INDUSTRIAL DATA PROCESSING APPLICATIONS REPORT

Applications	Real-Time Advance Reservation System
Type of Industry	Motel-Hotel
Name of User	General Data Corp. (Holiday Inns of America, Inc.) Memphis, Tenn.

Equipment Used	IBM 7740 Communications Control System (2)
	IBM 1971 Model 20 Reservations Terminals (2)
	IBM 1311 Disc Units (10)
	IBM 1440 Data Processing System
	IBM 1971 Model 20 Reservations Terminals (886) (In Field)

Synopsis

The Holidex Reservation System controls reservations for 87,200 rooms in some 740 Holiday Inns throughout the United States, Canada, Puerto Rico, and the Grand Bahamas. In addition to the Inns there are 18 sales offices, located in major cities, whose sole purpose is to make future reservations for businessmen, tour groups, conventions, and vacationing families.

The inns, situated in 550 cities, are connected to the communications center in Memphis, Tennessee, by 75,000 miles of telegraph lines, leased from the American Telephone and Telegraph Company. On a peak day as many as 84,000 messages are received, processed, and relayed by the IBM 7740 communications control system via a network of 84 half-duplex circuits.

The job-oriented reservations terminal enables rapid transmission of 11 different types of transactions with minimum intervention by the desk clerks. Based on central availability with local inventory control, the Holidex System keeps the availability status of each inn and its alternates for 365 days, reserves and cancels rooms, creates and forwards sold and cancellation notices, closes and opens room types, seeks out alternate accommodations and locations when requested types are not available, and switches administrative messages. Unless notified by the desk clerk to stop selling a particular type room on a given day, the computer assumes all rooms are available and confirms at a rate of 68 reservations a minute.

The Holidex System has surpassed the expectations of its original design. With maximum response time of 3 minutes, the system is a rapid medium for ordering inn supplies, locating missing persons, and informing innkeepers of bad credit card numbers and skippers. The daily statistics logged on the 1311 disc files provide input for traffic projections, selecting centers for concentrated advertising, analyses of future construction sites and additions to existing inns, and occupancy and denial reports for the individual inns.

Holiday Inns accommodates in excess of 100,000 guests every day. Expanding at a rate of 2.7 inns a week, HIA has 332 new inns either planned or under construction in the United States and Canada with proposed expansion of inns and sales offices into Denmark, Spain, France, Holland, West Germany, Africa, and Australia. Since it incorporated in 1954, HIA has become the world's largest public accommodation system with sales multiplying almost 12 times in the past 6 years.

The completely duplexed central computer system located in Memphis, Tennessee, consists of two IBM 7740 Communications Control Systems each with 16,000 words of core, giving enough memory to hold the complete operational program and the required message buffer area. The program is approximately 13,000 words in length, with the remaining 3,000 words used for message manipulation. There are two IBM 1050 operator consoles, one per system and switchable. A receive-only IBM 1050 printer can be connected to either system. In addition, there are two IBM 1971 terminals, one per system and switchable, and ten IBM 1311 disc units, five per system with each group switchable. There is also a gasoline generator at the control center for emergency power supply. Emergency back-up is the prime reason for the complete duplexing, but the duplication also enables preventive maintenance and full analysis of any program or machine halts.

The file organization consists of a master pack, three output message files, and a transaction log. The master file contains a 500-character master record of information for each inn, its main contents being the inn's room availability for 365 days into the future. Also on this disc are two areas for the flip-flop writing of checkpoint every five minutes and the operational program itself. Three other disc files are used for the daily output messages, consisting of reservation notices and administrative messages. The fourth file is used as a transaction log to record statistics for later reporting on the IBM 1440 or IBM 1401. Statistics include message origin, message destination, time of day, transaction type, etc. The output message and statistics files are daily files; only the master file is a continuous one, and it is updated nightly.

The Holidex Reservations System has designed to afford each Holiday Inn and each sales office the equipment necessary for making an advance reservation for a guest at any other inn in the chain.

Until total conversion in July, 1965, the Holiday Inn chain used a TWX system for reservation inquiries. Each inn had a TWX terminal, and the sales offices had both TWX machines and WATS lines. This method proved incapable of efficiently handling the ascending volume of traffic at a reasonable cost. By 1963 the measured time service varied from $150,000 to $350,000 per month, and the rapid expansion of inns projected prohibitive costs. TWX also required extensive operator intervention, since the clerk had to make a dial-up connection, teletype the message, and wait on line for the second inn's reply. Even if the accommodation were unavailable, the request had to be answered. Two desk clerks were tied to the terminal throughout the transaction, replies were too slow to serve guests properly, and, under the reverse billing system, inns had to accept and pay for calls that did not always result in confirmable reservations.

Approximately 2 years passed between the first system considered and the final configuration. The designers were confronted with a triple problem - the need for a flexible central processor within the right price range; a job-oriented, easily operated terminal; and ready maintenance on field equipment. After studying several proposals, the directors agreed that the IBM 7740 communications

control system possessed the features most applicable to the Holiday Inn requirements. This computer accepts any type of coding system, line, or terminal, and its reasonable cost permits duplexing. The 7740 equipment was intended as a temporary reservation system, operative for no longer than 2 years, and the order for an IBM 360 was placed simultaneously with that for the 7740. The original configuration included four 1311's, but a fifth unit was attached after six months of operation to log the increasing message volume.

Certain conditions unique to this project necessitated the design and manufacture of a special terminal. The TWX system had required too much intervention by the desk clerk and had interfered with the efficient performance of his many other duties. A TELEX network of 32 automatic send receive units was, thus, rjected because the 32's used alone were not job-oriented. There was also the problem of employe education, involving both initial and future personnel. These persons work scattered throughout the United States and unable to leave their posts for classes. This fact pointed to the need for an easily operated terminal. Surveys indicated that an average of 6 to 7 clerks in each inn, as well as sales office operators, with a notable degree of turnover in both, had to be considered.

Although a page printer was needed for typing variable information, such as guest's name, and for receiving administrative messages and reservation notices, the inns did not print or input-output enough data to make reasonable use of a heavy duty terminal. The 1050, used in conjunction with a special keyboard, was, therefore, rejected. Since General Data anticipated an eventual need for more than 1, 000 terminals, cost, installation, and maintenance were additional reasons for deciding against the use of 1050's.

The 1971 Model 20 reservation terminal, designed by General Data and the Industry and Customer Systems Division of IBM, solved all the previous problems. It consisted of a job-oriented keyboard and a control unit mounted on a 32 ASR. The special keyboard made the terminal simple to operate since the inn address, type of room desired, date of arrival, number of rooms, and length of stay could be set up by depressing the appropriate keys. With its teletypewriter, paper tape punch, and paper tape reader, the 32 gave the needed page printer, paper tape buffering for messages and the ability to type in any variable reservation information.

The 32 as a single component was inexpensive; the complete terminal was within a reasonable price range and promised to be easy to install and maintain. Terminal service could be controlled through the Memphis IBM office.

The most important factor in developing a communications network is the message load for the system. Detailed figures were available on many inns for analyzing the traffic patterns of the TWX system. A traffic mix study established peak hour load per inn, average message length per type of transaction, and frequency of each message type. However, since the proposed communications network was quite diverse in concept from the TWX system, it was impossible to accurately predict the projected traffic per inn.

IBM's Communications Network Design Program was an essential factor in the physical layout of the lines. The input incorporated correction and growth factors based on past traffic, message type and length, and peak hour volume. Each inn's location on a grid map and its volume per unit of time were the parameters given to the program. After 12 hours of optimizing on the 7094, the resulting network consisted of fifty-three 60 word-per-minute lines for the original 525 terminals. At the time of design, 60 word-per-minute lines were less expensive than 75 word-per-minute, but A.T.& T. announced that the costs would be the same by the fall of 1965. Plans were made for gradual conversion to the faster lines as soon as the price changes were effective. Of the first 53 lines, 35 were designated for the inns, 16 for the sales offices, and 2 for in-house operations. The inn lines averaged 20 terminals, with only 4 terminals on each of the sales office lines to insure the faster response time demanded by the nature of sales office work.

The original network design and the speed of the central processor have accommodated additional lines and terminals without compromising response time. Since July 20, 1965, when all lines and terminals became operational, 347 terminals and 17 lines have been added, and the entire com-

munications network converted to75 word-per-minute. There are now 40 lines allocated for inn usage, 28 lines installed for sales offices, one in-house line, and one floating test line. When excessive traffic is anticipated, as during the summer months, or new additions threaten response time on heavily loaded lines, terminals can be temporarily or permanently switched to other circuits with only minor changes to the program.

THE SYSTEM

The Holidex System is a job-oriented one, requiring little clerical attention. Once the proper entry is made on the 1971 terminal by the requesting inn, the desk clerk is no longer involved in the transaction and is free to perform other duties. Within 3 minutes either a green light indicates "available" and a printed confirmation notice, given to the guest; or a red light indicates "not available". If not available, alternate accommodations at the requested inn and at three other Holiday Inns within a 50-mile radius are indicated by lights.

The desk personnel at the requested or host inn are not involved in a reservation inquiry. Since the 7740 system is based on central availability with local inventory control, the computer con-

HOLIDAY INNS RESERVATIONS CONTROL CENTER

tinues to reserve 1 bed, 2 bed, and special (cabana, kitchenette, suite) type rooms until notified by the host inn that all rooms of a particular type are filled. The desk clerk at the host inn is responsible only for logging the incoming reservation notices, which are automatically forwarded by the computer following a "sell".

Computer and terminal hardware, the entire communications network, and the central operating costs are balanced to afford each inn a fixed monthly charge of $2.50 per room regardless of usage. During the first two months of use the average cost of each message was 72 cents less than a comparable TWX message for the same period, resulting in a savings of more than $1,400,000. Considering increased traffic and additional lines and terminals, the Holidex System resulted in a total savings of $3,500 per inn for the first year of operation.

New inns and sales offices, the various transaction types available on the present system, the job-oriented terminal, and the cost factor, i.e., unlimited usage at a fixed charge, have contributed to a 287.5% message volume increase per inn. In July, 1963, the 392 inns in study under the TWX system transmitted a total of 241,860 messages, while the sales offices averaged 43 calls to each inn. Traffic for July, 1966, had increased to 1,815,248 messages with 583 reservation inquiries from sales offices to each of the 730 inns in study.

The average daily traffic for August of 1966 was 65,495 transactions with a peak day of 83,930, as opposed to 38,710 for August, 1965, with a peak day of 54,201.

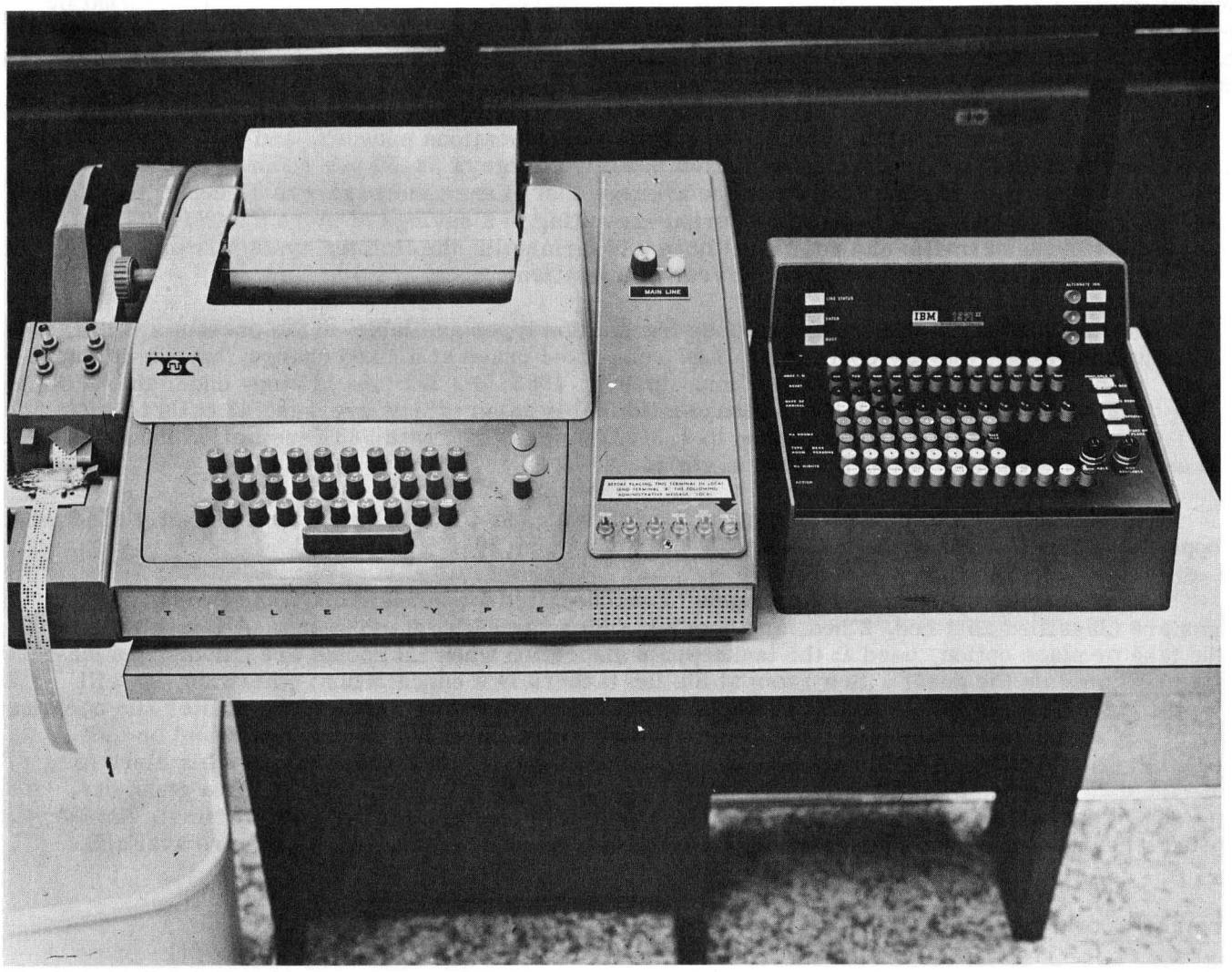
As previously mentioned, the innkeeper is responsible for keeping his room inventory. The rooms are classified as 1 bed, 2 bed, and special, which varies from inn to inn. A fourth category is the take or place option, used at the innkeeper's discretion when all rooms are filled. The innkeeper will provide the guest with a room at his inn if there is a cancallation; otherwise, he will place the guest at a nearby and comparable, non-Holiday Inn hotel or motel. The master file contains the types of rooms located in each inn and their status for the next 365 days - 'available' or 'not available'. As rooms of a given type are filled, it is necessary for the innkeeper or his clerk to notify the computer to 'CLSE' a particular room type or 'CLSE ALL' room types for a given day. The 'OPEN' key allows the innkeeper to resume sales for a closed room type at any time. Unless notified otherwise, the computer assumes all room types, including take or place, are available.

Terminal Operation

Used in conjunction with the terminal is a set of call cards, one for each inn in the system. These printed cards contain the inn's special call number, a definition of its special room catetory, the names of alternate inns assigned to it, as well as the directions from the major inn to the alternates, and a description of each alternate's special room type. Whenever the terminal is used, the first step is to place the call card for the inn to be contacted on the keyboard, i.e., the host inn. The card is designed to blend with the keyboard, giving all information necessary to complete a transaction.

After pulling the call card, the clerk simply depresses the necessary buttons on the keyboard, indicating the proper inn call number, date of arrival, number of rooms and persons, room type, length of stay, and transaction code. Depressing ENTER on the keyboard causes this 13-character header information to be punched into paper tape. Any variable information, such as guest name and time of arrival, is then entered on the 32 ASR teletypewriter and is punched into paper tape as it is typed. Depressing the SEND key on this unit then places the terminal in a ready-to-transmit status. Within 3 minutes the message will be relayed to the Memphis center and processed, and a reply will be received by the requesting terminal.

To assist the innkeeper in updating his room inventory and clarifying messages from requesting inns, the program attaches a date, the originating inn number, and a unique sequence number to all outgoing messages. This 3-digit sequence number is a part of each inn's master file and is reset



IBM 1971 RESERVATIONS TERMINAL WHICH IS LOCATED IN ALL HOLIDAY INNS AND SALES OFFICES.

to 001 at start-up time each morning. If any numbers are missing among these incoming messages or notices, the clerk can request a retrieval by sending a message to the Memphis control center.

Types of Transactions

The terminal is designed to transmit 11 different types of transactions, falling into four major categories. The availability check tests the status of any accommocation set up on the keyboard. No reservation is made as a result; there is simply a green or red light indication. In the latter case, if the request is available at one of the alternate inns, or, if other room types are available at the desired inn, these facts will be indicated by "alternate" lights on the keyboard.

The next major category includes several sell transactions - the ones most commonly used in a reservation system. The sell transaction incorporates an automatic availability check of the host inn status and a light answerback to the requesting inn. The green light indicates that the room is available and has been sold, guaranteed by a printed confirmation notice which is given the guest.

A reservation notice for this room is then queued for the host inn. On a denied sell request, as on an availability check, a negative answerback also indicates in light form the alternate inns which have the desired accommodation and any other room types available at the requested host inn. The use of these two transaction types has significantly contributed to the Holiday Inn referral policy. Alternate inn referral is automatic for "not available" replies.

The third category consists of room status transactions in which the computer is notified to change the status for a given room type on a given day from "available" to "not available" or vice-versa. The innkeeper uses these transactions to control the sales of his rooms and can alter status as frequently as necessary. The call number in the keyboard header is checked to insure that one inn cannot alter the status of another.

The last type of transaction available is an administrative message, limited to 146 text characters. In this instance the computer acts as a message switching center with little program manipulation other than statistical logging. This type of message handles any reservation that cannot be made by a regular sell transaction and is used for general communication between the inns.

Although the inns can only address a message to one terminal, the Memphis control center uses a universal code to send system-wide administrative messages or broadcasts. The program queues the broadcast once for each line, but the message is entered 3 times to insure that all terminals receive it. Since the broadcasts greatly deplete the available block count, they are normally restricted to off-peak hours. A "good morning" message at 5:00 A.M., containing the date and Central Standard Time, is the only scheduled broadcast, but an authorized emergency message may be sent at any time. Any system alert bulletins are punched into paper tape and transmitted from the in-house terminal approximately an hour before shutdown at 1:00 A.M.

Program Control

The program control scheme uses a series of tables. Each communications line uses the same subroutines, but a unique modifier is used to relate the line being serviced with an appropriate table entry. These table entries contain all necessary information to complete the task in progress on a given line at any given time.

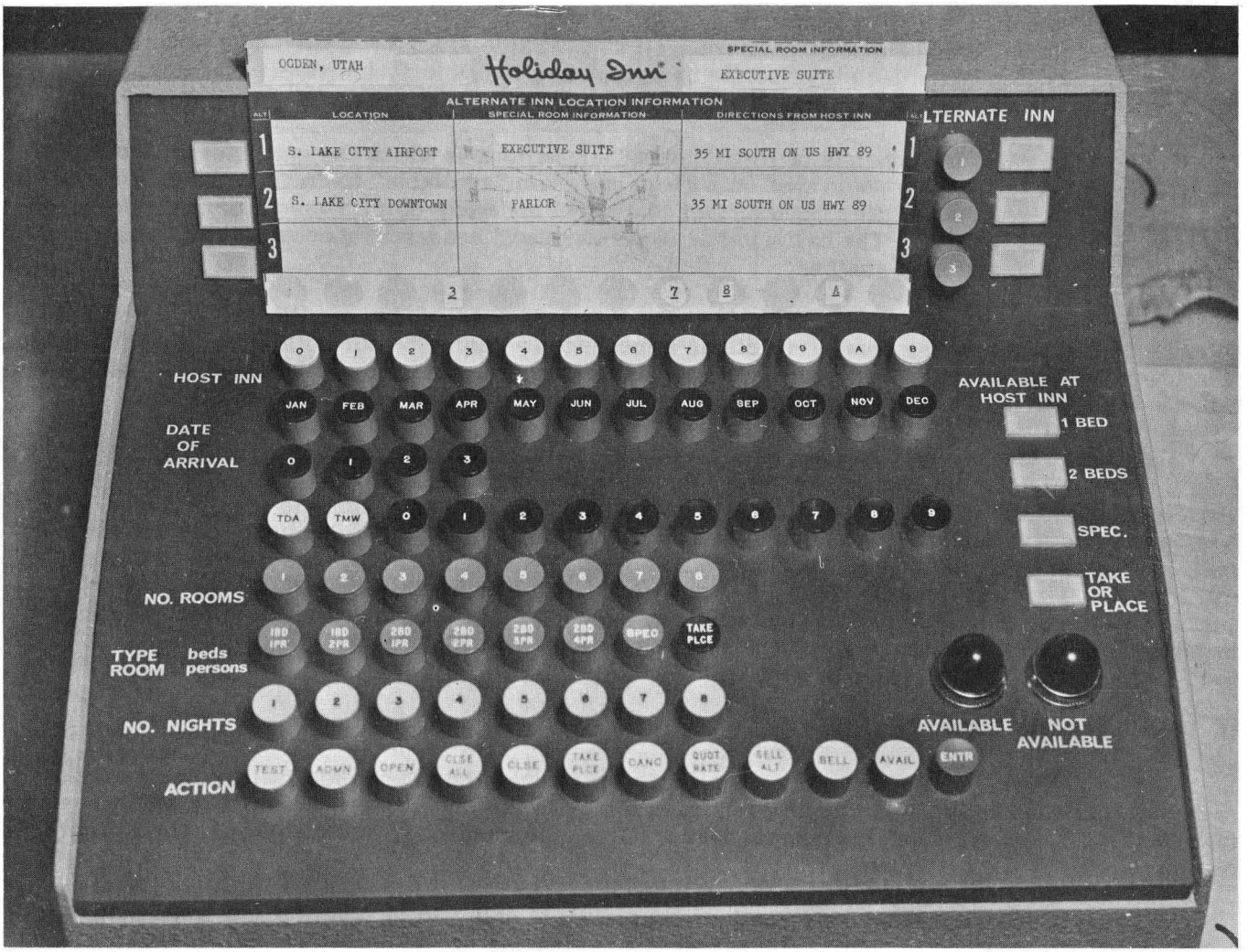
The monitor or multiplexing routine, consisting of only two instructions, is used with a program branch table (PBT) to control the line-to-line servicing in 'real-time'.

Since the 7740 can execute about 4000 instructions during one 75 word-per-minute line character time, the above scheme of program control allows for the complete servicing of the system's 84 lines in from one to two line character times.

In operation the monitor routine transfers the correct instructions needed at any moment to service a given line. This is accomplished by manipulation of the program branch table. Each time a subroutine finishes a task on a given line, it alters the PBT entry for that line to the next task to be performed. It then exits to the monitor, which increments to the next entry in the PBT and which contains the address of the subroutine to be executed for the next line. This is repeated for all 84 lines, and the PBT is then initialized to the first line in the sequence. This in essence is the multiplexing theory of communication line control. It is an extremely effective, simple, and fast method of handling multiple input-output devices simultaneously.

Queing Theory

In a system requiring that more than one entry be processed at any given time - one of the characteristics of a real-time system - a method of scheduling becomes necessary. All input messages requiring the use of a single I/O device, such as the master file, are queued sequentially, as



KEYBOARD OF IBM 1971 TERMINAL SHOWN WITH CALL CARD

received, and serviced in the same manner. Any of these messages which results in an output to another terminal is logged on a sequential output file. The file address of this output message is then placed in a line queue residing in available memory. If no output messages are pending for a given line, no core space is allocated for that line. This frees available blocks of core for other tasks. This method of core queuing is the alternative to various methods of file queuing and is a more rapid method for handling messages to and from a file.

Balance of Input to Output

The primary purpose of the system is to accept input from terminals with the least possible delay; therefore, input is given priority over output. The scheme used is designed to balance input to output by changing system priority from input to output as line usage decreases. This is accomplished by a decision routine which is entered at the end of each polling cycle on a line. If any input was received during the past cycle, only one output message is sent; if no messages were received during the cycle, three messages are sent, assuming there are that many queued. In order not to

become saturated with input, a further balancing technique is used when 14 or more messages become queued for a line. The system enters an output priority mode for that line, and seven messages are sent before polling is resumed.

These schemes balance, yet safeguard against, system saturation.

Retrieval

Any messages queued during the day can be retrieved by the console operator and sent to the requesting terminal. The technique employed here is to use the message number, which consists of the inn number and sequence number, as the input. This is typed on the 1050 console, and the search begins at the current cylinder, searching the file from the last received message backwards. When the message is found, it is queued for the correct line and is also printed out in the computer center.

Down Terminal

A message intercept routine is used to continue normal reservation service to inns with down terminals. When a message is ready for transmission to a terminal, a decision is made as to the status of the terminal. If it is down, the file address of the message is transferred from the normal line queue to an intercept queue for that terminal. These intercepted messages are relieved in one of the following ways: 1) the terminal comes up, 2) 40 minutes elapse, or 3) six messages are queued for one terminal. If the second or third method is used, the intercepted messages are printed on a 1050 receive-only in the computer center, and they are relayed by phone to the inn.

Checkpoint And Restart

A checkpoint is written on file every five minutes to facilitate a speedy recovery in the event of a system failure. Only that variable information necessary for a restart is used for the checkpoint. Checkpoints are written in alternate cylinders to prevent the loss of the last one while writing the new one. A time stamp is printed on the 1050 console after each checkpoint stating the time and current block count.

In the event of restart the checkpoint record is read from the file after a program load by console command. Line queues are reconstructed, and the system begins normal operation. This method may produce duplicate output messages but safeguards against any possible loss.

System Shutdown

At 1:00 A.M., Central Standard Time, each day an entry is made through the 1050 console signalling the system to close all lines, to relieve all output messages, and to discontinue polling. After all lines have been closed, the master pack is transferred to a IBM 1440 for file maintenance. The system is restarted on the alternate system at 5:00 A.M. for the new day's traffic.

On-Line Diagnostics

To facilitate easy terminal maintenance, two test messages have been programed into the system. These actions work with a test key on the terminal. The first type sends an "all-characters" message to the terminal, and the second returns the message. This not only allows the customer engineer to diagnose terminal trouble, but it enables the operator to check out his own terminal before requesting a service call.

Sell Request

Holidex is a polling system, not a contention system - the terminals do not vie for the line nor do they send incomplete messages. The completed message is held in a paper tape buffer and transmitted to the computer only when the terminal is polled. In polling, the computer moves from line to line, contacting one terminal on each line as it progresses. Dynamic block allocation, a feature of the IBM 7740, allows messages to be sent or received while the program continues the polling cycle. When a message is to be sent to a particular terminal, the program modifies the polling characters and uses them as addressing characters. The message is transmitted only when it has been determined thatthe receiving terminal is free.

The total process is best viewed by tracing a sell request from the terminal. The logical sequence of a message's flow through the system begins with the transmission of a poll message from the computer. This message consists of a control character which sets all terminals on the line to a control mode. The two-character terminal selection code in the message selects its particular terminal on the line; the terminal replies in one of three ways. 1) If there is no response, the terminal is considered down. It will be polled two more times before the "terminal down" indicator is turned on and its messages transfered to the intercept queue. 2) The terminal can respond with a "V", a negative response, indicating that it has no inquiry entered. 3) The message held in the terminal's paper tape buffer is transmitted. If the message begins with the correct start of message character, control of the line is given to a routine which monitors the reception of the message and converts it, character by character, from Baudot code to 1311 BCD. If the converted count is within the 146-character limit with the end of message character from the terminal is sensed, control for that line is switched to the routine that processes complete messages. This segment of the program checks the header for complete keyboard information, valid host inn number and date before analyzing the actual transaction type.

After the message has been edited, a sell request calls for access to the master file. Assuming no other lines are queued ahead of this one, control is transferred to the input-output mode for file access. After successful transfer of a master record to core, the message processing routine again takes control. The room availability for the request is now determined, and either a positive (confirmed) or a negative (unavailable) message is prepared. A negative message turns on the appropriate lights on the terminal to indicate other available rooms at that inn and any alternate inns which have the original request available.

If the room type is not available, the transaction ends here, and line control returns to the poll routine. If, however, the room is confirmed, the confirmation notice is sent to the requesting inn where it is given to the guest. A reservation notice is logged on the output file for later forwarding to the host inn.

After having polled all the other terminals on the host inn's line, control of the line is transferred to a decision routine which determines the number of messages to be sent on this line. If the reservation notice is to be sent, the file is accessed, the call directing code for this inn is found, and control is transferred to the transmitting routines which select the terminal and monitor the transmission of the outgoing message. After this sending sequence, the decision routine then returns control to the poll routine, and the complete cycle is ended.

RESULTS AND FUTURE PLANS

As previously discussed, the 7740 equipment was intended as a temporary reservations system, and an order for an IBM 360, Model 40 was placed simultaneously with that for the 7740. The unexpected traffic growth during the past year, the development of more applicable line networks, engineering improvements in the 1971 terminal, and new on-line applications for Holiday Inns and prospective customers have re-emphasized the need for this larger, more versatile system. The 360 is currently being installed, a multiplexor network has been designed, the new terminal has been

checked out, and the program is in the testing stage. Total conversion will be effective December, 1966.

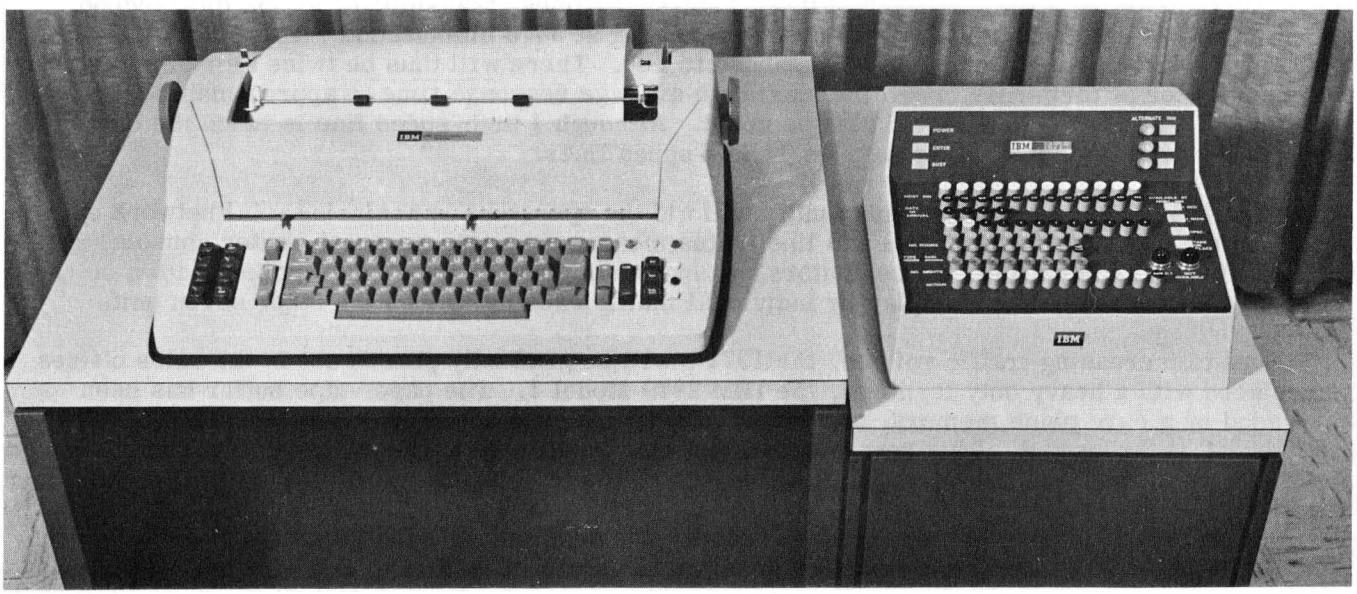
The new configuration includes:

2 - IBM 360 Model 40's With 256K Of Core
2 - IBM 1052 Consoles
8 - IBM 2311 Disc Storage Files - Switchable
2 - IBM 2841 Disc Control Units
10 - IBM 2401 Tape Drives
3 - IBM 2403 Control Units
8 - IBM 2260 Display Units
1 - IBM 2848 - 2260/1053 Control Unit
1 - IBM 1053 Printer
6 - IBM 2702 Transmission Control Units With 2712 Adapters
11 - IBM 2712 Multiplexors
1 - IBM 2973-1 Selector Channel
3 - IBM 2911-1 Multiplexor Channels
1 - IBM 2540 Card Reader/Punch
1 - IBM 2821 Printer Control
1 - IBM 1443 Printer
1 - IBM 1442 Card Reader/Punch
1 - IBM 1403 N1 Printer
1 - IBM 1403-2 Printer

Equipment used in the field includes:

200 - IBM 2970 Model 1 Terminals - To Be Installed After April, 1967
924 - IBM 1971 Terminals - To Be Installed By December 31, 1966

Certain limitations of the 7740 hardware necessitate conversion to the larger system. The total C.P.U. core available (64.5) is being used, the maximum number of disc drives (5) has been added, and the total line capacity (84) has been reached. Although the 10 lines still unassigned on the present system permit an additional 310 terminals, it is doubtful that the 7740 could maintain a 3-minute response time for the traffic volume expected in June, 1967.



IBM 2970 MODEL 1 TERMINAL TO BE USED BY HOLIDAY INNS

	7740	360/40
Instructions	25K	60K
Terminal Tables	12.5K	15K
Dynamic Buffer	15K	64K
Misc. (I/O Areas, Conversion Tables, etc.)	12K	20K
Total C.P.U. Core Used	64.5K	159K
Total C.P.U. Core Available	64.5K	256K
Instruction Execution Time	40 Micro Sec.	17 Micro Sec. (Average)
Line Interface (Char. Stuff and Fetch)	Total Hardware	Hardware (Except New Buffers)
Total Line Capacity	84 TTY Lines	248 TTY Lines
Total Capacity on Disc Per Pack	2.0 Million	7.2 Million
No. Transactions on Output Msg. Log File Per Pack	14,000	26,000
No. Drives Allocated to Msg. Log	4	4
Statistical Records	100,000 (Disc @ 2/Rec)	Unlimited (Tape @ 10/Rec)
Master Inn Records	500 Chars/Inn	520 Chars. Inn
Mode of Operation	Normal Attention Service I/O	Problem State Supervisor State
Systems Design		
Peak Hour Traffic	9,000	20,000
Maximum Average Response Time	3 Mins.	1 Min.
Total Transactions per Day	100,000	250,000
Total Number of Inns	1,000	4,000

COMPARISON OF RESERVATIONS SYSTEMS: IBM 7740 AND IBM 360 MODEL 40

The Holidex System now being tested incorporates a multiplexor communications network. Ten high-speed, full duplexed lines will connect the Memphis computer center to 10 multiplexors in various sections of the country. Each of these high-speed lines, transmitting at 852 bits/second, then breaks down into fourteen 75 wpm lines transmitting at 56.8 bits/second. The initial 155 lines, averaging 10 terminals per line, can be expanded to 248. There will thus be twice as many lines for the same number of terminals, reducing maximum average response time to approximately 1 minute instead of 3. The cost factor should also be noted. Although 1 high-speed line is twice the cost of a 75 wpm low-speed line, it actually carries 14 low-speed lines.

The IBM 2260 cathod ray display units will aid the operators in analyzing total network operations. Rather than printing terminal and line status messages on the computer center console, a master unit will display all ten concentrators, giving the number of lines and terminals down on each. The operator can then call for display by individual multiplexor or line on the other seven units.

Due to increasing traffic volume, the 1971's will be gradually phased out in the sales offices and replaced with a heavy duty terminal, the IBM 2970 Model 1. The paper tape buffer has been superceded by a core plane memory, and the 32 ASR by a high grade typewriter, enabling a third faster terminal throughput. This new terminal can also be adapted to the overseas transmission rate of 100 wpm, whereas the previous model is restricted to 75 wpm.

Future plans include other on-line applications to accommodate the growth of Holiday Inn subsidiaries, as well as its inns, and to afford reservation capabilities to regional airlines, car rental companies, and national credit card corporations.