

**SPERRY UNIVAC**  
**Operating System/3 (OS/3)**  
**Introduction to the**  
**Management Control**  
**System/90 (MCS/90)**

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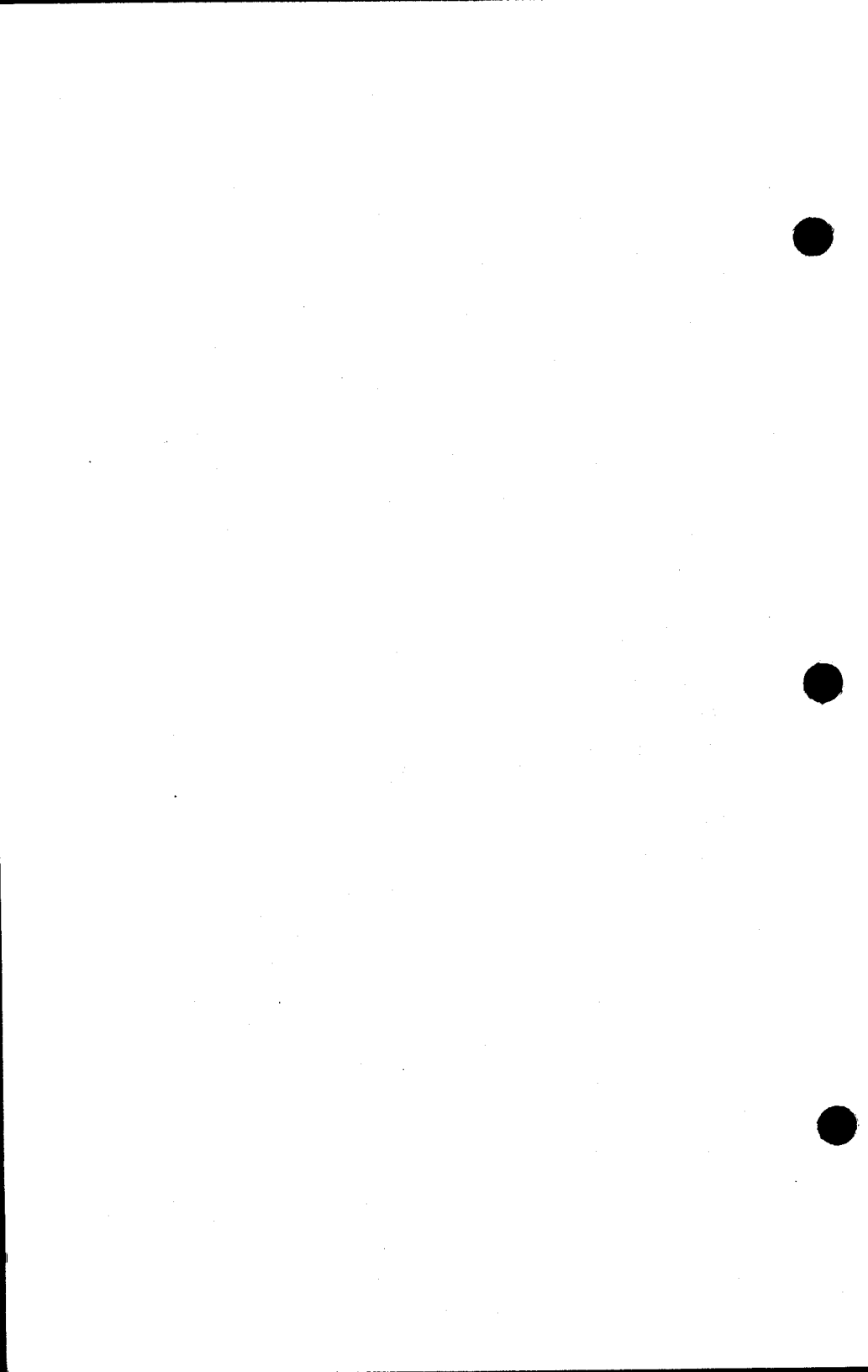
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## **preface**

This manual is one of a series designed to introduce the software available with the SPERRY UNIVAC Operating System/3 (OS/3). The actual programming procedures required to use the software described are not included in this introductory series. Such detailed information is beyond the scope and intent of these manuals and is included in the appropriate User Guide and/or Programmer Reference.

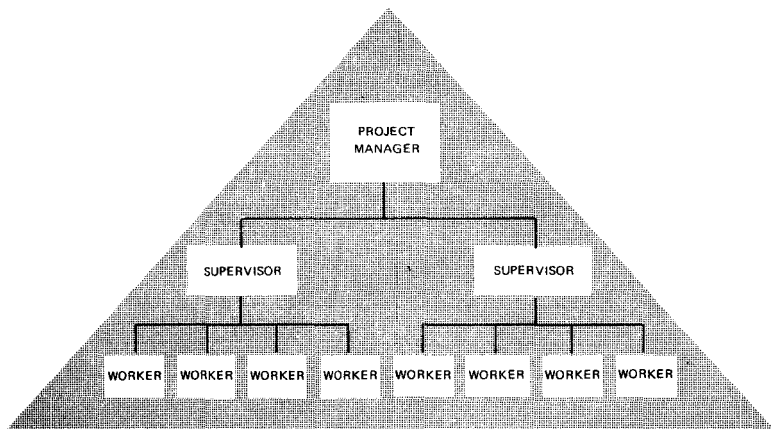
MCS/90 is also available on SPERRY UNIVAC Operating System/4 (OS/4); however, the files created for OS/3 cannot be used on OS/4.



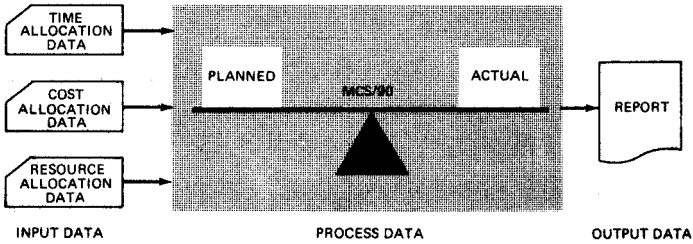
## what does MCS/90 do?

Scheduling time, controlling costs, and projecting resource needs (i.e., men and materials) are the basic functions of a manager. The SPERRY UNIVAC OS/3 Management Control System/90 (MCS/90) was developed to help you, the manager, do your job. MCS/90 enables the computer to collect and correlate the information you need. Then MCS/90 uses this information to automatically modify schedules and reallocate resources where potential problem areas exist.

Projects are built in steps or levels. Each level is a set of job steps with someone managing it. The job step manager reports to a manager who, in turn, reports to a higher manager.



Each job takes time, costs money, and utilizes men and materials. The job must be scheduled, since its completion affects the entire project. The manager at the top of the pyramid can't easily allocate time, costs, and resources throughout such a complex project structure. MCS/90 was designed to simplify the task by taking the data supplied at each level, comparing it to the project plan, and projecting the outcome at any stage of the job or for the entire job.



Take, for example, the job of building your house. You chose the style, acquired some property, and contracted a builder. After numerous meetings, you and the builder agreed on a completion date and price. Your house became a project, and the builder was the manager responsible for its completion at a specified time for a specified cost. If the builder doesn't complete your house on time, you're dissatisfied; if the builder spends more money on materials and labor than he anticipated, he's dissatisfied.

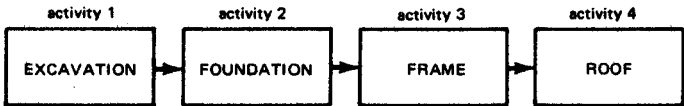
MCS/90 is a tool the builder can use to complete a project on time within the planned cost.

A house is built in steps — the excavation, the foundation laying, studding for framing, roofing, siding, etc. These steps are considered to be *activities*. From the activities, a *network* is built, which represents the entire job. The network shows the order and sequence in which the various steps must be performed to get the job done.

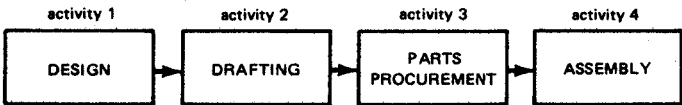
Most builders build many houses at the same time. Such a *project* increases the complexity of managing all the activities of the many networks involved. MCS/90 can coordinate *multinetwork* projects with the same speed and efficiency used to handle single networks.

Managers, like builders, are concerned with the networks of activities involved in project planning.

NETWORK OF BUILD-A-HOUSE PROJECT



NETWORK OF MANUFACTURE-AUTO PROJECT





## **how is MCS/90 used?**

You have seen why the SPERRY UNIVAC MCS/90 and similar programs were developed and what they were designed to do. As is true with any tool, you must learn how to use it before it can help you. MCS/90 does not require a great deal of experience and training to use it. It was designed to handle the types of information that managers already use when planning and scheduling projects. MCS/90 processes and correlates the information so that you can use it more efficiently.

### **VERSATILITY AND FLEXIBILITY**

MCS/90 uses information about each activity within a network. You supply the schedule dates, planned costs, and resource requirements for each activity. MCS/90 uses your information to monitor all the activities in each network, analyze time, cost, and resource data, and place them in a time-dependent, calendar-date schedule. With such information compiled rapidly and a printed report at your fingertips, you can compare projections and schedules and direct your immediate attention to trouble spots or potential problem areas within an entire network of activities.

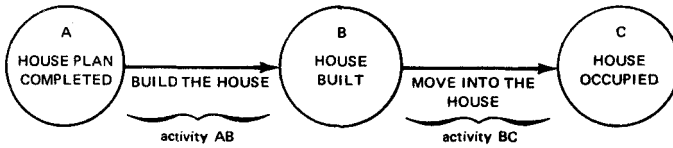
MCS/90 identifies the critical activities in each network. Delay in the completion of these activities causes delays in the completion of the project.

## **ACTIVITY NOTATION REFLECTING TIME DEPENDENCIES**

A project consists of networks, and networks are groups of activities. Each activity usually represents a process, job, or operation that takes time and resources to complete. The sequence in which the activities must be completed is specified in your networks. Someone must decide the order in which each activity must be completed. For example, the wheels, body, and engine must be built before a car can be assembled.

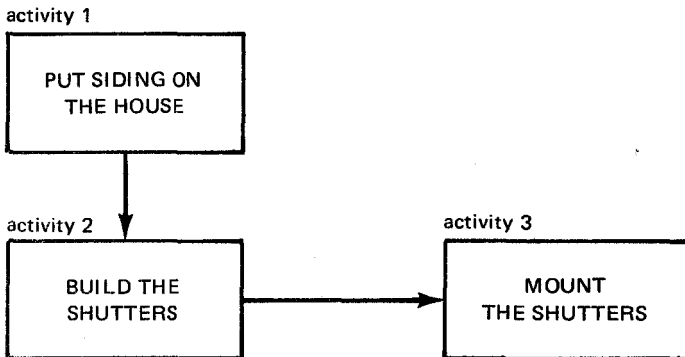
Once it is decided which activities must be finished before other activities can start, an activity diagram is drawn to show the sequential flow of work. The two accepted activity notations are *activity-on-arrow* and *activity-on-node* (precedence). MCS/90 accepts and processes either type of notation, which eliminates back-and-forth translation from your notation to one the program accepts, a task frequently required in similar systems available today.

Activity-on-arrow notation shows the flow of work between events.



In this typical activity-on-arrow diagram, activity AB does not start until event A has occurred, and event B does not occur until activity AB is completed. Activity BC does not start until event B has occurred, and event C does not occur until activity BC is completed.

Activity-on-node notation shows how the progress of an activity is dependent on the progress of other activities.



This typical activity-on-node diagram represents the order in which certain activities must be started and completed. Activity 1 and activity 2 must be completed before activity 3 can start. Activity 1 must be completed before activity 2 can finish.

Both activity-on-arrow and activity-on-node notations are standard ways to denote time-dependent work relationships within a network of activities.

## **variable workweek definition**

Since the hours and days that compose a workweek are not standardized, MCS/90 lets you define the workweek for each activity. You merely supply the workweek start day and the workweek length. The length of each workday may vary from one hour to three 8-hour shifts. If you don't define your own workweek, MCS/90 uses a 5-day workweek starting on Monday and ending on Friday with eight working hours per day. You may also supply a list of nonworking holidays and vacations for all activities. Your workweek definition may vary for each activity within a network. For example, one crew may work weekends on a certain activity, but the crew working on other activities may work a standard 5-day, 40-hour week. Such an arrangement wouldn't upset MCS/90 and would allow greater flexibility in planning and scheduling.

## **schedule dates and costs for each activity**

You are concerned with not only the schedule and cost of the entire project but also the individual schedule and cost of each activity. MCS/90 estimates the time schedule and cost of each activity by accumulating and projecting the data you supply. MCS/90 performs time calculations using a duration you supply for each activity. Sometimes it isn't possible to give a single, exact activity duration, so MCS/90 will estimate by using three durations you supply: *optimistic*, *most likely*, and *pessimistic*. MCS/90 uses your set of estimated durations in a mathematical equation and converts them to a single duration. This single duration is then used in MCS/90 time calculations. Costs are also estimated for each activity in terms of direct and overhead expenses. When all the cost, resource, and schedule data for each activity is specified, MCS/90 processes it to provide schedule and cost projections for each activity, network, or the entire project.

## interfacing

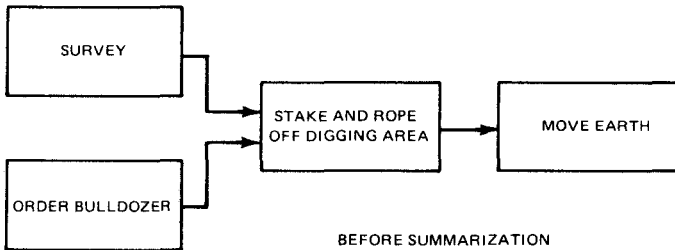
One of the benefits of the SPERRY UNIVAC MCS/90 is its ability to process activities that are common to two or more networks. The schedule of each common activity affects each network it is a member of. It is difficult for a manager to realize dependencies in a project until each network is planned and scheduled individually. After all the networks have been scheduled, a clear picture will enable the manager to tie dependent networks together through their interfaces, i.e. common activities. For example, when a contractor is building a group of houses, he must decide if there are any common activities. After diagramming all the job steps, he sees that he needs concrete sidewalks on each of the four streets in his housing development. He manually interfaces the "pouring the concrete" activity and orders only one truckload of concrete for all the sidewalks.

After you decide where the dependencies are, MCS/90 automatically ties the networks together through the common activity, as if all the networks make up one contiguous network. Any number of events, activity starts, and activity ends can be on each interface. Thus, valid dates, costs, and resource planning, which reflect the results of the interfaces, are computed for every activity. Since projects are so complex, interfacing activities without the aid of MCS/90 can be laborious. MCS/90 performs just as efficiently given any number of interfaced networks and projects, thus simplifying the manager's job of coordinating all the projects.

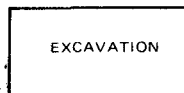


## network summarization

Many times it isn't practical for a manager to examine the schedule, costs, and resource allocation for each activity in a network. Instead, the manager may only be concerned with key areas within the project in terms of work done, cost, and resources used. MCS/90 allows the manager to segregate key areas within the project. Each key area contains the total data of all the activities that it represents. For example, excavating a house site involves a number of steps.



Each of these activities has a duration and a cost. MCS/90 can summarize all the information into a single activity.



## **cost summarization**

MCS/90 cost summarization provides three structures for cost accumulation:

- Networks
- Work breakdown structure
- Organizational accounting structure

*Network* cost accumulation is the sum of all the costs reported for activities in the network. The *work breakdown structure* (WBS) and *organizational accounting structure* (OAS) are multilevel sets of cost accounts based on charge numbers. Every activity can be assigned to a charge number in the WBS and a charge number in the OAS. Cost data can be accumulated by charge number to any level in the WBS or OAS. Accumulated cost is compared to planned cost, and overrun or underrun is reported and projected.

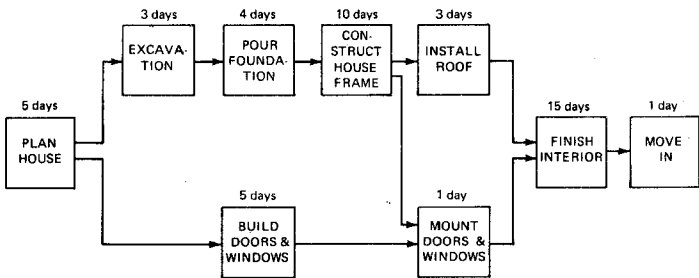
## reports generated

When you use a tool like the SPERRY UNIVAC MCS/90, a major concern is whether it provides *usable* reports. MCS/90 provides reports for all levels of management from the project leader to higher-level management. Most reports are in the form of documents; however, some reports are graphic displays. The reports provide comparisons between planned and projected accomplishments, highlight important information, and allow management to make its decisions with a full understanding of the current situation.

Reports are most useful if the information is concise and formatted in the way you want to see it displayed. MCS/90 allows you to control the content and format of each report. Not only can you choose a report format from a variety of available types, but you can decide how you want the information sorted for display. Your output would then be a report, or multiple copies if you need one for each manager, containing all the information you need, formatted the way you're used to seeing it.

After you prepare your network diagrams in either activity-on-arrow or activity-on-node notation, you punch the information onto cards, submit it to MCS/90 and receive reports.

The following reports are examples of the types of information MCS/90 prints, but they are only excerpts from actual, more detailed MCS/90 reports. This precedence diagram is for network "House 7" in project "Build".



## Type C Copies 1

## Activity Report

Status on Oct 12, 1974

System Description  
Project Build  
Network House 7

Rustic Farms Development  
Construction of Residence at North Woods  
The Moyer Residence - House No. 7

Network Schedule Start Oct 1, 1974  
Network Schedule Finish Dec 20, 1974

<u>Activity Description</u>	<u>Activity Name</u>	<u>Workweek Length</u>	<u>Workweek Start</u>	<u>Duration (Days)</u>	<u>% Complete</u>	<u>Earliest</u>		<u>Latest</u>	
						<u>Start</u>	<u>Finish</u>	<u>Start</u>	<u>Finish</u>
Design and plan the house	Plan	5	M	5	100	Oct 1	Oct 7	Oct 25	Oct 31
Clear site and excavate	Excav	5	M	3	100	Oct 8	Oct 10	Nov 1	Nov 5
Build doors and windows	Bld DW	5	M	5	80	Oct 8	Oct 14	Nov 21	Nov 27
Pour the foundation	PrFoun	5	M	4	25	Oct 11	Oct 16	Nov 6	Nov 11
Construct house frame	Frame	5	M	10	0	Oct 17	Oct 30	Nov 12	Nov 25
Mount doors and windows	Mnt DW	5	M	1	0	Oct 31	Oct 31	Nov 28	Nov 28
Install roof	Roof	5	M	3	0	Oct 31	Nov 4	Nov 26	Nov 28
Finish interior	Int	5	M	15	0	Nov 5	Nov 25	Nov 29	Dec 19
Move into the house	Move	5	M	1	0	Nov 26	Nov 26	Dec 20	Dec 20

Sample Activity Report



**SPERRY UNIVAC Management Control System**

Type U Copies 1

Financial Status Report

Status on Oct 12, 1974

System Description  
Project Build

Rustic Farms Development  
Construction of Residences at North Woods

Network Schedule Start Oct 1, 1974  
Network Schedule Finish Dec 20, 1974

Project	Network	Actual Cost To Date (\$)	Value Rec'd To Date (\$)	% and \$ (Over) Under To Date	Planned Cost (\$)	Latest Revised Estimate (\$)	Projected % and \$ (Over) Under
Bld	Hs2	25,000	22,500	11% (2500)	45,000	50,000	11% (5000)
Bld	Hs5	28,050	30,545	8% 2495	60,000	54,980	9% 5020
Bld	Hs7	29,010	29,575	2% 565	50,000	49,045	2% 955

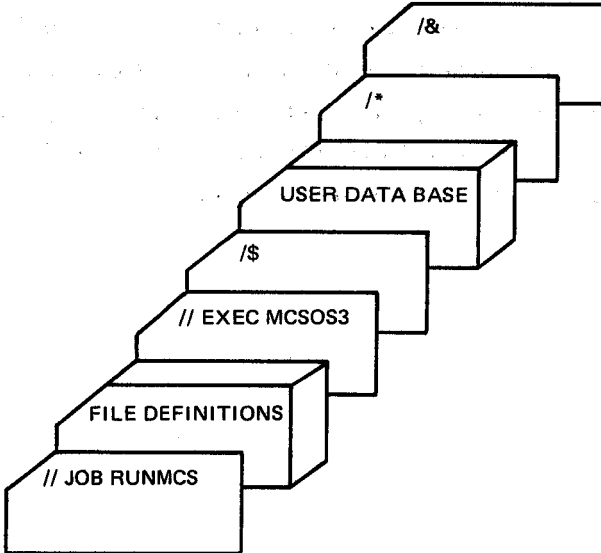
*Sample Financial Status Report*

## **execution of MCS/90**

MCS/90 is part of the SPERRY UNIVAC Operating System/3 (OS/3) software. OS/3 has a complete library of programs. Some of these programs are needed to control and operate the system. Others, like MCS/90, are designed to handle specific applications for individual users. To save you time, MCS/90 allows you to enter all your data (data base) once and then merely enter cards to reflect updates and changes. Cards can be entered into the system by any one of a number of sources from card readers to remote devices. After receiving your data, the system retrieves the MCS/90 program from the system library and uses it to process your data and provide you with accurate output reports.



To use MCS/90, you don't have to know how the processor operates, nor must you be concerned with the many other programs stored in the system's library. All you do is follow the easy-to-learn steps required to put MCS/90 in operation.



## **summary**

**MCS/90 is a management control technique for planning and monitoring work at every level within a large project. The main objectives of such a program are to determine and monitor schedules (and adjust them, if necessary), and to reallocate money or other resources to improve given schedules. MCS/90 is a versatile tool that is effective in reducing the tasks involved in managing large projects.**



