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the Univac® Data Communications System

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MANAGEMENT SERVICES AND OPERATIONS RESEARCH DEPARTMENT

Remington Rand Univac
DIVISION OF SPERRY RAND CORPORATION
INTRODUCTION

The Growth of the Data Communication Problem

The history of America is a story of unparalleled economic growth. Two of the principal characteristics of this growth have been: the extension of the market from a local to a nation-wide area; and the trend towards locating production facilities as close to the source of raw materials as is economically feasible.

The problem the American businessman has to face as a result of this economic growth is that of maintaining close contact with his market (the nation) and with the wide spread production facilities he commands for satisfying the market’s needs.

The answer to this problem has been the decentralization of industrial and business organization with the concurrent centralization of control. However, with the development of this organizational form, the communications between the central point of control, the decentralized production facilities, and the nation-wide market has become a serious problem. Distance, time and antiquated data processing methods have militated against efficient communications.
A Decentralized Organization

Pictured on this map is a typically decentralized nation-wide organization, arbitrarily divided into four regions: The Atlantic, Southeast, Central and Western Regions. Within each region are the regional offices represented by squares and a variety of sales offices, warehouses and factories represented by dots. Each of these facilities will be generating information which must be sent to the organizational headquarters at Detroit represented by the star on the map.

A Sale Is Made

For the sake of illustration, assume that a sale occurs in the San Francisco Branch sales office. The customer requests sale of a product to him on credit. The credit check is made locally and approved. The customer is then given a tentative date of delivery on a warehouse located in Salt Lake City. That evening the accumulated sales orders from the San Francisco office are tabulated and mailed to the Salt Lake City warehouse where the orders are checked on the following morning against existing stock. Ordinarily the bulk of the orders will be filled from stock. However, our customer’s product is not in stock. This situation aggravates the communications problem. The organizational headquarters
in Detroit must be checked to find out what production facility in the
nation can make this item available to the Salt Lake City warehouse.
Just what does this mean in terms of the communication problem?

Salt Lake City must communicate either through the mail or by telephone
with the Detroit office. Detroit must then check its records on produc-
tion and determine which plant nearest the Salt Lake City warehouse is
capable of filling the order for this material in the shortest possible
time. As a result of scanning the records, it is determined that the
Seattle Plant can best fill the needs of the Salt Lake City warehouse.
Detroit then notifies the plant to manufacture a quantity of the product
for the Salt Lake City warehouse. At the same time Detroit will notify
Salt Lake City that delivery will be made from the Seattle Plant. This
information will be relayed back to the San Francisco Sales office so
that they may notify the customer of the adjusted date of delivery.

On completion of the production order at Seattle, the product will then
be delivered to the Salt Lake City warehouse where it will be packed
and shipped to the customer. Salt Lake City will notify San Francisco
that the goods have been shipped, and how they have been shipped. The
Sale, for all intents and purposes, is complete.

To notify the customer that delivery on his complete order will be
delayed will probably take four days under the circumstances we have
just described. Four days to notify a customer when or if goods will
be delivered is an inordinately long period of time. A customer’s good
will tends to decrease with the length of time it takes for the delivery
of goods and with the promptness with which he is apprised of the con-
dition of his order. We see that the organization is not able to keep
up with the condition of its operations in order to efficiently and
economically meet the needs of the market. The focal point of the prob-
lem is inefficient communications.

This presentation has been designed to illustrate to you the scope of
the problem of data communications in industry today. Let us now look
at this problem as it would be handled by the Univac Data Communications
System.
Consider again the sale that is being made at the San Francisco office. The credit check has been made and approved and now the office begins to generate that data which will be of most importance to it locally and to the rest of the organization. The local office will develop copies of the original sales orders that will be included in its own files; one will be given to the salesman; one will state the condition of sale and the type of delivery to be made to the customer. The San Francisco office in developing its own records, will do this work with types of office machinery which are common in business today.

Punched Paper Tape - A By-Product of Local Processing

The types of office machines that may be found in this office will depend upon the volume and complexity of the data processed there. If the volume requirements are low, we can reasonably expect to find key-driven order writing machines used to process all data. If the volume requirements are very high and complex, it is safe to assume that punched card equipment will be used to process the data. Whatever the nature of the office machinery that may be employed, the machinery will be adaptable to
the highly flexible Univac Data Communications System. In the system previously discussed the data on the sale was developed and transmitted as either typewritten alphabetic or numeric information or as a verbal restatement of the sale. Our objective now is first to develop one medium of transmission that is economical and accurate. The answer lies in the use of encoded alphabetic and numeric data in the form of five channel punched paper tape.

Five channel punched paper tape is the standard medium of transmission in the communications industry. Its serviceability has been established through years of economical use.

Every traditional office machine (typewriters, calculators, cash registers, billing machines and punch card equipment) develops information in two forms:

1. The hard copy (readable alpha-numeric).
2. The machine language (pressure strokes of keys in equipment other than punched cards, and mechanical or electrical actions in punched card equipment).

For years the most frequently used form of information was hard copy. Today, however, we mechanically pick up and encode the machine language while the hard copy is developed. This language appears on five channel punched paper tape as a by-product of the development of readable hard copy.

A wide variety of office machinery is available which will either produce by-product paper tape recordings of the information they normally process or produce from by-product paper tape recordings made by other equipments.
The Remington Electronic Synchro-Tape Typewriter

The Remington Electronic Synchro-Tape Typewriter, a product of the Business Machine and Supplies Division of Remington Rand, represents the most advanced form of common language typewriters today.

The Remington Electronic Synchro-Tape Typewriter permits entry for automatic encoding of five, six or seven channel punched paper tape either manually through a keyboard, or automatically from other paper tape. Manual entry for encoding is a simple process that any typist can master with a minimum of training.

The Remington Electronic Synchro-Tape Typewriter with a three or four bank keyboard and upper or lower case keyboards eliminates cumbersome letter and figure shifts previously needed to encode alphabetic and numeric data on tape. An automatic memory device that will automatically recognize the need for, and cause the occurrence of these shifts, eliminates the common error of shift omissions.

The Remington Electronic Synchro-Tape Typewriter can be programmed to automatically encode data on five, six, seven or eight channel punched paper tape. This can be accomplished by using a combination of readers, some of which will be reading data tapes, others of which will be format control tapes. Format control tapes will consist of tape loops either of plastic or parchment type paper.

The ultimate in versatility, the Remington Electronic Synchro-Tape Typewriter permits manual, automatic, and semi-automatic entry of information for encoding and decoding to and from punched paper tape.

An important consideration is that all of these operations occur simultaneously and as a by-product of the production of hard copy by the typist.
The Remington Rand Punched-Card-to-Paper Tape Converter

If the volume of local processing done at San Francisco is large enough to justify the use of punched-card equipment, the data generated by the punched-card installation is readily converted to punched paper tape through the use of the Remington Rand Punched-Card-to-Paper Tape Converter, Model 318. Punched cards are stacked in the input bin of this machine and automatically read. Information is automatically translated from the punch-card code to five-channel code on punched paper tape. Another feature of this unit permits the editing of tape format. Thus, all data generated in San Francisco is easily converted into a transmittable form—punched paper tape. Now that the sale has been recorded both in hard copy form for the local office and in our transmittable five-channel punched paper tape, it remains for San Francisco to notify the warehouse of the items that are to be shipped.

The Paper Tape Transmitter

In order to notify the warehouse of the order, the Univac Data Communications System will utilize the lines of communications network to transmit the data from the San Francisco office to the Salt Lake City warehouse.

An inexpensive unit, the paper tape transmitter is the added piece of equipment that is necessary for San Francisco to accomplish this transmission.
Over Communications Lines

The previously prepared punched paper tapes are mounted on the paper tape transmitter and the data is sent on to the warehouse, over communications lines which are available through the utilities supplying these services to business and industry.

Developing a Shipping Order

At the Salt Lake City warehouse office, the message is received in the form of paper tape, a duplicate of the original paper tape prepared in San Francisco. The tape thus produced is introduced into a Remington Electronic Synchro-Tape Typewriter and the typewriter automatically reads the information from the punched paper tape. In the process of reading this information from the punched paper tape, the Remington Electronic Synchro-Tape Typewriter develops the typewritten shipping order.
The shipping order produced by the Remington Electronic Synchro-Tape Typewriter is then given to a shipping clerk who picks the ordered items from the warehouse floor and readies them for delivery. The dispatcher will then compare the items on the shipping order with those items that are actually shipped.

Let us suppose that the supply for one item appearing on the sales order whose progress we are following was suddenly wiped out earlier in the day. Some items will not be available for immediate delivery. A copy of the shipping order with the notation of the quantities that were shipped is then returned to the warehouse office.

Although some organizations may use centralized invoicing procedures, in this case we are invoicing from the warehouse. What information must appear on the invoice? The same information that appeared on the original sales order plus the new data—such as "quantity shipped." Information that was on the original sales order was previously punched on paper tape, the tape produced by the warehouse paper tape receiver. This information would include the customer’s name, bill to, ship to, the
date, along with the items listed on the original sales order. The typist need not retype this information. The punched paper tape containing this information is mounted on the Remington Electronic Synchro-Tape Typewriter.

Activated by the sales order tape, the Remington Electronic Synchro-Tape Typewriter reproduces simultaneously the hard copy of the invoice and a punched paper tape copy on a blank tape. The typewriter automatically stops at the proper points for manual insertion of new data resulting from warehouse operations. So we see that only newly created data need be processed by the typist.

With the partial shipment on its way and the preparation of the invoice set, a new tape is developed which contains the essential data required for eventual electronic processing.

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**Dual Address Transmission**

The new invoice tape is transmitted to Denver for relay to Detroit. This information is of value at two points in this organization in this particular case, Denver and San Francisco. Denver must be notified in order to relay this information for further processing at Detroit. The San Francisco office must be notified in order to inform the salesman and customer of a partial rather than a complete shipment and to adjust its records accordingly.

Both San Francisco and Denver are notified of the partial shipment by a conventional technique known as 'Dual Address Transmission'.
So far we have only been discussing three units of this organization. However, there are more than three units in the organization and all these units must be able to communicate with their respective regional offices in order to communicate with Detroit. Units will be grouped on various communications lines so that they may economically transmit and receive information. These lines, called way-lines, may service three or more units called drops. Five drops have arbitrarily been assigned to the line illustrated here. The arrangement of way-lines and the number of drops on a way-line is an engineering problem. The communications utilities from whom lines are leased provide the engineering advice to solve the problem.

Shown here are three way-lines of the western region, converging into Denver.

These way-lines and all the way-lines for each of the four regions comprise the entire communications network of the organization. Two forms of information may travel over this network: data and administrative messages.

A data message is information intended for eventual electronic machine processing. This form
of information may or may not be intelligible to human beings. Administrative messages, however, are messages which are intelligible to human beings and are not intended for machine processing.

Data messages will always travel from the more remote points of the organization to the central point for data processing. Intermediate stages of data collection may also be part of such a system. In this case Detroit represents the hub to which data will be sent. Denver represents an intermediate or sub-hub point of collection.

Administrative messages do not adhere to this "hub" type of communications; they are addressed to random points of the organization. A network designed for both administrative and data traffic is called a "shared network." Shared networks represent an economical method of handling the bulk of the communications of one organization.

Denver and its regional counterparts throughout the nation need not act only as relay stations to Detroit. The intermediate points in the "hub" systems may relay messages from one point to another when a sender and a receiver are on different way lines. For example, if Seattle wants to send messages to Los Angeles, they can do so by transmitting to Denver for relay to Los Angeles. This obviates the need for lines of connecting all the units of the organization with each other, and still affords a complete communications system without the expense of "spider-web" networks.

The Trunking System

Inside the Denver office is a three-bank paper-tape receiver. This unit is a cabinet containing three paper-tape receivers, one for each way-line in the region. The messages are punched on paper tape by the receiver. It is the task of the regional office in Denver to relay these messages on to Detroit.

The movement of data from Denver to Detroit is a communication procedure called trunking. Any type of wire service used for such intermediate to hub transmission is called a trunkline. In many instances trunking would be ac-
accomplished by the same paper tape equipment that was used to get the data to Denver. It is likely that several trunk lines would be necessary to meet normal transmission volumes. However, a breaking point will be reached where the capacity requirements and the resulting increase in the number of lines would make the use of punched paper tape equipment uneconomical.

Denver is receiving large masses of accumulated data from throughout the western region. This information has been shown as coming in on only three separate way-lines at a rate of six to ten characters per second. In reality, there would be more way-lines leading into Denver.

Currently way-lines are offered at three speeds: six, 7.5, or ten characters per second. The user can start with lower speeds and progress toward the higher speeds as increases in his data volume may dictate. Through this and other means, expenditures can be kept in ratio to the volume of data transmitted. While the total volume collected at the regional office from any one way-line may aggregate a six character per second average, the sum of all volumes of all regional way-lines may represent a sizable volume of data. Add to this the volume of data that is generated at Denver itself. If Denver is not to fall far behind in transmitting incoming data to Detroit, Denver must transmit at a rate equal to at least the aggregate incoming volume. Today a paper-tape transmission line can only carry a maximum of ten characters per second. Obviously, faster transmission media are needed to link a Denver to a Detroit.

A Solution

A similar trunking problem exists for all four regional offices. New York, Atlanta, Chicago and Denver are all collecting large volumes of data from their regions.

Within the scope of the Univac Data Communications System are those units whose function is to make Univac Data Automation Systems compatible with existing communications networks. The answer to the trunking problem lies in the use of these units.
The key to the solution of this trunking problem is the Univac Magnetic Tape-to-Magnetic Tape Transrecorder. The MTM Transrecorder uses magnetic tape as its input and output medium. Magnetic tape is used because it permits higher Operating Speed and automatic self-correction. Self correction differs from self-checking in that self-checking devices merely halt operations and await human intervention when an error is detected, whereas self-correcting devices not only detect the occurrence of error but also automatically proceed to correct the error.

In order to realize the benefits of the self-correcting features of the MTM Transrecorder, we must convert our data from paper tape to magnetic tape.

The Univac Paper Tape-to-Magnetic Tape Converter

The transition from paper tape to magnetic tape is accomplished automatically by the Univac Paper Tape-to-Magnetic Tape Converter (PTM). The PTM is a device for reading five, six or seven channel sixty-four character punched paper tape and recording the information on Univac magnetic tape. This device provides code translation and adequate format control so that the resulting magnetic tape can be used in various Univac Data Automation Systems. This equipment can convert punched paper tapes generated in a number of different ways. The original tapes in our story have been transmitted over wire to the site of the PTM converter (Denver).

A direct conversion is made from five channel code to the Univac System (7 channel) code

Special paper tape function codes (Figs., Ltrs., Space, CR, LF) converter control codes need not be converted into Univac System code or included on the output tapes. Other undesired codes can also be deleted.
Additional converter control code outputs may be connected to provide signals for converter control. Control codes may be selected by the individual user. A standard Univac magnetic tape is generated by the Univac PTM converter.

Errors made by the operator in tape preparation may be corrected by inserting an error code. When the converter receives this code it will automatically perform the desired operation.

The Univac PTM Converter will make your communications system more versatile by fully utilizing paper tapes generated by other data processing equipment and producing a standard Univac magnetic tape. Thus, our sales order information, processed by the Paper Tape-to-Magnetic Tape Converter, is now on magnetic tape in UNIVAC System code in the proper format for use within the Univac Data Automation System. The System is, however, in Detroit and the magnetic tape is in Denver. The problem now is to get this data on magnetic tape from Denver to Detroit.

The answer to this problem lies in the Univac Magnetic Tape-to-Magnetic Tape Transrecorder used in conjunction with the unit called a Modem (Modulator-Demodulator). The MTM Transrecorder reads the seven channel Univac System code in parallel.

Magnetic tape-to-magnetic tape transmission can be accomplished on a variety of wire services. Some services may be chosen for higher increments of speed; others because of availability of types of service. There is a wide range of choice for wire services used. Because of this circumstance it would be difficult to produce a Transrecorder to meet the peculiar technical requirements of each service. Therefore, the Univac Magnetic Tape-to-Magnetic Tape Transrecorder is designed so that it can be coupled with the particular Modem compatible with the wire service used.
It is the policy of certain wire services to supply Modems for their networks. In other instances users have their own transmission facilities. Under these circumstances Univac Division is able to supply the proper Modems. With some networks transmission must be accomplished serially - one pulse must follow another. In these cases a function of the Magnetic Tape-to-Magnetic Tape Transrecorder is to serialize the Univac System code as it is read out of its storage unit. The Magnetic Tape-to-Magnetic Tape Transrecorder sends a pulse pattern making up the Univac System characters to the Modem in the form of a train of electrical pulses.

Attention is focused on telephone lines because of their universal availability. In this case the Modem puts data on a voice-telephone line. At the other end of the line (Detroit) is another Modem and magnetic Tape-to-Magnetic Tape Transrecorder which will receive the message.

The user is completely assured that the message received is a faithful duplication of the message transmitted by the action of the previously described self-correcting features of the Univac Magnetic Tape-to-Magnetic Transrecorder.

The Trunking Problem Solved with Room for Expansion

The trunking problem has been solved through the use of the Univac MTM Transrecorder, the Modem, and telephone lines. In this case a transmission rate of from 50 to 70 characters per second is required. However, inasmuch as this combination of units can accommodate data transmission at a rate of 90 or more characters per second, the solution allows ample room for expansion.
The data processing center will be collecting vast amounts of data through leased voice telephone lines. Important among this data are reports of every single shipment that occurred this day at every point in the nationwide organization. The final shipment of the day, however, will not be recordable until the last warehouse closes for the day.

The computer-processed statistics are of vital interest to many executives in the organization. Production data on the previous days operation at the decentralized plants are available for analysis, and summary. The statement of the condition of the nationwide inventory can be developed quickly for the accounting and marketing functions of the organization. By processing this data at night the significant operating reports will be ready the next morning.

Where there are established leased voice telephone links for conversation between the regional offices and Detroit, the rates (tariff) are fixed for 24 hours a day availability. Yet they are normally utilized for about eight hours, or only one-third of the actual telephone time paid for. Since additional telephone time has already been paid for this is tantamount to having wire service on a no charge basis.

At the normal cutoff time for telephone conversation the Univac MTM Transrecorders can be switched onto the same telephone lines that we use during the day and our data is transmitted to the computing center during the evening.
Receiving Data In Detroit

We are using two MTM Transrecorders in Detroit for receiving data. Each of these MTM Transrecorders will service two regions. Since each MTM Transrecorder can receive only from one region at a time, transmission of data from the two regions must be staggered. (If two MTM Transrecorders were not adequate, owing to too great a volume of data from each region, four units could be used—one for each region. Or, one unit could service all four regions, if the volume of data were small. The number of MTM Transrecorders needed in the Data-Processing Center depends on the volume and due-time of data entering the Center.)

The MTM Transrecorder receives information in series, converts it into parallel form and records the information on magnetic tape, duplicating faithfully the information sent from the region.

The Univac Data Automation System Available to Every Operating Unit

Data received by the MTM Transrecorder has been gathered from every point in the organization. First the data was transmitted on paper tape, from the low volume feeder points (Salt Lake City). It was then converted to magnetic tape, and formatted for use by the Univac Data Automation System.

Data on these tapes is as unlimited in its use as data that would be developed in the Univac Computer Center. Now the data has arrived at the computing
center in a convenient medium and in the right form for use by the Univac Data Automation System.

At this point it is important to realize that every operating unit of the organization regardless of size, location, and scope of operation can use the ultimate in automated data processing facilities. Before the installation of a Univac Data Communications System, it would have been impossible to provide this facility for small operating units, no matter what the significance of the data they generate.

Payroll computation, market analysis, production control, inventory control, and many of the data-processing problems of modern business are solved through the logic of the Univac Data Automation System. Included with the data entered into the Univac Data-Automation System is the information on the sales order we have been following. The computer takes note of the sale and the fact that the shipment made by the warehouse at Salt Lake City was incomplete. It scans its records and determines that the Seattle plant can best manufacture this item for the customer. The shortage items can be manufactured and delivered to the customer in the shortest time by the Seattle plant.

One of the results of the computer operations on the data will be a production order recorded on magnetic tape.

The computer output tapes contain two classifications of data. The first class, routine operating reports, represents the bulk of the data. The second class, action feedback data, are those communications that will alter routine operations in the light of previously unknown conditions. The production order for the Seattle plant is an action feedback communication. It has been recorded on magnetic tape in Detroit. In order to accomplish its purpose, the order must arrive in Seattle in human language by morning.
The same MTM Transrecorders at the Data Processing Center which had been receiving data from the regional offices are now used to transmit the action feedback data to the four regional offices. Tapes containing this data are mounted on the MTM Transrecorders and the data is sent over the same telephone lines used earlier. At the regional office, in Denver, the Univac MTM Transrecorder now receives the action feedback data pertinent to its region.

**Back to Denver**

The information is received in Denver on the same Transrecorder used earlier to transmit information to Detroit. In order to transmit this information back to the levels of the organization where action will be taken, this data must be converted to a form which is transmittible between the regional offices and the operating units; that is, the information must now be converted from magnetic tape to punched paper tape.

**Univac Magnetic Tape-to-Paper Tape Converter**

The Magnetic Tape-to-Paper tape Converter, illustrated here, provides rapid data translation between two popular business languages: magnetic and paper tape codes. This unit complements the PTM converter (previously discussed); fulfilling the cycle of conversion. The Univac MTP Converter has the following characteristics: Any magnetic tape with the proper format generated on any Univac Data Automation System may be converted on this equipment. The Converter automati-
cally punches paper tape function codes (Figs., Ltrs., CR, LF) in the paper tape. With the exception of these function codes, any special codes required for the operation of the communications system would be recorded, in proper order, by the device which generates the magnetic tape.

A direct conversion is made from the Univac System code to a selected five-channel code. Selected Univac System codes can be deleted or used to start and stop the paper tape punch. If not deleted those characters of the System code which do not have a communications code equivalent, will stop conversion and indicate an error.

Compact, easily maintained, operating on normal house current with no special cooling requirements, the Univac MTP Converter is the complementary answer to data conversion problems in any system using both punched paper tape and magnetic tape as data handling media.

Here again is the western region. The action feedback date channeled through Denver now proceeds along these waylines to the various operating levels throughout the region.
A Production Order to Seattle

Included in the action feedback data placed on the Boise way-line at Denver will be the production order and associated data addressed to the Seattle plant. The plant receives the data in the form of punched paper tape. Production orders will be produced from the paper tape. With the proper selection of a system, the data on the paper tapes can automatically be exploded to machine schedules, operation time cards, move tickets, etc.

Due Dates to Salt Lake City and San Francisco

Denver, at the same time it relays production data to Seattle, will relay the delivery data established by the computer at Detroit to Salt Lake City and San Francisco via the San Francisco way-line.

Salt Lake City will then know when it will receive a replenishment shipment; San Francisco will be able to advise the customer of a delivery date.
The paper tape received at San Francisco and Salt Lake City can be converted into printed material by the Remington Electronic Synchro-Tape-Typewriter, or the Remington Rand Punched Paper Tape-to-Punched Card Converter can be employed for automatically punching the information into punched cards ready for use on the office tabulating equipment.

THE REMINGTON RAND Tape-to-Card Converter punches 90-column cards automatically from 5, 6, 7 or 8-channel tapes and senses perforated tape at the rate of 420 characters per minute. Rate of card punching is determined by number of columns to be sensed per card and number of characters on tape required for operating instructions to the punch. Tape controls automatically provide for practically all normal punch functions such as carriage return, skip, etc. With suitable preparation, tape from 80-column cards may be used for conversion to 90-column cards. The Tape-to-Card Converter may also be used independently as a manual key punch.
We have shown the operations of two communications systems. Both systems have the same objective—the transfer of data from one point to another. The first system grew topsy-like through attempts to solve, as individual problems, situations which were in reality segments of an overall problem. The result as we have seen is that with this out-moded system it required 96 hours to process a sales order.

With the Univac Data Communications System, which was designed to logically and economically solve the over-all communications problem, all phases of processing associated with the sales order required only one day. This new means of communication allows the business organization to keep in close contact with its market and its own diverse production facilities.
We have shown in this discussion how a Univac Data Communication System can operate. The design of the network for the purpose of discussion has been arbitrary. Networks will in reality be designed according to the specific needs of the user.

Univac Data Communication Systems, coupled with a network communication facility provides decentralized organizations with the following benefits:

1. More effective decentralization through faster and better communications.
2. Greater organizational flexibility.
3. Low cost high speed electronic data processing for all office operations.
4. More accurate and timely control data.
5. Better customer service through the reduction of transaction time.
6. Decreasing back order and stock-out problems.
7. Lower inventory costs.
8. More accurate statements of inventory requirements.
9. Reduction of unit costs per customer served.
10. New operating information for the decision-maker.

Whatever approach you may choose, the designed versatility of the Univac Data Communications System enables you to realize the benefits of an integrated data communications and data processing system. Its building block construction, its complete compatibility with existing office machines and communications networks, enables you to tailor-make a system to meet your needs most economically.

True automation the perfect balance of data collection and data processing at high speeds is yours with the Univac Data Communication System.
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