name or number as described above and will in general violate the hierarchy levels requirement. In these special cases the hierarchy error message may be suppressed by punching a 1 in column 41 of the control card. This will also suppress the printing of the total number of hierarchy errors in the special operator information.

SHIFTING THE CALENDAR

In order to keep the calendar current with sufficient room for planning, the calendar must be changed and the schedule must be shifted to the left on the printout periodically. It has been the practice to shift the schedule shown in figure 1 every 6 months when the asterisk cursor has reached or passed column 38. In figure 1, this corresponds to the fourth week in January 1971. It has been found convenient to write a special computer program tailored to the users particular schedule format to perform this shifting operation. After the shifted schedule deck is punched and a printout is run, all project personnel are asked to review the schedule in detail and expand and extend the work plan. This procedure saves the complete manual repunching of the schedule deck.

OTHER PROGRAM USES

The MAPS program has sufficient flexibility to make it useful for a variety of purposes where information is to be maintained in orderly lists. Example of actual program uses are shown in figure 8. These include a long range schedule, a long range schedule keyed to project part numbers, a failure and corrective action report index, a report list, a contractor report list, a drawing file index, a component and system test record, an engineering change order list, a parts list, and a glossary. These illustrate the flexibility of the "calendar" field format and of the hierarchy numbering system. The common denominator of all the uses is the ease of inserting and removing items at the appropriate location in a list.

When all 66 calendar field columns are needed and when there is no need to tag new calendar field entries with an asterisk in column 1 of the calendar field, the slash card should be removed from the schedule deck. Removing the slash card will prevent the asterisk from appearing thus making all 66 columns available for information.

EXPERIENCE WITH MAPS

The MAPS program has been written to provide a convenient, thorough, and maintainable project information system. The program has been used successfully for project review every two weeks for four years to coordinate the effort of 200 professional and nonprofessional personnel. Once the project information was organized, it has required approximately 25 percent of one man's time for maintenance of the input data and operation of the program for a set of program decks typically totaling 1100 items. It has been found a most effective tool for project management and maintenance and dissemination of detailed project information. A wide variety of lists including schedules, test hours, glossary, parts list, engineering order list, failure report list, and others have been conveniently maintained by means of the MAPS program.

An important feature of the program is ease of readability by the uninitiated reader. Experience with MAPS indicates little difficulty in quickly grasping the information listed by the program.

Most of all, the MAPS program has provided a means to generate a dynamic document displaying all aspects of a complex project using limited manpower to do so. This documentation has provided a valuable management tool to maintain orderly, efficient, and coordinated project progress.

Lewis Research Center

National Aeronautics and Space Administration,

Cleveland, Ohio, November 6, 1970,

120-27.

APPENDIX - MAPS FORTRAN PROGRAM LISTING

<pre> \$IBFTC MAPS DECK C THIS PROGRAM IS CALLED MAPS, AN ACRONYM FOR MANAGEMENT ANALYSIS C AND PLANNING SYSTEM. THE FOLLOWING ARE SOME SUGGESTIONS AND TIPS ON C IMPLEMENTING THIS PROGRAM ON YOUR COMPUTER. PRESENTLY IT IS RUN ON C AN IBM 7094, A 36 BIT WORD MACHINE WITH 32,768 WORDS OF CORE MEMORY. C C THIS PROGRAM IS WRITTEN IN FORTRAN IV FOR EXECUTION ON A 36 BIT C WORD COMPUTER. BY CUSTOM WRITING FOUR FUNCTION SUBPROGRAMS IT SHOULD C BE POSSIBLE TO USE THIS PROGRAM ON ANY COMPUTER WITH 36 OR MORE BITS C PER WORD. THE FOUR FUNCTIONS ARE ACCUMULATOR RIGHT SHIFT (ARS,IARS), C ACCUMULATOR LEFT SHIFT (ALS,IALS), LOGICAL-AND (AND), AND LOGICAL-OR C (OR). IN GENERAL THESE FOUR FUNCTIONS C ARE USED TO STANDARDIZE WORDS FOR MASK COMPARISON. IN SOME LOCATIONS C THESE FUNCTIONS ARE USED TO TRANSFORM HOLLERITH NUMBERS INTO INTEGER C NUMBERS. C C HOLLERITH MANIPULATION REPRESENTS THE MAJOR USE OF THESE FUNCTION C SUBPROGRAMS. IT IS EXPECTED THAT THE MAPS PROGRAM WILL EXECUTE AS C WRITTEN IF THE FUNCTIONS ARE CAREFULLY PROGRAMMED. C HOWEVER, THE NUMBER TRANSFORMATION SECTIONS C OF THE MAPS PROGRAM MAY NEED TO BE REWRITTEN DEPENDING ON YOUR C COMPUTER,S INTEGER REPRESENTATION. C STATEMENTS INVOLVING NUMBER TRANSFORMATIONS ARE MAPS 138, 166, 170, C 173, AND OPRINT 32, 34, 36, 38, 117, 119, 120. C C-----FUNCTION SUBPROGRAM FOR LEFT, RIGHT SHIFT----- C THE SHIFT FUNCTIONS ASSUME THAT ZEROS WILL BE LOADED INTO BIT C POSITIONS MOVED INTO THE REGISTER BY THE SHIFT. AN EXAMPLE OF USE FOR C THESE FUNCTIONS IS C C X=ALS(24,ARS(12,X)) C C THIS STATEMENT WOULD TRANSFORM FOR EXAMPLE THE HOLLERITH WORD X=ABCDEF C INTO THE HOLLERITH WORD X=CD0000. C C-----FUNCTION SUBPROGRAMS FOR LOGICAL-AND, OR----- C THE LOGICAL-AND AND LOGICAL-OR FUNCTIONS ARE USED TO TRANSFORM TWO C WORDS INTO A THIRD WORD CONSIDERING EACH BIT OF THE 36 BIT WORD C SEPARATELY. THESE FUNCTIONS OPERATE SIMULTANEOUSLY, HOWEVER, ON C ALL 36 BITS. THE LOGICAL OPERATIONS FOR ONE BIT POSITION ARE C SUMMARIZED AS FOLLOWS C C LOGICAL-AND LOGICAL-OR C X=AND(A,B) X=OR(A,B) C C A= 0 0 1 1 A= 0 0 1 1 C B= 0 1 0 1 B= 0 1 0 1 C --- --- --- --- --- --- --- --- C X= 0 0 0 1 X= 0 1 1 1 C C THESE TWO FUNCTIONS ARE USED FOR MASKING AND COMPOSING HOLLERITH C WORDS. C C SINCE CONSIDERABLE HOLLERITH MANIPULATION IS DONE BY THE PROGRAM C THE MACHINE OCTAL REPRESENTATIONS FOR HOLLERITH CHARACTERS IS LISTED C HERE FOR REFERENCE. THESE ARE USED TO COMPOSE SOME OF THE OCTAL MASKS C IN THE PROGRAM. </pre>	<pre> MAPS 1 MAPS 2 MAPS 3 MAPS 4 MAPS 5 MAPS 6 MAPS 7 MAPS 8 MAPS 9 MAPS 10 MAPS 11 MAPS 12 MAPS 13 MAPS 14 MAPS 15 MAPS 16 MAPS 17 MAPS 18 MAPS 19 MAPS 20 MAPS 21 MAPS 22 MAPS 23 MAPS 24 MAPS 25 MAPS 26 MAPS 27 MAPS 28 MAPS 29 MAPS 30 MAPS 31 MAPS 32 MAPS 33 MAPS 34 MAPS 35 MAPS 36 MAPS 37 MAPS 38 MAPS 39 MAPS 40 MAPS 41 MAPS 42 MAPS 43 MAPS 44 MAPS 45 MAPS 46 MAPS 47 MAPS 48 MAPS 49 MAPS 50 MAPS 51 MAPS 52 MAPS 53 MAPS 54 MAPS 55 MAPS 56 </pre>
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C	HOL	OCT	HOL	OCT	HOL	OCT	HOL	OCT	HOL	OCT	MAPS
C	---	---	---	---	---	---	---	---	---	---	
C	0	00	A	21	K	42	U	64	=	13	MAPS 57
C											MAPS 58
C	1	01	B	22	L	43	V	65	/	61	MAPS 59
C	2	02	C	23	M	44	W	66	*	54	MAPS 60
C	3	03	D	24	N	45	X	67	+	20	MAPS 61
C	4	04	E	25	O	46	Y	70	-	40	MAPS 62
C	5	05	F	26	P	47	Z	71	=	72	MAPS 63
C	6	06	G	27	Q	50	.	33	'	14	MAPS 64
C	7	07	H	30	R	51	,	73	\$	53	MAPS 65
C	8	10	I	31	S	62	)	34	BLANK	60	MAPS 66
C	9	11	J	41	T	63	(	74	≠	12	MAPS 67
C											MAPS 68
C											MAPS 69
C											MAPS 70
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											MAPS 115
											MAPS 116
											MAPS 117
											MAPS 118
											MAPS 119

ALL STATEMENTS IN THE PROGRAM WHICH INVOLVE LOGICAL OPERATIONS
 I.E. ALS, IALS, ARS, IARS, AND, OR, ARE PRECEDED BY THE COMMENTS CARD
 LOGICAL STATEMENT FOLLOWS
 DUE TO THE DECK SIZE, THIS PROGRAM USES OVERLAY AMONG SUBROUTINES
 CHECK, PUNOUT, PICK, OPRINT, AND SORTER.
 THE VARIABLES Q1, Q2, ETC. IN READ STATEMENTS 110, 124, AND 128 ARE
 USED ONLY WHEN PRINTING ERROR CARDS.

```

DATA FBL,FIF/6H 0000,2H51/
DATA TAXX/077777777770/
DATA INEED/0120000000000/
DATA XMAN(200)/6HBLANK /
DATA KSA/0/
DATA SLASH/1H//
DATA IN/00000000000001/
DATA TXQ/0000000000002/
DATA ROX1,ROX2/6H*00000,000777777777/
DATA TAST,TASX/6H000*00,0777777000000/
DATA TOT,EQUAL/5HTITLE,6H=====/
DATA SY,AST,BLANK,MSK1,MSK2,BNK1,BNK2,DASH,ASTQ,CEEQ,BANK,FLQ/1HS,
11H*,1H ,0000000000077,000000000777,0000000000060,0000000006060,6H
2-----,0000000000054,077777777700,0606060606060,0606060606054/
DATA MSK(1,1),MSK(1,2),MSK(1,3),MSK(1,4),MSK(1,5),MSK(1,6),MSK(2,1
1),MSK(2,2),MSK(2,3),MSK(2,4),MSK(2,5),MSK(2,6)/0777700000000,07777
277000000,077777777700,077777777700,077777777700,077777777700,0
300000000000,000000000000,000000000000,077000000000,07777770000
400,0777777770000/
DATA XNPX/000000077777/
DATA SYB/0120000000000/
DATA MXK/6H000000/
DATA TASQ/0000000770000/
DATA ROX3/0770000000000/
DIMENSION ZMAN(20), XLGND(42), H(8)
DIMENSION SP1(11), SP2(11)
DIMENSION MSP1(11), MSP2(11)
DIMENSION HEAD1(11), HEAD2(11), HEAD3(11)
DIMENSION GEN(2,1000), TITLE(5,1000), RSP(1000), CODE(1000), STAT(
11000), COMENT(1,1000), KOUNT(1001), XMAN(200), XORG(100), SKED(11)
2, SCHD(11,1000), TAME(3), HEADNG(14)
DIMENSION MSK(2,6), IZAM(2)
EQUIVALENCE (MSP1(1),SP1(1)), (MSP2(1),SP2(1)), (KLANK,BLANK)
EQUIVALENCE (H(1),KOLUMN), (H(2),KEND), (H(3),IZAM(1)), (H(8),KPUN
1CH), (H(5),KTI), (H(6),KBIN), (H(7),NOHE), (B,NB)
COMMON NUMBER,GEN,SCHD,LINE,KOLUMN
COMMON TITLE,RSP,CODE,STAT,COMENT
COMMON KOUNT
  
```

REAL IN,MANL,MAINL,MASUM,MXK	MAPS 120
C	MAPS 121
C	MAPS 122
C BEGIN EXECUTABLE PROGRAM	MAPS 123
C PROGRAM MESSAGE CARD (CARD 1)	MAPS 124
101 READ (5,166) HEADNG	MAPS 125
C	MAPS 126
IF (KSA.EQ.0) WRITE (6,167) (DASH,J=1,22),BLANK	MAPS 127
C	MAPS 128
C CONTROL CARD (CARD 2)	MAPS 129
READ (5,168) KOLUMN,KEND,IZAM,MAINL,MASUM,XNPR,KPUNCH,KTI,KBIN,NOH	MAPS 130
1E	MAPS 131
C	MAPS 132
KPUN=KPUNCH	MAPS 133
C	MAPS 134
KTM=0	MAPS 135
KERR=0	MAPS 136
C LOGICAL STATEMENT FOLLOWS	MAPS 137
H(8)=ARS(33,ALS(9,KPUNCH))	MAPS 138
C	MAPS 139
IF (KPUNCH.GT.0) PUNCH 166, HEADNG	MAPS 140
C	MAPS 141
IF (KPUNCH.GT.0) PUNCH 168, KOLUMN,KEND,IZAM,MAINL,MASUM,XNPR,KPUN	MAPS 142
1,KTI,KBIN,NOHE	MAPS 143
C	MAPS 144
IF (IZAM(2).EQ.KLANK) IZAM(2)=INEED	MAPS 145
C	MAPS 146
IF (KSA.EQ.0) WRITE (6,169) KOLUMN,KEND,IZAM(1)	MAPS 147
C	MAPS 148
KSET=1	MAPS 149
C	MAPS 150
C SUBROUTINE FLAG WITH KSET=1 ASSIGNS THE TOTAL AND SUMMARY LISTING	MAPS 151
C MASKS AND THE ID CARD FLAG COLUMN.	MAPS 152
CALL FLAG (MAINL,MASUM,MANL,CODE,LINE,MANOUT,KEND,KGT,KSET)	MAPS 153
C	MAPS 154
C LOGICAL STATEMENT FOLLOWS	MAPS 155
FLGU=ALS(24,ARS(12,MAINL))	MAPS 156
C	MAPS 157
C	MAPS 158
IF (XNPR.EQ.BLANK) XNPR=MXK	MAPS 159
C	MAPS 160
IF (KSA.EQ.0) WRITE (6,170) IZAM(2),SYB,MAINL,FLGU,MASUM	MAPS 161
C	MAPS 162
IF (KSA.EQ.0) WRITE (6,171) XNPR,KPUN,KTI,NOHE	MAPS 163
C	MAPS 164
C LOGICAL STATEMENT FOLLOWS	MAPS 165
B=ARS(33,ALS(3,H(1)))	MAPS 166
DO 102 JH=1,7	MAPS 167
IF (JH.EQ.4) GO TO 102	MAPS 168
C LOGICAL STATEMENT FOLLOWS	MAPS 169
H(JH)=ARS(32,ALS(8,H(JH)))	MAPS 170
102 CONTINUE	MAPS 171
C	MAPS 172
C LOGICAL STATEMENT FOLLOWS	MAPS 173
KOLUMN=KOLUMN+10*NB	MAPS 174
IF (KOLUMN.LT.0.OR.KOLUMN.GT.66) KOLUMN=0	MAPS 175
KOLUUM=KOLUMN	MAPS 176
C	MAPS 177
C LOGICAL STATEMENT FOLLOWS	MAPS 178
XNPR=OR(ARS(6,XNPR),XNPX)	MAPS 179
MANOUT=0	
JPAGE=0	

IF (KOLUMN.EQ.0) GO TO 104	MAPS 180
CEEP=CEEQ	MAPS 181
FLP=FLQ	MAPS 182
ASTR=ASTQ	MAPS 183
KRK=(KOLUMN+5)/6	MAPS 184
KOL=KOLUMN-6*KRK+6	MAPS 185
KSHFT=36-6*KOL	MAPS 186
C LOGICAL STATEMENT FOLLOWS	MAPS 187
SRK=ALS(KSHFT,MSK1)	MAPS 188
C LOGICAL STATEMENT FOLLOWS	MAPS 189
BRK=ALS(KSHFT,BNK1)	MAPS 190
C LOGICAL STATEMENT FOLLOWS	MAPS 191
ASTR=ALS(KSHFT,ASTR)	MAPS 192
IF (KOL.EQ.6) GO TO 104	MAPS 193
DO 103 J=KOL,5	MAPS 194
C LOGICAL STATEMENT FOLLOWS	MAPS 195
FLP=OR(ALS(6,FLP),BNK1)	MAPS 196
C LOGICAL STATEMENT FOLLOWS	MAPS 197
103 CEEP=OR(ALS(6,CEEP),MSK1)	MAPS 198
104 CONTINUE	MAPS 199
C	MAPS 200
C CALENDAR HEADING CARDS (CARDS 3,4,5)	MAPS 201
READ (5,172) (HEAD1(J),J=1,11),(HEAD2(J),J=1,11),(HEAD3(J),J=1,11)	MAPS 202
C	MAPS 203
IF (KPUNCH.GT.0) PUNCH 172, (HEAD1(J),J=1,11),(HEAD2(J),J=1,11),(HEAD3(J),J=1,11)	MAPS 204
C	MAPS 205
C LEGEND CARDS (CARDS 6,7,8)	MAPS 206
READ (5,173) XLGND	MAPS 207
C	MAPS 208
IF (KPUNCH.GT.0) PUNCH 173, XLGND	MAPS 209
C	MAPS 210
DO 105 JQZ=1,11	MAPS 211
MSP1(JQZ)=0	MAPS 212
105 MSP2(JQZ)=0	MAPS 213
DO 109 JQZ=1,11	MAPS 214
MSR=MSK(2,4)	MAPS 215
C LOGICAL STATEMENT FOLLOWS	MAPS 216
PER=ALS(30,BNK1)	MAPS 217
DO 108 JQX=1,6	MAPS 218
C LOGICAL STATEMENT FOLLOWS	MAPS 219
IF (AND(HEAD3(JQZ),MSR).NE.PER) GO TO 106	MAPS 220
C LOGICAL STATEMENT FOLLOWS	MAPS 221
SP1(JQZ)=OR(MSP1(JQZ),MSR)	MAPS 222
GO TO 107	MAPS 223
C LOGICAL STATEMENT FOLLOWS	MAPS 224
106 SP2(JQZ)=OR(MSP2(JQZ),AND(HEAD3(JQZ),MSR))	MAPS 225
C LOGICAL STATEMENT FOLLOWS	MAPS 226
107 PER=ARS(6,PER)	MAPS 227
C LOGICAL STATEMENT FOLLOWS	MAPS 228
108 MSR=IARS(6,MSR)	MAPS 229
109 CONTINUE	MAPS 230
C LOGICAL STATEMENT FOLLOWS	MAPS 231
IF (KOLUMN.NE.0) HEAD3(KRK)=OR(ASTR,AND(HEAD3(KRK),CEEP))	MAPS 232
C	MAPS 233
IF (KSA.EQ.0) WRITE (6,174)	MAPS 234
C	MAPS 235
C **** START ID CARD READ ****	MAPS 236
XMAN(1)=BANK	MAPS 237
MAN=1	MAPS 238
	MAPS 239

DO 119 J=1,999	MAPS 240
C	MAPS 241
C ID DECK (CARDS 9), AND ASTERISK CARD (CARD 10)	MAPS 242
110 READ (5,175) ST,Q1,(GEN(K,J),K=1,2),Q2,(TITLE(K,J),K=1,5),Q3,RSP(J	MAPS 243
1),Q4,CODE(J),Q5,STAT(J),Q6,(COMENT(K,J),K=1,1),Q7,Q8,Q9	MAPS 244
C	MAPS 245
IF (ST.EQ.SY) GO TO 111	MAPS 246
IF (ST.EQ.AST) GO TO 121	MAPS 247
C	MAPS 248
WRITE (6,176) ST,Q1,(GEN(K,J),K=1,2),Q2,(TITLE(K,J),K=1,5),Q3,RSP(	MAPS 249
1J),Q4,CODE(J),Q5,STAT(J),Q6,(COMENT(K,J),K=1,1),Q7,Q8,Q9	MAPS 250
C	MAPS 251
KERR=1	MAPS 252
GO TO 110	MAPS 253
111 IF (GEN(2,J).EQ.BLANK) GO TO 112	MAPS 254
C LOGICAL STATEMENT FOLLOWS	MAPS 255
IF (AND(MSK1,ARS(12,GEN(2,J))).NE.BNK1) GO TO 113	MAPS 256
C LOGICAL STATEMENT FOLLOWS	MAPS 257
IF (AND(MSK2,ARS(18,GEN(2,J))).NE.BNK2) GO TO 114	MAPS 258
KOUNT(J)=4	MAPS 259
GO TO 117	MAPS 260
C LOGICAL STATEMENT FOLLOWS	MAPS 261
112 IF (AND(MSK2,ARS(6,GEN(1,J))).NE.BNK2) GO TO 115	MAPS 262
C LOGICAL STATEMENT FOLLOWS	MAPS 263
IF (AND(MSK1,ARS(18,GEN(1,J))).NE.BNK1) GO TO 116	MAPS 264
C LOGICAL STATEMENT FOLLOWS	MAPS 265
IF (AND(MSK2,ARS(24,GEN(1,J))).EQ.BNK2) GO TO 116	MAPS 266
KOUNT(J)=1	MAPS 267
GO TO 117	MAPS 268
113 KOUNT(J)=6	MAPS 269
GO TO 117	MAPS 270
114 KOUNT(J)=5	MAPS 271
GO TO 117	MAPS 272
115 KOUNT(J)=3	MAPS 273
GO TO 117	MAPS 274
116 KOUNT(J)=2	MAPS 275
117 DO 118 JMAN=1,MAN	MAPS 276
IF (XMAN(JMAN).EQ.RSP(J)) GO TO 119	MAPS 277
118 CONTINUE	MAPS 278
MAN=MAN+1	MAPS 279
XMAN(MAN)=RSP(J)	MAPS 280
119 CONTINUE	MAPS 281
C	MAPS 282
WRITE (6,177)	MAPS 283
C	MAPS 284
C THIS READ SEARCHES ONLY FOR THE ASTERISK (CARD 10) IF MORE THAN 1000	MAPS 285
C ID CARDS HAVE BEEN ALREADY READ IN	MAPS 286
120 READ (5,178) QXJ	MAPS 287
C	MAPS 288
IF (QXJ.NE.AST) GO TO 120	MAPS 289
C	MAPS 290
C ALL CARDS READ IN AND BAD CARDS REJECTED	MAPS 291
121 NUMBER=J-1	MAPS 292
C	MAPS 293
C SORTER SORTS CARDS INTO ASCENDING HIERARCHY ORDER	MAPS 294
CALL SORTER (KXM)	MAPS 295
C	MAPS 296
C CHECK LOOKS FOR HIERARCHY ERRORS	MAPS 297
CALL CHECK (KXM)	MAPS 298
C	MAPS 299

IF (KSA.EQ.0) WRITE (6,179)	MAPS 300
C	MAPS 301
C **** START SCHEDULE CARD READ ****	MAPS 302
DO 123 LX=1,11	MAPS 303
DO 122 JX=1,NUMBER	MAPS 304
122 SCHD(LX,JX)=HEAD3(LX)	MAPS 305
123 CONTINUE	MAPS 306
KOG=0	MAPS 307
C	MAPS 308
C SCHEDULE JDATE DECK INCLUDING SCHEDULE CARDS, SLASH CARD, SCHEDULE	MAPS 309
C UPDATE CARDS, AND ASTERISK CARD (CARDS 11,12,13,14)	MAPS 310
124 READ (5,180) (SKED(J),J=1,11),ANEED,Q1,GEN1,GEN2,Q2	MAPS 311
C	MAPS 312
IF (SKED(1).EQ.AST) GO TO 127	MAPS 313
IF (SKED(1).EQ.SLASH) KOG=1	MAPS 314
IF (SKED(1).EQ.SLASH) GO TO 124	MAPS 315
KFLAG=0	MAPS 316
DO 126 JJ=1,NUMBER	MAPS 317
C LOGICAL STATEMENT FOLLOWS	MAPS 318
IF (GEN1.NE.AND(GEN(1,JJ),TAXX)) GO TO 126	MAPS 319
IF (GEN2.NE.GEN(2,JJ)) GO TO 126	MAPS 320
C LOGICAL STATEMENT FOLLOWS	MAPS 321
GEN(1,JJ)=OR(GEN(1,JJ),TXQ)	MAPS 322
C LOGICAL STATEMENT FOLLOWS	MAPS 323
CODE(JJ)=OR(ALS(12,ARS(12,CODE(JJ))),ARS(24,ANEED))	MAPS 324
KFLAG=1	MAPS 325
DO 125 JR=1,11	MAPS 326
C LOGICAL STATEMENT FOLLOWS	MAPS 327
125 SCHD(JR,JJ)=OR(MSP2(JR),AND(MSP1(JR),SKED(JR)))	MAPS 328
C LOGICAL STATEMENT FOLLOWS	MAPS 329
IF (KOLUMN.GT.0.AND.AND(SCHD(KRK,JJ),SRK).EQ.BRK) SCHD(KRK,JJ)=OR(	MAPS 330
1ASTR,AND(SCHD(KRK,JJ),CEEP))	MAPS 331
C LOGICAL STATEMENT FOLLOWS	MAPS 332
IF (KOG.EQ.1) SCHD(1,JJ)=OR(ROX1,AND(ROX2,SCHD(1,JJ)))	MAPS 333
126 CONTINUE	MAPS 334
IF (KFLAG.EQ.1) GO TO 124	MAPS 335
C	MAPS 336
WRITE (6,181) (SKED(J),J=1,11),ANEED,Q1,GEN1,GEN2,Q2	MAPS 337
C	MAPS 338
KERR=1	MAPS 339
GO TO 124	MAPS 340
127 CONTINUE	MAPS 341
IF (KSA.EQ.0) WRITE (6,179)	MAPS 342
C	MAPS 343
C **** START STATUS CARD READ ****	MAPS 344
KOG=0	MAPS 345
C	MAPS 346
C STATUS DECK INCLUDING STATUS CARDS, SLASH CARD, STATUS UPDATE CARD,	MAPS 347
C AND ASTERISK CARD (CARDS 15,16,17,18)	MAPS 348
128 READ (5,182) GEN1,GEN2,Q1,WKS,Q2,COT1,Q3,Q4,Q5,Q6,Q7,Q8,Q9,Q10,Q11	MAPS 349
C	MAPS 350
IF (GEN1.EQ.AST) GO TO 130	MAPS 351
IF (GEN1.EQ.SLASH) KOG=1	MAPS 352
IF (GEN1.EQ.SLASH) GO TO 128	MAPS 353
DO 129 JJ=1,NUMBER	MAPS 354
C LOGICAL STATEMENT FOLLOWS	MAPS 355
IF (GEN1.NE.AND(GEN(1,JJ),TAXX)) GO TO 129	MAPS 356
IF (GEN2.NE.GEN(2,JJ)) GO TO 129	MAPS 357
STAT(JJ)=WKS	MAPS 358
C LOGICAL STATEMENT FOLLOWS	MAPS 359

	IF (KOG.EQ.1) STAT(JJ)=OR(TAST,AND(STAT(JJ),TASX))	MAPS 360
	COMENT(1,JJ)=COT1	MAPS 361
	GO TO 128	MAPS 362
129	CONTINUE	MAPS 363
C		MAPS 364
	WRITE (6,183) GEN1,GEN2,Q1,WKS,Q2,COT1,Q3,Q4,Q5,Q6,Q7,Q8,Q9,Q10,Q1	MAPS 365
	11	MAPS 366
C		MAPS 367
	KERR=1	MAPS 368
	GO TO 128	MAPS 369
130	DO 131 JJ=1,NUMBER	MAPS 370
C	LOGICAL STATEMENT FOLLOWS	MAPS 371
	IF (AND(SCHD(1,JJ),ROX3).NE.ROX1.OR.AND(STAT(JJ),TASQ).EQ.TAST.OR.	MAPS 372
	1STAT(JJ).EQ.BLANK) GO TO 131	MAPS 373
C	LOGICAL STATEMENT FOLLOWS	MAPS 374
	STAT(JJ)=OR(TAST,AND(BLANK,TASX))	MAPS 375
131	CONTINUE	MAPS 376
C		MAPS 377
	IF (KERR.EQ.0.AND.KSA.EQ.0) WRITE (6,184) BLANK	MAPS 378
C		MAPS 379
C	PUNOUT PUNCHES A NEW ID,SCHEDULE,AND STATUS DECK	MAPS 380
	IF (KPUNCH.GT.0) CALL PUNOUT	MAPS 381
C		MAPS 382
C	PICK LISTS THOSE CARDS WITH A NON BLANK FLAG FIELD (CC 51-54) ON	MAPS 383
C	THE ID CARD	MAPS 384
	IF (KSA.EQ.0) CALL PICK (GEN,CODE,NUMBER)	MAPS 385
C		MAPS 386
	IF (KSA.EQ.0) WRITE (6,185) (XMAN(JAB),JAB=1,MAN)	MAPS 387
C		MAPS 388
	IF (KSA.EQ.0) WRITE (6,186) NUMBER	MAPS 389
C		MAPS 390
	IF (KXM.NE.0.AND.NOHE.EQ.0) WRITE (6,187) KXM	MAPS 391
C		MAPS 392
C		MAPS 393
C	**** START OF PROCESSING ****	MAPS 394
132	CONTINUE	MAPS 395
	LINE=1	MAPS 396
	KSET=2	MAPS 397
C	SUBROUTINE FLAG WITH KSET=2 ASSIGNS THE BY-MAN LISTING MASK.	MAPS 398
	CALL FLAG (MAINL,MASUM,MANL,CODE,LINE,MANOUT,KEND,KGT,KSET)	MAPS 399
C		MAPS 400
133	JPAGE=JPAGE+1	MAPS 401
C		MAPS 402
	WRITE (6,188) HEADNG	MAPS 403
C		MAPS 404
	IF (XMAN(1).EQ.BLANK) JMAN=200	MAPS 405
C		MAPS 406
	IF (MANOUT.EQ.1) WRITE (6,189) XMAN(JMAN),MANL	MAPS 407
C		MAPS 408
	IF (JMAN.EQ.200) JMAN=1	MAPS 409
C		MAPS 410
	WRITE (6,190) (HEAD1(KPX),KPX=1,11),(HEAD2(KPX),KPX=1,11),(DASH,J=	MAPS 411
	11,22)	MAPS 412
C		MAPS 413
	LNT=0	MAPS 414
	IF (MANOUT.EQ.1) LNT=2	MAPS 415
	GO TO 135	MAPS 416
134	LINE=LINE+1	MAPS 417
135	IF (LINE.GT.NUMBER) GO TO 163	MAPS 418
	IF (MANOUT.EQ.0) GO TO 139	MAPS 419

IF (RSP(LINE).EQ.XMAN(JMAN)) GO TO 136	MAPS 420
GO TO 137	MAPS 421
C LOGICAL STATEMENT FOLLOWS	MAPS 422
136 IF (KOUNT(LINE).GT.KIX.AND.AND(GEX1,MSK(1,KIX)).EQ.AND(GEN(1,LINE)	MAPS 423
1,MSK(1,KIX)).AND.AND(GEX2,MSK(2,KIX)).EQ.AND(GEN(2,LINE),MSK(2,KIX	MAPS 424
2))) GO TO 140	MAPS 425
KIX=KOUNT(LINE)	MAPS 426
GEX1=GEN(1,LINE)	MAPS 427
GEX2=GEN(2,LINE)	MAPS 428
GO TO 140	MAPS 429
137 KXXL=KOUNT(LINE)	MAPS 430
C LOGICAL STATEMENT FOLLOWS	MAPS 431
IF (KXXL.GT.KIX.AND.AND(GEX1,MSK(1,KIX)).EQ.AND(GEN(1,LINE),MSK(1,	MAPS 432
1KIX)).AND.AND(GEX2,MSK(2,KIX)).EQ.AND(GEN(2,LINE),MSK(2,KIX))) GO	MAPS 433
2 TO 140	MAPS 434
IF (GEX1.EQ.GEN(1,LINE).AND.GEX2.EQ.GEN(2,LINE)) GO TO 160	MAPS 435
DO 138 JKMA=LINE,NUMBER	MAPS 436
IF (KOUNT(JKMA+1).LE.KXXL) GO TO 160	MAPS 437
IF (RSP(JKMA+1).EQ.XMAN(JMAN)) GO TO 140	MAPS 438
138 CONTINUE	MAPS 439
GO TO 160	MAPS 440
139 CONTINUE	MAPS 441
140 NUM=KOUNT(LINE)	MAPS 442
KSET=3	MAPS 443
C SUBROUTINE FLAG WITH KSET=3 DECIDES WHEN A CARD SHOULD PRINT.	MAPS 444
CALL FLAG (MAINL,MASUM,MANL,CODE,LINE,MANOUT,KEND,KGT,KSET)	MAPS 445
C	MAPS 446
IF (KGT.EQ.1) GO TO 160	MAPS 447
IF (TOT.NE.RSP(LINE)) GO TO 141	MAPS 448
IF (MANOUT.EQ.1) GO TO 160	MAPS 449
C	MAPS 450
WRITE (6,191) ((HEAD3(KPX),KPX=1,11),K=1,2),(EQUAL,K=1,6),(HEAD3(K	MAPS 451
1PX),KPX=1,11),(TITLE(KPX,LINE),KPX=1,5),(HEAD3(KPX),KPX=1,11),(EQU	MAPS 452
2AL,KPX=1,6),(HEAD3(KPX),KPX=1,11)	MAPS 453
C	MAPS 454
LNT=5	MAPS 455
GO TO 160	MAPS 456
141 TEMX1=GEN(1,LINE)	MAPS 457
TEMX2=GEN(2,LINE)	MAPS 458
C LOGICAL STATEMENT FOLLOWS	MAPS 459
IF (ARS(6,GEN(1,LINE)).GT.XNPR.OR.MANOUT.EQ.1) GO TO 142	MAPS 460
C LOGICAL STATEMENT FOLLOWS	MAPS 461
GEN(1,LINE)=OR(BLANK,AND(GEN(1,LINE),IN))	MAPS 462
GEN(2,LINE)=BLANK	MAPS 463
C	MAPS 464
C	MAPS 465
C ***** START OF SCHEDULE OUTPUTING *****	MAPS 466
142 IF (NUM-2) 145,149,143	MAPS 467
143 IF (NUM-4) 151,153,144	MAPS 468
144 IF (NUM-6) 155,157,157	MAPS 469
145 IF (LNT.LT.38) GO TO 147	MAPS 470
IF (MANOUT.EQ.1) GO TO 161	MAPS 471
KKX=1	MAPS 472
DO 146 JX=LINE,NUMBER	MAPS 473
IF (KOUNT(JX+1).EQ.1.AND.LNT.LE.44) GO TO 147	MAPS 474
IF (KKX.GT.(44-LNT)) GO TO 161	MAPS 475
146 KKX=KKX+1	MAPS 476
C LOGICAL STATEMENT FOLLOWS	MAPS 477
147 IF (AND(GEN(1,LINE),IN).EQ.0.0.OR.NOHE.EQ.1) GO TO 148	MAPS 478
C	MAPS 479

C	WRITE (6,192)	MAPS 480
C	LNT=LNT+1	MAPS 481
C		MAPS 482
148	WRITE (6,193) ((HEAD3(KPX),KPX=1,11),KPZ=1,2)	MAPS 483
C		MAPS 484
C	WRITE (6,194) GEN(1,LINE),(TITLE(KX,LINE),KX=1,5),(SCHD(KX,LINE),K	MAPS 485
	IX=1,11),STAT(LINE),(COMENT(KX,LINE),KX=1,1),RSP(LINE)	MAPS 486
C		MAPS 487
C	OPRINT SETS UP AND PRINTS THE SLASH AND NEED DATE SCHEDULE OVERPRINT	MAPS 488
	CALL OPRINT (STAT(LINE),IZAM)	MAPS 489
C		MAPS 490
C	WRITE (6,195) (DASH,KK=1,5),(HEAD3(KPX),KPX=1,11)	MAPS 491
C		MAPS 492
C	LNT=LNT+4	MAPS 493
	GO TO 159	MAPS 494
C	LOGICAL STATEMENT FOLLOWS	MAPS 495
149	IF (AND(GEN(1,LINE),IN).EQ.0.0.OR.NOHE.EQ.1) GO TO 150	MAPS 496
C		MAPS 497
C	WRITE (6,192)	MAPS 498
C		MAPS 499
C	LNT=LNT+1	MAPS 500
C		MAPS 501
150	WRITE (6,196) GEN(1,LINE),(TITLE(KX,LINE),KX=1,5),(SCHD(KX,LINE),K	MAPS 502
	IX=1,11),STAT(LINE),(COMENT(KX,LINE),KX=1,1),RSP(LINE)	MAPS 503
C		MAPS 504
C	CALL OPRINT (STAT(LINE),IZAM)	MAPS 505
C		MAPS 506
C	LNT=LNT+1	MAPS 507
	GO TO 159	MAPS 508
C	LOGICAL STATEMENT FOLLOWS	MAPS 509
151	IF (AND(GEN(1,LINE),IN).EQ.0.0.OR.NOHE.EQ.1) GO TO 152	MAPS 510
C		MAPS 511
C	WRITE (6,192)	MAPS 512
C		MAPS 513
C	LNT=LNT+1	MAPS 514
C		MAPS 515
152	WRITE (6,197) GEN(1,LINE),(TITLE(KX,LINE),KX=1,5),(SCHD(KX,LINE),K	MAPS 516
	IX=1,11),STAT(LINE),(COMENT(KX,LINE),KX=1,1),RSP(LINE)	MAPS 517
C		MAPS 518
C	CALL OPRINT (STAT(LINE),IZAM)	MAPS 519
C		MAPS 520
C	LNT=LNT+1	MAPS 521
	GO TO 159	MAPS 522
C	LOGICAL STATEMENT FOLLOWS	MAPS 523
153	IF (AND(GEN(1,LINE),IN).EQ.0.0.OR.NOHE.EQ.1) GO TO 154	MAPS 524
C		MAPS 525
C	WRITE (6,192)	MAPS 526
C		MAPS 527
C	LNT=LNT+1	MAPS 528
C		MAPS 529
154	WRITE (6,198) GEN(1,LINE),GEN(2,LINE),(TITLE(KX,LINE),KX=1,5),(SCH	MAPS 530
	ID(KX,LINE),KX=1,11),STAT(LINE),(COMENT(KX,LINE),KX=1,1),RSP(LINE)	MAPS 531
C		MAPS 532
C	CALL OPRINT (STAT(LINE),IZAM)	MAPS 533
C		MAPS 534
C	LNT=LNT+1	MAPS 535
	GO TO 159	MAPS 536
C	LOGICAL STATEMENT FOLLOWS	MAPS 537
155	IF (AND(GEN(1,LINE),IN).EQ.0.0.OR.NOHE.EQ.1) GO TO 156	MAPS 538
		MAPS 539

C	WRITE (6,192)	MAPS 540
C	LNT=LNT+1	MAPS 541
C	LNT=LNT+1	MAPS 542
156	WRITE (6,199) GEN(1,LINE),GEN(2,LINE),(TITLE(KX,LINE),KX=1,5),(SCH	MAPS 543
	1D(KX,LINE),KX=1,11),STAT(LINE),(COMENT(KX,LINE),KX=1,1),RSP(LINE)	MAPS 544
C	CALL OPRINT (STAT(LINE),IZAM)	MAPS 545
C	LNT=LNT+1	MAPS 546
C	GO TO 159	MAPS 547
C	LOGICAL STATEMENT FOLLOWS	MAPS 548
157	IF (AND(GEN(1,LINE),IN).EQ.0.0.OR.NOHE.EQ.1) GO TO 158	MAPS 549
C	WRITE (6,192)	MAPS 550
C	LNT=LNT+1	MAPS 551
158	WRITE (6,200) GEN(1,LINE),GEN(2,LINE),(TITLE(KX,LINE),KX=1,5),(SCH	MAPS 552
	1D(KX,LINE),KX=1,11),STAT(LINE),(COMENT(KX,LINE),KX=1,1),RSP(LINE)	MAPS 553
C	CALL OPRINT (STAT(LINE),IZAM)	MAPS 554
C	LNT=LNT+1	MAPS 555
159	GEN(1,LINE)=TEMX1	MAPS 556
	GEN(2,LINE)=TEMX2	MAPS 557
160	LINE=LINE+1	MAPS 558
C	KSET=3	MAPS 559
	CALL FLAG (MAINL,MASUM,MANL,CODE,LINE,MANOUT,KEND,KGT,KSET)	MAPS 560
	IF(KGT.EQ.1) GO TO 134	MAPS 561
	IF (RSP(LINE).EQ.TOT.AND.MANOUT.EQ.0) GO TO 162	MAPS 562
	IF (LNT.LT.47) GO TO 135	MAPS 563
C	LOGICAL STATEMENT FOLLOWS	MAPS 564
161	IF (AND(GEN(1,LINE),MSK(1,1)).NE.AND(GEN(1,LINE-1),MSK(1,1)).OR.MA	MAPS 565
	INOUT.EQ.1.OR.KEND.GT.0) GO TO 162	MAPS 566
C	LOGICAL STATEMENT FOLLOWS	MAPS 567
	GOX=AND(GEN(1,LINE),MSK(1,1))	MAPS 568
C	WRITE (6,202) GOX,(HEAD3(KPX),KPX=1,11)	MAPS 569
162	WRITE (6,201) (DASH,KPX=1,22),(HEAD2(KPX),KPX=1,11),(XLGND(KPX),KP	MAPS 570
	1X=1,42)	MAPS 571
C	GO TO 133	MAPS 572
C	WRITE (6,201) (DASH,KPX=1,22),(HEAD2(KPX),KPX=1,11),(XLGND(KPX),KP	MAPS 573
163	1X=1,42)	MAPS 574
C	IF (KEND.LE.0) GO TO 164	MAPS 575
	KEND=0	MAPS 576
	GO TO 132	MAPS 577
164	KIX=6	MAPS 578
	GEX1=0	MAPS 579
	MAN=1	MAPS 580
	MANOUT=1	MAPS 581
C	BY-MAN CARDS (CARDS 19), AND FINAL PROGRAM DECK ASTERISK CARD(CARD 20)	MAPS 582
	READ (5,203) MANL,XMAN(1)	MAPS 583
		MAPS 584
		MAPS 585
		MAPS 586
		MAPS 587
		MAPS 588
		MAPS 589
		MAPS 590
		MAPS 591
		MAPS 592
		MAPS 593
		MAPS 594
		MAPS 595
		MAPS 596
		MAPS 597
		MAPS 598
		MAPS 599

C	IF (KPUNCH.GT.0) PUNCH 203, MANL,XMAN(1)	MAPS 600
C	IF (MANL.NE.AST) GO TO 165	MAPS 601
C	IF (KTI.EQ.1) KSA=1	MAPS 602
C	IF (KSA.EQ.0) WRITE (6,204) BLANK	MAPS 603
C	GO TO 101	MAPS 604
165	JMAN=1	MAPS 605
C	GO TO 132	MAPS 606
C		MAPS 607
C		MAPS 608
166	FORMAT (13A6,A2)	MAPS 609
167	FORMAT (1X,21A6,A5/114HOTHIS IS *MAPS-II* (MANAGEMENT ANALYSIS AND	MAPS 610
	1 PLANNING SYSTEM). FOR USER INFORMATION SEE DON PACKE OR GIL RAFF	MAPS 611
	2AELI./1X,A6)	MAPS 612
168	FORMAT (3A2,A1,A6,8X,A6,4X,A2,4A2)	MAPS 613
169	FORMAT (9X,12HCONTROL CARD/1X,30H-----/1X	MAPS 614
	1,7HCOLUMNS,5X,5HINPUT,6X,7HOPTIONS/1X,7H-----,5X,5H-----,6X,7H--	MAPS 615
	2-----/4X,3H1,2,9X,A2,6X,102HLOCATES THE VERTICAL ASTERISK CURSOR C	MAPS 616
	3COLUMN (01 THRU 66) IN THE SCHEDULE FIELD. BLANK ELIMINATES THE */6	MAPS 617
	4X,1H4,9X,A2,6X,103HBLANK GIVES TOTAL LISTING. ONE(1)GIVES TOTAL LI	MAPS 618
	5STING + SUMMARY LISTING. /6X,1H6,9X	MAPS 619
	6,A2,6X,92HBLANK GIVES SLASH(/) AND NEED DATE OVERPRINT IN THE SCHE	MAPS 620
	7DULE FIELD. ONE (1) SUPPRESSES THEM.)	MAPS 621
170	FORMAT (6X,1H7,5X,5X,A1,6X,30HNEED DATE SYMBOL. BLANK GIVES ,A1,66	MAPS 622
	1H. NON BLANK GIVES THE ACTUAL CHARACTER PUNCHED ON THE CONTROL CAR	MAPS 623
	2D/3X,4H 8,5X,1H ,A4,1H),6X,84HTOTAL LISTING MASK(MATCHED WITH CO	MAPS 624
	3LUMNS 51 THRU 54 ON THE ID CARD). BLANK ASSUMES 2./2X,5H10,11,9X,A	MAPS 625
	42,6X,83HID FLAG COLUMN NUMBER (51-54) WHICH IS TO BE MATCHED WITH	MAPS 626
	5MASKS. BLANK ASSUMES 51./2X,5H 22,5X,1H ,A4,1H),6X,87HSUMMARY L	MAPS 627
	6ISTING MASK (MATCHED WITH COLUMNS 51 THRU 54 ON THE ID CARD). BLAN	MAPS 628
	7K ASSUMES 4.)	MAPS 629
171	FORMAT (2X,5H32,33,5X,4X,A2,6X,87HSUPPRESSES THE PRINTING OF HIERAR	MAPS 630
	1CHY NUMBERS THAT ARE EQUAL TO OR LESS THAN THIS NUMBER./5X,2H35,9X	MAPS 631
	2,A2,6X,103HONE(1) GIVES NEW PROGRAM DECK SORTED IN ORDER WITH THE	MAPS 632
	3DATE PJNCHED ON THE * CARDS. BLANK GIVES NO DECK/5X,2H37,9X,A2,6X,	MAPS 633
	489HBLANK PERMITS THE PRINTING OF SUMMARY INFORMATION BETWEEN PROGR	MAPS 634
	5AMS. ONE(1) SUPPRESSES IT./5X,2H41,9X,A2,6X,93HBLANK PERMITS THE P	MAPS 635
	6RINTING OF HIERARCHY ERROR MESSAGES WITHIN THE TEXT. ONE(1) SUPPRE	MAPS 636
	7SSES IT.)	MAPS 637
172	FORMAT (11A6/11A6/11A6)	MAPS 638
173	FORMAT (13A6,A2/6A6,A4,6A6,A4/13A6,A2)	MAPS 639
174	FORMAT (12HOERROR CARDS)	MAPS 640
175	FORMAT (A1,A1,A5,A4,A1,5A6,A1,A6,A1,A4,A1,A3,A1,3A6,A3)	MAPS 641
176	FORMAT (39H THIS CARD IN ID DECK IS NOT ID FORMAT(,A1,A1,A5,A4,A1,	MAPS 642
	15A6,A1,A6,A1,A4,A1,A3,A1,3A6,A3,1H))	MAPS 643
177	FORMAT (54HOMORE THAN 1000 VALID ID CARDS--PROGRAM IGNORES EXCESS)	MAPS 644
178	FORMAT (A1)	MAPS 645
179	FORMAT (1H)	MAPS 646
180	FORMAT (11A6,A2,A1,A5,A4,A2)	MAPS 647
181	FORMAT (39H NO ID CARD FOR THIS SCHEDULE CARD (11A6,A2,A1,A5,A4	MAPS 648
	1,A2,1H))	MAPS 649
182	FORMAT (A5,A4,A5,A3,A5,9A6,A4)	MAPS 650
183	FORMAT (39H NO ID CARD FOR THIS STATUS CARD (,A5,A4,A5,A3,A5,	MAPS 651
	19A6,A4,1H))	MAPS 652
184	FORMAT (36HONO ERROR CARDS IN FOLLOWING PROGRAM/1H A1)	MAPS 653
185	FORMAT (24HLRESPONSIBLE PERSON LIST/(15(1X,A6)))	MAPS 654
		MAPS 655
		MAPS 656
		MAPS 657
		MAPS 658
		MAPS 659

186	FORMAT (1HL,I4,40H VALID ID CARDS READ--PROGRAM MAX =1000)	MAPS	660
187	FORMAT (1H0,I5,17H HIERARCHY ERRORS)	MAPS	661
188	FORMAT (1H1/1X,13A6,A2)	MAPS	662
189	FORMAT (31HORESPONSIBILITY BY MAN FOR *** ,A6,4H *** ,6X,8HMASK =	MAPS	663
	1,A4,1H))	MAPS	664
190	FORMAT (11H0HIERARCHY ,38X,11A6,10X,7H.PERSON/8H NUMBER,13X,11HDE	MAPS	665
	1SCRIPTION,17X,11A6,17H COMMENT .RSPBLE/1H ,21A6,A5)	MAPS	666
191	FORMAT (2(49X,11A6/),6X,6A6,7X,11A6/9X,5A6,10X,11A6/6X,6A6,7X,11A6	MAPS	667
	1)	MAPS	668
192	FORMAT (1X,8X,17H*HIERARCHY ERROR*,/)	MAPS	669
193	FORMAT (49X,11A6/49X,11A6)	MAPS	670
194	FORMAT (1X,A2,2X,5A6,14X,11A6,A4,A6,1X,A6)	MAPS	671
195	FORMAT (5X,5A6,14X,11A6)	MAPS	672
196	FORMAT (1X,A3,3X,5A6,12X,11A6,A4,A6,1X,A6)	MAPS	673
197	FORMAT (1X,A5,4X,5A6,9X,11A6,A4,A6,1X,A6)	MAPS	674
198	FORMAT (1X,A5,A1,6X,5A6,6X,11A6,A4,A6,1X,A6)	MAPS	675
199	FORMAT (1X,A5,A3,7X,5A6,3X,11A6,A4,A6,1X,A6)	MAPS	676
200	FORMAT (1X,A5,A4,9X,5A6,11A6,A4,A6,1X,A6)	MAPS	677
201	FORMAT (1X,21A6,A5/49X,11A6/10HOLEGEND. ,13A6,A2,6A6,A4/10H	MAPS	678
	1.. ,6A6,A4,13A6,A2)	MAPS	679
202	FORMAT (7H (ITEM ,A2,21H CONTINUED NEXT PAGE),19X,11A6)	MAPS	680
203	FORMAT (A6,1X,A6)	MAPS	681
204	FORMAT (1H1,A1)	MAPS	682
	END	MAPS	683

\$IBMAP	DATE	DECK	DATE	1
	ENTRY	DATE	DATE	2
DATE	SAVE	4	DATE	3
	OLD	.JDATE+1	DATE	4
	DST*	3,4	DATE	5
	RETURN	DATE	DATE	6
	END		DATE	7

\$IBFTC FLAG	DECK	FLAG	1
	SUBROUTINE FLAG (MAINL,MASUM,MANL,CODE,LINE,MANOUT,KEND,KGT,KSET)	FLAG	2
C		FLAG	3
C	THE FLAG SUBROUTINE IS USED FOR THE SELECTIVE PRINTOUT OPTIONS OF	FLAG	4
C	MAPS. THE SUBROUTINE IS ORGANIZED INTO THREE MAIN SECTIONS.	FLAG	5
C	THE FIRST ASSIGNS THE TOTAL AND SUMMARY LISTING MASKS, AND THE ID CARD	FLAG	6
C	FLAG COLUMN. THE SECOND SECTION ASSIGNS THE BY-MAN MASK.	FLAG	7
C	THE THIRD SELECTS ITEMS TO BE PRINTED ACCORDING TO THE LISTING BEING	FLAG	8
C	PROCESSED.	FLAG	9
C		FLAG	10
	DATA SL,TMS/6H0(0000,0000000000077/	FLAG	11
	DATA BLANK,ONE,TWO,FOUR,(F(J),J=1,4),ZERO/6H0000 ,6H000001,6H0000	FLAG	12
	102,6H000004,6H000051,6H000052,6H000053,6H000054,6H000000/	FLAG	13
	DIMENSION CODE(1), F(4)	FLAG	14
	REAL MAINL,MASUM,MANL	FLAG	15
C		FLAG	16
	IF (KSET.EQ.3) GO TO 304	FLAG	17
	IF (KSET.EQ.2) GO TO 303	FLAG	18
C	LOGICAL STATEMENT FOLLOWS	FLAG	19
	TMSK1=ARS(30,MAINL)	FLAG	20
C	LOGICAL STATEMENT FOLLOWS	FLAG	21
	TMSK2=ARS(30,MASUM)	FLAG	22
C	LOGICAL STATEMENT FOLLOWS	FLAG	23
	FLGCL=ARS(24,ALS(12,MAINL))	FLAG	24
C	LOGICAL STATEMENT FOLLOWS	FLAG	25
	IF (TMSK1.EQ.ARS(6,BLANK)) TMSK1=TWO	FLAG	26
C	LOGICAL STATEMENT FOLLOWS	FLAG	27
	IF (TMSK2.EQ.ARS(6,BLANK)) TMSK2=FOUR	FLAG	28
	IF (FLGCL.EQ.BLANK) FLGCL=F(1)	FLAG	29
	DO 301 K=1,4	FLAG	30
301	IF (FLGCL.EQ.F(K)) GO TO 302	FLAG	31
	K=1	FLAG	32
C	LOGICAL STATEMENT FOLLOWS	FLAG	33
302	MAINL=OR(SL,OR(ALS(30,TMSK1),ALS(12,F(K))))	FLAG	34
C	LOGICAL STATEMENT FOLLOWS	FLAG	35
	MASUM=OR(SL,OR(ALS(30,TMSK2),ALS(12,F(K))))	FLAG	36
	L=36-6*K	FLAG	37
C	LOGICAL STATEMENT FOLLOWS	FLAG	38
	TMSK1=ALS(L,TMSK1)	FLAG	39
C	LOGICAL STATEMENT FOLLOWS	FLAG	40
	TMSK2=ALS(L,TMSK2)	FLAG	41
C	LOGICAL STATEMENT FOLLOWS	FLAG	42
	BNK=ALS(L,ARS(6,BLANK))	FLAG	43
C	LOGICAL STATEMENT FOLLOWS	FLAG	44
	TMX=ALS(L,TMS)	FLAG	45
	RETURN	FLAG	46
C	LOGICAL STATEMENT FOLLOWS	FLAG	47
303	TMSK3=ARS(30,MANL)	FLAG	48
C	LOGICAL STATEMENT FOLLOWS	FLAG	49
	IF (TMSK3.EQ.ARS(6,BLANK)) TMSK3=ONE	FLAG	50
C	LOGICAL STATEMENT FOLLOWS	FLAG	51
	MANL=OR(SL,OR(ALS(30,TMSK3),ALS(12,F(K))))	FLAG	52
C	LOGICAL STATEMENT FOLLOWS	FLAG	53
	TMSK3=ALS(L,TMSK3)	FLAG	54
	RETURN	FLAG	55
C	LOGICAL STATEMENT FOLLOWS	FLAG	56
304	TEMP=AND(CODE(LINE),TMX)	FLAG	57
C	LOGICAL STATEMENT FOLLOWS	FLAG	58
	IF (KEND.GT.0.AND.(TEMP.EQ.BNK.OR.AND(TEMP,TMSK2).EQ.ZERO)) GO TO	FLAG	59

1306		FLAG	60
	IF (KEND.GT.0) GO TO 305	FLAG	61
C	LOGICAL STATEMENT FOLLOWS	FLAG	62
	IF (MANOUT.EQ.0.AND.TEMP.NE.BNK.AND.AND(TEMP,TMSK1).EQ.ZERO) GO TO	FLAG	63
1 306		FLAG	64
C	LOGICAL STATEMENT FOLLOWS	FLAG	65
	IF (MANOUT.EQ.1.AND.TEMP.NE.BNK.AND.AND(TEMP,TMSK3).EQ.ZERO) GO TO	FLAG	66
1 306		FLAG	67
305	KGT=2	FLAG	68
	RETURN	FLAG	69
306	KGT=1	FLAG	70
	RETURN	FLAG	71
	END	FLAG	72

\$IBFTC SORTER DECK	SORTE 1
SUBROUTINE SORTER (KXM)	SORTE 2
C	SORTE 3
C SUBROUTINE SORTER SORTS IN ORDER BY RIPPLING THROUGH THE DECK IN	SORTE 4
C BOTH DIRECTIONS AND EXCHANGING ADJACENT CARDS IF THEY ARE OUT	SORTE 5
C OF ORDER	SORTE 6
C	SORTE 7
DATA ASK1,ASK2,ZERO/6H00C00 ,6H0000 ,6H000000/	SORTE 8
COMMON N,GEN,SKED,L1,K1,TITLE,PERS,X,WKS,STAT,IXT	SORTE 9
DIMENSION GEN(2,1000), TITLE(5,1000), SKED(11,1000), WKS(1000), ST	SORTE 10
1AT(1,1000), PERS(1000), X(1000), IXT(1001)	SORTE 11
DIMENSION TEMP(6), ITST(11,1000)	SORTE 12
EQUIVALENCE (ITST,SKED)	SORTE 13
C	SORTE 14
C	SORTE 15
DO 403 J=1,N	SORTE 16
LOGICAL STATEMENT FOLLOWS	SORTE 17
TEMP(1)=ARS(24,GEN(1,J))	SORTE 18
C LOGICAL STATEMENT FOLLOWS	SORTE 19
TEMP(4)=ARS(30,ALS(12,GEN(1,J)))	SORTE 20
C LOGICAL STATEMENT FOLLOWS	SORTE 21
TEMP(2)=ARS(24,ALS(18,GEN(1,J)))	SORTE 22
C LOGICAL STATEMENT FOLLOWS	SORTE 23
TEMP(5)=ARS(30,GEN(2,J))	SORTE 24
C LOGICAL STATEMENT FOLLOWS	SORTE 25
TEMP(3)=ARS(24,ALS(6,GEN(2,J)))	SORTE 26
C LOGICAL STATEMENT FOLLOWS	SORTE 27
TEMP(6)=ARS(30,ALS(18,GEN(2,J)))	SORTE 28
DO 401 K=1,3	SORTE 29
IF (TEMP(K).EQ.ASK2) TEMP(K)=ZERO	SORTE 30
401 CONTINUE	SORTE 31
DO 402 K=4,6	SORTE 32
IF (TEMP(K).EQ.ASK1) TEMP(K)=ZERO	SORTE 33
402 CONTINUE	SORTE 34
C LOGICAL STATEMENT FOLLOWS	SORTE 35
SKED(1,J)=OR(ALS(12,OR(ALS(6,TEMP(1)),TEMP(4))),TEMP(2))	SORTE 36
C LOGICAL STATEMENT FOLLOWS	SORTE 37
403 SKED(2,J)=OR(ALS(6,OR(ALS(12,TEMP(5)),TEMP(3))),TEMP(6))	SORTE 38
KXX=1	SORTE 39
N1=N-1	SORTE 40
404 DO 411 JY=1,2	SORTE 41
KOUNT=0	SORTE 42
DO 410 JX=1,N1	SORTE 43
J=JX	SORTE 44
IF (JY.EQ.2) J=N-JX	SORTE 45
IF (ITST(1,J+1)-ITST(1,J)) 406,405,410	SORTE 46
405 IF (ITST(2,J+1)-ITST(2,J)) 406,410,410	SORTE 47
406 TEMP1=GEN(1,J+1)	SORTE 48
TEMP2=GEN(2,J+1)	SORTE 49
DO 407 J1=1,5	SORTE 50
407 TEMP(J1)=TITLE(J1,J+1)	SORTE 51
TEMP3=PERS(J+1)	SORTE 52
TEMP4=X(J+1)	SORTE 53
TEMP5=SKED(1,J+1)	SORTE 54
TEMP6=SKED(2,J+1)	SORTE 55
TEMP7=STAT(1,J+1)	SORTE 56
TEMP8=WKS(J+1)	SORTE 57
ITMP=IXT(J+1)	SORTE 58
GEN(1,J+1)=GEN(1,J)	SORTE 59

	GEN(2,J+1)=GEN(2,J)	SORTE	60
	DO 408 J1=1,5	SORTE	61
408	TITLE(J1,J+1)=TITLE(J1,J)	SORTE	62
	PERS(J+1)=PERS(J)	SORTE	63
	X(J+1)=X(J)	SORTE	64
	SKED(1,J+1)=SKED(1,J)	SORTE	65
	SKED(2,J+1)=SKED(2,J)	SORTE	66
	STAT(1,J+1)=STAT(1,J)	SORTE	67
	WKS(J+1)=WKS(J)	SORTE	68
	IXT(J+1)=IXT(J)	SORTE	69
	GEN(1,J)=TEMP1	SORTE	70
	GEN(2,J)=TEMP2	SORTE	71
	DO 409 J1=1,5	SORTE	72
409	TITLE(J1,J)=TEMP(J1)	SORTE	73
	PERS(J)=TEMP3	SORTE	74
	X(J)=TEMP4	SORTE	75
	SKED(1,J)=TEMP5	SORTE	76
	SKED(2,J)=TEMP6	SORTE	77
	STAT(1,J)=TEMP7	SORTE	78
	WKS(J)=TEMP8	SORTE	79
	IXT(J)=ITMP	SORTE	80
	KOUNT=1	SORTE	81
410	CONTINUE	SORTE	82
	IF (KOUNT.EQ.0) RETURN	SORTE	83
	KXX=KXX+1	SORTE	84
	IF (KXX.GE.N) RETURN	SORTE	85
411	CONTINUE	SORTE	86
	GO TO 404	SORTE	87
	END	SORTE	88

\$IBFTC CHECK	DECK	CHECK	1
	SUBROUTINE CHECK (KZX)	CHECK	2
C		CHECK	3
C	SUBROUTINE CHECK CHECKS THE SORTED ID DECK FOR HIERARCHY ERRORS	CHECK	4
C		CHECK	5
	DATA IN/00000000000001/	CHECK	6
	DATA LKB1/00000000006060/,LKB2/00000000000060/	CHECK	7
	DIMENSION GEN(2,1000), SCH(11,1000), TAG(1001)	CHECK	8
	EQUIVALENCE (SCH(1,1),TAG(1)), (XIN,IN)	CHECK	9
	COMMON NUMBER,GEN,SCH,LINE,KOLUMN	CHECK	10
	INTEGER TAG	CHECK	11
C		CHECK	12
C		CHECK	13
	KZX=0	CHECK	14
	DO 522 JCTR=1,5	CHECK	15
	DO 509 KCTR=1,NUMBER	CHECK	16
	GO TO (501,501,501,502,502),JCTR	CHECK	17
C	LOGICAL STATEMENT FOLLOWS	CHECK	18
501	LT=IARS(6,GEN(1,KCTR))	CHECK	19
	GO TO (503,504,505,505,505),JCTR	CHECK	20
C	LOGICAL STATEMENT FOLLOWS	CHECK	21
502	LT=IARS(12,GEN(2,KCTR))	CHECK	22
	GO TO (506,506,506,506,507),JCTR	CHECK	23
C	LOGICAL STATEMENT FOLLOWS	CHECK	24
503	TAG(KCTR)=IARS(18,LT)	CHECK	25
	GO TO 508	CHECK	26
C	LOGICAL STATEMENT FOLLOWS	CHECK	27
504	TAG(KCTR)=IARS(30,IALS(30,IARS(12,LT)))	CHECK	28
	GO TO 508	CHECK	29
C	LOGICAL STATEMENT FOLLOWS	CHECK	30
505	TAG(KCTR)=IARS(24,IALS(24,LT))	CHECK	31
	GO TO 508	CHECK	32
C	LOGICAL STATEMENT FOLLOWS	CHECK	33
506	TAG(KCTR)=IARS(18,LT)	CHECK	34
	GO TO 508	CHECK	35
C	LOGICAL STATEMENT FOLLOWS	CHECK	36
507	TAG(KCTR)=IARS(24,IALS(24,IARS(6,LT)))	CHECK	37
508	CONTINUE	CHECK	38
509	CONTINUE	CHECK	39
	DO 510 LCTR=1,NUMBER	CHECK	40
	IF (TAG(LCTR).EQ.LKB1.OR.TAG(LCTR).EQ.LKB2) GO TO 510	CHECK	41
	GO TO 511	CHECK	42
510	CONTINUE	CHECK	43
511	CONTINUE	CHECK	44
512	IW=0	CHECK	45
C	LOGICAL STATEMENT FOLLOWS	CHECK	46
	L=IARS(6,GEN(1,LCTR))	CHECK	47
C	LOGICAL STATEMENT FOLLOWS	CHECK	48
	M=IARS(12,GEN(2,LCTR))	CHECK	49
	GO TO (513,514,515,516,517),JCTR	CHECK	50
C	LOGICAL STATEMENT FOLLOWS	CHECK	51
513	JC=IARS(30,IALS(30,IARS(12,L)))	CHECK	52
	IF (JC.EQ.LKB1.OR.JC.EQ.LKB2) GO TO 514	CHECK	53
	IW=1	CHECK	54
C	LOGICAL STATEMENT FOLLOWS	CHECK	55
514	JC=IARS(24,IALS(24,L))	CHECK	56
	IF (JC.EQ.LKB1.OR.JC.EQ.LKB2) GO TO 515	CHECK	57
	IW=1	CHECK	58
C	LOGICAL STATEMENT FOLLOWS	CHECK	59

515	JC=IARS(18,M)	CHECK	60
	IF (JC.EQ.LKB1.OR.JC.EQ.LKB2) GO TO 516	CHECK	61
	IW=1	CHECK	62
C	LOGICAL STATEMENT FOLLOWS	CHECK	63
516	JC=IARS(24,IALS(24,IARS(6,M)))	CHECK	64
	IF (JC.EQ.LKB1.OR.JC.EQ.LKB2) GO TO 517	CHECK	65
	IW=1	CHECK	66
C	LOGICAL STATEMENT FOLLOWS	CHECK	67
517	JC=IARS(30,IALS(30,M))	CHECK	68
	IF (JC.EQ.LKB1.OR.JC.EQ.LKB2) GO TO 518	CHECK	69
	IW=1	CHECK	70
518	CONTINUE	CHECK	71
C	LOGICAL STATEMENT FOLLOWS	CHECK	72
	IF (IW.EQ.1) GEN(1,LCTR)=OR(GEN(1,LCTR),IN)	CHECK	73
	IF (LCTR.EQ.NUMBER) GO TO 522	CHECK	74
	J=LCTR+1	CHECK	75
519	IF (TAG(LCTR)-TAG(J)) 521,520,521	CHECK	76
520	IF (J.EQ.NUMBER) GO TO 522	CHECK	77
	J=J+1	CHECK	78
	GO TO 519	CHECK	79
521	LCTR=J	CHECK	80
	GO TO 512	CHECK	81
522	CONTINUE	CHECK	82
	DO 523 JX=1,NUMBER	CHECK	83
C	LOGICAL STATEMENT FOLLOWS	CHECK	84
523	IF (AND(GEN(1,JX),IN).EQ.XIN) KZX=KZX+1	CHECK	85
	RETURN	CHECK	86
	END	CHECK	87

\$IBFTC PUNOUT DECK	PUNOU 1
SUBROUTINE PUNOUT	PUNOU 2
C	PUNOU 3
C THE PUNOUT SUBROUTINE PUNCHES A NEW DATA DECK INCLUDING ID,SCHEDULE,	PUNOU 4
C AND STATUS CARDS	PUNOU 5
C	PUNOU 6
DATA BLK/6H 0000/	PUNOU 7
DATA AST,PER/6H*00000,6H.00000/	PUNOU 8
DATA BLANK/1H /	PUNOU 9
DATA TAST/6H *00/	PUNOU 10
DATA TXQ/00000000000002/	PUNOU 11
COMMON N,GEN,SKED,L1,K1,TITLE,PERS,X,WKS,STAT	PUNOU 12
DIMENSION TEMP(66), DA(2)	PUNOU 13
DIMENSION GEN(2,1000), TITLE(5,1000), SKED(11,1000), WKS(1000), ST	PUNOU 14
1AT(1,1000), PERS(1000), X(1000)	PUNOU 15
C	PUNOU 16
C	PUNOU 17
C SUBROUTINE DATE IS USED TO EXTRACT THE PROGRAM RUN DATE FROM	PUNOU 18
C THE COMPUTER CLOCK. AT LEWIS IT IS WRITTEN IN IBM MAP LANGUAGE.	PUNOU 19
C IT COMPOSES AN EIGHT CHARACTER DATE (E.G. 11/24/71) INTO TWO	PUNOU 20
C HOLLERITH WORDS.	PUNOU 21
CALL DATE (DA)	PUNOU 22
DO 601 J=1,N	PUNOU 23
C	PUNOU 24
601 PUNCH 610, GEN(1,J),GEN(2,J),(TITLE(K,J),K=1,5),PERS(J),X(J)	PUNOU 25
C	PUNOU 26
PUNCH 609, DA	PUNOU 27
C	PUNOU 28
DO 606 J=1,N	PUNOU 29
C	PUNOU 30
LOGICAL STATEMENT FOLLOWS	PUNOU 31
IF (AND(GEN(1,J),TXQ).NE.TXQ) GO TO 606	PUNOU 32
DO 602 M=1,11	PUNOU 33
JM=6*M-5	PUNOU 34
C	PUNOU 35
LOGICAL STATEMENT FOLLOWS	PUNOU 36
TEMP(JM)=ALS(30,ARS(30,SKED(M,J)))	PUNOU 37
C	PUNOU 38
LOGICAL STATEMENT FOLLOWS	PUNOU 39
TEMP(JM+1)=ALS(30,ARS(24,SKED(M,J)))	PUNOU 40
C	PUNOU 41
LOGICAL STATEMENT FOLLOWS	PUNOU 42
TEMP(JM+2)=ALS(30,ARS(18,SKED(M,J)))	PUNOU 43
C	PUNOU 44
LOGICAL STATEMENT FOLLOWS	PUNOU 45
TEMP(JM+3)=ALS(30,ARS(12,SKED(M,J)))	PUNOU 46
C	PUNOU 47
LOGICAL STATEMENT FOLLOWS	PUNOU 48
TEMP(JM+4)=ALS(30,ARS(6,SKED(M,J)))	PUNOU 49
C	PUNOU 50
LOGICAL STATEMENT FOLLOWS	PUNOU 51
602 TEMP(JM+5)=ALS(30,SKED(M,J))	PUNOU 52
DO 603 M=1,66	PUNOU 53
IF (TEMP(M).EQ.AST) TEMP(M)=BLANK	PUNOU 54
603 CONTINUE	PUNOU 55
C	PUNOU 56
LOGICAL STATEMENT FOLLOWS	PUNOU 57
TM=ALS(24,X(J))	PUNOU 58
DO 604 M=1,66	PUNOU 59
IF (TEMP(M).NE.BLANK.AND.TEMP(M).NE.AST.AND.TEMP(M).NE.PER) GO TO	
1605	
604 CONTINUE	
IF (TM.NE.BLK) GO TO 605	
GO TO 606	
C	
605 PUNCH 611, (TEMP(M),M=1,66),TM,GEN(1,J),GEN(2,J)	
C	

606	CONTINUE	PUNOU	60
C		PUNOU	61
	PUNCH 608	PUNOU	62
C		PUNOU	63
	PUNCH 609, DA	PUNOU	64
C		PUNOU	65
	DO 607 J=1,N	PUNOU	66
	IF ((WKS(J).EQ.BLANK.OR.WKS.EQ.TAST).AND.STAT(1,J).EQ.BLANK) GO TO	PUNOU	67
	1 607	PUNOU	68
C		PUNOU	69
	PUNCH 512, GEN(1,J),GEN(2,J),WKS(J),STAT(1,J)	PUNOU	70
C		PUNOU	71
607	CONTINUE	PUNOU	72
C		PUNOU	73
	PUNCH 608	PUNOU	74
C		PUNOU	75
	PUNCH 609, DA	PUNOU	76
C		PUNOU	77
	RETURN	PUNOU	78
C		PUNOU	79
C		PUNOU	80
C		PUNOU	81
608	FORMAT (1H/)	PUNOU	82
609	FORMAT (1H*,5X,A6,A2,11H=PUNCH DATE)	PUNOU	83
610	FORMAT (1HS,1X,A5,A4,1X,5A6,1X,A6,1X,A4)	PUNOU	84
611	FORMAT (66A1,A2,1X,A5,A4)	PUNOU	85
612	FORMAT (A5,A4,5X,A3,5X,A6)	PUNOU	86
	END	PUNOU	87

\$IBFTC PICK	DECK	PICK	1
	SUBROUTINE PICK (GEN, CODE, N)	PICK	2
C		PICK	3
C	SUBROUTINE PICK SELECTS ALL ID CARDS WITH A NON BLANK MASK IN	PICK	4
C	COLUMNS 51-54	PICK	5
C		PICK	6
	DATA BNK/077777770000/	PICK	7
	DATA BLANK, BNK/1H ,6H 00/	PICK	8
	DIMENSION GEN(1), CODE(1), X(3,8)	PICK	9
C		PICK	10
	WRITE (6,704)	PICK	11
C		PICK	12
	DO 701 MX=1,3	PICK	13
	DO 701 MY=1,8	PICK	14
701	X(MX,MY)=BLANK	PICK	15
	MX=1	PICK	16
	DO 703 J=1,N	PICK	17
C	LOGICAL STATEMENT FOLLOWS	PICK	18
	IF (AND(CODE(J),BNK).EQ.BNK) GO TO 703	PICK	19
	X(1,MX)=GEN(2*J-1)	PICK	20
	X(2,MX)=GEN(2*J)	PICK	21
	X(3,MX)=CODE(J)	PICK	22
	MX=MX+1	PICK	23
	IF (MX.LT.9) GO TO 703	PICK	24
C		PICK	25
	WRITE (6,705) ((X(J1,J2),J1=1,3),J2=1,8)	PICK	26
C		PICK	27
	DO 702 MX=1,3	PICK	28
	DO 702 MY=1,8	PICK	29
702	X(MX,MY)=BLANK	PICK	30
	MX=1	PICK	31
703	CONTINUE	PICK	32
C		PICK	33
	WRITE (6,705) ((X(J1,J2),J1=1,3),J2=1,8)	PICK	34
C		PICK	35
	RETURN	PICK	36
C		PICK	37
C		PICK	38
C		PICK	39
704	FORMAT (52HLTHE FOLLOWING ID CARDS HAVE A FLAG IN COLUMNS 51-54)	PICK	40
705	FORMAT (3X,8(1H(,A5,A4,1H*,A4,1H)))	PICK	41
	END	PICK	42

\$IBFTC OPRINT DECK	OPRIN 1
SUBROUTINE OPRINT (STATUS,NEXIT)	OPRIN 2
C	OPRIN 3
C SUBROUTINE OPRINT FORMS THE SLASH AND NEED-DATE LINE FOR OVERPRINTING	OPRIN 4
C STATUS ON THE SCHEDULE. THE SLASH WILL NOT OVERPRINT THE SYMBOLS	OPRIN 5
C DOT(.),ASTERISK(*),MINUS(-),AND ZERO(0)	OPRIN 6
C	OPRIN 7
DATA IZB/00000000000060/,IAST/00000000000054/,IPD/00000000000033/	OPRIN 8
DATA IZQ/6H0000 /	OPRIN 9
DATA CAS/0000000007777/	OPRIN 10
DATA IM/00000000000040/,IA/00000000000020/	OPRIN 11
DATA IBLK/06000000000000/,ISS/6H/ /	OPRIN 12
DATA (ON(J),J=1,10)/00000000000000,00000000000001,00000000000002,0000	OPRIN 13
1000000003,00000000000004,00000000000005,00000000000006,00000000000007,	OPRIN 14
200000000000010,00000000000011/	OPRIN 15
DATA IDASH/6H000000-/	OPRIN 16
INTEGER ON	OPRIN 17
INTEGER SCH	OPRIN 18
DIMENSION ON(11), NEXIT(2)	OPRIN 19
DIMENSION DUMMY(6000), CODE(1000)	OPRIN 20
DIMENSION SCH(11,1000), GEN(2,1000), JS(6), IP(66), IZ(66)	OPRIN 21
COMMON NUMBER,GEN,SCH,LINE,KOLUMN	OPRIN 22
COMMON DUMMY,CODE	OPRIN 23
EQUIVALENCE (XCD,KXCD)	OPRIN 24
C	OPRIN 25
CN(11)=ON(1)	OPRIN 26
IF (NEXIT(1).GT.0) RETURN	OPRIN 27
DO 801 NCT=1,66	OPRIN 28
801 IZ(NCT)=IBLK	OPRIN 29
KOUNT=0	OPRIN 30
C LOGICAL STATEMENT FOLLOWS	OPRIN 31
IS=IARS(30,STATUS)	OPRIN 32
C LOGICAL STATEMENT FOLLOWS	OPRIN 33
IT=IARS(24,IALS(6,STATUS))	OPRIN 34
C LOGICAL STATEMENT FOLLOWS	OPRIN 35
IU=IARS(6,IT)	OPRIN 36
C LOGICAL STATEMENT FOLLOWS	OPRIN 37
IW=IARS(30,IALS(30,IT))	OPRIN 38
IF (IS.EQ.IZB.AND.IW.EQ.IZB.AND.IU.EQ.IZB) GO TO 805	OPRIN 39
DO 802 JCT=1,11	OPRIN 40
IV=ON(JCT)-IU	OPRIN 41
IF (IV.EQ.0) GO TO 803	OPRIN 42
802 CONTINUE	OPRIN 43
GO TO 819	OPRIN 44
803 JCT=JCT-1	OPRIN 45
DO 804 KCT=1,11	OPRIN 46
IV=ON(KCT)-IW	OPRIN 47
IF (IV.EQ.0) GO TO 805	OPRIN 48
804 CONTINUE	OPRIN 49
GO TO 819	OPRIN 50
805 KCT=KCT-1	OPRIN 51
ISL=KCT+10*JCT	OPRIN 52
MCT=0	OPRIN 53
DO 807 LCT=1,11	OPRIN 54
IW=SCH(LCT,LINE)	OPRIN 55
C LOGICAL STATEMENT FOLLOWS	OPRIN 56
JS(1)=IARS(30,IW)	OPRIN 57
C LOGICAL STATEMENT FOLLOWS	OPRIN 58
JS(2)=IARS(30,IALS(6,IW))	OPRIN 59

C	LOGICAL STATEMENT FOLLOWS	OPRIN 60
	JS(3)=IARS(30,IALS(12,IW))	OPRIN 61
C	LOGICAL STATEMENT FOLLOWS	OPRIN 62
	JS(4)=IARS(30,IALS(18,IW))	OPRIN 63
C	LOGICAL STATEMENT FOLLOWS	OPRIN 64
	JS(5)=IARS(30,IALS(24,IW))	OPRIN 65
C	LOGICAL STATEMENT FOLLOWS	OPRIN 66
	JS(6)=IARS(30,IALS(30,IW))	OPRIN 67
	DO 806 NCT=1,6	OPRIN 68
	IF (JS(NCT).EQ.IZB.OR.JS(NCT).EQ.IAST.OR.JS(NCT).EQ.IDASH) JS(NCT)	OPRIN 69
	1=0	OPRIN 70
806	CONTINUE	OPRIN 71
	IP(MCT+1)=JS(1)	OPRIN 72
	IP(MCT+2)=JS(2)	OPRIN 73
	IP(MCT+3)=JS(3)	OPRIN 74
	IP(MCT+4)=JS(4)	OPRIN 75
	IP(MCT+5)=JS(5)	OPRIN 76
	IP(MCT+6)=JS(6)	OPRIN 77
	MCT=MCT+6	OPRIN 78
807	CONTINUE	OPRIN 79
	IF (IS.EQ.IZB) GO TO 814	OPRIN 80
	IF (IS-IM) 809,808,809	OPRIN 81
808	INCR=-1	OPRIN 82
	GO TO 811	OPRIN 83
809	IF (IS-IA) 819,810,819	OPRIN 84
810	INCR=1	OPRIN 85
811	CONTINUE	OPRIN 86
	IF (ISL.EQ.0) INCR=1	OPRIN 87
	JJ=KOLUMN	OPRIN 88
	JK=KOLUMN+INCR*ISL+1	OPRIN 89
	IPDS=0	OPRIN 90
812	IF (IP(JJ).EQ.IPD) IPDS=IPDS+1	OPRIN 91
	IF (JJ.EQ.JK) GO TO 813	OPRIN 92
	JJ=JJ+INCR	OPRIN 93
	GO TO 812	OPRIN 94
813	ISL=ISL+IPDS	OPRIN 95
814	CONTINUE	OPRIN 96
	IF (IS.EQ.16) GO TO 815	OPRIN 97
	IF (IS.EQ.32) GO TO 816	OPRIN 98
	NEWCOL=KOLUMN-1	OPRIN 99
	GO TO 817	OPRIN 100
815	NEWCOL=KOLUMN+ISL-1	OPRIN 101
	GO TO 817	OPRIN 102
816	NEWCOL=KOLUMN-ISL-1	OPRIN 103
817	IF (IP(NEWCOL).EQ.0) GO TO 818	OPRIN 104
	IF (IP(NEWCOL).EQ.IPD) GO TO 818	OPRIN 105
	IZ(NEWCOL)=ISS	OPRIN 106
	KOUNT=1	OPRIN 107
818	IF (NEWCOL.LE.1) GO TO 819	OPRIN 108
	NEWCOL=NEWCOL-1	OPRIN 109
	GO TO 817	OPRIN 110
C	LOGICAL STATEMENT FOLLOWS	OPRIN 111
819	XCD=AND(CAS,CODE(LINE))	OPRIN 112
	IF (KXCD.NE.IZQ) KOUNT=1	OPRIN 113
	IF (KOUNT.EQ.0) RETURN	OPRIN 114
	IF (KXCD.EQ.IZQ) GO TO 820	OPRIN 115
C	LOGICAL STATEMENT FOLLOWS	OPRIN 116
	KXCDT=IARS(6,KXCD)	OPRIN 117
C	LOGICAL STATEMENT FOLLOWS	OPRIN 118
	KXCD=KXCD-IALS(6,KXCDT)	OPRIN 119

```

      KXCD=KXCD+10*KXCDT
      IF (KXCD.GT.0.AND.KXCD.LT.67) IZ(KXCD)=NEXIT(2)
C
820  WRITE (6,821) IZ
C
      RETURN
C
C
C
821  FORMAT (1H+,48X,66A1)
      END

```

```

OPRIN 120
OPRIN 121
OPRIN 122
OPRIN 123
OPRIN 124
OPRIN 125
OPRIN 126
OPRIN 127
OPRIN 128
OPRIN 129
OPRIN 130

```

TABLE I. - INSTRUCTIONS FOR PUNCHING MAPS PROGRAM DECK CARDS

[Organization of the deck for these cards is shown in fig. 2.]

Card number (as in fig. 2)	Card columns	Description	FORTRAN variable name used in READ statements
Program message card			
1	All 80 columns available for any message. This message will appear at the top of every page.		HEADNG
Control card			
2	1,2	Locates vertical asterisk cursor column (01 to 66) in schedule field. Blank eliminates asterisk.	KOLUMN
	4	Blank gives total program listing (using total program mask in card column 8). One (1) gives total program (using total program mask) and summary listing (using summary mask in card column 22).	KEND
	6	Blank gives slash (/) and need-date overprint in sched-field. One (1) suppresses the overprint.	IZAM(1)
	7	Need date symbol. Blank gives +. Nonblank gives character punched in this column.	IZAM(2)
	8	Total listing mask (matched with columns 51 to 54 on ID card).	MAINL
	10,11	Flag column number on ID card (51 to 54) which is to be matched with masks. Blank assume 51.	MAINL
	22	Summary listing mask (matched with columns 51 to 54 on ID cards).	MASUM
	32,33	Suppresses printing of hierarchy numbers equal to or less than this number (OO to ZZ).	XNPR
	35	One (1) gives a new program deck sorted in order, with date punched on asterisk cards. Blank gives no new deck.	KPUNCH
	37	Blank permits printing of summary information between programs. One (1) suppresses it.	KTI
	41	Blank permits printing of hierarchy error messages within text. One (1) suppresses it.	NOHE
Calendar heading cards (3,4,5)			
3	1 to 66	First line of calendar heading.	HEAD1
4	1 to 66	Second line of calendar heading.	HEAD2
5	1 to 66	Position of periods (.) which are vertical columns in schedule field. (These must be period (.) or blank. Periods will supercede any other character in the schedule field.)	HEAD3
Legend cards (6,7,8)			
6	1 to 80	First 80 characters of top line of legend.	XLGND
7	1 to 40	Last 40 characters of top line of legend.	XLGND
	41 to 80	First 40 characters of bottom line of legend.	
8	1 to 80	Last 80 characters of bottom line of legend	XLGND
ID deck (total number of cards cannot exceed 1000)			
9	1	Columns 1 must always have an S.	ST
	3 to 11	Hierarch number. Must start in column 3.	GEN
	13 to 42	Title or description of task. Always starts in column 13.	TITLE
	44 to 49	Person or organization responsible.	RSP
	51 to 54	Flag - for special printout (see table II).	CODE
	56 to 58	Optional status. (Prints in same position on printout as columns 15, 16, 17 on status card.)	STAT
	60 to 65	Optional comments. (Prints in same position on printout as columns 23 to 28 on status card.)	COMENT

TABLE I. - Concluded. INSTRUCTIONS FOR PUNCHING MAPS PROGRAM DECK CARDS

Card number	Card columns	Description	FORTTRAN variable name used in READ statements
Asterisk card			
10	1	Single asterisk card (* in column 1) must always be used at the end of the ID deck. Columns 2 to 6 must always be blank. Punch date of reproduced deck will appear on this card.	ST
Schedule cards (Schedule deck)			
11	1 to 66 67 to 68 70 to 78	Schedule field. Any legal key punch character may be used except period (.), asterisk (*), or zero (0). Number of column in schedule field in which the need date symbol is to be printed (01 to 66). May be blank. Hierarchy number. Must start in column 70.	SKED ANEED GEN1, GEN2
Slash card			
12	1	Slash in column 1. Columns 2 to 6 must always be blank. This card serves to separate schedule cards from schedule updated cards.	SKED(1)
Schedule update cards			
13		Same as schedule cards (cards 11).	
Asterisk card			
14		Same as card 10. This card must always be used even if no schedule or schedule update cards are used.	SKED(1)
Status cards (Status deck)			
15	1 to 9 15 to 16 23 to 28	Hierarchy number. Must start in column 1. Status of form $\pm NN$ where N is a numeral 0 to 9. If any other characters or blank (except all 3 blank) are used, slash overprint will be suppressed. Comments, any legal keypunch character.	GEN1, GEN2 WKS COT1
Slash card			
16		Same as card 12.	GEN1
Status update cards			
17		Same as status cards (cards 15).	
Asterisk card			
18		Same as card 10. This card must be used even if no status or status update cards are used.	GEN1
By-man cards			
19	1 8 to 13	By-man mask (matched with columns 51 to 54 on ID cards). Name of responsible person spelled exactly as it appears in columns 44 to 49 of ID cards.	MANL XMAN(1)
Asterisk card			
20		Same as card 10. This card must be used when running multiple program decks even if no by-man cards are used.	MANL

TABLE II. - FLAG CODE FOR SELECTIVE PRINTOUT

[P = PRINT; N = NOT PRINT.]

Flag punch (ID card columns 51 to 54)	Print combinations selected by flag punch ^a		
	Summary	Total	By-man
0	N	N	N
1	N	N	P
2	N	P	N
blank (or 3)	N	P	P
4	P	N	N
5	P	N	P
6	P	P	N
7	P	P	P

^aAssumes use of built-in mask values: by-man = 1,
total = 2, summary = 4.

Figure 1. - Example MAPS printout.

Figure 1. - Example MAPS printout.

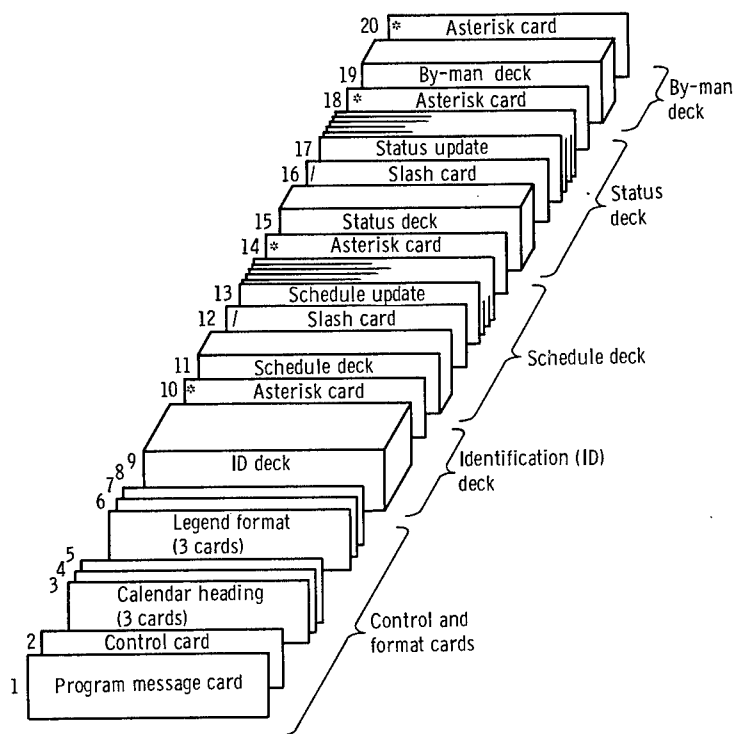


Figure 2. - Single program setup with card numbers keyed to table I and text.

CARD COLUMNS

Card number
per fig. 2

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

CCCCCCCC	11111111	22222222	33333333	44444444	55555555	66666666	77777777
1234567890	1234567890	1234567890	1234567890	1234567890	1234567890	1234567890	1234567890
30	****--SUN DIAL	POWER CONVERSION SYSTEM--****					
70			1			71	
JFFAMJ	JJJJAAA	SSSS	SSSSSSSS	DDDD	JJJJFF	FFFFMMMM	AAAAAMMM
	A=ASSY	B=REVIEW	C=CHKOUT	D=DESIGN	E=EVALUATE	F=FAR	G=DWGS
	K=CUMP.	L=LAYOUT	M=MOD.	P=PROCUR	Q=STUDY	R=REOMTS	S=SPECS
	W=SOW	X=DFL	Y=INSTL	Z=APXVL	*=CONTRACT	+=NEED DATE	--=NO ACTIVITY
S 29	SUN DIAL	I			TITLE		
S 21	SYSTLM	ENGINEERING			VINCI	6	
S 218	CCNCPT				NURTZ	6	
S 21K	SYSTEM	ANALYSIS			MAXWEL	2	
S 21M	SYSTEM	APPLICATIONS			FAKADY	3	
S 21M11	EARTH				FERRA		
S 21M15	LUNAR				ARMSTR		
S 21M17	SPACE				VERNE		
S 41	COMPONENTS				NURTZ		
S 41B	FRAME				HOOKE		
S 41D	WHEEL (PRIMARY)				JOULE		
S 41D21	HCOB				SINGER	1	
S 41D210	INNER STRUCTURE				LENZ		
S 41D21J	OUTER STRUCTURE				FPDFRM		
S 41D21J21	RING				BELL		
S 41D21J21B	RIM				LENZ	1	
S 41D21J21K	FRICITION SURFACE				LENZ		
S 41D31	SPOKES, HI-METAL				HOOKE		
S 41D41	BEARINGS				LENZ		
S 41J	WHEEL (SECONDARY)				CARNOT		
S 41J11	DISK				HOOKE		
S 41J31	RIM GEAR (FRICITION)				LENZ		
S 41J41	BEARINGS				LENZ		
S 41L	COLLECTOR				STEFAN		
S 41P15	REFLECTOR				PLANCK		
S 51	SYSTEM BUILDUP AND CHECKOUT				H.FORD		
S 51B	ASSY AND CALIBRATION				EDISON		
S 51K	FEASIBILITY DEMONSTRATION				EDISON		
S 61	TEST PROGRAM				NEWTON		
S 61D	VAC. CHAMBER (SOLAR SIMULATOR)				HELIOS		
S 61F	FLIGHT TEST				ICARUS		
	COMPLETED IN 1969					21B	
Q C00VBZ						21K	
CCQC						21M11	
Q0						21M15	
Q0						21M17	
PPPP\$DDDDFFFX						40 41B	
						42 41D	
LLLLG						41D21	
DDDDFFFX FFFK-X						41D21D	
LLG						41D21J	
G						41D21J21	
R \$FFFX						40 41D21J21K	
WWPPPPPP\$--X						41D31	
						41 41J	
WWPPPPPP\$ DDDFFK						41J11	
WWPPPPPP\$ DDDFFK						41J31	
WWPPPPPP\$ DDDFFK						41J41	
DDDDFFFX						48 41L	
DDDDFFFX						48 41P15	
AAAAA						55 51	
AAAAA						51B	
XYIC TTTT						51K	
TT						61D	
						61F	
DDFFK						41D21J21B	
R \$FFFX						38 41D21J21K	
WWPPPPPP\$FFFFFTX						41D31	
WWPPPPPP\$FFFFFTX						41D41	
51K	-04	DELETE					
21B	*	26 DIA					
41D21	-04						
41D31	+02						
41J31							
/							
41P	-04						
41J11	-04	MATRL					
11M1							

Control and
format cards

Identification
(ID) deck

Schedule deck

Status deck

By-man deck

Figure 4. - Listing of cards used to produce figures 1, 3, 5, and 6.

Figure 5. - By-man excerpt listing for BELL from example MAPS printout.

THIS IS *MAPS-II* (MANAGEMENT ANALYSIS AND PLANNING SYSTEM). FOR USER INFORMATION SEE DON PACKE OR GIL RAFAELI.

CONTROL CARD		OPTIONS
COLUMNS	INPUT	
1,2	30	LOCATES THE VERTICAL ASTERISK CURSOR COLUMN (01 THRU 66) IN THE SCHEDULE FIELD. BLANK ELIMINATES THE *
4		BLANK GIVES TOTAL LISTING. ONE(1)GIVES TOTAL LISTING + SUMMARY LISTING.
6		BLANK GIVES SLASH(/) AND NEED DATE OVERPRINT IN THE SCHEDULE FIELD. ONE (1) SUPPRESSES THEM.
7	#	NEED DATE SYMBOL. BLANK GIVES *. NON BLANK GIVES THE ACTUAL CHARACTER PUNCHED ON THE CONTROL CARD
10,11	2(51)	TOTAL LISTING MASK(MATCHED WITH COLUMNS 51 THRU 54 ON THE ID CARD). BLANK ASSUMES 2.
22	51	ID FLAG COLUMN NUMBER (51-54) WHICH IS TO BE MATCHED WITH MASKS. BLANK ASSUMES 51.
32,33	4(51)	SUMMARY LISTING MASK (MATCHED WITH COLUMNS 51 THRU 54 ON THE ID CARD). BLANK ASSUMES 4.
35	00	SUPPRESSES THE PRINTING OF HIERARCHY NUMBERS THAT ARE EQUAL TO OR LESS THAN THIS NUMBER.
37	1	ONE(1) GIVES NEW PROGRAM DECK SORTED IN ORDER WITH THE DATE PUNCHED ON THE * CARDS. BLANK GIVES NO DECK
41		BLANK PERMITS THE PRINTING OF SUMMARY INFORMATION BETWEEN PROGRAMS. ONE(1) SUPPRESSES IT.
		BLANK PERMITS THE PRINTING OF HIERARCHY ERROR MESSAGES WITHIN THE TEXT. ONE(1) SUPPRESSES IT.

ERROR CARDS

(A) THIS CARD IN ID DECK IS NOT ID FORMAT(51K FEASIBILITY DEMONSTRATION EDISON)

(B) NO ID CARD FOR THIS SCHEDULE CARD (51K)

(C) NO ID CARD FOR THIS STATUS CARD (51K -04 DELETE)

(D) THE FOLLOWING ID CARDS HAVE A FLAG IN COLUMNS 51-54
 (21 * 6)(218 * 6)(21K * 2)(21M * 3)(41D21 * 1)(41D21J218* 1)(*)

(E) RESPONSIBLE PERSON LIST
 TITLE VINCI NURTZ MAXWEL FARADY TERRA ARMSTR VERNE HOOKE JOULE SINGER LENZ EPDERM BELL
 CARNOT STEFF PLANCK H.FORD EDISON NEWTON HELIOS ICARUS

(F) { 30 VALID ID CARDS READ--PROGRAM MAX =1000
 { 1 HIERARCHY ERRORS

Figure 6. - Special operator information.

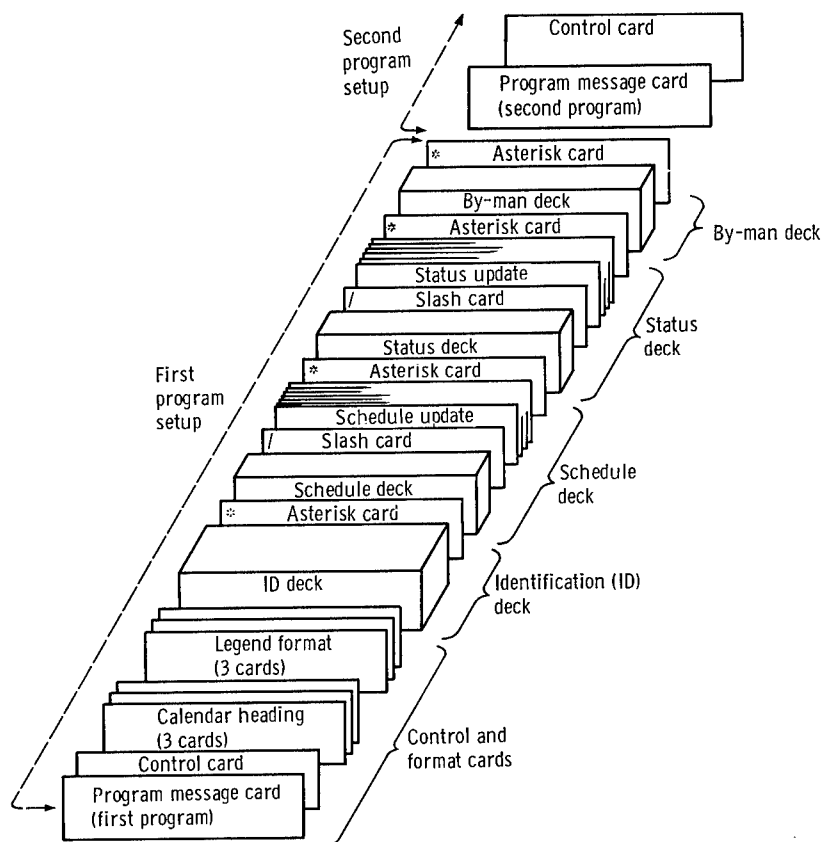


Figure 7. - Deck setup for running multiple programs.

SCHEDULE REVIEW 9-30 9-21-70 **NEXT MEETING IS 10-5, UPDATE IS DUE 9-29

HIERARCHY NUMBER	DESCRIPTION	69 JFMAMJJASOND	70 JFMAMJJASOND	71 JFMAMJJASOND	72 JFMAMJJASOND	73 1234	74 1234	75 1234	PERSON RESPBLE
COMPONENTS PROCUREMENT									
	BRU RESEARCH PACKAGES	.	.	.	.	.	.	.	
	BRU (GAS BRGS), 4 UNITS	.	.	.	.	.	.	.	
	BRU-R (ROLLER BRGS)	.X X	.	.	.	.	.	.	
	BHXU, 3 UNITS	.XXXXX	.	.	.	.	.	.	
	BHXU-A	.XXXX	.	.	.	.	.	.	
	PUMPS WITH INVERTERS, 7 SETS	.	.	.	.	.	.	.	
	GAS MANGTM SYS, 2 SYS	.	.	.	.	.	.	.	
	ENGINE CONTROL SYS, 2 SYS	.	.	.	.	.	.	.	
	CONTRL PKG. 2	.	.	.	.	.	.	.	

(a) Long range schedule.

THIS MEETING 8-06-70 RM 2102 DEB AT 9AM NEXT MEET 8-20-70 SAME TIME, RM.

HIERARCHY NUMBER	DESCRIPTION	1970 AAMMJJJJAASSOONDD	1971 JJFFMMAAMHJJ	1971 JASOND	72 1234	73 1234	74 1234	75 1234	RPM NUMBER	COMMENT	PERSON RESPBLE
31	VALVES	.	.	.	.	.	.	.			SUMNER
31A	SOLND LF2 TANK PRESS.- 3 UTS	.EE\$DDFFFFFTT.TX	.	.	.	.	.	.	.HF-SV-1510A		GOELZ
31C	CHK VALV LF2 TANK PRES.-3UNITS	.MMW\$DDFFFFFTT.TX	.	.	.	.	.	.	.HF-CV-1516A	HTL	MELNER
31C11	SPARE	.	.	.	.	.	.	.			MELNER
31C12	SPARE	.	.	.	.	.	.	.			MELNER
31E	SOLENOID LH2 TANK PRES.-3UNITS	.EE\$DDFFFFFTT.TX*	.	.	.	.	.	.	.HF-SV-2511A		GOELZ
31C	CHK VALV LH2 TANK PRES.-3UNITS	.MMW\$DDFFFFFTT.TX *	.	.	.	.	.	.	.HF-CV-2517A	HTL	MELNER
31C11	SPARE	.	.	.	.	.	.	.			MELNER
31C12	SPARE	.	.	.	.	.	.	.			MELNER
31G12	HIGH FLOW SOLENOID-3UNITS	.	.	.	.	.	.	.	.HF-SV-2509A		GOELZ
									.HF-CV-2510A		

(b) Long range schedule keyed to project part (RPM) number.

FAILURE AND CORRECTIVE ACTION REPORT

HIERARCHY NUMBER	DESCRIPTION	SOLUTION TO PROBLEM	COMMENT	PERSON RESPBLE
99	ENGINE COMPONENTS			ENGINE
99C	ELECTRIC HEAT SOURCE			
99C11	EXCESSIVE HT. LOSS TO COOL H2O	.DEPOSITS ON LAMP REFLECTORS IN VACUUM FROM MATL NOT PASSIVATED	CLEAN	WINKY
99C12	LAMP OVERHEATING+EARLY FAILURE	.FAILURE TO CLEAN FINGERPRINTS OFF QUARTZ WITH ALCOHOL	CLEAN	WINKY
99E	TXU			
99E11	TXU NO.1			
99E11C	TURBINE WHEEL/SCROLL RUB	.SCROLL /SCROLL CLEARANCE INCREASED 5 MILLS	COR 1	
99E13	TXU NO.2			
	DIRT CHIPS IN TURB SCROLL			
	T/C CONNECTOR			

(c) Failure and corrective action report index.

TECHNICAL REPORTS LIST AS OF 7-7-69

HIERARCHY NUMBER	DESCRIPTION	TITLE AND DESCRIPTION OF THE REPORT	PERSON RESPBLE
11	NASA TN-D-1315 (8-62)		
11C	ROBERT Y WONG		
11R	WILLIAM NUSBAUM	.AIR PERFORMANCE EVALUATION OF A 4.0 INCH MEAN DIAM. SINGLE STAGE	
11T		.TURBINE AT VARIOUS INLET PRESSURES FROM .14 TO 1.88 ATMOSPHERES	
		.AND CORRESPONDING REYNOLDS NUMBERS FROM 2500-50,000	
15	NASA TN-D-2621 (2-65)		
15C	SAMUEL M FUTRAL		
	CHARLES A WASSERBAUER	.OFF-DESIGN PERFORMANCE PREDICTION WITH EXPERIMENTAL	
		.TOTAL INFLOW TURBINE	

(d) Report list.

SPACE POWER SYSTEMS DIVISION

HIERARCHY NUMBER	DESCRIPTION	CONTRACT NO.	TASK NO.	CONTRACTOR	START DATE	FUNDED TO	DATE DUE	DATE RECEIVED	COMMENT	PERSON RESPBLE
11	SPS CONTRACTOR REPORTS									
11A										
11A02	FATIGUE TESTING OF REF ALLOYS	.NAS3 6010	.L0103	.TRW	.06-30-64	.03-31-69				MOORHEAD
11A08	F M PUMP	.NAS3 9422	.L0533	.GE	.07-18-66	.10-31-70				GOUGH
11A10	DES FAB SINGLE SHAFT BR TURB	.NAS3 9427	.L1807	.AIRESEARCH	.06-30-66	.07-02-70				DUNN
11A12	HI AXIAL CREEP T-111	.NAS3 9437	.L2087	.GE	.03-08-67	.11-08-69				STONE
11A14	LG DIA T-111 TUBING	.NAS3 10602	.L2086	.WESTINGHOUSE	.04-06-67	.12-01-69				MILKO
	3 STAGE POTASSIUM VAP TURBINE									KAPLAN

(e) Contractor reports list.

Figure 8. - Examples of various MAPS program uses.

HIERARCHY NUMBER	DESCRIPTION	DRAWING NUMBER	LATEST REV AND DATE	NO. SOURCE OF ORIGINAL	PRESENT LOCATION	REMARKS	COMMENT	PERSON RESPBLE
23	ELECTRIC HEAT SOURCE							
23A	CONTROL SUB-SYSTEM	55820	2-29-68	SOLAR	SOLAR			CANTINI
23A11	SCHEM-POWER TRANSDUCER	035363	6-07-68	RES. INC.				CANTINI
23A12	SCHEM-POWER CONTROL DEVICE	035364	8 11- 7-68	RES. INC.	BPO FILE			CANTINI
23A13	SCHEM-REMOTE CONTROL PANEL	035365	8 11- 7-68	RES. INC.	BPO FILE			CANTINI
23A14	40 KVA P. CONTROLLER M 6429	035373	6-12-68	RES. INC.	BPO FILE-SHT 1 OF 5 ONLY			CANTINI
23A15	3 RACK CONF 40 KVA CONTROLLER		6-12-68	RES. INC.				CANTINI
	3 RACK TEMP CONTROL		7-68	RES. INC.	BPO FILE-SHT 1 OF 4			CANTINI

(f) Drawing file index.

HIERARCHY NUMBER	DESCRIPTION	TOTAL HOURS TO DATE	FAIL FREE HOURS	TOTAL STARTS OR CYCLES	FAIL FREE STARTS/CYCLES	DATE OF UPDATE	COMMENT	PERSON RESPLE
11	CST 14 SPF (ELECTR.HT.SOURCE)	.	.	.	.	.	.	
110	BRU 1A,BHXU 2	668	668	9	9	3-04-70		FENN
11K	BRU 2 ,BHXU 2	1893	1893	4	4	6-32-70		FENN
11Y		---	---	---	---			
11Z	TOTAL	2561		11		6-30-70		
11	BRU-BHXU TEST (W-1AA)	.	.	.	.	.	.	VALRNO
				1				

(q) Component and system test record.

HIERARCHY NUMBER	DESCRIPTION	HARDWARE AFFECTED	ORDER WRITTEN		DATE REQUESTED	DATE APPROVED	DATE COMPLETED	DATE CFA/GID	DOC.	COMMENT	PERSON RESPBLE
			NO	BY							
2=	F.O.S COMPLETED										
2BENG002=	INSTL T/C'S ON R ENG FRAME	R ENG FRAME	008.	BERMND.	07 07 69.09	18 69.09	-- 69.05	-- 69.			SPF
2BENG003=	THERMAL SHIELD T/C'S FROM TURR	ALT COOLNT T/C'S	017.	NUSSLE.	08 14 69.09	18 69.09	-- 69.	NCNE			SPF
2BENG004=	INSUL WASHR ON T/C'S-ELECT COMP.	ENG DC PWR+INVS.	028.	THOMAS.	09 12 69.09	18 69.09	-- 69.	NCNE			SPF
2BENG005=	GRNDNGS FCR T/C'S	ENG T/C'S	034.	CINTLA.	09 15 69.10	31 69.10	-- 69.	LC	-- 69.		SPF
2BENG006=	CHG LIQ COOLNT FLOW RATE	ENG COOLNT SYS	037.	FENN	10 22 69.10	31 69.10	10 69.	NCNE			SPF
2BENG009=	CHG A LOOP FLOW RATES	ENG	052.	WINTKY.	11 18 69.01	15 70.01	-- 70.	ACNE			SPF
	CHG A+B LOOP			DEVO	01 12 70.01	15 70.01	-- 70.				SPF
					03 11 70.03	20 70.03	-- 70.				

(h) Engineering change orders.

HIERARCHY NUMBER	DESCRIPTION	PR NUMBER	DWG NUMBER	PRESENT LOCATION	MFGR SOURCE	COORDINATES			WTS LBS	REFK	COMMENT	PERSON RESPBLE
						X	Y	Z				
10	PART NUMBER AND DESCRIPTION											
10A01A51A												
10A01A51A	WHEEL BOLT	PART NUMBER										EST.
13A11F437	FLYK 1598	10000	1598	300896	621297							KASPER
13A11F467	FLYK 1598	10000	1598		621298							KASPER
13A11F47A	FLYK 1598	10000	1598		621299							KASPER
13A11F47B	FLYK 1598	10000	1598		621298							KASPER
13A11F47C	FLYK 1598	10000	1598		621299							KASPER
13A11F47D	FLYK 1598	10000	1598		621298							KASPER
13A11F47E	FLYK 1598	10000	1598		621299							KASPER
13A11F47F	FLYK 1598	10000	1598		621298							KASPER
13A11F47G	FLYK 1598	10000	1598		621299							KASPER
13A11F47H	FLYK 1598	10000	1598		621298							KASPER
13A11F47I	FLYK 1598	10000	1598		621299							KASPER
13A11F47J	FLYK 1598	10000	1598		621298							KASPER
13A11F47K	FLYK 1598	10000	1598		621299							KASPER
13A11F47L	FLYK 1598	10000	1598		621298							KASPER
13A11F47M	FLYK 1598	10000	1598		621299							KASPER
13A11F47N	FLYK 1598	10000	1598		621298							KASPER
13A11F47O	FLYK 1598	10000	1598		621299							KASPER
13A11F47P	FLYK 1598	10000	1598		621298							KASPER
13A11F47Q	FLYK 1598	10000	1598		621299							KASPER
13A11F47R	FLYK 1598	10000	1598		621298							KASPER
13A11F47S	FLYK 1598	10000	1598		621299							KASPER
13A11F47T	FLYK 1598	10000	1598		621298							KASPER
13A11F47U	FLYK 1598	10000	1598		621299							KASPER
13A11F47V	FLYK 1598	10000	1598		621298							KASPER
13A11F47W	FLYK 1598	10000	1598		621299							KASPER
13A11F47X	FLYK 1598	10000	1598		621298							KASPER
13A11F47Y	FLYK 1598	10000	1598		621299							KASPER
13A11F47Z	FLYK 1598	10000	1598		621298							KASPER
13A11F47A	FLYK 1598	10000	1598		621299							KASPER
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13A11F47R	FLYK 1598	10000	1598		621298							KASPER
13A11F47S	FLYK 1598	10000	1598		621299							KASPER
13												

(i) Parts list.

[illegible]

(j) Glossary.

Figure 8. - Concluded.

REMARKS

[illegible]NASA-C-909 (Rev. 2-71)
(OP)

Project _____ Prepared by _____ Approved by _____
NOTE: Deletion of I.D. Card automatically deletes corresponding schedule and status cards.

Project _____ **Prepared by** _____

NOTE: Deletion of ID Card automatically deletes corresponding schedule and status cards.

REMARKS (Delete, etc.)

NOTES

1. Use plus or minus in Column 15, and a two-digit number in Columns 16 and 17 to denote status referenced to asterisk cursor column. Two-digit number implies columns away from the asterisk. Numbers less than 10 must be written with a zero in Column 16 (e.g., +03, -07). Period (.) in Column 15 suppresses the slash overprint of narrative notes in the schedule area.
2. Comment columns can be used to elaborate on the status with words of six characters or less such as "late, lost, \$5,000, 302 HRS" or by a code related to the legend.

Project _____ Prepared by _____ Approved by _____

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