

## SERIES 200/OPERATING SYSTEM-MOD. 1 (TAPE RESIDENT)

The Series 200/Operating System — Mod 1 (Tape Resident) is a powerful computer-management system encompassing an extensive set of preparation and maintenance, control, and utility functions. These functions can be selectively combined to meet the specific requirements of each user while providing for the systematic exploitation of the equipment capabilities. This building-block approach eliminates uneconomical fixed overhead and guards the user against incurring costs for unnecessary functions and features. It also relieves the user of a host of complex programming and execution supervision tasks. In the Mod 1 Operating System, both hardware and software are modular in structure, compatible in function, and flexible in implementation.

The Tape Resident Mod 1 Operating System is the unifying element for medium-scale, tape-oriented installations. This system operates on Series 200 computers having core memory capacities ranging from 12K to 262K characters and from three to six tape drives. Flexibility at this level permits efficient use of mass storage, communication, paper tape, and punched card devices in both independent and semi-centralized operations. Basic to the design of Mod 1 are the standardization of the machine-language formats generated by the various language processors and functional program modularity. Standardization of machine-language formats provides the capability to combine the outputs from the various language processors into a single executable job. Modularity is achieved by the segmentation of programs into program units which accomplish specific functions under operating system control. Functional compatibility allows any model of the Series 200 to utilize all of the wide range of peripheral devices and controls with any of the central processors in the Series 200 line. Upward compatibility of programs exists for Series 200 computers, restricted only by memory capacity and peripheral equipment.

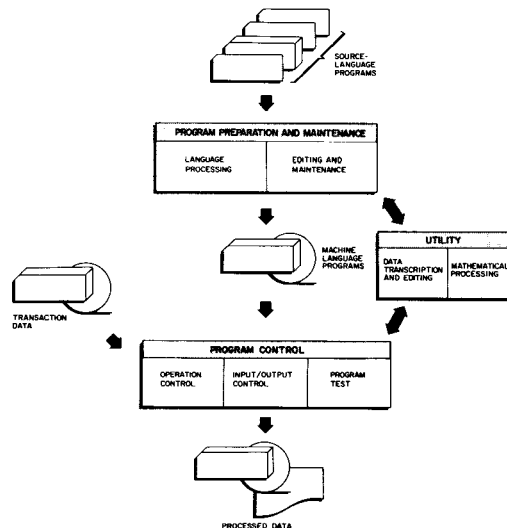
### PROGRAM PREPARATION AND MAINTENANCE

In Mod 1, the functions of program preparation and maintenance are divided among (1) language processing functions and (2) program editing and maintenance functions. The following language processing subsystems, empowered to translate source programs into a single machine-language format, are tailored to each user's requirements and allow him to concentrate more on the definition of a job and the best method of solving problems, and less on the burdensome coding details:

1. **Assemblers:** Translate symbolic source (Easycoder) language into machine language;

Specifications remain subject to change in order to allow the introduction of design improvements.

# SERIES 200



2. **COBOL Compilers:** Translate commercial (COBOL) language into machine language;
3. **Fortran Compilers:** Translate scientific (Fortran) language into machine language; and
4. **Conversion Translators:** Translate competitive language into Honeywell language on both a source-language and a machine-language level.

The resultant standard-format programs can be combined for execution in a single sequential operation. A powerful programming aid is provided to simplify the task of analyzing any Series 200 program that is coded in the Easycoder symbolic language. Library routines, either Honeywell-supplied or user-written, are a further extension of the assembly system.

Program editing and maintenance functions involve such processes as storing, modifying, and maintaining both assembly-language and binary-executable programs. These functions enable programs to be selected and ordered — in the sequence best suited to the specific requirements of the job — to create processing run tapes which contain only the required systems and processing programs.

### PROGRAM CONTROL

The functions of program control include (1) operation control, (2) input/output control, and (3) program test. Operation control — the central function — includes program loading, monitoring, and sequencing; it also includes interrupt processing and other associated elements.

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# Honeywell

ELECTRONIC DATA PROCESSING

As a result of inherent hardware/software interrupt capabilities, the user may take full advantage of communication equipment. In addition, peripheral data conversion or real-time operations may be performed concurrently with a major data processing job.

Since (1) only the loader resides in memory and (2) the object programs may be segmented into optimum-size loading units (only the required portion of the program need be in memory at any one time), loading is accomplished with a highly efficient usage of core memory. Punched cards, magnetic tape, and mass storage are examples of the media from which the loading process may operate. In all cases, the loading process retains the same functional characteristics, incorporating those features that permit the most practical and convenient operation of the computer installation.

Another important aspect of the operating control function is the ability to process a series of logically connected programs or "jobs" — with little or no operator intervention. Although these programs may be independently generated, they are made compatible for execution through the common interface of the operating system. This means that a typical job may be a mixture of programs derived from the various language processors, systems routines, and common library routines.

The interrupt control process governs the simultaneous processing of two programs by reassigning program control on interrupt signal. As a result of this increased efficiency in the use of memory cycles, throughput is increased and greater utilization of equipment is attained.

Other elements of the operation control function provide for the "floating" of the loader-monitor to the high end of the upper 4K memory bank. Also, a process is included for communicating with the operator through printed or typed instructions.

The input/output control functions consist of a set of macro routines which may be specialized and incorporated into a user's data processing system. These routines facilitate such operations as checking labels, checking file identifications, and checking for read/write errors. The input/output control functions include processes which manage the standard input/output operations for magnetic tape, punched cards, printer, drum, and console in such a way that the need for writing detailed and exhaustive input and output coding is eliminated. The input/output control functions are specialized as required to the applicable individual programs at the source-language level, thus reducing equipment overhead to a minimum. The result is a flexible system for the control of operations that allows the selection of only those processes required by the object program.

The program test function includes several processes which may be used either separately or as part of an automatic checkout system. The checkout subsystem can process several programs or a job and automatically produce the necessary documentation to evaluate the programs. Processes such as automatic sequencing from one program to the next, printouts of messages and operator instructions, generation of test data, octal correction of programs, tape dumps, and dynamic, terminal, and emergency memory dumps are among the operations performed by the program test function. Depending on the function involved, these processes may be executed before, during, or after the user's object program.

## UTILITY FUNCTIONS

An extensive set of utility functions provides a variety of transcription, editing, and mathematical processes.

Tape handling, media conversion, report generation, tabulator simulation and sorting and collating of data stored on magnetic tape are among the data transcription and editing functions. The Polyphase sorting process, first successfully implemented for computer processing by Honeywell, permits sorting with as few as three tape drives while minimizing the number of passes required over the data. Other processes offer facilities for collating up to five sorted magnetic tape files.

The mathematical processing functions provide a broad library of scientifically-oriented routines which complement the capabilities of the Fortran compilers. This library includes the basic Fortran routines, such as square root, exponential, trigonometric, and logarithmic functions, as well as matrix, statistical and other more comprehensive processes. All of the routines in this library can be used with or without the scientific hardware option.

## SYSTEM OPERATION

Mod 1 operations are controlled by operating directors. These directors may be specified either (1) internally, using programmed calls, or (2) externally, through the use of console call cards or by manual entry through the console or control panel. Through the use of these directors, the user's object programs become an integral part of the operating system. Systems routines as well as the user's routines are thereby readily available and can be called and executed as required — assuring complete, efficient data processing in accordance with the user's requirements.

## SUMMARY OF ADVANTAGES

- Relieves the operator of detailed and burdensome execution supervision
- Optimizes throughput by automating operations and minimizing human intervention
- Assures maximum use of the central processor and peripheral units through multiprogramming
- Assures program compatibility as an installation grows
- Enables running of user-written programs, library, and systems programs as integral parts of the operating system
- Provides execution of stacked jobs without operator intervention
- Allows tailoring and specialization of precoded, fully tested library routines
- Enables automatic monitoring and documentation of test and production runs
- Provides for segmentation of programs to conserve memory space
- Maintains systems programs simply and economically
- Standardizes operating procedures
- Modular design permits operation with only the needed functions and features

For a list of all programs in the Mod 1 Operating System and a cross-referenced index of all applicable publications, refer to the software bulletin **Software Classifications and Designations**, Order No. 379, and the general bulletin **Publications Catalog**, Order No. 074.