

when you need all the computer you can get...you're ready for the **HONEYWELL 1800-II**

FAST

The Honeywell 1800-II is a high-speed computer in every sense. Take memory time, for example. It's two microseconds. That's the time required to take a 48-bit word out of memory and put it back again. Take instruction time. The H-1800-II processes more than seven million three-address instructions a minute. (Multiply that by 2.2, if you're comparing it with a one-address system.) Take floating-point speeds. It's tough to come up with a meaningful average, but many H-1800-II floating-point instructions are measured in nanoseconds (billions of a second). Let's take magnetic tapes, too, while we're on speed. There are four models available. The fastest can transfer 186,000 decimal digits a second and you can have as many as eight reading and eight more writing at once.



But sheer speed is only a part of the story. The H-1800-II puts this speed to work for you in the most efficient way possible. Both high-volume business data and large-scale scientific computations can be processed on the H-1800-II. Simultaneously. How? The H-1800-II's automatically controlled parallel processing permits the handling of up to eight independent programs. A built-in memory of 8192 Honeywell words helps here; more is available should you need it. Sixteen controlled input/output trunks connected to a wide range of peripheral equipment give solid back-up to this unique Honeywell feature. How wide a range? From high-density magnetic tapes, high-speed line printers, fast card and paper tape readers and punches to high-capacity random access magnetic disc memories, optical scanners, self-correcting orthoscanners and data communications devices. There is simultaneous reading and writing on magnetic tape and one tape control unit.

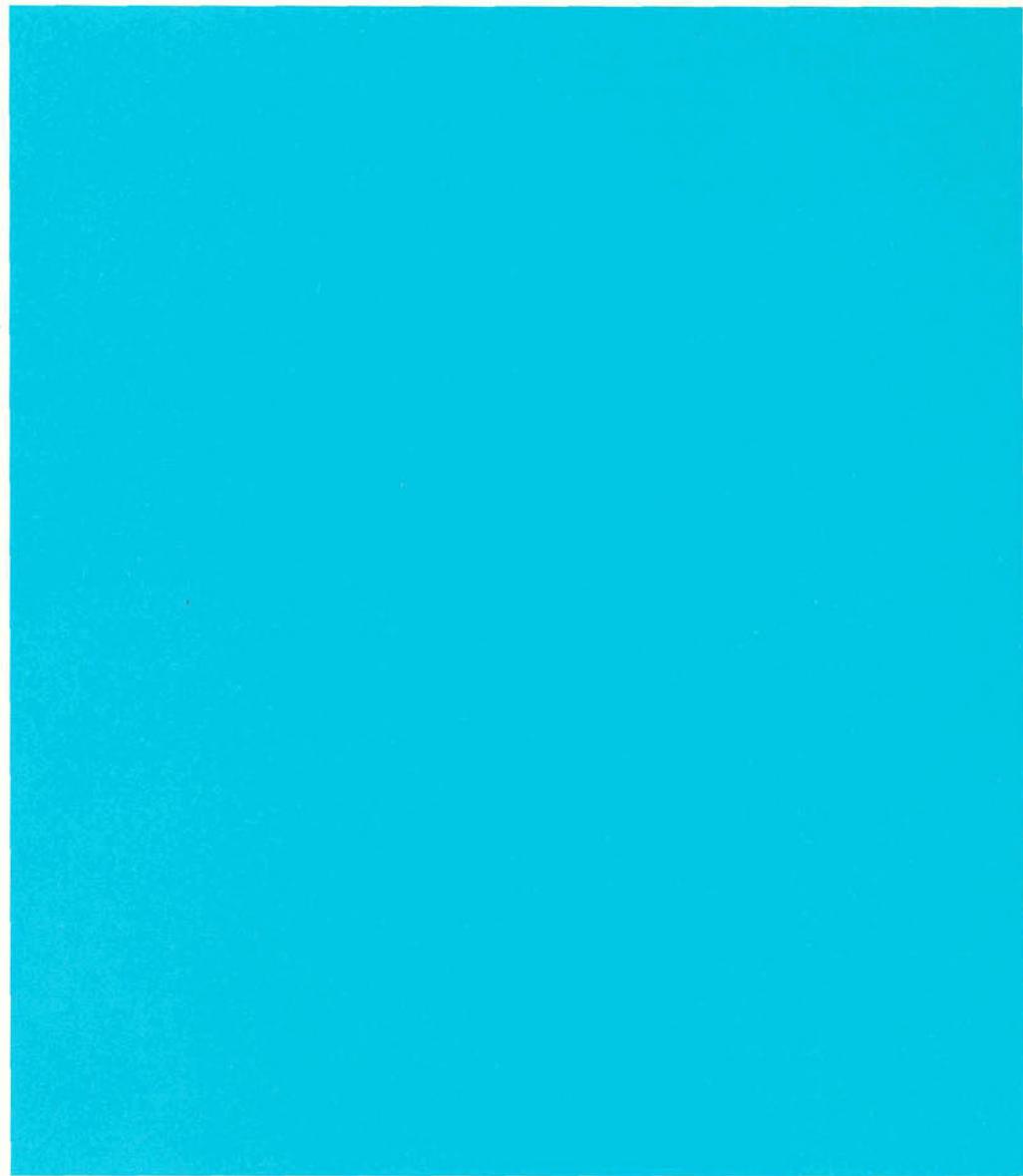
EFFICIENT

For greater efficiency in major input/output operations, Honeywell offers a versatile central processor. A key feature of this central processor is an Input/Output Control Center (IOCC) that provides complete control functions for a card reader/punch, a high-speed printer, and up to four magnetic tape units. The IOCC completely controls the simultaneous operation of the devices connected to it, and, in addition, it allows these devices to operate simultaneously with other input/output equipment connected to standard peripheral controls.

How about programming packages? Honeywell provides a full range of programming aids, including business and scientific compilers, assembly systems, a unique Computer Optimization Package (COP) and COBOL, plus other H-1800-II programs that help you utilize the speeds and capacities efficiently and effectively. The 48-bit Honeywell word (12 decimal digits or 8 alphanumeric characters) can be "packed" to full capacity for variable length records and more versatile data handling.

But you're also interested in accuracy. So Honeywell makes sure of that accuracy in the processing of your data. Extensive internal checking insures complete accuracy of data during computing. Orthotronic Control, a Honeywell exclusive, provides automatic error detection and correction of data stored on magnetic tape. Actually, it regenerates missing or incomplete data through a unique automatic checking system. Orthotronic Control also saves costly time by eliminating manual correction of data.

ACCURATE



FLEXIBLE

Now let's zero in on flexibility. Many Honeywell equipment features offer this to a high degree. There is an expandable core memory for the central processor (up to 32,768 words), plus a random access disc system with a capacity of more than 805 million alphanumeric characters. With seven of eight input and output trunks available, one H-1800-II can handle up to 56 magnetic tape units and varied combinations of peripheral equipment. Incidentally, tape translators enable data from non-Honeywell computers to be read directly into Honeywell computers. Finally, you don't have to pay for data processing capacity that you don't use. You specify the system configuration that you need to handle your current workload. Then as your data processing requirements grow, you add to the H-1800-II system in modular increments. Now let's go take a closer look at some of the benefits and capabilities of the Honeywell 1800-II.

HONEYWELL 1800-II CENTRAL PROCESSOR

The central processor for the Honeywell 1800-II includes: a control unit which monitors program and equipment time sharing, directs execution of instructions, and governs address selection; an arithmetic unit in which all arithmetic operations are performed at exceptionally high speeds; a control memory containing 256 special registers (described below); and four banks of high speed memory, each capable of storing 2048 forty-eight-bit Honeywell words. Up to three additional units of memory storage each capable of storing 8192 words, may be added to the basic memory.

In addition, the Honeywell 1800-II central processor includes an Input/Output Control Center (IOCC). The IOCC is capable of handling input/output functions common to almost all data processing applications: card reading and punching, printing, and tape operations related to data conversion. The card and printer connected to the IOCC may be operated independently or under the control of stored programs. A special buffer storage area in the IOCC allows a high degree of simultaneity to be attained in these operations. The IOCC buffer is connected to the main memory of the central processor through the eighth input/output trunk, and traffic between the two flows in either direction at standard Honeywell 1800-II operating speeds. (The operation of the IOCC is discussed further on page 9.)

Each Honeywell word can contain a variety of information configurations as shown below.

A memory cycle time of only two microseconds affords the Honeywell 1800-II user unusually fast operating speeds. Typical arithmetic instructions, such as addition and subtraction, are performed at a rate of 120,000 three-address instructions per second.

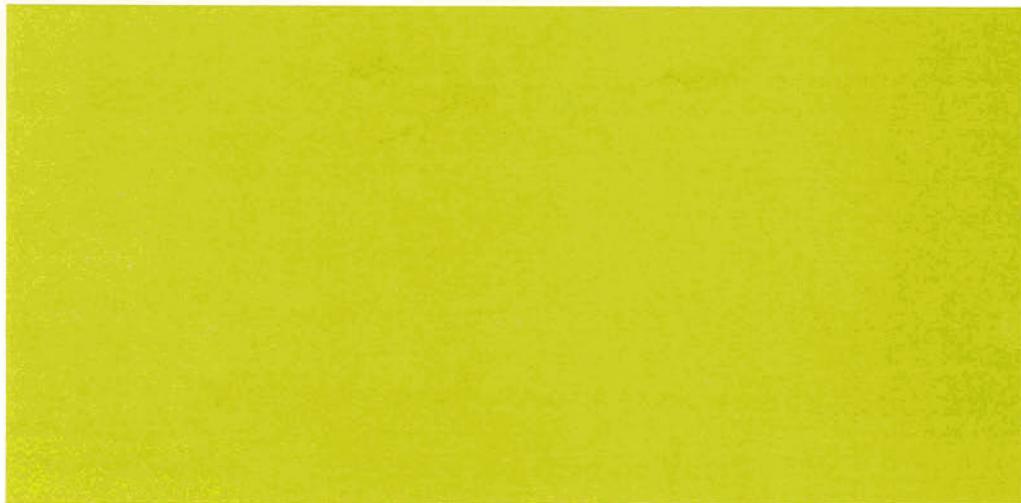
BIT POSITION	1	5	9	13	17	21	25	29	33	37	41	45	48
DECIMAL	±	1	2	3	4	5	6	7	8	9	0	1	
ALPHANUMERIC	A	B	C	D	E	F	G						H
ALPHANUMERIC COMPRESSED	C	•	W	E	B	B	1	7	4				
BINARY	±	(44 BINARY BITS)											
INSTRUCTION	COMMAND CODE			A ADDRESS		B ADDRESS		C ADDRESS					
HONEYWELL WORD													

CONTROL MEMORY, MULTIPROGRAM CONTROL AND TRAFFIC CONTROL FACILITATE PARALLEL PROCESSING

The Honeywell 1800-II control memory contains eight identical groups of 32 registers each, including sequence counters, index registers, registers for indirect addressing, etc. The memory cycle time of the control memory and the main memory are the same. However, they are out of phase in such a way that additional time is seldom required to perform internal instructions involving control memory.

Multiprogram control, an exclusive Honeywell technique, directs the time sharing of the central processor for up to eight active programs. Each of the programs processed in parallel is assigned one group of special registers in the control memory. Once the program is loaded, its corresponding group directs the selection of instructions. In this way, each program may start, proceed and stop independently of all other programs.

Traffic control monitors the transmission of information to and from the central processor and directs the time sharing of memory by the magnetic tape units, other peripheral units, and central processor operations. Traffic control monitors up to 16 input and output channels and makes the necessary channel connections at the proper time between these channels and the central processor. Virtually any combination of input and output devices can be connected to these parallel channels via appropriate control units. This provision for having up to sixteen input/output devices connected at one time means an unusually wide range of simultaneous operations is possible.



SEQUENCING OPERATIONS IN THE HONEYWELL 1800-II

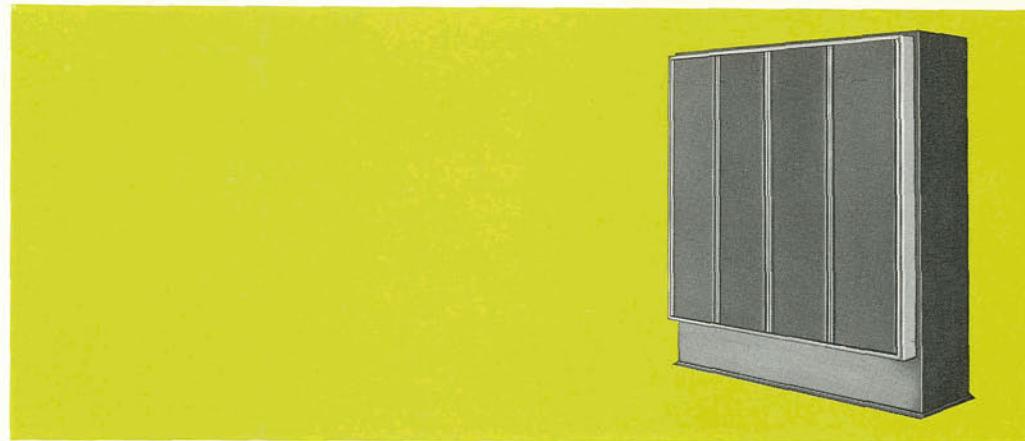
Every group of special registers in the control memory of the Honeywell 1800-II contains a sequence counter. The sequence counter always contains the memory address of the next instruction to be performed in a program. In this way, the exact order of the instructions is specified.

Special instructions allow the programmer to set the sequence counter to a pre-determined value, thereby permitting a departure from the basic sequence whenever desired. A history register retains a record of the settings, providing a means of returning to the proper point in the program. Still greater flexibility is provided by the co-sequence counter associated with each sequence counter. The selection of successive instructions to be performed may be controlled by either of the counters at the option of the programmer; this is called operating in the bi-sequence mode.

ORTHOTRONIC CONTROL LOWERS THE COST OF MAINTAINING ACCURACY

Orthotronic Control, another unique Honeywell advantage, is a powerful technique which insures the user against problems arising from magnetic tape errors occurring during writing, storage, or subsequent reading. Experienced data processing personnel know that long storage periods or inept operator handling can adversely affect information on magnetic tape even though the accuracy of the data was checked at the time the record was written. Even infrequent occurrences of this type can result in many man and machine hours being spent in re-acquiring lost information. With Orthotronic Control, time losses are eliminated. At the end of each record of information, Orthotronic check numbers are added to each information channel. These check numbers aid in pinpointing lost or damaged information and provide the information necessary to regenerate the original data, eliminating costly and time-consuming manual correction procedures.

NANOSECOND FLOATING-POINT UNIT



An optional floating-point unit may be added to the Honeywell 1800-II. This unit provides hardware for performing floating-point arithmetic as well as fixed-point arithmetic. New tunnel diode circuitry brings the speed of many floating-point operations into the nanosecond range. There are 20 scientific instructions for use with the floating-point unit. In a system which does not contain this unit, pseudo instructions call in a special library routine to perform the function. The Honeywell 1800-II floating-point unit includes its own arithmetic unit and control unit, in addition to the similar units in the central processor. The floating-point arithmetic unit performs all floating-point instructions in accordance with the logical rules of the command codes. The control unit selects, interprets and directs the execution of these instructions. To insure accuracy, the floating-point unit incorporates an extensive internal checking network which tests all data received or transmitted.

The wide range of values which can be represented by the floating-point word minimizes the possibility of underflow and overflow during most arithmetic operations. The values of the floating-decimal word may range from 10^{-64} up to 10^{63} . The 10-digit precision of the mantissa often eliminates the need for time-consuming multiple-precision computations. The floating-point binary word provides even greater range and precision than the floating-decimal word. Its values may range approximately from 10^{-78} up to 10^{76} . The mantissa has 40 binary places, the equivalent of over 12 decimal digits.

BIT	1	2	8	9	48
DECIMAL	\pm	EXONENT (7 BIT)	MANTISSA (10 DECIMAL DIGITS)		
BINARY	\pm	EXONENT (7 BIT)	MANTISSA (40 BINARY BITS)		
HONEYWELL 1800-II FLOATING-POINT WORD					

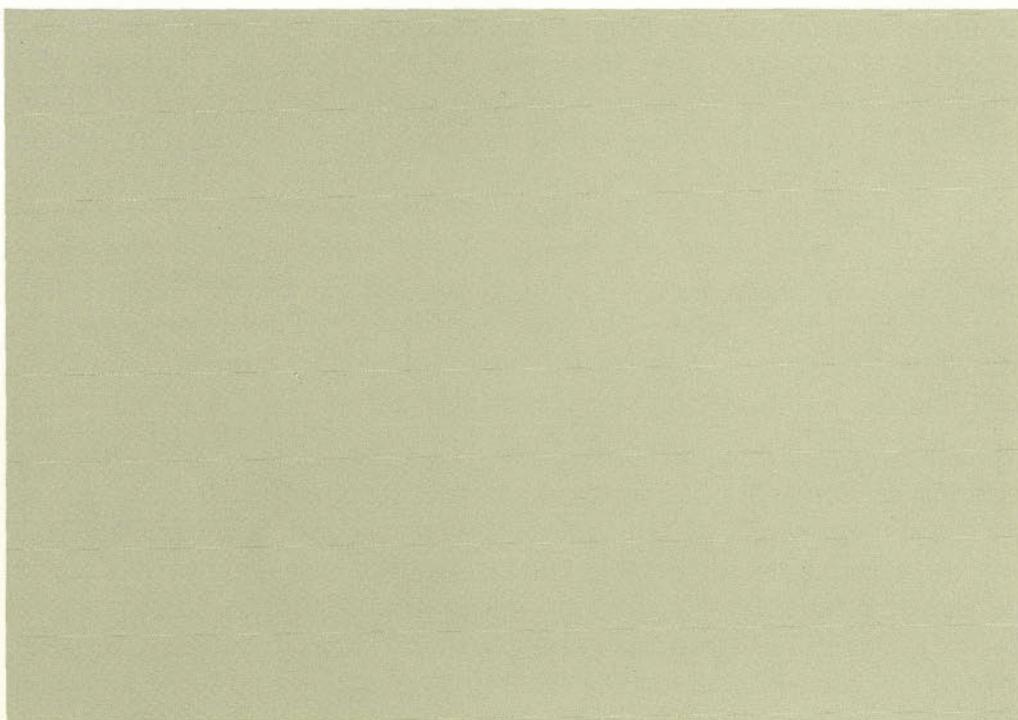
Although physically independent, the Honeywell 1800-II console is an integral part of the central processor. Display lights keep the operator informed of the progress of each program in operation. A modular display panel indicates the exact status of all peripheral units at all times. The console keyboard and typewriter make it possible for the operator to control and communicate directly with the central processor.

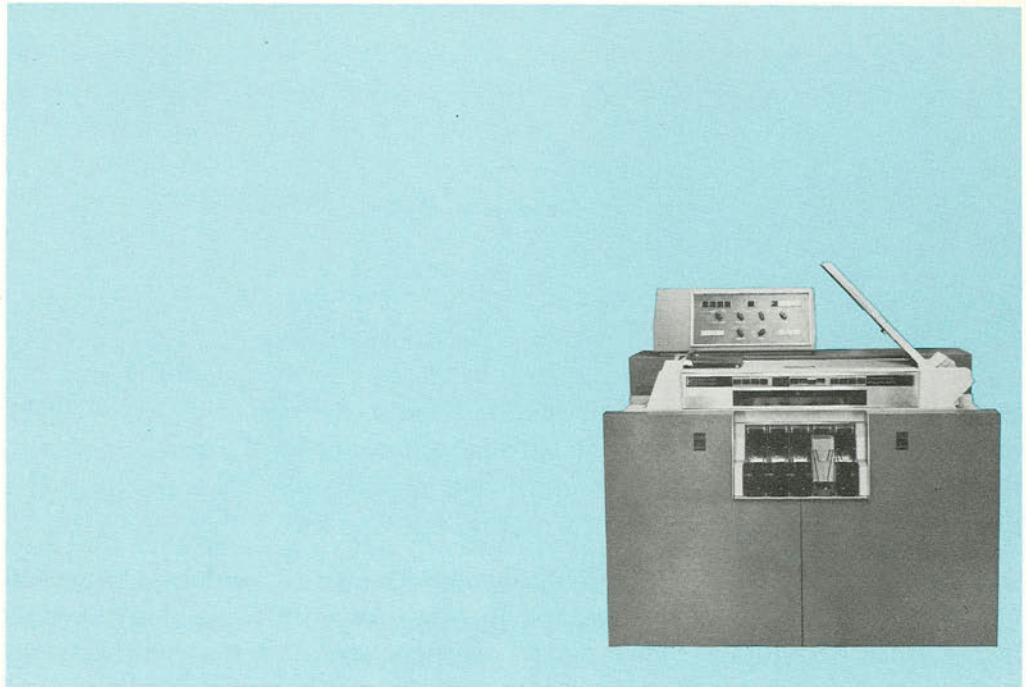
The Honeywell 1800-II user may choose his peripheral units from the wide range of devices offered with the Honeywell 800 and 800-II. From the input and output devices described below, each customer can pick the equipment which best suits his particular needs. All the peripheral units described operate in conjunction with peripheral control units. In general, these control units buffer the input and output, and they perform the necessary conversion of the information passing through these units.

Of special note is the Input/Output Control Center which, connected to the H-1800-II central processor through an input/output trunk, performs all control functions for a card reader/punch, a high-speed printer, and up to four magnetic tape units. With the IOCC, card reading, card punching, printing, and magnetic tape operations related to data conversion proceed simultaneously; that is, any combination of three of these devices may operate at the same time. Furthermore, this is in addition to the wide variety of additional peripheral equipment that may be connected to the Honeywell 1800-II through standard peripheral controls and that can operate simultaneously with the IOCC-controlled equipment.

HONEYWELL CONSOLE PROVIDES CONTROL AND COMMUNICATION

THOROUGHLY TESTED AND PROVEN PERIPHERAL UNITS





CARD READERS

The Honeywell 1800-II may operate with either the standard speed (240 cards per minute) or high speed (650 cards per minute) card reader. With the exception of speed, the operation of the two readers is the same. The card readers operate either on-line or off-line. A combination card reader/punch is also available and described below.

Information from 80-column punched cards is read into the control unit where it is converted into Honeywell 1800-II machine language. It is then transmitted to the central processor. A switch on the card reader permits selection of either the normal or transcription mode of conversion. In the normal (Hollerith) mode, each of the 80 columns on the card is converted into one 6-bit character; one card contains 10 Honeywell words. In the transcription mode, each of the 960 positions on the card is converted separately, a punch being converted into a 1 bit and no punch into a 0 bit. In this mode, one card contains 20 Honeywell words. The transcription mode permits cards being read to contain the information in any format, without being restricted to Hollerith configurations.

The accuracy of reading is assured by passing each card through two reading stations; the results of these two readings must match. If an inconsistency occurs, switch settings on the reader determine whether or not the card reader should stop and/or eject the card and/or transmit the converted information. In addition, an extra word is added at the end of the information read from every card to identify this information as being one of the following: a correct reading of good data; a correct reading of illegal data; or an incorrect reading.

CARD READER/PUNCH

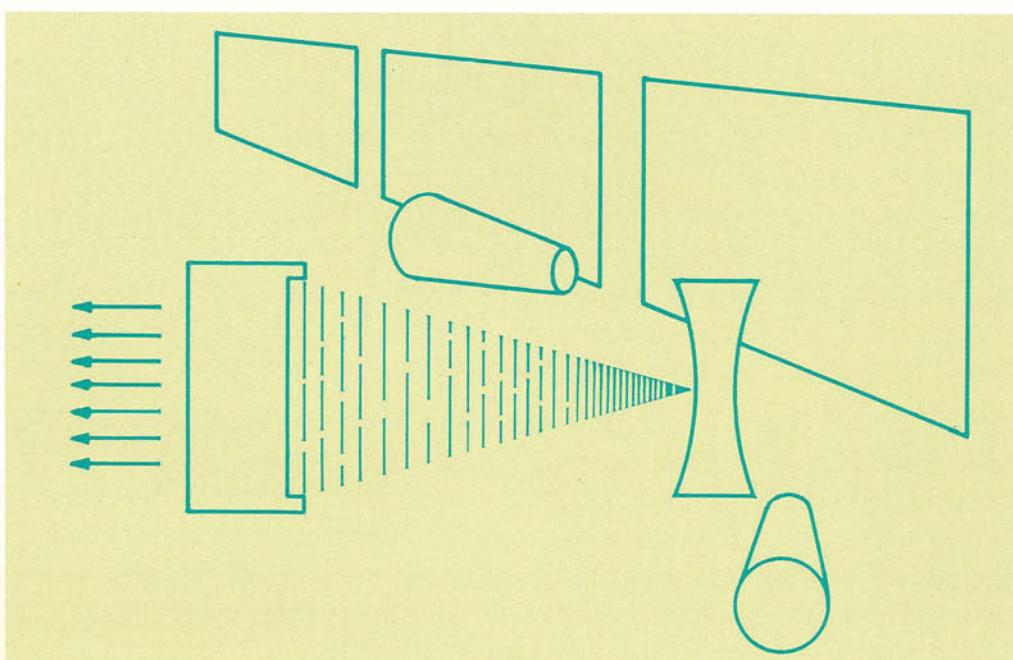
A combination card reader/punch is also available for use with the Honeywell 1800-II. It operates at a reading speed of 800 cards per minute and a punching speed of 250 cards per minute.

ORTHO SCANNER

The Orthoscanner, a Honeywell exclusive, utilizes a newly developed scanning technique. This new system recognizes characters in the form of a printed code of vertical bars (Orthocode). In this form 600 decimal digits can be scanned per second, with a document rejection rate of about one-tenth of one percent. The Orthocode contains Orthocorrection digits which make automatic regeneration of lost data possible.

OPTICAL SCANNER

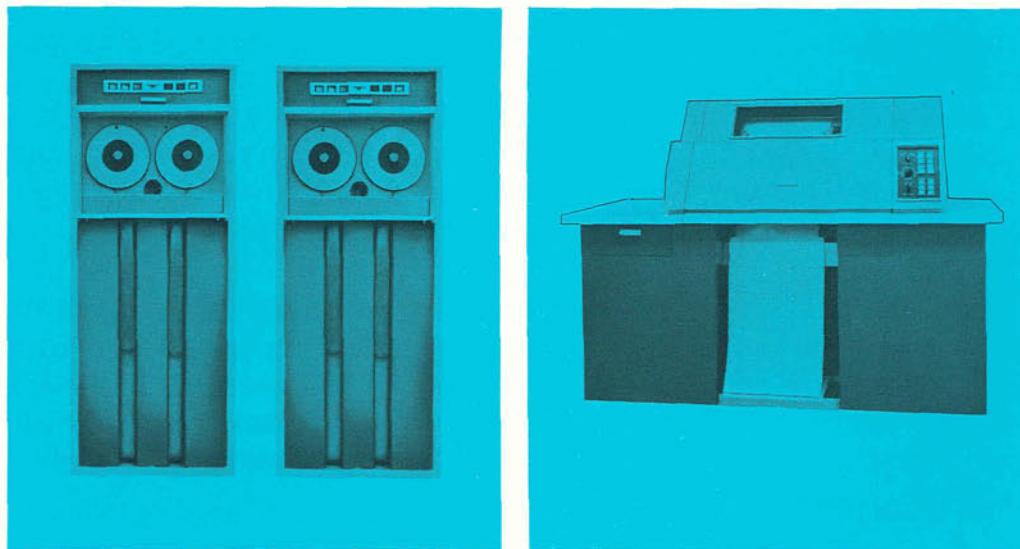
The Honeywell optical scanner is an on-line input device operable with the Honeywell 1800-II. The scanner can recognize 14 characters and reads up to 312 one-line documents per minute. The scanner accepts a wide range of stock sizes and weights. Information is fed from the scanner into the control unit which converts the characters into machine language.



MAGNETIC TAPE UNITS

Four standard magnetic tape units are available to Honeywell 1800-II users. The transfer rates of the four units are 48,000, 96,000, 133,000 and 186,000 decimal digits per second. The first of these units is a low-speed, economy unit which reads tape at a speed of 60 inches per second and rewinds tape at 180 inches per second. All other units read at 120 inches per second and rewind at 360 inches per second.

All tapes are protected by Honeywell's vacuum control technique which replaces the customary pinch rollers and other mechanical feed devices. The reading surface of the tape is protected against abrasion since it comes into contact with only the read-write head. All tapes may be read in either a forward or reverse direction.



HIGH-SPEED PRINTER

The high-speed printer operates on-line or off-line at a speed of 900 lines per minute. It accepts a wide range of stock weights and sizes and produces clean, crisp carbon copies. Two-part heat transfer forms and offset master forms are acceptable. For every line printed, there are 160 possible print positions of which any 120 may be active for a given run. At each print position, there are 56 characters available (26 alphanumeric, 10 numeric, and 20 special symbols).

Printed output has a horizontal spacing of 10 characters per inch and vertical spacing of 6 lines per inch. A special option provides manual switch selection of 6 lines or 8 lines per inch. Double spaced reports are printed at a rate of 800 lines per minute. Information to be printed is received by the printer control unit which decodes it into the necessary pulses to drive the appropriate print hammers. An echo check technique assures the accuracy of the printed information.

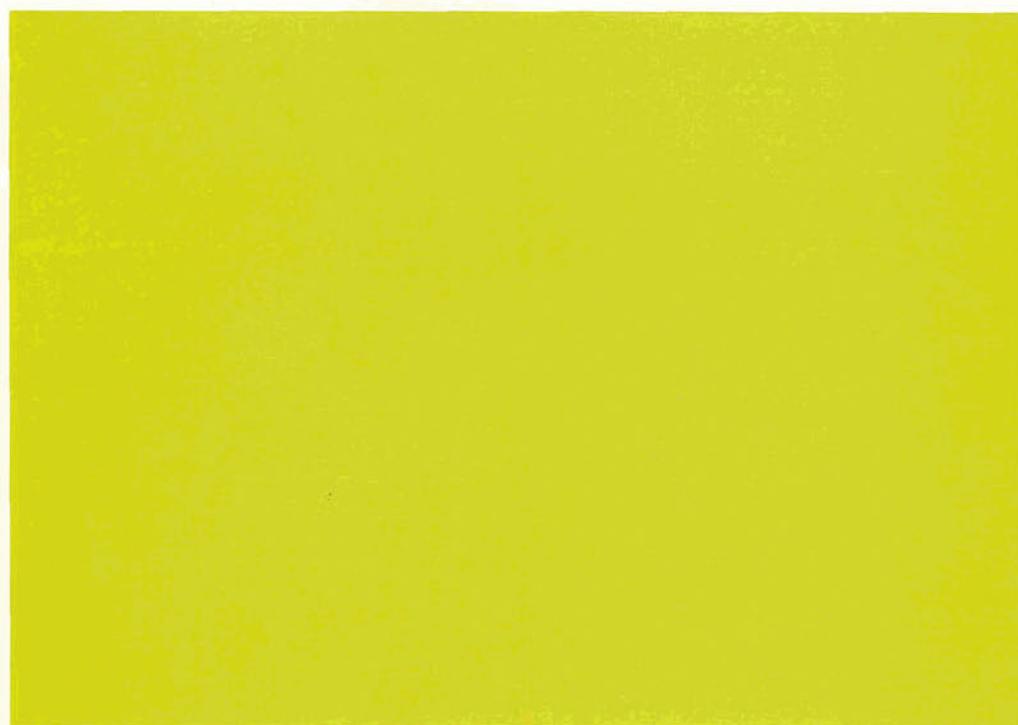
CARD PUNCHES

The standard-speed and high-speed card punches for use with the Honeywell 1800-II operate at a rate of 100 and 250 cards per minute respectively. In all other respects, the operation of these output devices is the same. Both punches may be used on-line or off-line.

Information to be punched on 80-column cards is transferred from the central processor to the card punch control unit for conversion and transmission to the card punch. The first word sent to the control unit specifies the conversion mode required: normal (Hollerith-coded) or transcription. Accuracy of transmission from the card punch control unit to the card punch is verified by an echo checking technique. Standard double punch, blank column detection is available as a further check.

TAPE TRANSLATORS

Magnetic tape translators may be operated on-line with the Honeywell 1800-II. These tape translators provide a means of direct interchange of data between Honeywell and non-Honeywell computers. Data is read automatically from the non-Honeywell tape units into the tape translator. Here, the Honeywell character codes are automatically substituted for the non-Honeywell codes. The information is then sent to the central processor where a Honeywell program edits it before it is recorded on Honeywell tapes. Conversely, the system can also translate Honeywell computer language into non-Honeywell language for recording on other tapes, thus providing complete compatibility.



RANDOM ACCESS STORAGE AND CONTROL

The random access storage file used with the Honeywell 1800-II is a rapid-access magnetic disc memory providing large capacity auxiliary storage. Any combination of characters and digits comprising data and Orthotronic Control words equal to 50,331,000 alphanumeric characters can be stored on twelve magnetic discs. Eight other similar units with capacities ranging from 100,663,000 to 805,304,000 alphanumeric characters are also available. The access time excluding disc latency time varies from 60 milliseconds minimum to 130 milliseconds maximum and will average about 95 milliseconds. Disc latency time averages 34 milliseconds. The transfer rate (the rate at which information can be written on or read from a disc) is approximately 6 milliseconds for a full record, a record being a 64-word group.

MANY OTHER PERIPHERAL DEVICES TO MEET SPECIAL NEEDS

In addition to the standard input and output devices described, the Honeywell 1800-II user may choose from the following: paper tape equipment; data transmission units; real time controls; and inquiry stations.



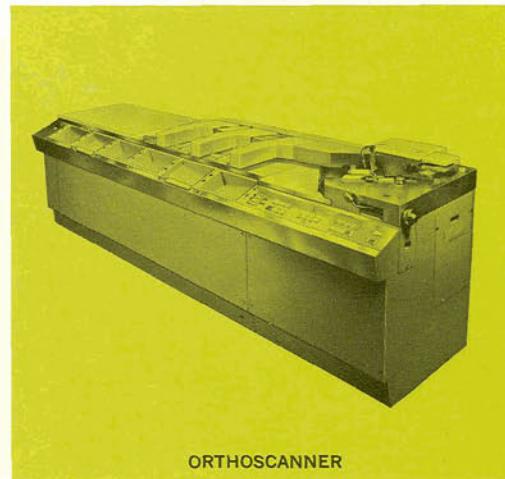
OPTICAL SCANNER



RANDOM ACCESS STORAGE



COMMUNICATIONS CONTROL



ORTHO SCANNER

PROGRAMMING THE HONEYWELL 1800-II

The complement of instructions in the Honeywell 1800-II has been designed to perform all normal data processing operations of both business and scientific applications with the greatest efficiency and flexibility possible. These instructions include general instructions, masked and unmasked; inherent mask instructions; peripheral instructions; simulator instructions; and scientific instructions.

The Honeywell instruction word is an easy-to-use, 48-bit, three-address word. For most instructions the word is divided into an operation code and three addresses.

BIT 1	13	25	37	48
COMMAND CODE	A ADDRESS	B ADDRESS	C ADDRESS	

For example, the instruction DA/PAY/OVERTIME/GROSSPAY performs decimal addition on the contents of location PAY and OVERTIME and puts the sum in location GROSSPAY. The instruction would be performed in eight microseconds.

The full power of these instructions, however, lies not only in their speed but in the flexibility they allow the programmer. Such techniques as masking, whereby the programmer can perform arithmetic operations on fields of less than word length and select data from within a word; and indexing, whereby index registers are used to augment memory addresses, are an indication of the full power of the Honeywell 1800-II instructions.

HONEYWELL AUTOMATIC PROGRAMMING AIDS COMPLEMENT AND CAPITALIZE ON THE CAPABILITIES OF THE HONEYWELL 1800-II

The many outstanding automatic programming aids written by Honeywell are available free of charge to every Honeywell 1800-II user. These include an assembly system, two business compilers, a scientific compiler, and a computer optimization package of special operating routines.

ARGUS

AUTOMATIC ROUTINE GENERATING AND UPDATING SYSTEM

The ARGUS programmer uses easy-to-learn symbolic codes to write his programs which are then automatically assembled, translated, and expanded into the complex pattern of machine instructions necessary to instruct the computer in the most effective manner possible. ARGUS provides the programmer with the ability to incorporate a large number of pre-checked program segments, thus relieving him of a major portion of the programming effort.

FACT

FULLY AUTOMATIC COMPILE TECHNIQUE

FACT is Honeywell's outstanding business compiler which accepts programs written in English language statements and translates these programs into thousands of corresponding machine instructions. With FACT, all programs make "business sense" and no time is lost in programmer-to-management translation.

PROGRAM REVIEW AND EVALUATION TECHNIQUE

PERT was originally developed by the U.S. Navy to control the activities of the many contractors engaged in the Polaris missile project. This technique proved so successful that it has since been taken over by the business world as a management tool for estimating the time required to complete a project and for evaluating the project's status. PERT 800 is Honeywell's efficient and versatile computer program for processing data in applications where PERT is used as a management tool. PERT 800 operates on the Honeywell 800, 800-II, 1800 and the Honeywell 1800-II. The program vastly reduces the work involved in processing PERT networks by enabling the computer to perform automatically the many required computations and to provide management with timely, comprehensive information on which to base operational decisions. In many areas, such as in the variety of output reports which may be requested, PERT 800 offers much greater flexibility than other PERT programs.

PERT

COMPUTER OPTIMIZATION PACKAGE

COP is comprised of a group of routines which efficiently automate program testing, operating, and maintenance. COP includes monitoring and scheduling routines to facilitate parallel processing, program test systems, thoroughly tested library routines, sort routines, tape handling and maintenance routines, simulator routines, and SCOPE (System to Coordinate the Operation of Peripheral Equipment), which is capable of operating up to seven different peripheral devices simultaneously.

COP

COBOL

COMMON BUSINESS ORIENTED LANGUAGE

Developed by the government and a group of computer manufacturers and users, COBOL is an English language business compiler which allows programmers to write programs in a common language and adapt these programs to run on more than one computer. Honeywell's implementation of COBOL provides an unusually fast compiler; and Honeywell COBOL programs may be processed in parallel on the Honeywell 1800-II with other programs.

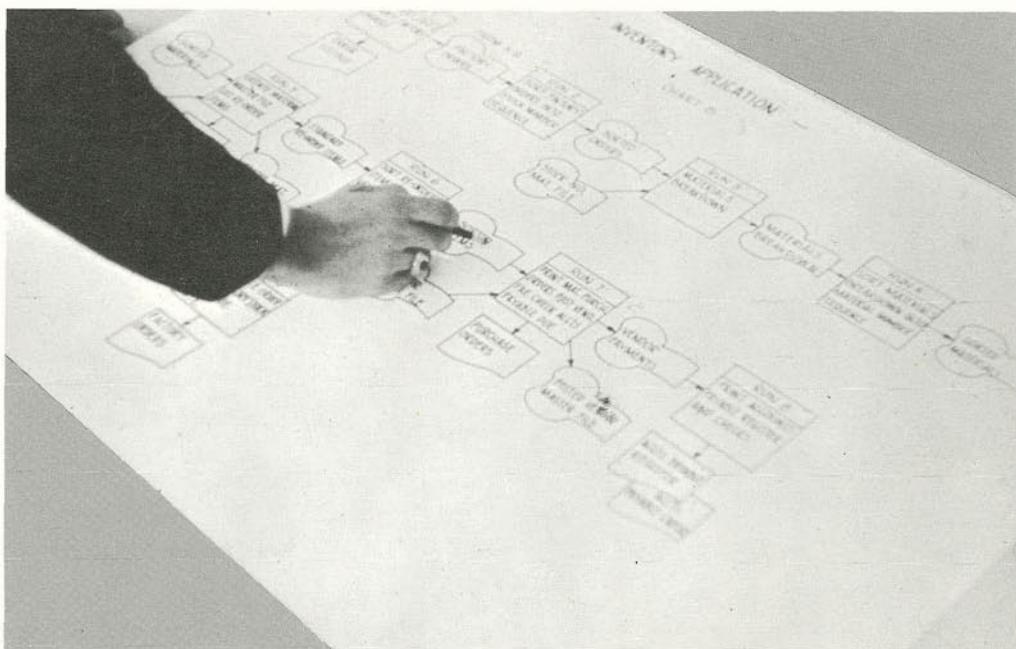
AUTOMATH 1800

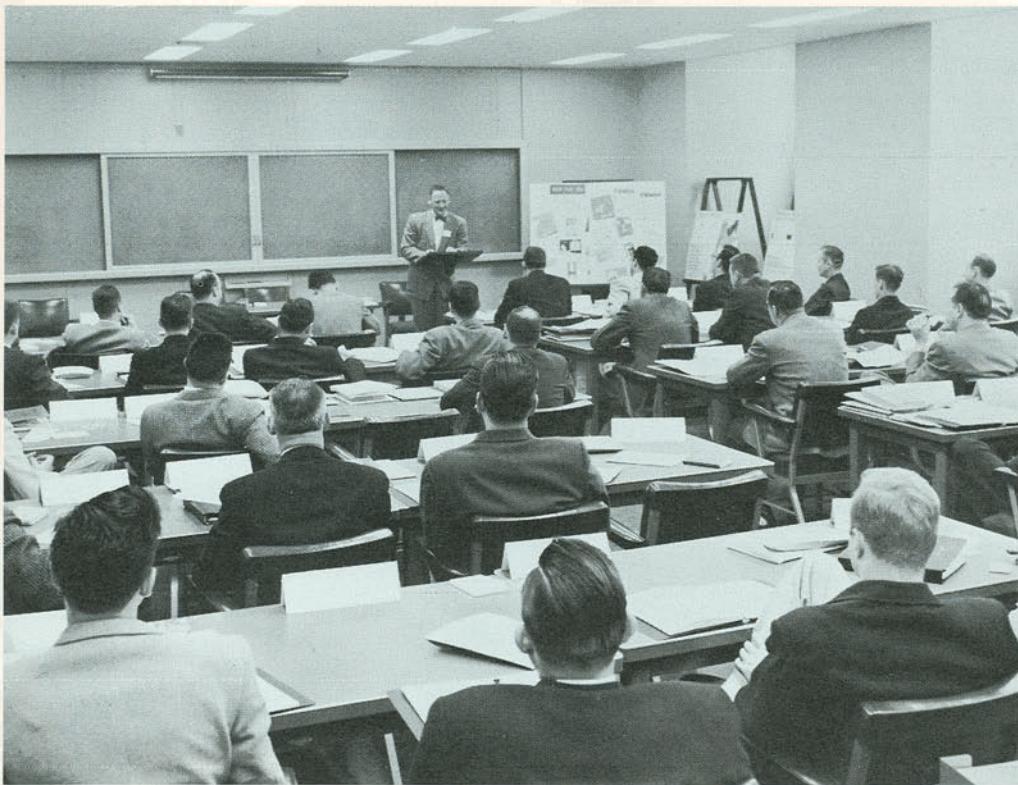
HONEYWELL'S SCIENTIFIC COMPILER

Using the Automath compiler, mathematicians and engineers can write programs for the Honeywell 1800-II in the mathematical language and symbols familiar to them. Once written, an Automath 1800 program is compiled, assembled, and executed under control of the outstanding Honeywell 1800 monitor in one continuous operation. Automath programs use the most recent version of Fortran statements, and, with relatively little modification, programs written for a non-Honeywell computer can run on the Honeywell 1800-II.

CONTINUING CUSTOMER SUPPORT

Honeywell's support program goes into effect long before your Honeywell 1800-II is installed and never stops, helping you to realize the maximum return from every data processing dollar you invest.





SYSTEMS ANALYSTS from Honeywell go to work for you when you first formulate your data processing plans. They assist your staff in studying your data processing requirements and developing the most efficient and economical solutions to your problems.

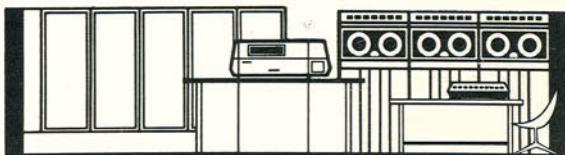
HONEYWELL INSTALLATION SPECIALISTS begin many months in advance to help you prepare for your computer installation. They help your methods and engineering personnel to choose the best location for equipment, draft equipment and space layouts, provide specifications for raised floors and air conditioning, set up safety standards, and many other such tasks.

EDUCATION PERSONNEL provide the training necessary to meet all your needs. Everything from operator training to executive seminars is offered to prepare your personnel for your data processing system. Each class is taught by instructors who have a broad background in electronic data processing, and modern teaching techniques are employed to speed the learning process and further reduce your personnel costs.

Maintenance engineers keep your system in top operating condition at all times to assure maximum productive "up-time". (Honeywell's "up-time" record is far ahead of the industry average.) Honeywell resident engineering personnel carry out daily diagnostic tests and perform preventive maintenance on the equipment to give you reliable, efficient and economical operation.

Honeywell

ELECTRONIC DATA PROCESSING



WELLESLEY HILLS 81, MASSACHUSETTS