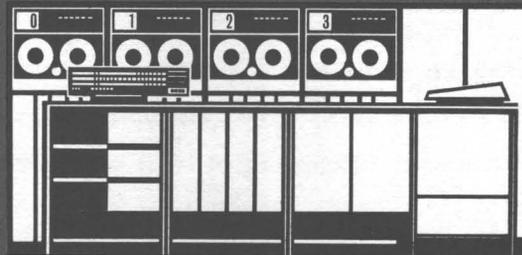


COMMUNICATIONS Systems and Devices SUMMARY

for the H-200/H-300/H-2200



Honeywell
ELECTRONIC DATA PROCESSING

These computers:	can be connected via these communication services:	to these terminal devices:	for these purposes:
Honeywell 200 Honeywell 300 Honeywell 2200	Leased private lines WATS TELEX TWX TWX C. E.	Other computers Magnetic tape units Card punches Card readers Tape punches Tape readers Teleprinters Character printers Line printers	Inquiry handling Data collection Management control Message switching

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 Electronic Data Processing Division
 Wellesley Hills, Massachusetts 02181

Honeywell Computer-Communication Capabilities

The ability to link computers to communication networks has greatly increased the value of computers to business and industry. Direct communication makes a central computer a working tool of branch offices, warehouses, plant locations, and other far-flung stations. It allows the computer to gather information more efficiently and to disseminate the results of its processing more rapidly. Production, inventory, and sales data can be assembled, processed, and distributed in a small fraction of the time that was previously required. Facts of interest to a field manager can be extracted from the computer's files in seconds. Management can be directly apprised of situations requiring fast executive decisions or action.

Computer-communication is a new operations weapon that offers tremendous competitive advantages to those businesses that are first to grasp and utilize its possibilities.

COMMUNICATION IN BUSINESS DATA PROCESSING

Applications that wed computers with communication systems are as varied as business organizations themselves, but they fall essentially into three basic categories: (1) inquiry handling, (2) data collection, and (3) message switching.

Inquiry Handling

In conventional computer systems with large files, inquiries are generally handled on a periodic basis. They are accumulated in some manual form, converted to punch cards or magnetic tapes, sorted to the same sequence as the records in the master file, and processed as a group. Answers are printed or punched and ultimately distributed to fulfill the original requirement. In many instances, such batch handling of inquiries is perfectly adequate.

Where more immediate response to inquiries is desired or necessary, an on-line inquiry system may be the answer. Master files are stored in such a fashion that any record is, for all practical purposes, as quickly available (within fractions of a second) as any other. Depending on requirements in terms of speed, size of files, and cost, the file storage medium may be magnetic tape, disc, or drum. Inquiries, instead of being accumulated in batches, are entered from remote points into the computer where they are processed - individually and immediately. Organizations such as banks, airlines, hotels, brokerage houses, and credit checking firms that strive for fast response to customer queries can often benefit richly from this type of system.

Data Collection

The second broad category of computer-communication applications involves the processing of a large number of inputs from one or more remote reporting stations. This category differs from inquiry handling in that the communication is essentially one-way. Computer applications of this type (production or inventory control systems, for example) have generally involved some form of initiating document such as a time card or parts requisition. These are collected and forwarded to a computer center where they are converted to a machine-readable medium and processed periodically in batches.

New developments in data recording and transmitting devices have made it possible for initial data to be forwarded directly to a remote computer via a communication link. The problems of manual collection, transportation, and conversion are eliminated. While the data may still be accumulated into batches within the computer prior to processing, the results are available

for processing considerable earlier, and a great deal of pre-processing work, particularly manual procedures, is completely eliminated.

Message Switching

Many organizations maintain communications among remote company offices via a central message-switching center. This technique offers decided advantages over systems wherein each field office handles message transmission independently. Message switching reconciles incompatibilities among various terminal stations and provides savings in line costs, better message accounting, and more efficient message transmission.

There are many different kinds of switching plans, and they handle messages with varying efficiency. Most of them, however, are characterized by manual or mechanical operations which are slow and error-prone.

A computerized switching system handles messages automatically, at electronic speeds, and with great accuracy. It offers several advantages. For instance, where in manual systems a multi-address message would have to be transmitted or handled once for each destination, a computer transmits such a message to all destinations in one operation. The computer also:

- interprets the message header (which contains sender and destination identification, message and line number, etc.)
- performs error detection and correction while reducing the possibility of errors
- temporarily stores incoming messages and retrieves these messages from storage upon availability of an outgoing line
- queues messages on a priority or a first-in-first-out basis
- converts incoming codes and speeds to those required by the receiving terminals
- maintains message accounting tables
- retransmits lost or garbled messages

As a result of all these and other functions, it affords more efficient use of lines and, consequently, reduced over-all line costs.

MANAGEMENT CONTROL

One advantage of a computer-communication system is its ability to deliver information directly to management. This function can range from simple printers that reproduce summaries or reports at some executive location remote from the computer to sophisticated interrogation devices that permit an executive to query the computer's files for whatever up-to-the-moment facts he may desire.

With such communication capability, the executive (a sales manager, for example) can ask for an up-to-the-minute total of the day's sales, or for year-to-date totals on product sales, or perhaps for a month-by-month comparison. He might ask for a credit report or for how much a particular customer has bought to date.

TAKE ADVANTAGE OF HONEYWELL EXPERIENCE

Connect a computer to a remote terminal unit via a communication line and you have a computer-communication system. But do you have the kind of system that will do the job you want done? Will it have the capability and expandability you need? Can it handle non-communication data processing applications as well? How many communication lines will the system require, and of what type? Should you use leased lines or toll lines? What type of terminal equipment is required? Will a teleprinter suffice at the branch offices, or should you have higher-speed equipment? Do you need error control and correction?

These are a few of the considerations that enter into the planning of a computer-communication system. You may find among the following brief descriptions of actual Honeywell installations some answers to your own requirements.

● A large distributor uses a Honeywell communication system – two home-office computers linked by teletype to several warehouses – to handle an average of 3,000 orders per day on its inventory of 20,000 items. Orders are transmitted from the warehouse to the computer, which checks the customer's credit, computes quantity, brand, size, and price, and transmits the totalled invoice back to the warehouse in minutes for immediate delivery of the order. In addition to faster service, this prompt, efficient system enables the distributor's customers to reduce inventory by performing continuous stock control. The computers also provide complete analysis of sales trends and customer buying habits and perform all accounting functions.

● A large manufacturer uses a Honeywell system for double duty, handling both data processing and message switching. The computer controls and relays communications among a hundred teletypewriter stations from coast to coast. The operation is completely automatic once the message has been entered into the system. The message is punched into paper tape and placed on a tape reader, and the computer is notified of the readiness of the message to be transmitted. Computer time is automatically allocated to reception of the message, and the computer stores the message and forwards it upon availability of a line to the outgoing destination. An answer-back feature tells the computer that the message has been received by the correct station; also, the computer will cause a printout at the sending station, confirming that the message has been received by the computer and is being forwarded.

● A Honeywell system geared to handle some 300,000 inquiries per day is used by a nationwide credit bureau. Subscribing companies send their credit inquiries to one of eight transmission terminals scattered throughout the country. From these terminals, the inquiries are transmitted to the credit bureau's computer center where they are checked against bad debt files maintained up to the minute on magnetic tape. Replies are returned to the inquiry originator within 24 hours.

● A trucking firm uses a Honeywell communication system to link its several freight terminals with a Honeywell computer at its home office. Before shipments leave the terminal, freight data is transmitted to the computer, which assigns delivery routes, computes charges, and transmits a final freight bill to the destination terminal. This last feature is a highlight of the system. Trucks do not have to wait for bills and can thus depart as soon as they are loaded. In addition, the receiving terminal knows in advance what to expect by way of incoming shipments and can therefore schedule its business day much more efficiently. Important by-products of the system are management reports on sales, service, and performance.

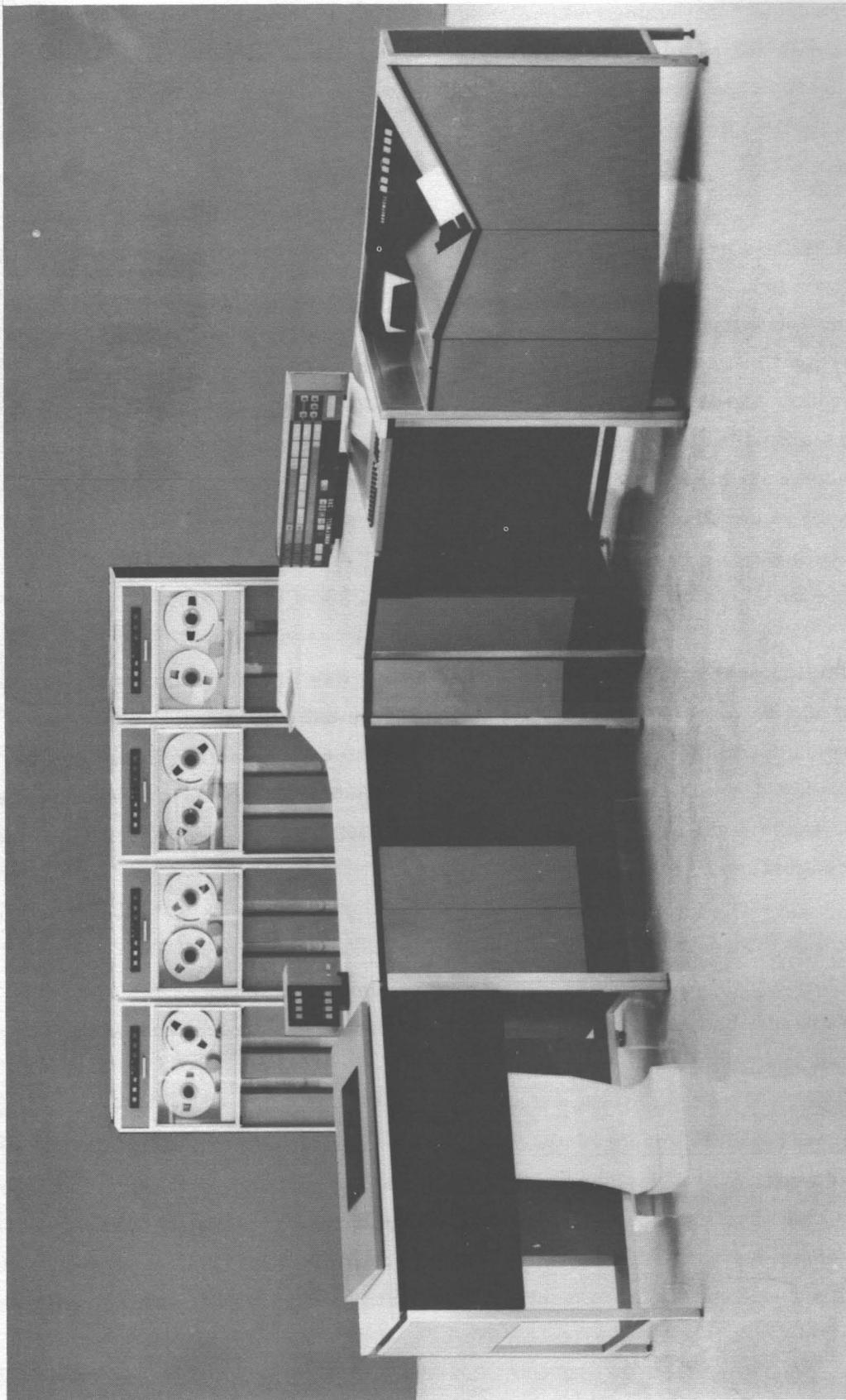
HONEYWELL 200, 300 AND 2200 COMPUTERS

The selection of the right computer will go a long way in determining whether your communication system will be a success or only a mild improvement over existing procedures. Many computers can handle communication, but some are better equipped for it than others. Three such systems are Honeywell's 200, 300, and 2200 computers. The most outstanding feature of these systems is their ability to handle both communication and conventional data processing applications concurrently.

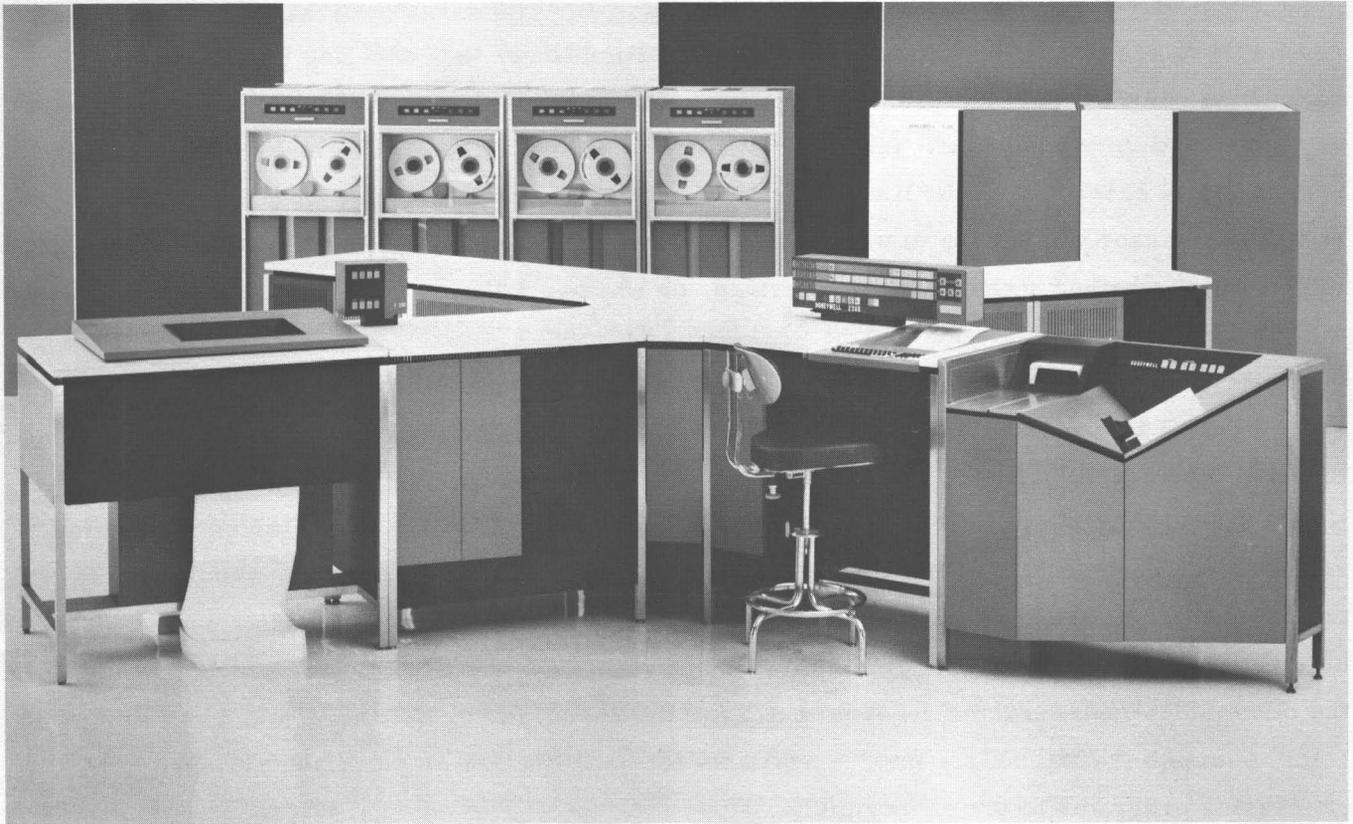
Communication and Conventional Data Processing - Concurrently

Thanks to simultaneity and the automatic interrupt feature, Honeywell 200, 300, and 2200 computers can handle both communication and conventional data processing at the same time.

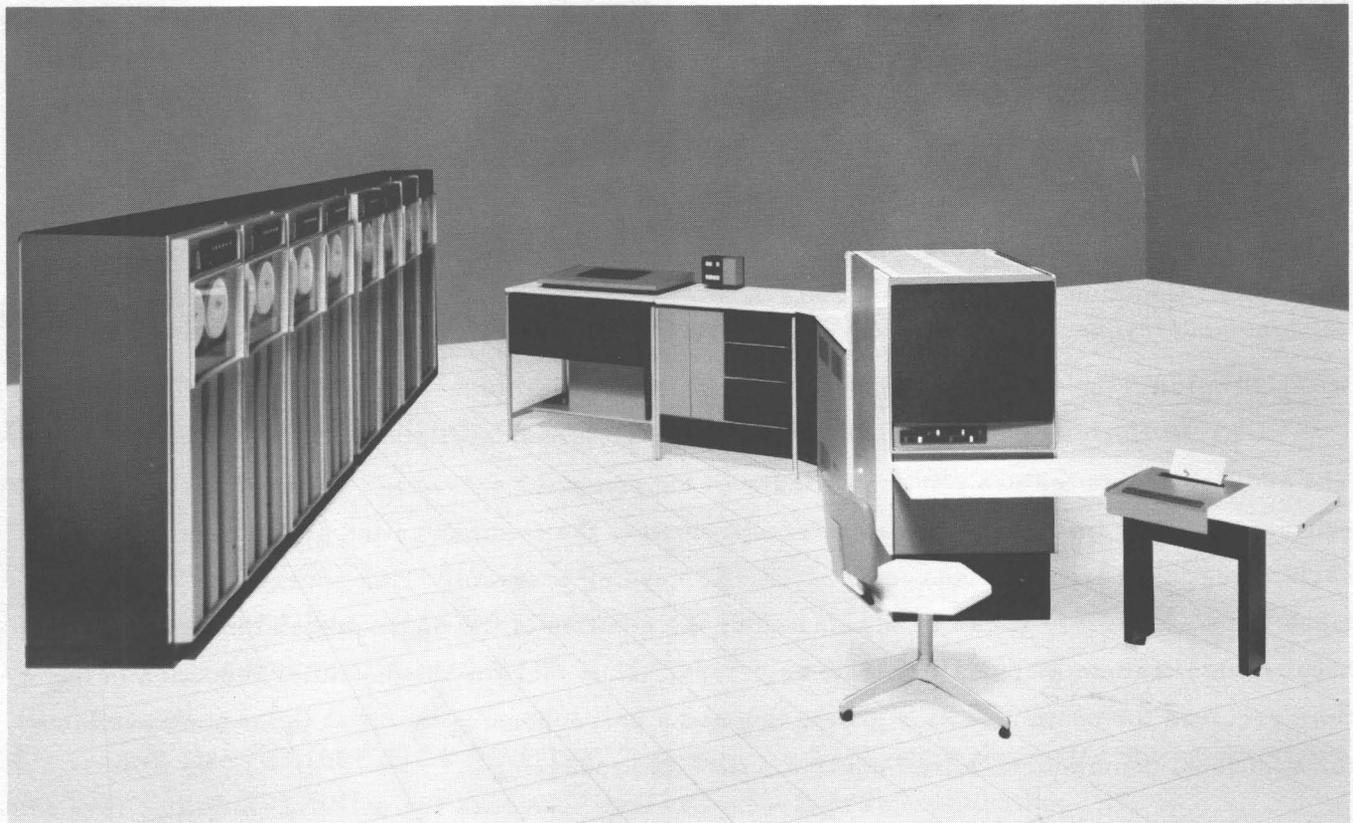
SIMULTANEITY is the ability of Honeywell computers to direct the flow of data to and from several peripheral devices concurrently. It delivers much greater throughput than serial systems in which only one peripheral device at a time can transfer data. This greater throughput is simultaneity's chief contribution to integrated communication/conventional data processing systems. While other systems might fail under a double load such as this, Honeywell's simultaneity assures high production rates on conventional applications even while handling heavy communication traffic.



Honeywell 200 Computer



Honeywell 2200 Computer



Honeywell 300 Computer

AUTOMATIC INTERRUPT AND INTERRUPT ROUTINE - The purpose of the interrupt routine is to assure timely servicing of communication lines, thus avoiding loss of data and permitting conventional data processing to be handled concurrently. Honeywell equipment incorporates a completely automatic interrupt facility. The advantage of this interrupt is that the presence of a character on the line automatically triggers the interrupt routine; otherwise, the central processor would have to waste valuable time in continually testing the lines (via program) to determine whether a character has arrived, or whether a line is ready to send another character. Here's how the interrupt routine works.

Assume that you are running a conventional data processing program, such as payroll, and that data is being transferred to and from several peripheral devices simultaneously. At some point, the automatic interrupt is set off by the arrival of an incoming character on the communication line. The central processor completes its current payroll instruction, handles the incoming communication character (while read/write channels continue to transfer payroll program data between peripherals and main memory), and returns to the payroll program. Processing the communication character requires but a few microseconds in all; therefore, even with heavy communication traffic, ample time is available for handling one or more conventional data processing programs at the same time.

High-Volume Data Communication

The memory cycle times of the H-200, H-300, and H-2200 computers are 2, 1.75, and 1 microsecond, respectively. These speeds, much faster than those of systems in comparable price ranges, enable complete processing of communication data even when transmission is at high volume rates: 2400 characters per second for multi-line systems and 5100 characters per second for single-line systems. Much higher rates than these are possible (see section on "Honeywell Communication Control Units").

Multi-Programming Provides Added Communication Capability

A particularly attractive multi-programming feature is available with the Honeywell 2200. The addition of this feature eliminates many of the computer operations included in communication processing. For instance, when an interrupt occurs, the communication program borrows certain registers from the conventional data processing program. This "borrowing" process takes time. However, it can be eliminated by the addition of the multi-programming feature because this feature includes duplicate registers. Thus there is a substantial reduction in the time required for communication processing and a corresponding increase in the time available for additional communication and conventional data processing.

Honeywell 200, 300, and 2200 Computers Do Not Require Expensive Buffers

The character-handling capability of Honeywell 200, 300, and 2200 computers corresponds with the character operation of communication facilities. When handled one character at a time, communication does not require expensive buffer units to compile incoming characters into blocks acceptable to the central processor. Also, character operation contributes to extremely easy and flexible programming.

A Full Line of Software for Extensive Message Handling

To complement the high-performance features of the 200, 300, and 2200 computers, Honeywell provides an extensive and efficient message-handling software package. This package can be subdivided into simple routines fitting all user needs, from highly sophisticated message switching to polling systems involving only a few lines. Some of these routines and their specific functions are:

INTERRUPT ROUTINE .. determines which communication line is demanding service and whether the line is incoming or outgoing. It recognizes the priority of high-speed lines over low-speed lines in gaining access to processing routines. Additionally, it provides a means of distributing the processing time to critical operations over less demanding operations, resulting in a higher throughput capability.

REAL TIME INPUT ANALYZER ROUTINE .. provides conversion of the communication code to that used by the computer, interprets the message header (if necessary), provides for the accumulation of the message in memory, requests storage assignments, checks message format for validity, generates output queue requests for the output routine, and appends control information to the message for later use.

OUTPUT STACKING AND INTERFACE ROUTINE .. provides efficient output communication from the central processor. It places requests for messages, receives the messages from output queues, and provides for their transmission. It also keeps track of queues for each line and of line priorities.

RANDOM ACCESS STORAGE AND RETRIEVAL ROUTINE .. consists of a number of functions involving the allocation of random access storage, reading and writing records, placing and retrieving queue entries, and performing all message-queuing functions.

LINE STATUS DIRECTOR ROUTINE .. performs all activities associated with determining the availability of each line and exercises over-all control of line utilization.

DATA PROTECTION PACKAGE . . recognizes incorrect messages and notifies the message desk of error while directing the sender to retransmit. It also control procedures for correcting such conditions as excessive errors due to faulty lines. Corrective action for error conditions extends from disconnection of faulty lines to branching to error correction routines.

FAST-ACCESS STORAGE

A major requirement of many communication applications, such as those involving inquiry and message switching, is fast access to information which has been placed in storage. Of course, core memory provides the fastest access possible. But when dealing with large files, core memory becomes too expensive.

To fill this need for economical storage, Honeywell offers three fast-access devices, magnetic drum, magnetic disc, and magnetic tape. All are available in a range of capabilities, and each has its own strong points. For instance, the drum can access any record at random in an average time of 27 milliseconds. On the other hand, disc units, while not as fast, can store 100 million characters.

With intelligent file layout, Honeywell magnetic tape units provide sufficiently fast access for the majority of applications, and they are by far the most economical of the three types of devices in terms of storage capacity per dollar. Moreover, they feature Honeywell's own vacuum-transport operation, acclaimed throughout the industry for its protective handling of tape.

LARGE AND VARIED PERIPHERAL CAPABILITY

Associated with the Honeywell 200, 300, and 2200 computers are a large number of input/output trunks to which a wide variety of peripheral devices can be connected. In addition to fast-access drums, discs, and tapes, Honeywell offers many other types of highly respected peripheral equipment: several models of card equipment, including the latest Honeywell optical card reader which uses less than 1/20th of the memory cycle time required by conventional card readers; printers of intermediate-to-high speeds, and offering a variety of character sets and varying numbers of print positions; paper tape units, MICR equipment, and many other devices - all available in a range of capabilities.

The Honeywell 200, 300, and 2200 computers all use the very same peripheral devices, that is, any device used by the 200 can also be used by the 300 and 2200. This and the fact that their central processors provide data compatibility are advantages that are capitalized upon by a number of Family Interface (switching) units, making for some highly imaginative and profitable systems, as discussed in the section on "Total Systems Integration."

HONEYWELL COMMUNICATION CONTROL UNITS

To computer flexibility add communication flexibility. One of the most outstanding features of Honeywell communication systems is the broad selection of communication services (lines, speeds, terminal devices) to which Honeywell computers can be connected. This selection is larger than that offered by any other manufacturer. Furthermore, a greater mix of these services can be hooked up to a single Honeywell computer than is possible with any other system.

This wide choice of communication services is due to a corresponding array of Honeywell communication control units, each perfectly matched to the transmission characteristics (speed, code, etc.) of a particular type of communication service and remote terminal. The function of these controls is to act as interfaces between communication lines and the computer, facilitating the flow of data in and out of the system without waste of time or loss of information.

More specifically, Honeywell communication control units: provide one- or two-character buffer storage for incoming and outgoing data; assemble data coming into the computer and disassemble data being transmitted from the computer; test lines for incoming data and distribute data for transmission; generate interrupts; and control "handshaking" functions, that is, synchronize the sending and receiving stations for message transmission.

Single-Line and Multi-Line Capabilities

There are two basic types of communication control units associated with Honeywell 200, 300, and 2200 computers: the 281 single-line unit, and the 284 multi-line unit. The 281 features a high transmission speed of up to 5100 characters per second; higher-speed units are possible and will be furnished upon request. While the 281 accepts only one line, several stations can be tied to this line and can transmit information on a scheduled basis.

The paramount feature of the 284 is its ability to receive and transmit data over as many as 63 lines simultaneously, though it requires only one computer input/output trunk. It is designed to accept lines having speeds of up to 300 characters per second and using any of the three communication modes: start-stop, bit stream, and parallel by character. The over-all character speed of a 284 is determined by the particular system's requirements: under the busiest circumstances - 63 lines representing a random mix of speeds, codes, and transmission methods, and all contending simultaneously for the computer's attention - a high rate of 2400 characters per second can still be maintained without interruption while the data flows from lines to storage units (tape drive, drum, disc) and back to the lines again. Ordinarily, such a high rate would not be required even by a high volume, 63-line message-switching system.

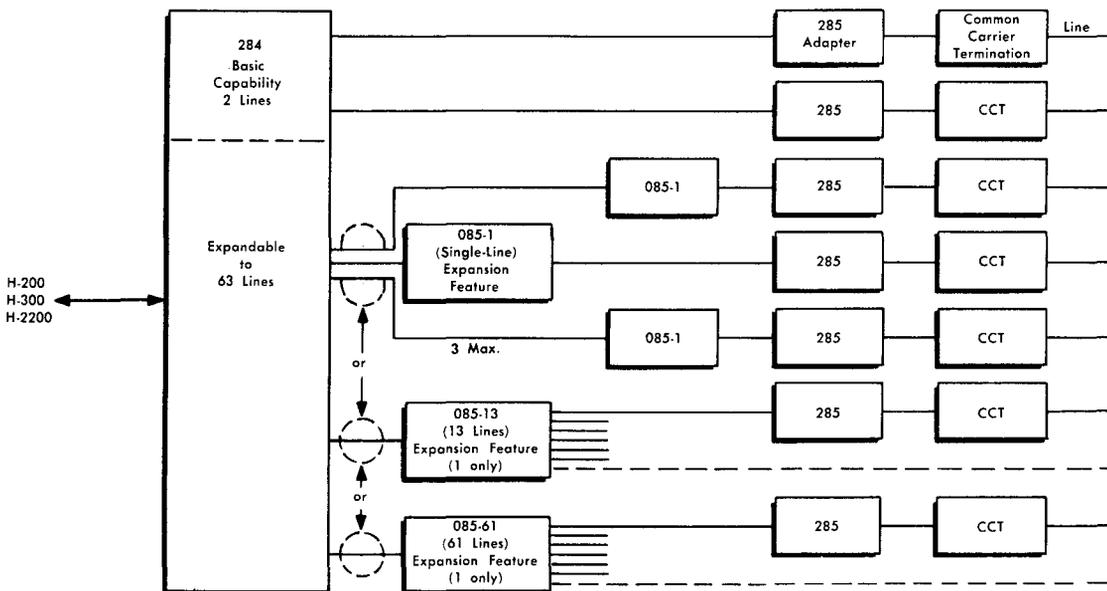
Codes

Both the 281 and the 284 handle 5-, 6-, 7-, and 8-level codes. The modular design of Honeywell control units makes it easy to add special units for other codes.

Multi-Line Expansion

The 284, because it must handle so many lines of different types, was modularly designed so that the system could be easily changed. A 285 adapter unit is connected to each line in the 284 multi-line system and performs the line interfacing functions for the 284. Therefore, the same 284 can be used when the user's requirements change.

In addition, the 284 multi-line control is designed so that the user will pay for only the line capability that he needs. Starting with only two lines, this capability can be gradually expanded to 3, 4, 5, 15, and 63 lines (see illustration).



284 Multi-Channel Communication Control: Serves two lines.

085-1 Expansion Feature: Expands 284 line-handling capability by 1 line (max. of 3 per 284).

085-13 Expansion Feature: Expands 284 line-handling capability by 13 lines.

085-61 Expansion Feature: Expands 284 line-handling capability by 61 lines.

Wide Variety of Communication Controls - Wide Selection of Services

The 281 single-line control unit and the 285 adapter (which handles line functions for the 284 multi-line control unit) are each available in many models. Each model corresponds to a particular type of communication service and terminal device (see "Lines, Services, and Terminal Devices"). The 281-1A, for instance, connects directly to a Western Union Telex station operating at 66 words per minute for on-line transmission and reception of data via Western Union Telex service. Models of the 285 adapter units correspond with those of the 281

in designation and type of service: the model 285-1A adapter also connects to a Western Union Telex station using the same speed and service as the 281-1A.

Transfer Modes

The 284 multi-line control is designed to handle 63 lines simultaneously, and communication between the lines and the computer occur on a character-by-character basis, with each character generating an interrupt. The 281 single-line unit can operate in either the character mode (character-by-character) or the message mode. When in the message mode, the control fills (or transmits from) a programmer-defined area in main memory, generating only two interrupts, one at the beginning and one at the end of each message.

Data Protection

Data being transmitted and received by a Honeywell communication control can be protected in many ways:

CHECK FOR TRANSMISSION LAPSES - An indicator, which can be tested by the controlling program, is set if a receiving control senses a signal lapse of longer than a specified duration.

SEMI-AUTOMATIC MESSAGE RECEIPTING SYSTEM - A communication control can be instructed by the controlling program whenever necessary to send a special "request-for-answer-back" signal in order to test the current status of communication. The receiving device may then send one of three special "answer-back" codes which may indicate "satisfactory reception", "last transmission received in error", or other predefined conditions.

PARITY AND LONG CHECKS - For codes with more than 6 bits, a frame parity check is available at no extra cost with 281 single-channel controls, and as an option with 284 multi-line controls. A long check feature is also available with the 281 and with 284's having 15 or 63 lines.

Distinguishing Characteristics of 281 and 284 Communication Control Units	
281	284
Single line	Up to 63 lines
Character and message transfer modes	Character transfer mode
Performs as both computer interface and line interface	Performs as computer interface; 285 adapter interfaces each line
Transmission rates up to 5100 characters per second	Transmission rates up to 300 characters per second per line; up to 2400 characters per second for all lines

DATA STATION

This is Honeywell's new remote terminal device, the Data Station. It is a completely modular unit and offers a wide choice of component devices, all of which can be used for off-line preparation of data and direct on-line transmission to and from a computer. It permits efficient, economical use of telephone-grade lines, operating at speeds up to 120 characters per second. In many ways, it is similar to the terminal devices designed by Honeywell for inclusion in the world's largest commercial computer-communication network.

The Data Station can be used to prepare source data at branch offices, warehouses, different reporting locations throughout a plant, or any other company outpost. It can be one of a large network of Data Stations, or it can be included in a mixed network involving other terminal devices. It can be used for large-volume, high-speed reporting transmissions, or it can be used for high-speed reception of computed invoices and other documents and operational data for your field force. It can be used, in short, for virtually any application involving data transmission to and from a computer. Following are some of its features:

Flexibility

The Data Station is completely modular, permitting flexible systems arrangements. As illustrated, one or several component devices, of different types and varying speeds and capabilities, can be attached to the central control unit.

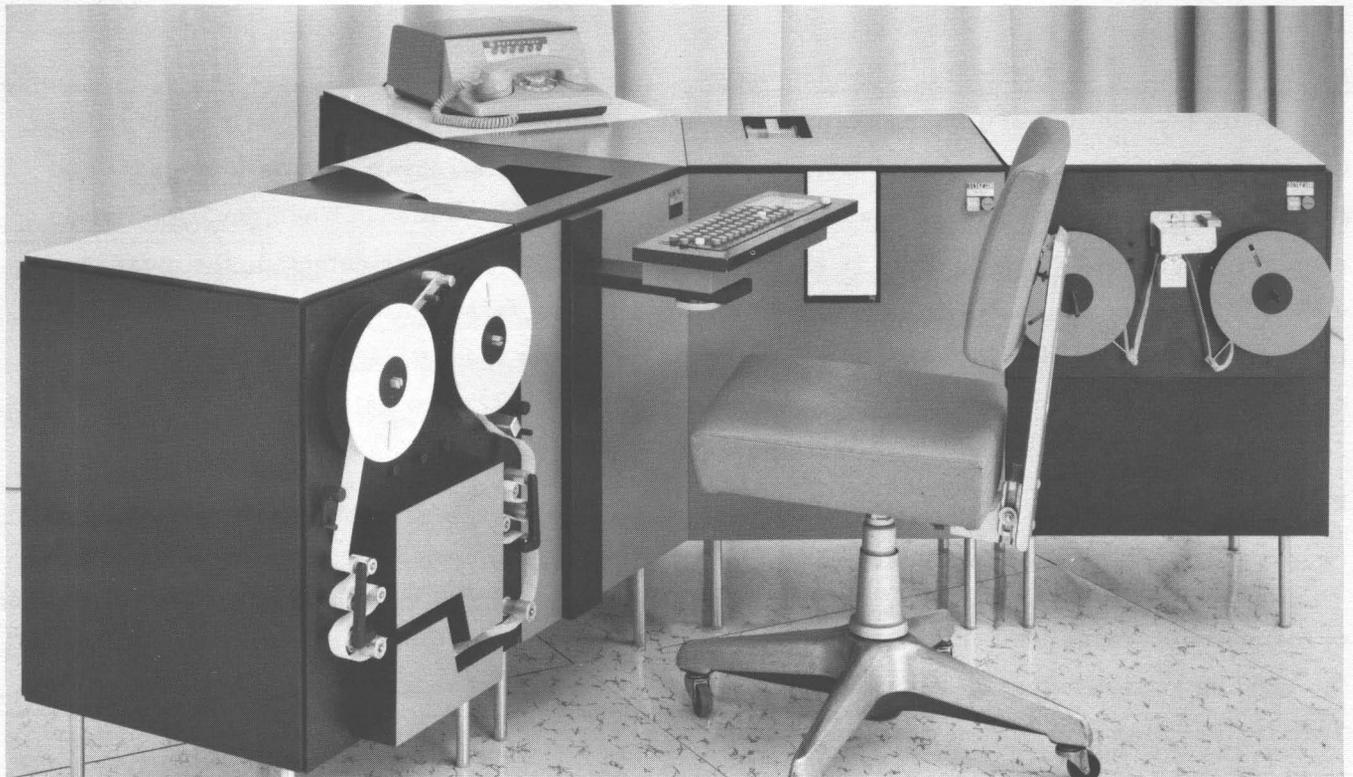
Dual Purpose Use

When not being used for actual on-line transmission, the Data Station can be used off-line for data preparation and editing, etc. Off-line data preparation can take many routes, depending upon your system requirements, e. g., keyboard to paper tape or card to tape with simultaneous printing.

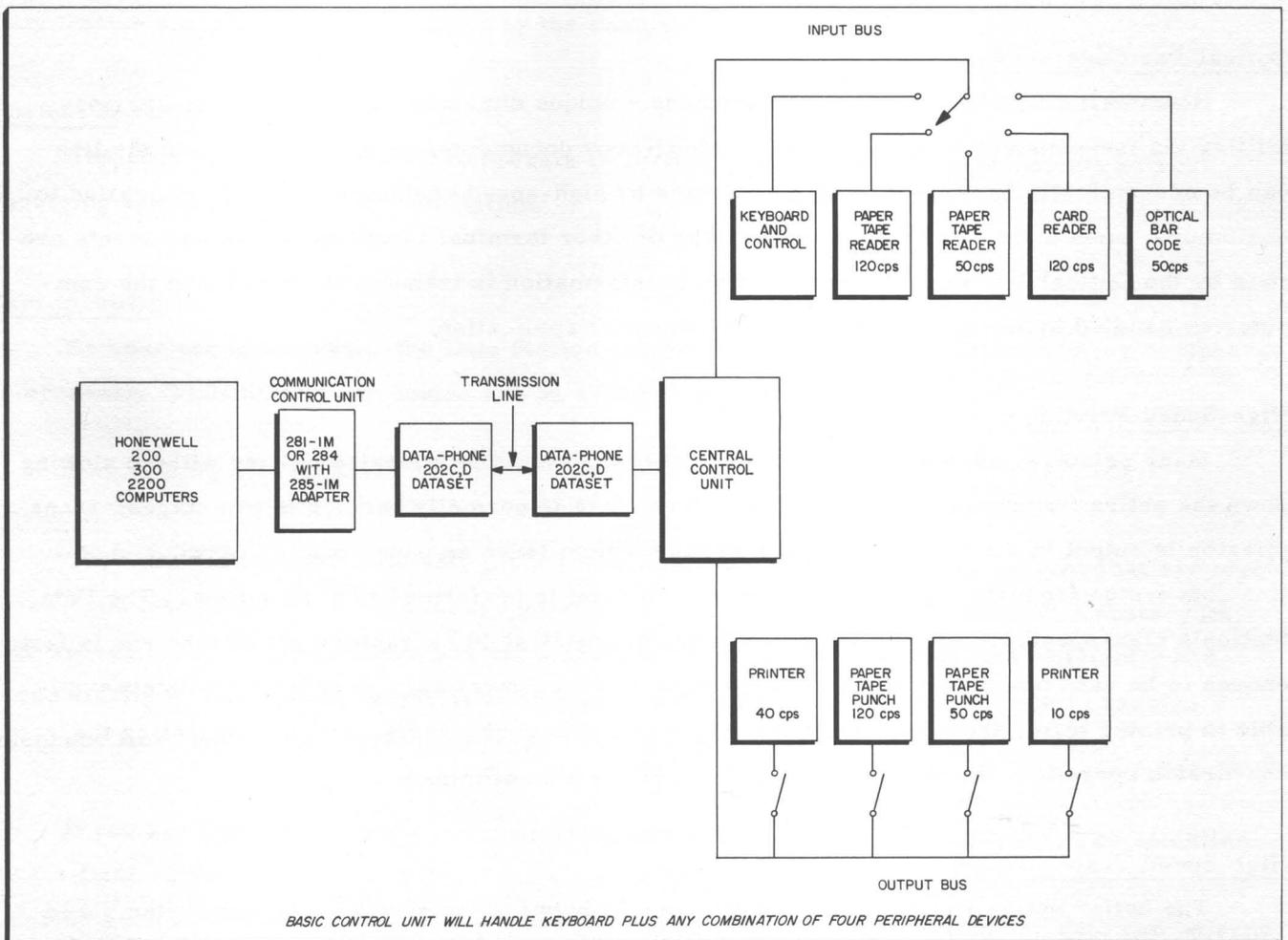
Code and Error Detection

The Data Station uses a standard 8-bit ASCII code which includes parity.

Transmission errors are detected by parity and long (channel) checking. These error detecting features are essential to on-line operation. Although you can count on Honeywell computer systems to deliver outstanding accuracy and reliability, communication lines will occasionally err during transmission due to accidental noise. Consequently, these error-detecting features are recommended for computer-communication applications wherein data coming over the lines will subsequently be processed with other data. Otherwise, one transmission error may be compounded into many other errors.



DATA STATION



DATA STATION Remote Terminal Configurator

Error Correction by Automatic Retransmission

With the addition of a buffer feature (two 132-character buffers), blocks of data containing errors due to transmission can be retransmitted correctly. Retransmission is immediate and fully automatic and, therefore, does not require operator intervention. When the Data Station receives a message in which there is an error or errors, the error is detected, the message is withheld from the output device, a signal is sent demanding retransmission, and the corrected block is retransmitted. By withholding erroneous messages from its output devices pending a correct retransmission, the Data Station eliminates the post-transmission manual editing procedure characteristic of many terminals which must pass transmission errors on to their output devices.

In addition, the automatic retransmission feature eliminates the time-consuming procedure of manually scanning the received data for errors, re-contacting the sending station, and having the sending station manually search for the incorrect block(s) of data before retransmitting. This feature also permits the computer to adhere to heavy and rigid station-calling schedules because the time-consuming jobs and unscheduled calls described above have been eliminated.

Optical Bar Code Reader

Honeywell's Optical Bar Code Reader adds a unique dimension to systems planning possibilities via inexpensive bar-coded media. Multi-copy documents, coupons, bills, and the like can be economically bar-coded in large volumes by high-speed computer printers and mailed to customers; upon their return to branch offices or other terminal locations, these documents are read by the Optical Bar Code Reader, and their information is transmitted directly to the computer or handled in any other way that best suits your application.

High-Speed Printing

Many printers, because of their slower speeds, cannot be operated on-line without slowing down the entire transmission process; therefore, data is normally handled in two stages: transmission is output in the form of a higher-speed medium (such as paper tape or card), and off-line conversion from the higher-speed medium to print is performed at a later time. The Data Station's high-speed printer, on the other hand, operates at 40 characters per second and is fast enough to be used on-line. The advantages of this arrangement are: data is immediately available in printed form; the extra operation (conversion) is unnecessary; and in eliminating the conversion operation, a potential source of errors is also eliminated.

High-Speed Transmission

The buffer option reconciles speed differences between the maximum transmission speed (120 characters per second) and those of Data Station devices. Therefore, transmission can be

maintained at a high speed of 120 characters per second, maximizing line utilization and eliminating the necessity of having the central processor adjust its speed for different devices.

Automatic Operation

In the on-line mode, the Data Station is operated under computer program control; it does not require an operator once the medium has been loaded into the device. Through program control, the central processor will turn the Data Station on or off, select the appropriate peripheral components for reception or transmission, and execute a full data transmission cycle.

Line Sharing

Many Data Stations can economically share a party line. Each station on a party line has its own coded address and can be individually called by the computer via program control.

Interrupt Feature

With the interrupt feature, a particular data transmission can be interrupted to make way for a more urgent transmission, perhaps an inquiry. Interrupts can be initiated either by the Data Station operator or automatically by the computer.

Normal Environment Requirements

The Data Station is designed to operate in normal business office environments without requiring additional cooling or ventilation.

Expandability

As your needs increase, the Data Station can be expanded by the addition of other peripheral components. Multiples of any device can be added without restriction.

Economy

The Data Station is attractively priced to compete with other terminal devices that are much slower and less flexible. It also makes possible large savings in transmission line costs. Its high speeds (up to 120 characters per second) allow you to use a telephone line efficiently and economically - unlike many terminal units whose low speeds are just high enough to require a telephone line, but not high enough to repay your investment in such a line.

If you are currently using a flat-rate telephone service, WATS for instance, you can often tie the Data Station onto this line at no extra cost. Even if yours is a busy line, there is usually a period such as lunch time or evening when the line is inactive. At such times, data can be sent over the lines for little or no charge over your normal telephone bill.

Whatever your telephone billing plan, - flat monthly rate, time on the line, etc. - the Data Station delivers more data for your telephone dollar; operating the Data Station at a rate of 120 characters per second and transmitting data for only one hour a day, five days a week, you can transmit over two million characters of information (equal to 6,000 invoices, 20,000 inventory transfers, or 50,000 stock transactions).

Attractive, Functional Design

The Data Station was designed with a view to many objectives: modularity, high performance, operator comfort, easy operation, and beauty. To achieve these objectives, Honeywell assigned the same crack Honeywell team that designed the H-200 computer, selected by Product Engineering magazine (from the entire gamut of new industrial products) as one of the ten best master designs of the year.

LINES, SERVICES AND TERMINAL DEVICES

Illustrated here are many of the combinations of lines and terminal devices which can be connected to Honeywell computers via 281 and 284 communication control units. It is important to note that the actual selection is even greater than that shown here. For instance, in addition to the terminal devices listed, there are still others which, as long as they have similar transmission characteristics, can be utilized.

Remember, too, that up to eight different services (lines, speeds, terminal devices) can be intermixed on a Honeywell multi-line system.

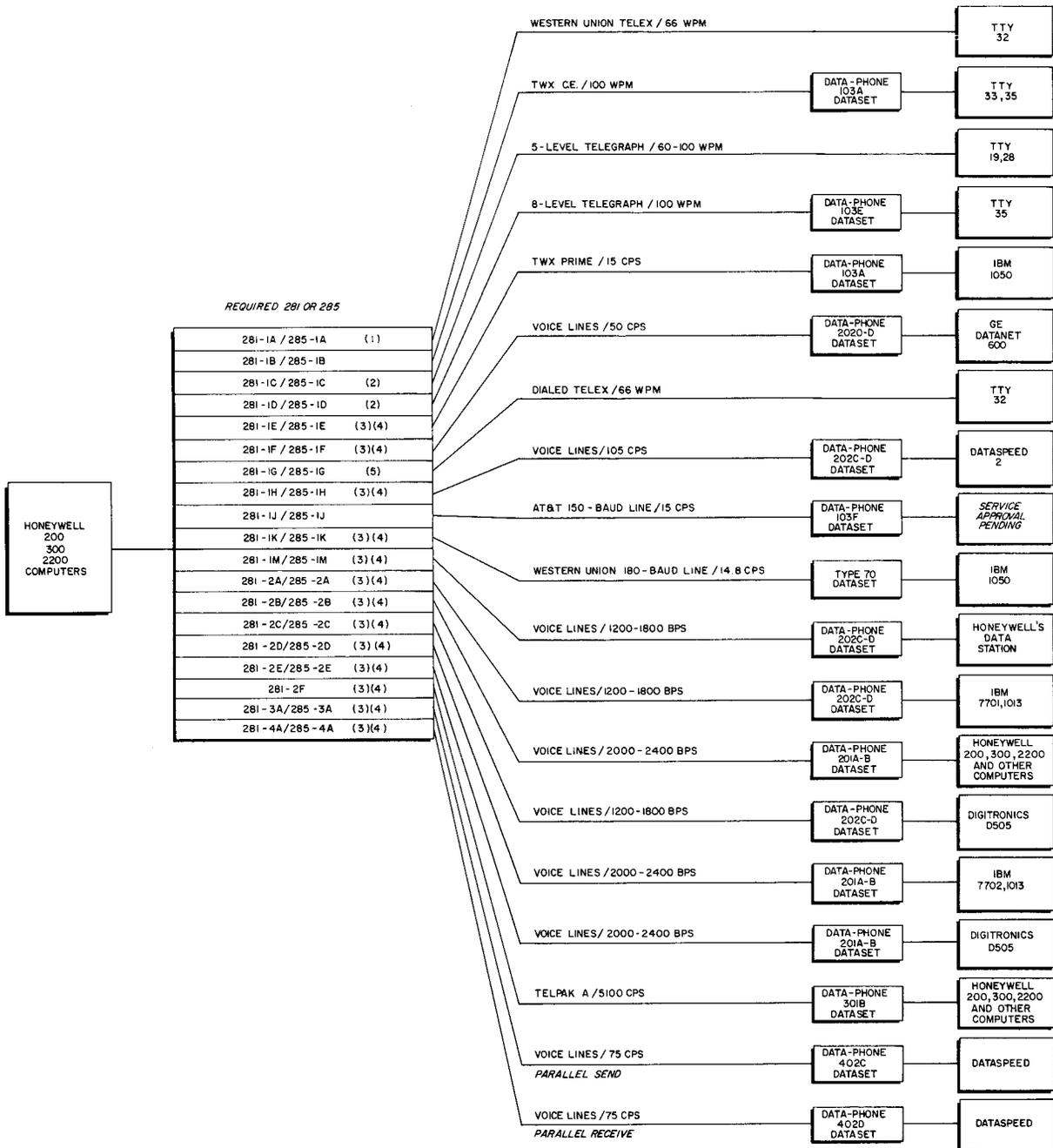
This wide array of speeds, services, and terminal capabilities is unique in the computer industry and affords you the opportunity to select from the broadest, most effective computer-communication package offered today. Furthermore, it is being continually expanded as new services and terminals become available.

Datasets

Datasets are required to convert the data signals used by communicating units to signals acceptable for transmission over certain transmission service lines.

Remote Motor Start

Some data transmission operations - such as transmitting from remote paper tape reader to the computer, or from the computer to a remote printer - are fully automatic and do not require an operator for any purpose other than to turn the remote terminal ON or OFF. However, even this requirement can be eliminated with certain terminal devices - those associated with



A 285-5A AUTOMATIC DIALING UNIT IS AVAILABLE WITH MULTI-LINE SYSTEMS.

- (1) MANUAL DIAL
- (2) PRIVATE LINE USE
- (3) OPTION 086 - PARITY GENERATION AND PARITY CHECK-IS AVAILABLE AT NO EXTRA COST WITH 281, AND AS AN OPTION WITH 284 (ONE PER CONTROL UNIT)
- (4) OPTION 087-LONG CHECK-AVAILABLE WITH 281, AND WITH 284'S HAVING 15 OR 63 LINES
- (5) TO BE AVAILABLE SOON FROM WESTERN UNION

Communication Control Units, Lines, Services and Terminal Devices

Honeywell's 281-1C, 281-1D, 285-1C and 285-1D adapter units. These devices can be turned on and off automatically by a signal sent from the computer. If, then, you wish to transmit and receive data at night, you do not have to pay an operator to attend the terminal device simply for purposes of turning it on and off.

Supervisory Reply Channel

A Supervisory Reply Channel (Reverse Channel) feature is available as an option on Bell System datasets 202C and 202D. This capability allows the continuous return of an "OK" signal to the sending station simultaneously with sending, thus confirming proper and accurate data transmission.

A BRIEF LISTING OF VARIOUS COMMUNICATION SERVICES

Communication companies offer a variety of communication services including special networks and special billing plans. All of the following can be utilized through the Honeywell communication control units.

Leased Private Lines

A leased communication line is sometimes preferable to the switched-message network; this is generally true when a large volume of data is sent regularly to a small number of fixed points. Leased lines are available for both teleprinter and high-speed equipment. The customer is provided with exclusive use of the circuit between two or more locations for a scheduled period of time each day or on a 24-hour basis. Although generally more costly than the switched-message network, leased lines insure availability of the circuit. Both AT&T and Western Union provide polling plans whereby a number of way stations on a line may be either operated as a large party line or called selectively from a control station. Data transmission speed over leased lines is governed by the speed of the transmission equipment.

WATS (Wide Area Telephone Service)

WATS is a special billing plan offered by AT&T. WATS allows the user to make unlimited calls over the switched-message network within a given area for a fixed monthly rate. WATS pertains only to communication over voice-grade circuits. As WATS is only a billing plan, no special equipment configurations are required and the speed of transmission is not fixed.

Telex

Telex is a switched teleprinter network offered by Western Union. Any Telex subscriber may dial any other Telex subscriber in this country and in Europe. Information is transmitted over the Telex network at a rate of 66 words per minute. Telex billing is based on airline distance between stations and the duration of the connection.

TWX

TWX is a Bell System network providing some 60,000 subscribers with a real-time, two-way teleprinter transmission. Teleprinter equipment is connected to the general switched-message network through Bell datasets in the 100 series. TWX provides transmission at 60 or 100 words per minute. The exact configuration of dataset and teleprinter equipment required depends upon the speed desired. Any TWX subscriber may dial any other TWX subscriber. There is a monthly charge for the TWX connection and terminal equipment plus a toll charge for each call made.

TWX - C. E. (Customer Equipment)

This is a new service offered by AT&T to permit the dialed connection of a variety of business machines to a low-speed communication network. This service is similar to TWX, but it does not impose the same restrictions on the type of terminal equipment and signal used. Greater flexibility in the choice of terminal equipment is possible as the business machine can operate at any rate up to 150 bits per second. TWX - C. E. subscribers have unlisted numbers and, therefore, communicate with only those stations on their own hook-up.

TOTAL SYSTEM INTEGRATION

Honeywell's Family Plan

Never have systems been so flexible - or so foolproof - as those fashioned under Honeywell's Family concept. This concept takes advantage of the logical similarities between Honeywell 200, 300, and 2200 central processors, and of the fact that all three systems use the very same peripheral devices, to provide Honeywell systems with another level of flexibility - Family flexibility.

Specifically, a number of Honeywell switching units, aptly called Family Interfaces, freely switch one or many peripheral devices and communication devices between any combination of two Honeywell 200, 300, and 2200 computers, or allow one Honeywell computer to use its associated equipment in the most economical way possible, or permit one of the above central processors to communicate directly with another. In addition to systems flexibility, the user gains equipment-sharing economy, greater equipment utilization, and - for a system that literally won't quit - back-up security.

There are four different types of Family Interfaces. Following is a brief description of each.

One Peripheral Control Switching Unit will switch up to eight Honeywell peripheral control units of any type. All controls connected to any one switching unit will be switched simultaneously;

however, more than one switching unit can be used, and each switching unit can be switched individually. Therefore, if you wish to switch only one control unit (as illustrated), you simply connect it to its own exclusive switching unit.

COMMUNICATION SWITCHING UNITS are used to switch up to 63 communication lines from one 284 communication control to another and thus to provide back-up for both the computer and the communication control unit. However, Peripheral Control Switching Units also can be used to switch communication. For instance, you would use a Peripheral Control Switching Unit, rather than a communication control interface, to transfer the entire communication activity (including random access devices) to a second computer. Such an arrangement is shown in the illustration.

The MEMORY-TO-MEMORY ADAPTER provides bi-directional, high-speed, memory-to-memory linkage between any combination of two H-200, H-300, or H-2200 central processors.

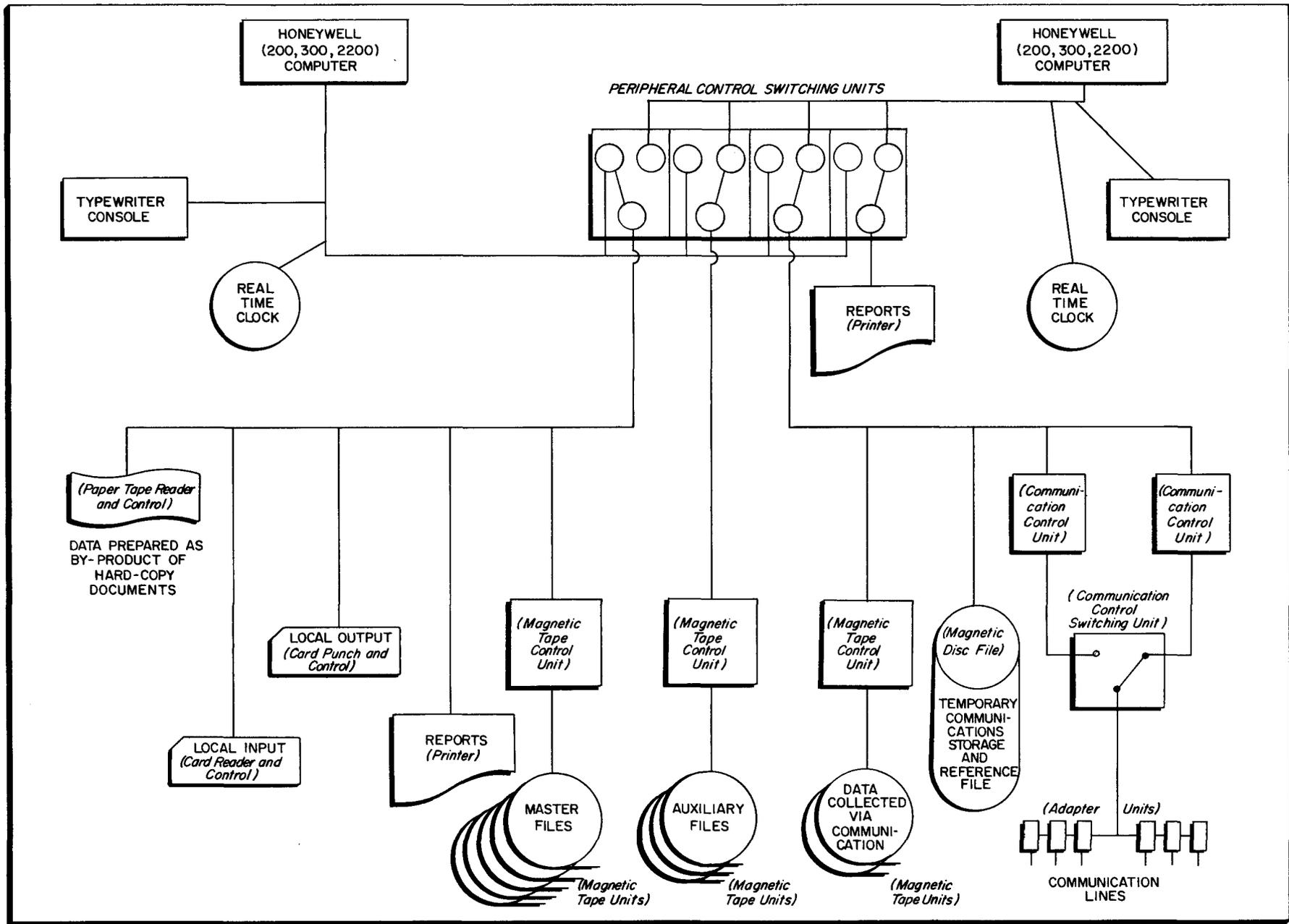
MAGNETIC TAPE SWITCHING UNITS permit switching a large number of magnetic tape drives (up to eight per unit) between two different systems. Switching units can be switched in groups (all units simultaneously) or individually, in accordance with the rules described above for Peripheral Control Switching Units.

BACK-UP PROTECTION

Back-up is vital to any communication system, and Honeywell's Family Interface switching units deliver standby protection in the most efficient manner possible.

Illustrated here is a typical systems configuration using some of these switching units. The computer on the left is performing non-communication data processing, while the computer to the right is handling communication. In the center is a battery of Peripheral Control Switching Units. Note the devices attached to these switching units. Should the necessity arise, communication capability can be shifted, by the flick of a switch, to the computer on the left, thereby averting a communication shutdown. Or, should the computer at the left be temporarily disabled, its peripheral devices could be transferred to the system handling communication. In either event, communication and data processing can be handled simultaneously on one and the same computer while, in the meantime, the disabled computer is being restored.

Within the communication complex itself, a Communication Control Switching Unit is shown. In the unlikely event that trouble arises in one of the control units, the lines can quickly be switched to the other, thus maintaining an uninterrupted flow of communication.



A Typical Integrated System Using Honeywell Switching Units

Sharing Peripheral Equipment

You will also note that two peripheral units, a magnetic tape control (and associated drives) and a printer, are each occupying a switching unit by themselves. All devices connected to any one switching unit are switched simultaneously, but the switching units themselves are switched separately; therefore, being the only units attached to their respective switching units, the magnetic tape control unit and the printer are switched individually.

Such an arrangement can be very rewarding. Many applications have requirements that frequently call for incrementing the peripheral complex. In the application illustrated here, a few individually switchable devices can fulfill this need for both systems. In addition to flexibility, obvious economics result from the use of the same peripherals by two different computers, both of which require the equipment only part of the time. This economy is possible in many applications, and often to a greater degree than shown here.

There Are Countless Interface Combinations

As stated before, this layout illustrates a typical system; it is not a comprehensive display of Honeywell's equipment or switching capability. For one thing, the on-line adapter and tape drive switching units discussed above are not shown in the system illustrated here. For another, we have demonstrated the Family Interface units using a two-computer system, but single-computer systems also can make good use of this concept. For instance, the Communication Control Interface would be used to back up one 284 with another. Or, for high-volume integrated (data processing and communication) systems involving a single computer, data processing might be carried on during the day and communication at night. With the Peripheral Control Switching Unit, you could simply switch at night from a conventional data processing device, such as a card reader, to a communication control, and economize by using two devices at different times on the same pair of input/output trunks.

To exhaust the possible Family Interface combinations would take many more pages than can be allowed here. However, from what has been covered it should be evident that the Honeywell Family Interface concept assures a completely reliable, efficient, and fluid system that can be transformed to meet your requirements with only a flick of a switch. You might review this illustration to see how it would apply to your own operation. Or, simply call your nearest Honeywell representative.

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Note: Terminology used in this text is consistent with that defined in Honeywell's Glossary of EDP and Communications Terms.

HONEYWELL
ELECTRONIC
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WELLESLEY HILLS,
MASSACHUSETTS 02181