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SALES and SYSTEMS GUIDE

DATA ENTRY MARKETING GUIDE

This Marketing Guide has been written to give you a better insight into the Data Entry Product Area. The Data Input Characteristics, IBM Product Characteristics and the evaluation of throughput and price comparisons are discussed in the Marketing Guide in terms of the relationship to all IBM Data Entry Products. An improved understanding of these factors will help you to sell "Total Data Entry Systems" to your customers.

CONTENTS

Second Edition

This is a major revision of, and obsoletes Z20-0841-0. The IBM 50 Magnetic Data Inscriber and the IBM 2495 Tape Cartridge Reader have been added to the data entry product line. In addition, Appendix III provides a sample 2260 proposal to aid the systems designer. Changes in the text are indicated by a vertical line to the left of the change; revised illustrations are denoted by the symbol (o) to the left of the caption.

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INTRODUCTION

Source Data Entry and Source Data Automation are terms that have taken on new meanings during the last few years. Greater importance is being put on the problems associated with the recording of source data for input into data processing systems.

IBM has become increasingly aware of the costs, as well as the bottlenecks associated with source recording. Many data processing users have been anxiously awaiting the development of commercial optical readers which would do their job and ease the source recording burden. IBM has previously announced several optical reader products. These products have eased the data entry burden in some areas. The announcement of the IBM 1287 Optical Character Reader has made a very substantial contribution. Many other customers are installing terminals to capture data at the source. Each data processing user has his own set of unique problems associated with capturing data from the various parts of his business for input to the data processing system.

IBM has recognized the need to provide customers with a choice of products which are all designed for high performance data entry. Products announced recently provide the IBM salesman with an extensive data entry product line.

This Data Entry Marketing Guide has been written to assist you with the evaluation of your customer's requirements, and to aid you in developing the best possible data entry systems design.

The best method of recording source data for any application should require the least number of steps. The most accurate data is available at the first stage of recording. Therefore, wherever practical, enter the information recorded at this first step directly into the processor. Determine whether to batch process or process immediately on-line for every application before designing a total data entry system. When single step source recording is not feasible seek to re-record data for input into the processing system keeping recording and error correction costs low. While a detailed survey may be needed to implement the "best possible" data entry systems for a given customer, it is possible to evaluate applications in somewhat less detail and determine the potential of one type of data entry product solution over another by using this guide.

A comparison of keying methods in the Product Characteristics Section will assist in the evaluation. Many other factors must be considered in the selection of the best product for a given application. These factors should be appropriately weighed and then summed to derive the total potential. The customer should be encouraged to document his survey of potential source recording methods so that the effect of later changes in circumstances or business procedures can be quickly assessed. The advantages gained from the improvements in the source recording methods will range all of the way from a reduction of operating costs and employment and training problems to a direct effect on the growth of a business.

Assess your customer's cost of doing his data entry job and the possible savings. Let's start with the preparation of data at the source.

Due to the pressing problems of the daily data processing workload, improving systems design, and job conversion, many customers have not studied the preparation of data at the source of their many applications.

The input characteristics of source information can be grouped into the following categories:

Original input
Turn around
Source Document origination
Special advanced preparation
Inquiry/response
File conversion
Textual information

ORIGINAL INPUT

Definition: Original input is defined as additions or changes to information in the data processing system master file.

Examples: Opening new accounts, adding new parts or models to the file, adding new employees to the file, address changes, and bill of material changes.

Characteristics: Alphameric, usually lengthy, more than one punched card, and has unused fields.

Partially or completely verified.

Input Methods:

Cards Punched and Verified

IBM 24, 26, 29 Card Punches
IBM 56, 59 Verifiers

Magnetic Tape Cartridge

IBM 50 Magnetic Data Inscriber

Typewritten for OCR (1428)

A model C or IBM Selectric typewriter would be used.

On Line Display or Printer Terminal

IBM 2260/2848 Mod. 21 and 22 via S/360 channel
IBM 2740, 2741, 1050 via communication lines.

TURN AROUND

Definition: Turn around documents are defined as those documents originated in the data processing installation and returned to update the master file.

Examples: Telephone and utility bills, meter reading, stock picking tickets, drivers license renewal applications and subscription renewals are examples of turn around document applications.

Characteristics: All needed identification for re-entry is on the document. The record can be all numeric. Addition of quantitative information may be required. A small amount of information is provided per message.

Input Methods:

Punched Cards - Cards can be punched by the system punch and printed on a 408 or 1404 printer. Change data would be keypunched.

Card and Paper-Printed Documents - These documents can be prepared on a 407 or 1403 printer or the Model C or Selectric typewriter for input to an IBM 1418, 1428, 1287, or 1282 optical reader. Variable or change data can be pencil marked or hand printed for 1287 input.

Marked Documents - These documents can be prepared on IBM 1443, 2203, or 1403 printer. Change data can be marked for input via 1231, 1232, 1418, 1428,1287, and 1282 optical readers.

SOURCE DOCUMENT ORIGNINATION

Definition: The recording of the transaction will occur at the source over relatively widely dispersed locations.

Examples: Credit card transactions, cash register journals, pencil marking, hand printing, and Port-A-Punch cards, are examples of source document origination for direct input to the S/360.

Characteristics: Transaction frequency, sequence and/or location cannot be predicted even though the account is in the master file.

The identifier can be all numeric. Quantitative information may be needed in addition to the identifier.

A small amount of information is recorded in each message.

Input Methods:

Credit Card Imprinting - Imprinter recording can be read by either the IBM 1282 or 1287.

Typing for Scanning - The Model C and Selectric typewriters may be used to type for scanning by OCR products 1282, 1287, 1418, and 1428.

Cash Register Journals - May be read on either the 1285 or 1287.

Port-A-Punch Cards - Can be prepared by hand and read directly into the system.

Numeric Hand Printing - Can be read directly into the system via the 1287.

Handwritten or Telephoned Transactions - Can be entered by any of the key entry products.

Magnetic Data Inscriber	-	IBM 50
Card punches and Verifiers	-	IBM24, 26, 56, 29, 59, 824, 826
On-line Displays	-	IBM 2260/2848 Mod. 21 and 22
On-line Keyboard Printer Terminals	-	IBM 2740, 2741, 1050

SPECIAL ADVANCED PREPARATION

Definition: Special industry or application-oriented media.

Examples: MICR, Dennison tags, tub files, and OCR preprinted documents.

Characteristics: The documents are prepared in advance in anticipation of future entry into the system.

The time lapse between preparation and re-entry is unimportant.

The identifier can be all numeric.

A small amount of information is recorded in each message.

Input Methods:

Punched Cards - Tub files would be punched in advance by the system punch, key punched and interpreted, or reproduced.

Printed Documents - Would normally be printed on-line by the 1403 printer for later input via the IBM 1428, 1418, 1282 or 1287 optical readers.

MICR - Documents printed in advance, or printed on the 1445 printer, are read by the 1412 or 1419 magnetic character readers.

INQUIRY/RESPONSE

Definition: Inquiry/response can be defined as interrogation and possible updating of the master file with immediate response.

Examples: Airline reservation systems, bank teller systems, and management information systems.

Characteristics: May or may not require document preparation.

The identifier can be all numeric in some applications.

There will be a small amount of information in the input message with output messages varying from small to large.

Input Methods:

Remote or Local - Inquiries are best handled by on-line displays 2260/2848 or Keyboard Printer Terminals 2740, 2741, and 1050. Special purpose terminals such as 1060's will be used too.

Slow Response Inquiries can be processed with any of the key entry methods.

FILE CONVERSION

Definition: File conversion will be defined as the conversion of files now processed manually, into machine processable form.

Examples: A driver's license file, library file, insurance group claims file, and title insurance file are good examples of the type of input that falls into this category.

Characteristics: High percentage of alphabetic information.

Long records are usually more than one punched card.

The information is completely proofed or verified either by rekeying or by sight.

Source documents are relatively poor.

Error correction and resolution is a bigger problem than with the established file.

Input Methods:

On line displays or keyboard printer terminals are applicable if the job is large enough.

DATA TEXT terminals and 2741 terminals with ATS Type II Program support have application in file conversion.

TEXTUAL INFORMATION

Definition: Alpha-numeric information which will be entered into a processing system for editing, storage, updating and output.

Examples: Examples of textual information are proposal preparation, legislative drafts, equipment specifications, and other internal business publications.

Characteristics: High percentage of alphabetic information.

Long variable records.

No fixed fields.

Insertion and deletion of information within a record which changes the position of information within the record.

Sight verification is applicable.

Input Methods:

On-line displays (IBM 2260/2848) and keyboard printer (2741) terminals. The 2741 is program supported by ATS/360 Type II program.

DATA TEXT terminals provide an on line text processing service at the lowest cost where a small number of terminals are required.

The OPD Magnetic Tape Selectric Typewriter (MTST) records off-line on a tape cartridge. Editing, updating, and inserting information can be done off line. The IBM 2495 Tape Cartridge Reader reads the cartridge into the system.

IBM PRODUCT CHARACTERISTICS

This section will discuss the characteristics of the data entry products which may be applied to "general" data entry use. 1060 terminals for banking, as well as the 357, 1030, 1070 and 1080 terminals for manufacturing, process and data acquisition use will not be included in this section. Following the individual product characteristics are some comparisons of throughput factors and data flow.

OPTICAL CHARACTER RECOGNITION

Optical character recognition implies machine-reading of human-readable documents; thus, closing the data processing loop between document creation and document processing. It also offers several economic and operational advantages. For one, it completely eliminates manual transcription. It also hastens the entry of the actual source document into the system, thereby eliminating the need for substitute media.

A range of optical scanners are available in the IBM product line:

1. The 1418 handles a fairly broad range of unit record sized documents and reads only numeric data.

2. The 1428 handles the same size documents as the 1418 but can read alphabetic as well as numeric data. Document sorting and optical mark reading are also available on both of these machines.

3. The 1281 Optical Reader Card Punch reads numeric information imprinted on an IBM card and punches the data into the same card.

4. The 1285 Optical Reader employs cathode ray tube scanning and reads numeric information printed on adding machine or cash register tapes. Under switch control, the 1285 can read more than one type font, but does not read the different type fonts in a single pass.

5. The IBM 1230 series of optical mark readers is used to capture source data in a wide variety of applications. The 1231 and 1232 are designed for data gathering applications and are used in opinion survey work, order entry, inventory, payroll, accounts payable and insurance. Models of the 1231 are available to read data sheets and transfer the data directly into a 1401, 1440, 1460 or System/360. The 1232 is an off-line reader which punches the data into IBM cards for processing at a later time.

6. The 1287 Optical Reader is the most advanced scanner in the IBM product line, and with its ability to read both machine printed and handprinted data, offers a fast and economical method of data conversion. To use such an optical character reader effectively, it is necessary to understand some of the basic facts concerning optical scanning and how the optical reader relates to the operation of the total system.

In the past, computer input media have been in finite form such as punched holes or magnetic spots defined with definite limits and tolerances. Specifications of machine printed or handprinted characters, however, can at best be only partially defined, and measurement of their characteristics is even more difficult. We describe a character to be optically read with terms such as print quality, shape, reflectance, stroke width, font, and voids. Some of these terms suggest finiteness; others vagueness.

Printing devices vary widely in their method of printing and the resultant characteristics of their printed output. In fact, print devices and the carriers used to supply the ink are the major causes for the variances in printed characters. There are thousands of different print fonts. Handwriting is as varied as the number of persons who write.

It becomes evident very quickly, that if one expects to capture mechanically printed and handprinted data with a machine, that the machine must have a capacity to recognize a vast variety of characters; or if the machine has a narrow tolerance, the characters presented must be severly restricted. The IBM 1287 can read a wide range of mechanically printed and hand printed numeric data, but we restrict the data to several fonts, with some constraints on the acceptable print quality.

Today's data processing systems have an urgent need for more data in less time and at a lower cost. An optical character reading system is one of the exciting new answers to this need. The method of document preparation must be considered, keeping in mind that the most efficient system would prepare optically readable data at the source. Only after careful study shows that acceptable source recording is not feasible should the best intermediate recording method be selected.

Proper data preparation is the key to a successful optical scanning input system. This area offers a great challenge. Ingenuity and creativeness applied here will lead to more data in less time and at lower cost. We must consider the personnel preparing the input, the preparation devices, image transfer carriers or ribbons, document design, programming, and throughput.

Usually prime consideration should be given to the personnel preparing the documents. Very often it is here that we realize the greatest savings with an optical character recognition system. Where these persons are preparing documents full time, it is particularly important that the method of inscribing the data, the design of the document, and the preparation environment be geared to the greatest possible production and accuracy. Of course, some consideration will be given to programming and scanner throughput, but emphasis on reducing the number of transcribing stations will usually result in reduced overall systems costs.

If optically readable data can be prepared by many people, with each inscribing relatively small quantities per day, the individual additional time will not be noticeable and prime consideration can be given to reducing the printing device costs and increasing system throughput.

Another type of application is in areas where valuable data is presently being printed by business machines of some type such as cash registers or bookkeeping machines. If the print characteristics of these machines are adequate for optical scanning, optical input is free; if not, one would consider retrofitting present equipment or replacing it with new printing devices

suitable for optical reading. Turn-around documents such as customer statements are especially suited to reducing input costs with an optical character reader. Normally the document printing costs are no greater than documents presently used and the data enters the system from the original document.

The flexibility of the IBM 1287 makes it possible to build up a complete data record on a document prepared at several stations, with different inscribing methods; or the record could even be completed from more than one document. The 1287 can read an almost unlimited number of fields, from a wide range of printing devices, numeric hand printing and mark reading; on one pass through the machine. It is important, however, to read only the amount of data which is useful to the system because fewer characters read will result in a lower reject rate and a greater throughput.

Error correction procedures should be considered along with the methods of document preparation and document design. There are several methods of checking and correction on a 1287 attached to a system:

1. Any type of self checking number calculation can be performed to either correct an unreadable character or check the accuracy of a field.

2. Fields which are added and totaled on the document can be checked wile the document is being processed.

The 1287 can be programmed for immediate on line correction, or to reject the documents which must be further handled for error correction. They may be selected into the reject pocket and one of the other two pockets if there is a need to separate two types of rejects. The correctly read characters can be read into the system to be used in later correction procedures. Any of the key entry methods may be used including the 2260 Display Station.

The on line correction procedure is to stop the reader with the unreadable character displayed and enter the correct character via the operator's keyboard.

Since mechanically printed or hand printed characters are the input media for an optical scanning system, special attention must be given to the print quality of the characters. For the purposes of this discussion, print quality will also be used, where applicable, to describe characteristics of hand printing. Detailed requirements for print quality of each optical character reader may be found in the SRL Manuals for each machine.

When considering a device for printing optically read data, we must first determine that it is capable of inscribing suitable print quality for the optical reader to be used. At this time the operation, reliability and service requirements should also be considered. It was pointed out earlier that print quality requirements are specified with a mixture of definite and indefinite terms. Generally speaking, acceptable characters are evenly formed, with proper contrast, in an acceptable font and size. Assistance in qualifying optical input in regard to print quality and document design is available through IBM's Document Evaluation Program. The procedures for obtaining this assistance are available from the Regional Product Marketing Department.

Print quality is affected by document handling and paper quality. Document handling after printing can detrimentally affect documents if printed characters are mutilated. Particular

care should be exercised where documents are audited after preparation. The areas to be scanned must remain free of pencil checks or other contamination. Paper quality must be considered from two standpoints;

1. Its characteristics for properly accepting the character transfer.

2. Its ability to withstand the handling required after printing.

Operator training for OCR systems, as in any other data processing system, is important to the success of the operation. Personnel preparing optical documents must have some awareness of print quality, registration, and other unique requirements of optical input to keep the system at maximum efficiency. Training for preparation of handwritten documents is relatively simple and unique to this media. There are training guides and other aids available to assist with training programs for handprinting characters for the IBM 1287.

Programming and throughput of optical character readers are closely interrelated, and document design affects both. In fact, it should be apparent that each area of an OCR system has some effect on all others, so that some time before installation the total optical acanning systems approach should be carefully developed for maximum efficiency. Since most optical readers are on-line to a computer, consideration must also be given to the host system. With the 1287 and System/360, programming and document design are especially important to the throughput of the optical reader and the other processing in the system. A study of the maximum document throughput in the 1287 SRL manual will show that document throughput is affected by; the size of the document, the number of characters read, the types of characters read, the number of fields and whether programming is in the time-dependent or time-independent mode. Keep in mind, however, that if the documents are being prepared by hand, that prime consideration must be given to the efficiency and accuracy of the personnel preparing the input documents.

To summarize the considerations of an optical character reader system, there are seven major areas of concern which must be evaluated separately as well as jointly:

1. Document design
2. Document preparation
3. Error correction
4. Programming
5. Print quality
6. Training
7. Throughput

Most of these areas are unique to optical scanning and new to most of us. Some of them can be clearly defined; others, such as print quality are more a matter of judgment or overall understanding. In order to effectively plan and install an optical scanning system a reasonably good knowledge of these areas is required.

CENTRALIZED TYPING FOR SCANNING

One of the methods of preparing input to the optical scanner is the typing of documents which are recorded by hand or other means and are not scannable in the original form. This approach to preparation of source data, which could not otherwise be read by the optical scanner, can provide the additional justification

for some customers who will not otherwise have economic justification due to the low volume of well-controlled scannable documents.

The justification of an optical scanner based solely on centralized typing of all documents for scanning is more difficult. While there are a number of IBM and competitive scanners now installed on this basis, a great deal of the justification is based on reducing the number of key entry operators. The price/performance evaluation must now include the high performance IBM data entry products (See Throughput Comparison).

While the typewriter prices are lower than the other key entry products mentioned, the optical scanner is considerably more expensive than the card reader, or the attachment of 2260's to the system.

ON LINE VS OFF LINE DATA ENTRY

IBM, as well as the data processing systems users, are placing emphasis on improved access to information in the customer's files. Whether it be management information, required to make timely decisions, or file interrogation and transaction activity for customer service, the emphasis is on saving time. This time saving is one of the principal advantages of on line data entry. When the terminal or display device used for on line data entry can be located at the point of the initial recording of the source data, the additional advantage of reducing costs and reducing errors is present.

Another area of significant advantage provided by on line data entry, is that of error correction and error resolution. The ability of the system to edit the input and give the operator directions to help with the resolution of any errors which are detected can be accomplished while the document is still in the hands of the operator who keyed in the information initially. The keying of information directly on line also provides the advantage of being able to accumulate production records and error statistics automatically without a separate manual procedure for recording and assembling this type of data. The status of all work in process is also known at all times and can be interrogated from the systems console.

Most of the advantages which can be gained by inserting data from the system files in an input record and processor verification to eliminate the necessity to key certain fields, can be accomplished even though the initial keying is off line however, not to the same degree. For example, a name and address change could be entered off line just by entering a customer number and the change data. However, if the same change is made on line, the display of the name and address before and after the change allows visual verification that the change was made to the proper record and that it was made correctly. The advantage of on line processor verification is that when errors are detected the correction can take place without the manual operations of bringing together an output error listing with the source document. The anticipated error rate is a significant factor in determining the value that these functions have to a given application in an on line versus the off line mode of keying.

While there are significant advantages to keying on line, there are also some disadvantages. The most significant are:

1. Equipment backup - while system availability percentages are very high, when the system is down for maintenance or alteration, the data entry function will either stop or must be switched to a backup processing capability. This backup adds additional costs to the system.

2. Location - It may be desirable for a customer to locate his key entry units in many different physical locations. The advantages of being on line, must then be weighed against the cost of the communications facilities or cabling required.

3. Programming - The initial programming and program maintenance involved would not be as extensive with off line key entry products.

ON LINE TERMINALS AND DISPLAYS

Significant advantages can be realized by keying directly on line rather than keypunching for later batch input to the system.

These advantages may be present even when the data which is entered on line would be processed on a batch basis at some later point in time. There are basically two categories of on line keyboard terminals which would be used for data entry. These categories are CRT displays and keyboard printer terminals. These two product groups will be discussed separately here to show the advantages and disadvantages of each.

2260 FOR DATA ENTRY (2260 DE)

What Is It?

The 2260 display station used for data entry will usually be connected to the 2848-Model 21 or 22 display control. There are exceptions to this, however. Some applications may work perfectly well without the additional features the 2848-21 and 22 provide (Refer to Appendix I, 2260 Display Station Guidelines). The configuration of 2260's and 2848's Models 21 and 22 will be referred to as the data entry configuration.

How Does 2260 DE Differ?

The data entry models of the 2848 (21 and 22) are for local systems attachment. The data entry units look very much the same to the operator as other 2260's. An additional optional keyboard is available. The additional keyboard option is the block numeric type keyboard similar to the 29 card punch alphameric keyboard. Shift lock keys are provided similar to a typewriter to facilitate the keying of all numeric fields. Any combination of the three optional keyboards can be attached to the 2848 Model 21 or 22 control unit.

Other features provided by the data entry configuration are improved character handling circuits in the display buffers to provide interference-free operation even with a maximum number of stations attached to the 2848 Model 21 and 22, and additional instructions which provide read and write without keyboard restore to allow communication between the System/360 program and the operator. Refer to SRL #A27-2700-1 and TNL N27-2910-0 for a detailed description of the data entry features provided by the 2848 Models 21 and 22.

How Does It Work?

The 2260 can be used for data entry in many different ways. "Data Entry with the IBM 2260" Form Z77-6048 described 15 different data entry techniques for use with the 2260 for data entry.

Only one of the techniques will be discussed here, the "Free-Form with Delimiters" technique. This technique has been selected since it appears to satisfy a wide variety of applications.

The following is a description of the data entry operation using the "Free-Form with Delimiters" technique:

The operator starts the job by entering document numbers and the job code used to access the record format.

The operator receives a response message containing the above information plus the file address for the first record.

The operator keys in the data from the source document, in the free-form fashion, and transfers the entire message to the computer when the record is completed. At a minimum, the

System/360 program should ascertain at this time that the correct number of fields are keyed. Considerably more editing and validation of the keyed data is possible, while the operator still has the document in hand. When the message is entered, the System/360 program can leave the keyboard locked until the record is checked by the program.

Since the operator is keying into a buffer and has a display of the record she is keying at all times, it is a simple matter for her to backspace and correct any errors she detects herself.

If an error was detected by the CPU program, the keyboard would not be restored and the error display would instruct the operator in the corrective action to be taken.

Key verification can be reduced considerably by use of the 2260 for data entry in some jobs. Field validation, reasonableness checks, and zero balancing routines can take the place of key verification on many jobs. However, if key verification is necessary it can be done in much the same way as key entry is done with the 2260. The rekeyed data would simply be matched to appropriate fields of the record entered during the data entry operation.

How Do You Justify The 2260 For Data Entry?

While the hardware costs will most likely be higher than card punches and verifiers, usually the total input costs will be lower. The advantages of keying data directly on-line are not always easily translated into dollar savings.

1. How much is it worth to have immediate posting?

2. How much is it worth to resolve all input errors without the necessity to search the files for the source documents?

3. How much more efficient can the data processing system be if the status of all jobs in process is immediately available as well as error and performance statistics of the key entry operators?

4. Can immediate order confirmation of a telephone order increase the wholesalers business?

Answers to these questions provide motivation to go on line with 2260 data entry.

In addition to the benefits from keying directly on line, the 2260 used for data entry has the following advantages:

1. Quiet operation

2. Variable length records

3. Flexible formats

4. Simplicity of operation

Some 2260 data entry systems can be justified on throughput alone and this will naturally be a factor in every system.

Improved throughput can be expected from 2260 operators due to the following capability present in the system:

1. Reduced keystrokes and operator's decision time programmed zero and blank insertion.

2. Reduced keystrokes due to access to systems files.

3. Immediate error detection.

4. Zero balancing reasonableness checks and self check number routines reduce key verification.

5. Operator detected error correction with no delay.

6. Repetitive control numbers are unnecessary.

In addition to the factors which improve the operator's throughput, the following factors would reduce costs when 2260's are used for data entry:

1. Improved error resolution.

2. Key entry production records, error statistics, and job status can be obtained automatically without maintaining manual records and keypunching the manual records to prepare reports.

3. Card costs, storage, and handling would be reduced proportionally to the number of keypunches replaced by 2260's.

4. Elimination of the separate card to tape run.

5. The same 2260 display station can be used for either data entry or verifying.

6. The 2260/2848 and processor costs may be shared by other applications such as inquiry.

The justification will be found in a different way in each application as shown by the three examples that follow.

Error Correction

A magazine publisher has a problem with excessive costs in error correction associated with his subscription fulfillment job. He has an error rate of 15% of the transactions for any one of several reasons including operator keying errors, misspelled cities, wrong addresses, edit errors discovered by the computer, and mismatches with the master file on complaints, inquiries and payments. Approximately 80% of the input costs result from retrieving the source document, making the corrections, rebatching and reprocessing the rejects. The use of 2260's on-line with batch processing, against a section of the file at a time, eliminates the recycling of errors. This magazine publisher can reduce his job cost by 20%. At the same time IBM rental would be increased by 40%.

CPU Verification

Another example is the income tax data entry job which is justified on a very different basis even though the error correction is a major part of the justification. The resolution of errors would very likely be handled by specially qualified personnel using 2260 display stations dedicated to that function. All of the other factors which improve keying performance would be present, but the most significant is that of zero balancing all money fields, and use of self checking numbers to eliminate the verifier step for the taxpayers records that are in the file.

Turn Around Time

A drug wholesaler has justified the use of 2260's for entering telephone orders. He will improve customer service by confirming orders immediately and advising the customers of available substitutes when out of stock conditions occur. The payoff will be in increased sales.

Programming Systems

The 2260/2848 Models 21 and 22 data entry configurations will be supported by programming systems DOS BTAM Local and OS Graphic Program Services.

Prospects For 2260 Data Entry

The prime prospects for 2260 Data Entry are the large customers with 20 or more keypunches and verifiers.

Customers with other 2260 applications are also good prospects since the 2848 Display Control and in some cases even the 2260 Displays can be shared. A good example of such a justification would be a credit bureau. The 2260's could be used on one shift for credit checking from telephone inquiries and on another shift for the data entry job.

Limitations

1. The principal limitation to 2260 data entry is the effect of system down-time on the data entry operation. The need for back-up must be assessed in each case individually. Channel switches are available by RPQ which will permit using another System/360 for back-up.

2. The highest priority will normally be required for the data entry program to avoid operator delays caused by concurrent processing.

Throughput

The keying rates, which can be expected of 2260 operators can be related directly to the type of data, the operator's basic skill, and the style keyboard selected. If the information to be keyed is largely numeric, the keypunch style keyboard with the block numeric overlay on the alpha keyboard will be faster. If the information keyed is mostly alpha (name and address or textual) the typewriter layout with top row numeric may prove faster, particularly when the operators used do not have keypunching experience.

If we assume that the proper keyboard selection has been made, then while actually keying, the operator speed may not be any greater when using the 2260 than when keypunching. The improvement in performance results from reduced key strokes, decreasing the lost time caused by error correction procedures, data inserts, eliminating decision time on high order fields, and eliminating delays caused by the machine such as keypunch duplicating, skipping and card feeding.

The throughput gain is very application dependent, and therefore cannot be assigned an average percentage. Comparison of keying performance of the various products is discussed in the Throughput Comparison section.

Keyboard printer terminals may be used more effectively than any other data entry product in some applications.

KEYBOARD PRINTER TERMINALS

This discussion will be limited to the data entry usage and will not address many other terminal applications. The products being considered here are the 2740, 2741, and 1050.

What Are The Advantages?

1. Direct input at the source of the data.

   The keyboard-printer terminals can eliminate both the keypunch and verifier hardware and operator cost when the terminal can be located where the document is created.

   The total number of errors in the input data will be reduced when the original recording of the source document causes direct input to the System/360.

   In locations where the source creation of the data is now typewritten for input to keypunching, hard copy will normally be required for local use.

2. Application program support (ATS) is available with IBM 1440, 1460, and System/360 for text processing and can be adapted to data entry and file conversion.

3. The 2740 or 2741 terminals can be used as Selectric typewriters in low usage locations.

4. DATA TEXT terminals are available for customer use when they do not have their own computer, but will benefit from the on-line advantages of data entry.

What Are The Disadvantages Of Keyboard Printer Terminals Vs 2260 Display Stations?

1. When the hard copy provided by the printer terminal is not an absolute requirement, usually the display station will be faster. The reason is that output on the display is 2560 cps rather than 14.8 cps for typing error messages or review of textual information.

2. The 2260 is quieter and will be more desirable in an office environment.

IBM 50 MAGNETIC DATA INSCRIBER

The Magnetic Data Inscriber has been developed to provide the customer with a more convenient high-performance key entry product. This keyboard-to-magnetic tape unit is applicable wherever cards are not a prerequisite. The product has been designed with the operator in mind and retains many of the features the operator is used to in keypunching.

The standard features which will greatly enchance operator acceptance, increase throughput, and improve job performance are:

- Ease of setup and tape cartridge handling
- Variable record length
- 8 program levels
- Improved error correction capability

- Improved left zero insertion with no field limits
- Verify feature on all units
- Quietness of operation

The record backspace, field backspace, and search features enable the operator to correct detected errors with a minimum of lost time. A magnetic data inscriber may be used either as a recorder or a verifier. This provides additional flexibility for handling peak job requirements and in most installations will reduce the total number of units required.

The mechanical delays inherent in Card Punch and Verifier operations such as skipping, duplicating, card feeding and card registering, have been eliminated. Skipping and duplicating occur at 100 CPS speed when required. The need for skipping and duplication can be eliminated or greatly reduced by proper design of the input formats.

The magnetic tape cartridge used on the IBM 50 Magnetic Data Inscriber unit is the same cartridge used by the IBM Magnetic Tape Selectric Typewriter (MTST). When placed in the cartridge receptacle, the tape is automatically loaded for recording or verification.

The cartridge concealed tape is never exposed to contamination through operator handling. The capacity of the cartridge is 23,000 alpha numeric and control characters which represents an average in excess of two hours of keying. This capacity is suited to high volume keying. The convenience of the small cartridge makes it ideal for the small batch jobs and the distribution of high-volume, time-critical jobs to several stations. This convenience is a strong marketing advantage of the 50 Magnetic Data Inscriber. Additional detail on the functions of the 50 Magnetic Data Inscriber may be found in SRL#A27-2725-0.

Upon completion of the keying, the cartridges are entered into the system by means of the IBM 2495 Tape Cartridge Reader. The 2495 tape cartridge reader contains an automatic cartridge loader with a hopper and stacker capacity of twelve cartridges. The 2495 automatically feeds, reads, rewinds and stacks a fully recorded cartridge in approximately one minute. SRL#A27-2726-0 provides a detailed description of the 2495.

The 2495 will also read the cartridges recorded on OPD's MTST (Magnetic Tape Selectric Typewriter). The MTST has experienced wide acceptance in applications other than "power typing" or letter writing. Many customers will use the 2495 to enter data prepared on the MTST as well as on the 50. The MTST would be used for recording textual information such as proposals, in house publications, and specifications.

50/2495 MARKETPLACE

The prospects for the Magnetic Data Inscriber are customers with more than 10 keypunches and verifiers. Based on an estimated average increase in throughput of approximately 25% over card punches, and a concommitant reduction in the number of stations, the displaceable costs will approximately equal the 50/2495 and personnel costs at 10 keypunches and verifiers. The customer savings will be realized primarily in reduced personnel and card costs. In situations where the cost justification cannot be substantiated the intangible benefits to the customer such as, operator satisfaction, noise elimination, space savings (machine space and card storage) will influence the customers decision to order the 50.

2495 Program Support

The programming systems support for the 2495 Tape Cartridge Reader will be limited to DOS. The Type 50 Magnetic Data Inscriber and the 2495 Tape Cartridge Reader will be sold to customers with an exclusive OS environment. The modification of the Operating System to include the 2495 Tape Cartridge Reader support will be the individual customer's responsibility.

KEYPUNCHING PROCEDURES

While the consideration up to this point have beeen centered on the improvement of the customers data entry operation by installing high performance data entry products, many customers can improve the performance of their keypunch section simply by improving their procedures.

Many of the keypunching procedures in use today are quite inefficient because they have not received the necessary attention to bring them up to date.

Some of the areas which can be improved are:

1. The use of a single batch header card to contain common information for cards within a batch such as branch office or date rather than duplicating from card to card. The duplication takes time and adds a certain amount to the error rate.

2. Free form keying can be used with either of two methods depending on whether space on the card is a factor.

   a. One free form keying approach is to terminate each field with a special character and only key significant digits in each field. If the card ends in the middle of a field, the field being keyed must be rekeyed on the next card. This approach packs information on a card but does offer some difficulty in verifying and error correction.

   b. The other method is to key only significant digits and use the skip key to terminate the field.

   In either case, the edit run would reformat the information.

3. Reduced key verification. Some keypunch sections are key verifying information which can be positively verified by a program routine in the edit run. In some applications the error rate may be too high or the consequence of waiting to detect this error until the edit run too significant to permit using this procedure. However, in others the use of the edit program to reduce the key verification will save keying time.

One example of the savings which can be uncovered by improved procedures is a customer who increased his keypunching production by 42% by redesigning the sales analysis application to take advantage of all the improvements mentioned above.

THROUGHPUT COMPARISONS

An important factor in the selection of the proper data entry product is the throughput of an operator using a particular key entry unit.

There have beeen a number of customer tests conducted for the purpose of determining the relative speeds of typing versus keypunching. Many of these tests have proven a speed improvement when certain format and correction procedures are used. This speed improvement has been borne out by successful installation of "ATS" Systems for "textual" information processing and "File Conversion", and retyping for scanning in other applications.

The case has often been overstated, though, to the point where some people assume that the keying rate of typists is faster than the keying rate of keypunch operators. Limited tests of inter keystroke time distribution for typists and keypunch operators show that the keying rates and distribution of time between keystrokes are very similar. The only significant difference exists in a small percentage of the keystrokes in which case decision factors and mechanical functions of the keypunch delay the operator.

Do not confuse the average keying rate of 8,000 keystrokes per hour sometimes used fro keypunching with the word per minute speed rating of a typist. The 8,000 key stroke rate for keypunch operators is a production rate while the word per minute rate normally expressed is a typing test rate or speed potential.

A June, 1966 Business Education World article for Mr. George L. Zucchi, OPD Division, IBM Corporation, states that:

> "Most business organizations hire typists to type from 40-80 net words a minute. This rate is established as a result of the straight-copy typing speed test as a basis for determining net words a minute. Yet, the on-the-job production rate of these same typists is closer to 10-20 words a minute. Why?
>
> A number of "typing pressures" that contribute to a normal slowdown in production typing are absent during a typing speed test, such as:
>
> --Carbon copy requirement
> --Typing deadlines
> --Page balance and layout
> --Degree of difficulty of material
> --Quality of source copy
> --End-of-page pressures
>
> However, a major cause of diminished typing production is errors, followed by the inveitable and time-consuming erasures."

Keying speeds must be looked at objectively to start from a firm base when the various data entry approaches are considered. The two basic keyboards used on all of the IBM key entry products are the Selectric and 29 type keyboards. Both designs are capable of staying ahead of the operators and have good keying feel. The

basic speed of the keyboards is then approximately equal. Many competitive keyboards do restrict the operators keying speed and others contribute to higher error rates due to poor keying feel.

When we compare the IBM key entry products, we may then conclude that the productivity of an operator will be determined by the following factors:

DELAYS BETWEEN KEYSTROKES

24-26-29- SKIPPING (80 COLUMNS PER SECOND)
duplicating (20 columns per second) and card feed 0.25 sec.

50 MAGNETIC DATA INSCRIBER
None except for skipping and duplicating (100 cps).
Variable length records allow elimination of most skipping and duplicating.

SELECTRIC TYPEWRITER - (INCLUDING MTST)
Tabbing, Carriage Return

1050, 2740, 2741 KEYBOARD PRINTER TERMINAL
Tabbing, carriage return, transmission errors.

2260/2848-21 or 22 DISPLAYS
None, (2260's on other models of the 2848 can experience interference at high keying rates.)

NUMBER OF KEYSTROKES

IBM 24, 26
Keystrokes plus operator decision time are required for all fields with high order zeros.

IBM29
Left zero fill limited to 8 positions (minimum keystrokes if within this limit).

IBM 50
Minimum keystrokes

2260 AND KEYBOARD PRINTER TERMINALS

There will be reduced keystrokes due to access to system files and elimination of high-order zeros. Otherwise a slight increase in keystrokes occurs over the 29 due to shifting for numeric fields (assuming the block numeric keyboard) and field deliniators used in free-form keying which must also be used in fixed fields on 2260. (The tab may replace the field delinator character on the keyboard printer terminal.) The net keystrokes will usually be less than the 29 card punch.

SELECTRIC TYPEWRITER

Either free form or formatted typing, using the tab key, will result in approximately the same number of keystrokes as the 2260 or terminals. Some scanning formats require specific special characters at the beginning of each field.

ERROR CORRECTIONS

While error rates vary a great deal from one customer to another, the relationship of operator detected errors to the total keying errors is relatively constant. Approximately five out of six keying errors are self-detected by the operator.

IBM 24, 26, 29

Operator detected errors require feeding out the card and duplicating to the point of error, then keying the correct information. The bad card must be intercepted at the stacker by the operator. The IBM 29 left zero field errors can be corrected before punching.

IBM 50

Operator detected errors are corrected by the operator by field or record backspace followed by rekeying the field(s) in error.

2260

Operator detected errors are corrected by character backspacing and changing the character in error. Errors caught by the edit program can also be corrected at this time. Error messages are displayed at 2560 characters per second, and can give the operator directions for handling the error.

KEYBOARD PRINTER TERMINALS

Operator detected errors are corrected by backspacing and overstriking or using special delete codes. Errors caught by the program can be corrected at this time. Error messages will print out at 15 cps.

SELECTRIC TYPEWRITER

For OCR input, operator detected errors are corrected by backspacing and overstriking with a delete character to delete the error and then keying the correct character. Multiple deletes can be programmed to reject the whole line, or to reject a single field.

VERIFICATION

The amount of key verification required will directly affect throughput. When the initial recording of the transaction occurence creates a machineable record, there is no need for verification. If the initial record of the transaction must be re-recorded to get it into processable form, verification becomes necessary. The need for verification can be reduced when the recording is done on line to a processor. Program routines for validation of data can replace key verification of some fields of data, thus reducing the total keystrokes involved.

PROOFING VS VERIFICATION

Key verification of every key stroke of input data, is the most complete method of checking the accuracy of input data. However, it can be much more expensive than proofing. Some customers have replaced key verification with proofing procedures at a considerable savings since they find proof reading to be faster than key verification. The proofing procedure will be most applicable when the data being recorded is highly alphabetical and the consequences of errors entering the system are not particularly serious. The most effective proof reading is achieved when the source document is compared to a print out of the data actually stored in the system. This can be implemented regardless of the keying method used to record data for system input.

It should be noted here that an even more dramatic saving in verification costs is possible if the original creation of the record, when the transaction occurs, results in machineable data which is visually verified by the person recording the transaction.

KEYBOARD ARRANGEMENT

The speed of keying can be affected by the suitability of the keyboard arrangement to the type of data being keyed. The typewriter keyboard, with top row numerics, may be more suitable for highly alphabetic information. This keyboard arrangement is available on the Selectric typewriter, all keyboard printer terminals, and the 2260 display station.

The 29 keypunch arrangement, which has a 10-key block numeric inset on an alphabetic keyboard, is more desirable when a significant amount of the data is numeric. This keyboard arrangement is available on all keypunches, the IBM 50 Magnetic Data Inscriber, the 2260 Display Station, and the Selectric typewriter.

SUPPLIES

The performance of the keypunches and typewriters will be degraded due to the requirement of the operator to load and unload cards in the keypunch and insert and align paper in the typewriter. The 2260 will have no time associated with handling of supplies, and the type 50 cartridge handling time will be very minor.

QUALITY OF SOURCE DOCUMENT

Regardless of the keying method used, the quality of the source document can have a significant effect on keying speed. These source document factors are:

Legibility
Search (finding the next field)
Decision

KEYBOARD INTERLOCKS

The mechanically interlocked keyboards used on the IBM products will provide better keying accuracy than non-interlocked keyboards.

HUMAN FACTORS

The Human Factors aspects of the card punches and the Type 50 Magnetic Data Inscriber are quite well controlled in the design of the station. Operator comfort, working space, and position of the keyboard relative to the source documents are some of the main factors which will affect the operators thruput. These factors must be considered when typewriters, 2740, and 2741 terminals and 2260 display stations are used for high volume data entry.

JOB COST COMPARISON

Now that we have looked at the factors which will affect keying throughput of the various data entry products, let us compare the applicability of each data entry product in one of the input characteristics categories. Let us look at the Source Document Origination category and use the order entry application since all of the various data entry products will undoubtedly find use in this application. The case example is a sales order entry job with a volume of seventy thousand invoices per week. The invoices represent 90% of the keypunching workload. The other 10% is made up of several small keypunch jobs which will not be analyzed for this example.

The equipment configuration being used by the customer (Figure 1) is sixteen 24 card punches, one 26 card punch, and twelve 56 verifiers. The equipment rental for this installation is $1,532. The total data entry cost for the customer is $15,313. Only numeric information is required for this order entry application, therefore, the 1287 should be considered as a solution to this data entry requirement. Since the sales order forms are now prepared by hand the numeric handprinting feature of the 1287 will be included. The 1287 confuguration cost shown in Figure 2A totals $5,774 for IBM equipment, and a total data entry cost of $10,544 for equipment facilities and personnel. This represents a 1/3 savings in cost to the customer for his data entry job while increasing the hardware rental by a factor of approximately 4 to 1. The key to being able to justify the 1287 in this application is "control". If adequate control can be exercised over the people preparing the input these savings could be realized. If it is necessary to retype before scanning the costs will be considerably higher as shown in Figure 2B.

Next consider a 2260 data entry configuration to do this same order entry job. (Figure 3) A 40% throughput gain is estimated for this job when the 2260's are utilized for the following reasons:

1. The elimination of high order zero key strokes.

2. Invoice number to be intered only once for the entire invoice.

3. There is no card skipping, duplicating or feeding time required.

4. The elimination of verification of quantity, unit price, and the amount of sales by providing the extension in the CPU program.

5. The elimination of verification of customer code and invoice number by using self check number subroutines.

If we look at price alone for these high performance data entry solutions to this application, the 1287 approach would be the winner. However, the price is not the whole story. Therefore, a close look must be taken to determine whether or not it is possible to exercise the necessary control to utilize the 1287. If so, it is obviously the best choice.

Next, the on-line advantages of the 2260 configuration must be looked at a little further. So far we have only looked at the

advantages which affect throughput. How important is it to process the orders faster, learn about out of stock conditions sooner, and reduce the special handling provisions for emergency orders? The 2260 on-line configuration offers some very powerful data entry advantages as well as giving the customer the ability to inquire into his files. Is it worth the difference?

Had this been a telephone order entry job, the 2260's on-line would clearly have had the advantage because of the immediate verification and rapid processing of the orders.

If the control necessary for 1287 or the on-line advantages of 2260 are not present, the IBM 50 will be the choice to improve the off line data entry operation and at the same time reduce operating costs.

Total equipment rental		$ 1,532
16-24-1 @ $48	768	
1-26-1 @ $68	68	
12-56-1 @ $58	696	
29 operators @ $450		13,050
17 times card costs @ $33/ station		561
17 card to tape costs @ $10/station*		170
	TOTAL	$15,313

Card to tape costs will vary considerably from one installation to another. The actual costs should be used for comparison in a given account. This example uses the hourly rate of a minimum System/360, Model 20.

Self check number features (Modulus 10 for $25 or Modulus 11 for $30) were not included in this example.

Figure 1A. Operator and equipment costs for keypunching and verifying the order entry job example.

An estimated average throughput increase of approximately 25% over 24/56 for the following reasons:

1. Elimination of left zero
2. Invoice number entered once for the entire invoice regardless of the number of line items
3. No card skipping, duplicating, or feeding time.
4. Eliminate card handling
5. Error correction by field and record backspace

Total Equipment Costs		$ 4,324
21 Incriber Units @ $180	3,780	
1 2495 Tape Cartridge Reader	350	
2-26-1 @ $68	136	
1-56 @ $58	58	
24 Operators @ $450		10,800
2-Card Cost @$33/station		66
2-Card/Tape cost @ $10/station		20
		$15,210
Less Reduced Card Reader Cost (1) -		- 535
Total		$14,675

(1) The 2540-1 Card reader can be replaced with a 1442-N1 in this configuration.

Figure 1B. Type 50 Magnetic Data Inscriber Configuration

This configuration assumes a high percentage of rejects (20%) to illustrate that the 1287 may be applicable even when the re-entry rate is quite high.

Total equipment costs			$ 5,774
Total 1287		3,600	
1287-I	2,800		
Numeric handprinting	800		
System 360 cost (1)		1,740	
Total card punch cost		434	
4-24-1 @ $48	192		
1-26-1 @ $68	68		
3-56-1 @ $58	174		
Personnel costs			4,300
1287 operator and programmer salaries (2)		700	
8 card punch & verifier salaries @ $450		3,600	
5 card to tape @ $10/station			50
Form costs and card costs (forms estimated to=75%-card cost)			420
		TOTAL	$10,544

1. The system costs included are as follows:

$1,235	-for increasing the System 360/30 core from 32K to 65K.
665	-System cost is due to an assumption that the 1287 program in one partition will utilize 7% of processing time.
$1,900	
- 160	-Reduced card reader cost
$1,740	

2. This $700 includes 50% of an operators time and 50% of a programmers time.

3. There is also a reduction in supervision costs and floor space which is not included in this comparison.

Figure 2A. 1287 optical reader configuration and costs for the same order entry job.

Total equipment costs			$ 4,670
1287-I		2,800	
System/360 costs (1)		1,340	
Total card punch cost		194	
2-26-1 @ $68	136		
1-56-1 @ $58	58		
21 Selectric @ $16 (including maintenance)		336	
-Supplies			316
Forms and ribbons		250	
2-cards @33/station		66	
2-card to tape cost @ $10 station			20
Personnel cost			11,500
1287 operator & programmer salaries		700	
24 Selectric & card punch operators @ $450		10,800	
		TOTAL	$16,506

1. The system costs will be less than the previous 1287 configurations due to a further reduction of card reader requirement.

   i.e.: 1,125 -Increase from 32K to 65K
   640 -System cost
   1,875
   - 535 -Reduced card reader cost
   1,340 -System/360 cost

Note: The typewriter throughput is considered to be 25% better than 24/26.

Note 2: Fields normally verified are assumed to be keyed twice.

Figure 2B. 1287 optical reader with a central pool for transcribing prior to input via the 1287.

A 40% throughput gain has been assumed for the following reasons:

1. Elimination of left zeros.

2. The invoice number will be entered once for the entire invoice.

3. No card skipping, duplicating or feeding time.

4. Elimination of key verification of quantity, unit price, the amount of sale by providing the extension in the CPU program.

5. Eliminate verification of customer code and invoice number by using a self check number subroutine.

6. Error correction by character backspacing.

Total equipment costs			$ 4,323
Total 2260/2848 costs		2,559	
19-2260 @ $31	589		
19 DE keyboards @ $30	570		
1-2848 - 21	750		
1-expansion unit	50		
10 display adaptors @ $60	600		
System/360 cost (1) (3)		1,670	
Total card punch cost		194	
2-26-1 @ $68	136		
1-56-1 @ $58	58		
Personnel costs			10,300
22 Operators @ $450	9,900		
Programming cost (2) (3)	400		
2 card costs @ $33/station			66
2 card to tape @ $10/station			20
		TOTAL	$14,809

1. System costs include the following:

$1,235	-For increasing the System 360/30 core from 32K to 65K.
380	-System costs is due to an assumption that the 2260 programs in one partition will utilize 4% of the processing time.
590	-One additional 2311 file
2,205	
- 535	-Reduced card reader cost
$1,670	-System/360 cost

2. Programming costs are estimated in this case to be one half of a programmer's time. Most of this cost would be in writing the initial program.

3. While both programming and system costs are shown in this case, many customers will not charge these costs to 2260 data entry. This will be particularly true when 2260 are used for another application.

Figure 3. The 2260 System Configuration

The number of manual job steps necessary to complete the entry of transaction data into a data processing system can add significantly to the costs as well as time to enter the data.

The chart shown in Figure 4 shows the data flow for a particular application. The number of steps required is drastically reduced when the data entry is directly on line from the transaction origin. On line data entry with a centralized system and local terminal requires a few more steps than when the terminals are at the origin, but still requires less than half as many job steps as the off line key entry approach. A similar reduction in manual steps will result from the use of IBM optical readers when the original document is scannable.

The procedures used for control, balancing and checking will vary a great deal and therefore the chart shown in Figure 4 would not remain the same for all customers and applications. However, the relationship of number of job steps is typical.

In addition to the thruput capability of the various data entry products and the cost per station, the data flow should be included in the evaluation process used for selection of the best data entry product for a customer or application.

Data Flow Comparisons
Job Steps Starting at Transaction Origin

Off Line Key Entry	OCR	On Line Local	On Line Origin
-Wait Processing			
-Card to tape input			
-Locate card to tape instructions			
-Recycle corrections			
-Batch Balance			
-Send to Operations			
-Recycle Corrections			
-Verify			
-Log Completion			
-Key Punch			
-Locate Job Instructions			
-Distribute to Punch Operators	-Wait Processing		
-Wait in Shelf	-Reenter Corrections	-Wait Processing	
-Take to Key Punch	-OCR Read Batch and Balance	-Verify	
-Prepare Reference Card	-Wait in Shelf	-Data Entry (Log and Batch Balance)	
-Log into Controls	-Log into Con trols	-Wait in Shelf	
-Inter office Mail/Courier	-Inter office Mail/Courier	-Inter office Mail/Courier	
-Batch Balance	-Batch Balance	-Batch Balance	-Wait Processing
-Send to Collection Area	-Send to Collection Area	-Send to Collection	-Data Entry (Log and Batch Balance)
-Complete Document	-Complete Document	-Complete Document	
-Transaction Origin	-Transaction Origin	-Transaction Origin	-Transaction Origin

* Start reading upward here

Card Punch & Verify	OCR	On Line Local	On Line Source
24,26,56,29,59 50-Magnetic Data Inscriber Centralized Typing for Scanning	Typing, Numeric Hand Printing or Marking at the origin for OCR Scanning	On Line Data Entry Stations at the Data Processing Center	On Line Data Entry Stations at the source location

Figure 4. Data flow comparison by job steps

If your customers are not fully aware of the potential for improvement of all data entry jobs, it should be recommended that they document a job profile for each data entry job. The purpose of doing this is to enable evaluation of the data entry devices against each job to determine what potential exists for improvement in data entry procedures and equipment.

The data entry job analysis will be done in four steps.

1. The Job Profile Sheets (Figs. 5 thru 10) should be prepared for all significant jobs by the department responsible for the job.

2. The ranking of product solutions for each job profile sheet should be done by the customer's data processing department with the aid of the IBM salesman or systems engineer.

3. The job profile sheets should be summarized using the Data Entry Product Acceptability Summary (Fig. 11) or similar form.

4. The Minimum Acceptance Criteria Matrix (Fig. 12) should then be applied to the product acceptability summary totals for each product.

   The acceptance criteria are based on the product rental and throughput.

The result of this procedure should be a good focus on the potential which exists for all data entry products for that particular customer.

Preparation of the profile sheet and summary forms occurs as follows:

Select a profile sheet for each input characteristic which is found in a given job. Simple profile sheets such as the examples shown in Figs. 5-10 should be adequate to establish this potential.

ORIGINAL INPUT OR SOURCE DOCUMENT ORIGINATION

Application Name _____

Department Name _____

I. Nature & Volume of Data _____

a) Number of Source Document Formats _____

b) Average Number of characters/document _____

_____

c) Average Daily Volume (No. of Doc.) _____

d) Peak Daily Volume _____

e) Percentage of Alpha Data _____

SELECTED PRODUCT SOLUTION
(Name of Product)

Best (.4) _____

2nd (.3) _____

3rd (.2) _____

4th (.1) _____

Daily Volume
Char/Day _____
(thousands)

II. Characteristics of Data Source

a) Who prepares the source document? _____

b) How many people prepare source documents? _____

c) Where are the source documents prepared? _____

d) Are source documents handwritten, typed, or other? _____

_____

Why is this method used? _____

_____

_____

e) Can the quality of source recording be controlled for optical reading? _____

_____

III. Error Problems

A) List the causes of error and approximate % of total documents.

	Cause of Error	% of Total Documents
1.	_____	_____
2.	_____	_____
3.	_____	_____

Figure 5. Job Profile Form

4. _____ _____

5. _____ _____

TOTAL _____

B) Is this error rate considered to be a major factor needing improvement? _____

_____

C) What percentage of recorded data is key verified? _____

D) How much can the key verification be reduced by programmed balancing of fields, self check number routines, and other edit routines? _____

_____

_____

IV. File Access and Turn Around Time

A) Can the amount of data keyed be reduced by having access to systems files at the data entry station? _____

_____

_____

B) How important is fast response to data input in this application? _____

_____

_____

TO WHOM? _____

_____

WHY? _____

_____

V. Is the cost of inputting data the prime motivation for improving data entry in this application? _____

_____

If not, explain: _____

_____

Figure 5. (Continued)

TURN AROUND

Application Name _____

Department Name _____

I. Method now used to prepare the turn-around document _____

_____

II. Daily Volume (documents received) _____

_____

SELECTED PRODUCT SOLUTION
(Name of Product)

Best (.4) _____

2nd (.3) _____

3rd (.2) _____

4th (.1) _____

Daily Volume
Char/Day _____
(thousands)

III. How is variable data recorded? _____

_____

IV. How many characters/document? _____

Alpha _____

Numeric _____

V. Can the recording of variable data be controlled for optical reading? _____

_____

VI. What % of the variable data is key verified? _____

_____

VII. Is the cost of inputting data the prime motivation for improving data entry in this application? _____

_____

If not, explain: _____

_____

_____

_____

_____

Figure 6. Job Profile Form

SPECIAL ADVANCED PREPARATION

Application Name _____

Department Name _____

I. How are the documents prepared? _____

_____

_____

II. What is the daily volume? _____

_____

SELECTED PRODUCT SOLUTION
(Name of Product)

Best (.4) _____

2nd (.3) _____

3rd (.2) _____

4th (.1) _____

Daily Volume
Char/Day _____
(thousands)

III. How many characters/document? _____

_____

IV. Is the identifier all numeric? _____

If not, explain: _____

_____

_____

_____

_____

V. How are the documents processed? _____

_____

Figure 7. Job Profile Form

INQUIRY/RESPONSE

Application Name _____

Department Name _____

I. What is the volume of inquiries/day? _____

_____

Alpha _____

Numeric _____

SELECTED PRODUCT SOLUTION
(Name of Product)

Best (.4) _____

2nd (.3) _____

3rd (.2) _____

4th (.1) _____

Daily Volume
Char/Day _____
(thousands)

II. How many characters per average reply? _____

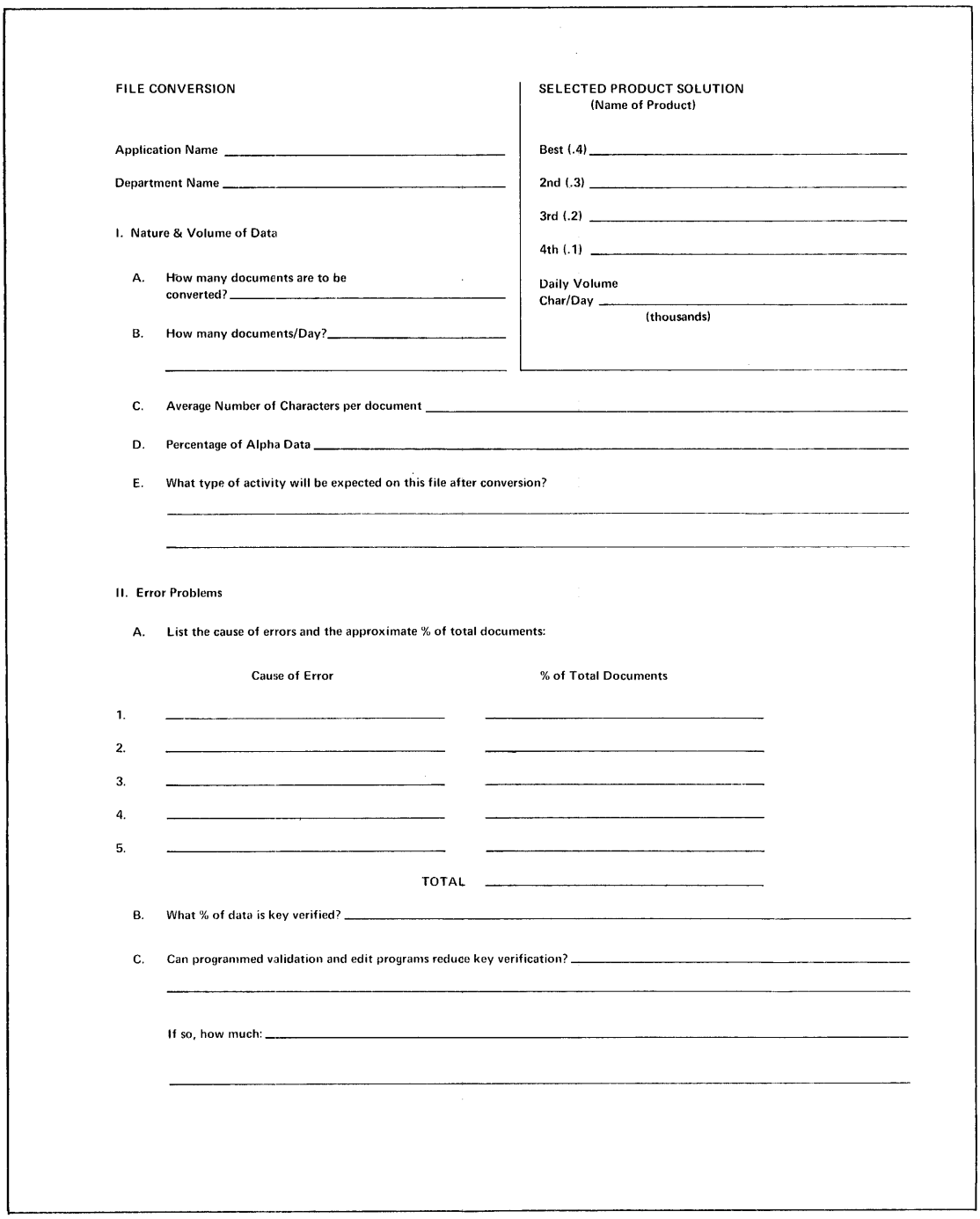
III. Is hard copy of the inquiry required? _____

IV. Is immediate response required? _____

V. Are the inquiry requests now handwritten or typed? _____

_____

Figure 8. Job Profile Form



FILE CONVERSION

Application Name _____

Department Name _____

I. Nature & Volume of Data

A. How many documents are to be converted? _____

B. How many documents/Day? _____

SELECTED PRODUCT SOLUTION
(Name of Product)

Best (.4) _____

2nd (.3) _____

3rd (.2) _____

4th (.1) _____

Daily Volume
Char/Day _____
(thousands)

C. Average Number of Characters per document _____

D. Percentage of Alpha Data _____

E. What type of activity will be expected on this file after conversion?

_____

_____

II. Error Problems

A. List the cause of errors and the approximate % of total documents:

	Cause of Error	% of Total Documents
1.	_____	_____
2.	_____	_____
3.	_____	_____
4.	_____	_____
5.	_____	_____
	TOTAL	_____

B. What % of data is key verified? _____

C. Can programmed validation and edit programs reduce key verification? _____

_____

If so, how much: _____

_____

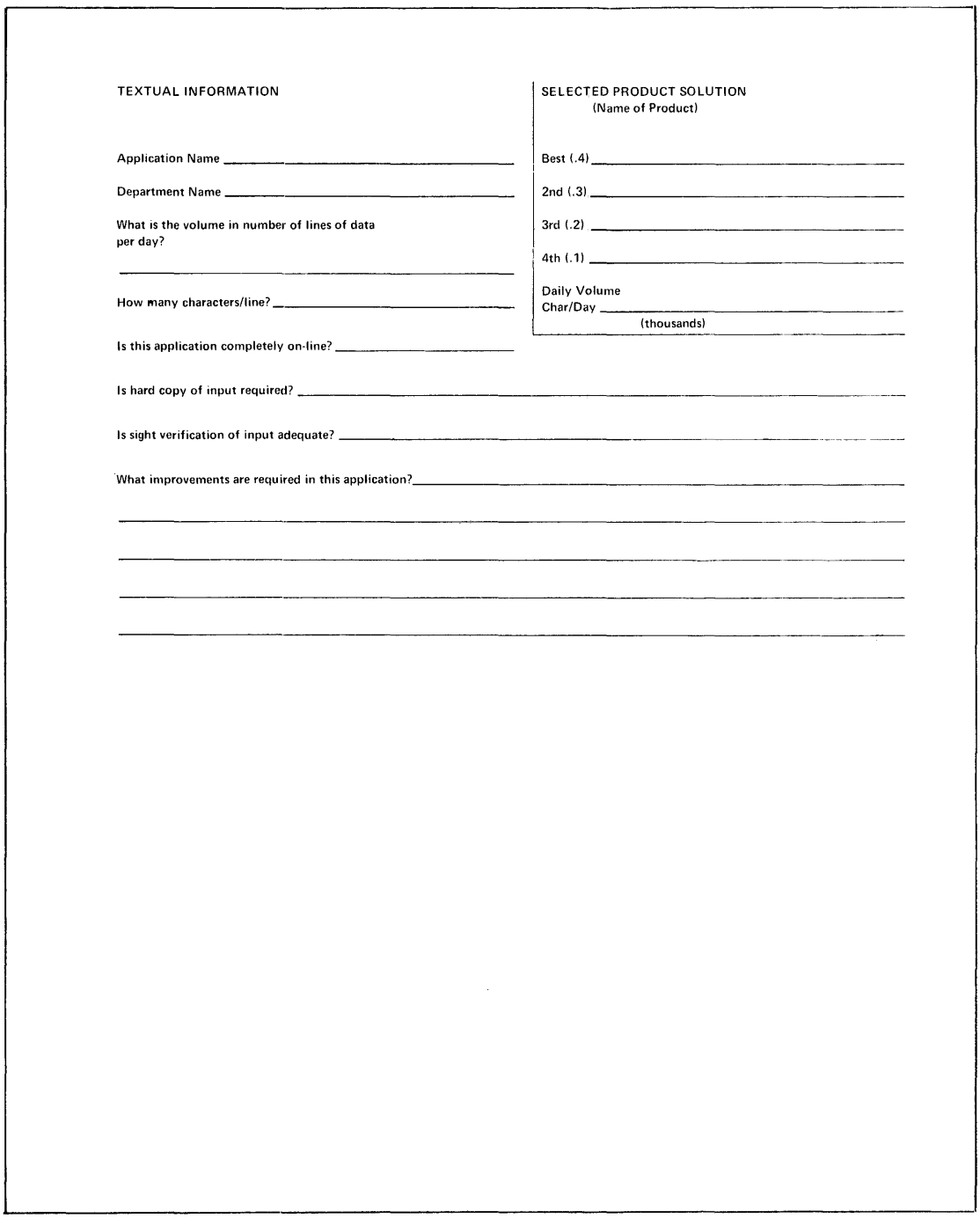
Figure 9. Job Profile Form

D. Has proofing of a machine print out vs. the source been considered?

III. Is the cost of converting the file the prime motivation for improving Data Entry in this application?

If not, explain:

Figure 9. (Continued)



TEXTUAL INFORMATION

Application Name _____

Department Name _____

What is the volume in number of lines of data per day?

_____

How many characters/line? _____

Is this application completely on-line? _____

SELECTED PRODUCT SOLUTION
(Name of Product)

Best (.4) _____

2nd (.3) _____

3rd (.2) _____

4th (.1) _____

Daily Volume
Char/Day _____
(thousands)

Is hard copy of input required? _____

Is sight verification of input adequate? _____

What improvements are required in this application? _____

_____

_____

_____

_____

Figure 10. Job Profile Form

The Marketing Guide Section "Input Characteristics" covers the classifications of input characteristics with examples of applications and products which fit into each category. Each of the questions asked has a bearing on the suitability of each data entry product.

The next step is for the IBM salesman or systems engineer to assist the customer in a review of these job profile sheets and establish a product fit for each job. The product characteristics section of this sales guide will help with the understanding of the tradeoffs to be considered. The selected product solutions should be ranked on the profile forms.

Selected Product Solution (Name of Product)	
Best (.4)	2260
2nd (.3)	1287
3rd (.2)	50
4th (.1)	024/026
Daily Volume Char/Day (thousands)	602

The Data Entry Product Summary form should then be used to record the ranking (.4 for the highest and .1 for the lowest) by product, multiplied by the volume (thousands of characters).

JOB NAME	Daily Volume in Characters	24, 26, 29 Card Punches	2740-41 1050 KB Prtr. Terminal	2260 Display Station	1231-32 Mark Reader	1282 Optical Reader Card Punch	1428 Alpha Numeric Optical Reader	1285 Optical Reader	1287 Optical Reader	50 Magnetic Data Inscriber
SALES ORDERS	602	60		240					180	120
MISCELLANEOUS	60	18		12						24
Sheet TOTAL	662	78		252					180	144
Cust. TOTAL	662	78		252					180	144

Figure 11. Data Entry Product Acceptability Summary

The summary totals from the Data Entry Product Summary form should be recorded on the Minimum Acceptance Criteria Matrix. It is now possible to measure the potential for each product in this particular customers office. The acceptance criteria numbers used in the Matrix are based on price and throughput of the products.

DATA ENTRY PRODUCT

Minimum Acceptance Criteria Matrix

Machine Type	Very Likely	Likely	Doubtful	Very Doubtful	Prod. Accept. Summary Totals
24, 26, 29	–	–	–	–	84
50	192	96	48	24	144
2740, 2741, 1050	384	192	96	48	
2260DE	384	192	96	48	252
1231-32	38	19	9.6	4.8	
1282	192	96	38	14	
1428	230	115	48	38	
1285	144	72	38	24	
1287	192	96	48	24.	180

Figure 12. Minimum Acceptance Criteria Matrix

This is obviously a gross measurement and when assembled for all jobs does not design a data entry system. It will, however, show the potential advantages of the various products based on all of the data entry jobs and not just the most obvious high volume jobs.

The products showing no acceptance can be eliminated, and a more detailed cost performance review as well as an evaluation of the intangible factors will lead to a good data entry systems design.

The miscellaneous one time job activity which can be best handled by card punches and does not realize advantages from the high performance key entry products will continue to be card punch jobs.

A further refinement could be added to the profile sheet by assigning a code which represents importance of the job to management. If used, this code would be 4=Very High - 3= High - 2=Medium and 1=Low and would be multiplied by the product of the ranking and volume numbers.

IBM now offers a full-range of data entry products. These products are all directed toward reducing our customer's costs and improving the efficiency when entering high volume data. IBM card punch and verifiers, which have been serving our customers so well, will continue to provide the most economical, and reliable methods of preparing the lower volume data for entry into the System/360, or for that matter, any other system. The sales strategy which offers the best solution to the customer's high volume data entry problem also provides the greatest NSRI to the IBM Company.

A retail store can now afford data processing equipment because of the announcement of the IBM 1287, which will cost approximately four times that of keypunch hardware cost to do the same job.

Why? Because a keypunch installation is made up of 10-15% equipment costs and the balance of the costs are made up of personnel, facilities, and supplies costs. Where the 1287 can be justified to replace keypunch installations a similar ratio of equipment cost will exist. The point here is to sell the IBM optical character recognition equipment wherever the source recording can be properly controlled for its use.

For those customers who are not prepared to take the step to optical character recognition equipment, encourage an intermediate step which will prepare them for the move tomorrow, but also show improvement in their present data entry operations. The intermediate step is to exercise planning and control over the recording of all source data, wherever possible, with the immediate benefit of reduced errors and increased productivity in their keypunch section or with high performance key entry equipment.

Next to OCR products in NSRI potential, are on-line data entry systems. In addition to the economies which can be realized from the increased production, improved error correction procedures, and processor verification; the on line data entry system can also drastically reduce the time from the transaction occurence until processing is completed. Many systems will be justified by saving this all important commodity, time, even with an increase in total cost to the customer.

Additional benefits from selling on line data entry are the system growth which will follow due to the multiple use which can be made of the data entry terminals. The customer can ease into other on line applications by moving his bread and butter job (keypunching) on line first.

The customers we've been talking about are obviously not the small customers. With the exception of the retail industry 1287 customers and the 1231-1232 optical mark reader customers, the OCR and on line data entry customers will be primarily those customers who have 20 or more punches and verifiers installed.

Next is the customer who is the prime potential for the new IBM 50 Magnetic Data Inscriber. He will be found in both the large customer and medium size customer who has high volume key-entry requirements, but does not find OCR products or on-line systems beneficial. This customer will be primarily the customer with 10 or more keypunches and verifiers. The magnetic data inscriber provides the customer with a high volume key-entry product which uses the convenient magnetic tape cartridge as a recording media. The keyboard and operator features have purposely been kept very similar to the IBM card punch and verifier equipment since operators are expected to work interchangeably between the magnetic data inscriber units and IBM card punches and verifiers. The magnetic data inscriber units record on the magnetic tape cartridge which can subsequently be taken to a systems reader, automatically loaded, and read into the system. The magnetic data inscriber units provide the customer with the high performance off-line data entry unit for all jobs, large or small, which don't require the use of the punched card. This unit should be easy to sell, and will bring in a significant amount of NSRI (approximately doubling equipment costs which were displaced while reducing the customers cost of doing the job).

Promote the advantages of the new IBM data entry products to the key punch supervisor and operators to achieve a high level of acceptance.

The theme of the marketing strategy for data entry products is "Total Data Entry Systems." Improve every facet of your customer's data entry system.

APPENDIX I

2260 DISPLAY STATION GUIDELINES

These guidelines superseded those given in Issue No. 66-010 of the Installation Newsletter. The reasons for this are as follows:

1. To simplify use of the guideline, the family of performance curves was replaced by one using only the Short Read DS MI command to show the highest possible thruput.

   The single performance curve presented is based on measurements of experienced operators and is more representative of a typical application environment. The average operator rates used ranged from 3.5 char/sec to 5.6 char/sec, with a composite average keying rate of 4.2 char/sec. These average rates include a representative number of high speed character bursts, of course.

2. Engineering change improvements have been added since publishing Installation Newsletter No. 66-010.

This guideline will help to determine how many 2260 display stations can be supported on one 2848 display control in your application. If the limit indicated is found to be unacceptable, it is recommended you consider the 2848 Model 21 or 22 display control in place of the 2848 Models 1, 2, and 3, to prevent customer dissatisfaction due to an unacceptable keyboard lock-out rate.

The 2848 display control contains common circuitry to service the individual 2260 delay line buffers and the interface of the host computer. Since the common circuitry operates in a serial fashion (it can do only one thing at a time), requests for service are queued and handled on a priority basis. If a heavy demand is placed on the 2848 to service messages across the interface, and at the same time operators are keying rapidly on the attached 2260 keyboards, the 2848 may not be able to respond to a keystroke request in time to restore the keyboard before the next key depression. When this occurs, the operator may sense a resistance to her finger pressure.

The 2848 Model 21 and 22 display control for volume key entry applications provides additional circuitry which allows high production thruput rate to be sustained without incurring keyboard lock-outs.

Thus, when configuring a 2260 system, consideration must be given to the volume of activity expected at each station. The performance curves (Exhibit 1) will serve as a guide in determining which Model 2848 is required.

Use of the Performance Curves (Exhibit 1)

The performance curves are plotted as a function of:

1. Thruput per station (records/hour/station) The number of records to be entered per hour at each station. Pick a representative peak hour and assume the total job load of the

system to be divided equally among all active stations.

2. Record length (characters) The average number of character positions on the 2260 display station between the START symbol of the record to be entered and the cursor.

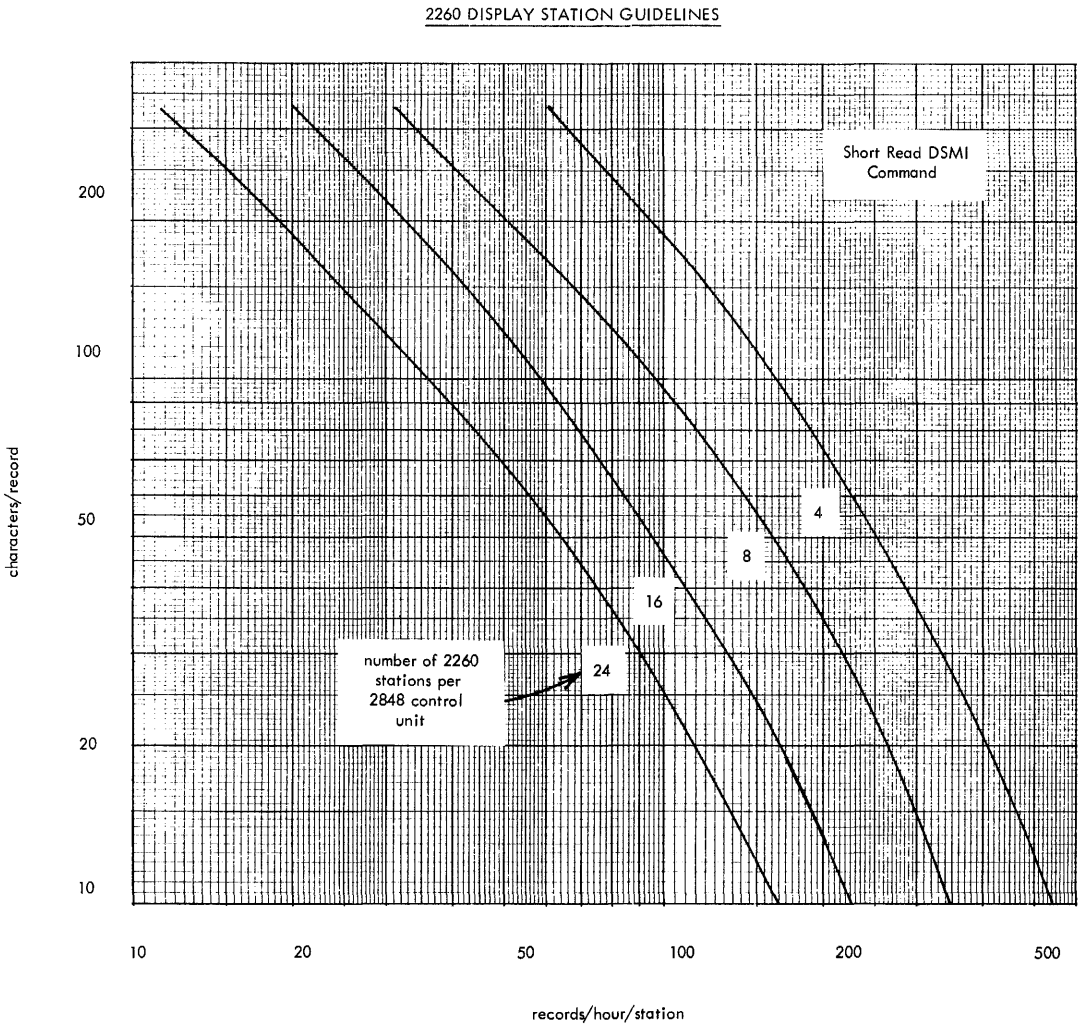


Exhibit 1

Thruput per station and record length are the ordinate and abscissa of the graph. The curves, numbered 4, 8, 16, and 24, represent the operating limits when the respective number of 2260 display stations are attached to one 2848. For example, any point below the 8-curve represents a thruput for which 8 stations per control unit will operate with 3 lock-outs per hour per station or less. Above the curve, keyboard lock-outs increase. Curves for other numbers of 2260's may be interpolated. (Note: The following examples are the same as in the superseded guideline. Average operator keying rate is now assumed to be the same as the actual measured sample upon which the new curves are based. This eliminates keying rate as a parameter for consideration, which is reasonable, since it is not usually known.)

Examples

1. At a thruput of 100 records/hour/station and 55 characters, we find the operating point lies above the curve for 16 but below the curve for 8 stations per control unit. This indicates that 8 stations/d.c. may be satisfactory while 16 stations/d.c. would not. Interpolating, it is probable that up to 12 stations/d.c. would be acceptable.

   By dividing the number of stations allowed per control unit into the total number of stations desired, the number of control units required to support the configuration is determined.

2. The following are two examples of use of the performance curves in typical applications:

   a. A wholesaler receives 900 telephoned orders per day (8 hours) from retailers. Each order has, on the average, ten entries. Twelve operators enter the orders at 2260 stations as they are received on the phone. Each entry consists of a 20 character record, for which there is a one line response, indicating whether the item called for is in stock, or its status if not in stock. In addition, there are two low volume stations for inquiries and corrections. Can one 2848 Display Control handle this configuration?

      Thruput is calculated as follows:

      $$\text{Thruput} = \frac{900 \text{ orders/day} \times 10 \text{ entries/order}}{8 \text{ hours/day} \times 12 \text{ stations}}$$

      $$= 94 \text{ entries/hour/station}$$

      With a record length of 20 characters, this point is found to lie below the limiting curve for 24 stations per control unit. Therefore, the above 14 stations can be handled by one 2848 control unit with room for expansion or peak period performance.

   b. Operators are entering data from a stack of documents. Each document results in a 60 character record. Output consists of a one line response. Ten seconds are required to check the response and acquire the next document. If 36 operators are needed, how many control units are required?

      $$\text{Thruput} = \frac{3600 \text{ sec/hr}}{\frac{60 \text{ char rec}}{+10 \text{ sec}}} = 148 \text{ rec/hr/station}$$

      $$4.2 \text{ char/sec}$$

Plotting this point on the performance curve, it appears that 6 stations per control unit can be handled, and for 36 operators, six 2848 control units would be required.

However, two data entry control units should be considered to accommodate the 36 operators. The 2848 Models 21 and 22 are more economical and provide increased function.

To guide the user of the performance curves, some additional information is presented here regarding their generation.

They are based on the output of a simulation model of the 2260/2848 system using the IBM General Purpose Simulator (GPSS III). Several assumptions are implicit in the mood.

1. The first assumption concerns lock-outs. Any time that the keyboard is locked at the beginning of a keystroke, it is considered a lock-out regardless of its duration. The distribution of lock-out duration times indicated by the simulations is shown in the following table:

Lock-out Duration (ms)	Percent of Lock-outs
0 - 5	50
5 - 10	35
10 - 20	13
20 - 50	2

   The criterion on which the performance curves are based is that each station experiences less than one lock-out per 20 minute period on an average.

2. A standard mix of operator keying distribution was used, ranging from average keying rates of 3.5 to 5.6 cps. These distributions were derived from data collected by monitoring actual keying operations for an Inter-keystroke Timings Study. The composite mean keying rate of the operators used in the simulation was 4.2 cps, the same as determined in the study. It was found that the percentage of inter-keystroke times below 100 ms had a more pronounced effect on the performance curve than the actual mean keying rate. Thus, an operator keying at a smooth steady rate will experience fewer lock-outs than a slower, but erratic, operator who keys many bursts of two or three characters.

3. An operator error rate is incorporated in the model, consisting of one error in 266 characters. It is assumed these errors are immediately recognized and corrected. An increased use of backspace due to such errors adds to the lock-out frequency.

4. The model provides for program erase and display of one line of data following each entry.

5. The multiplexor channel and CPU are considered to be always available to the 2848 control unit.

APPENDIX II

SAMPLE JOB ANALYSIS FORMS

ORIGINAL INPUT

Definition: Original input is defined as additions or changes to information in the data processing system master file.

Examples: Opening new accounts, adding new parts or models to the file, adding new employees to the file, address changes, and bill of material changes.

Characteristics: Alphameric, usually lengthy, more than one punched card, and has unused fields.

Partially or completely verified.

Input Methods:

Cards Punched and Verified

IBM 24, 26, 29 Card Punches
IBM 56, 59 Verifiers

Magnetic Tape Cartridge

IBM 50 Magnetic Data Inscriber

Typewritten for OCR (1428)

A model C or IBM Selectric typewriter would be used.

On Line Display or Printer Terminal

IBM 2260/2848 Mod. 21 and 22 via S/360 channel
IBM 2740, 2741, 1050 via communication lines.

SOURCE DOCUMENT ORIGINATION

Definition: The recording of the transaction will occur at the source over relatively widely dispersed locations.

Examples: Credit card transactions, cash register journals, pencil marking, hand printing, and Port-A-Punch cards, are examples of source document origination for direct input to the S/360.

Characteristics: Transaction frequency, sequence and/or location cannot be predicted even though the account is in the master file.

The identifier can be all numeric. Quantitative information may be needed in addition to the identifier.

A small amount of information is recorded in each message.

Input Methods:

Credit Card Imprinting - Imprinter recording can be read by either the IBM 1282 or 1287.

Typing for Scanning - The Model C and Selectric typewriters may be used to type for scanning by OCR products 1282, 1287, 1418, and 1428.

Cash Register Journals - May be read on either the 1285 or 1287.

Port-A-Punch Cards - Can be prepared by hand and read directly into the system.

Numeric Hand Printing - Can be read directly into the system via the 1287.

Handwritten or Telephoned Transactions - can be entered by any of the key entry products.
Magnetic Data Inscriber - IBM 50

Card punches and Verifiers	-	IBM 24, 26, 56, 29, 59, 824, 826
On-line Displays	-	IBM 2260/2848 Mod. 21 and 22
On-line Keyboard Printer Terminals	-	IBM 2740, 2741, 1050

ORIGINAL INPUT OR SOURCE DOCUMENT ORIGINATION

Application Name _____

Department Name _____

I. Nature & Volume of Data _____

a) Number of Source Document Formats _____

b) Average Number of characters/document _____

_____

c) Average Daily Volume (No. of Doc.) _____

d) Peak Daily Volume _____

e) Percentage of Alpha Data _____

SELECTED PRODUCT SOLUTION
(Name of Product)

Best (.4) _____

2nd (.3) _____

3rd (.2) _____

4th (.1) _____

Daily Volume
Char/Day _____
(thousands)

II. Characteristics of Data Source

a) Who prepares the source document? _____

b) How many people prepare source documents? _____

c) Where are the source documents prepared? _____

d) Are source documents handwritten, typed, or other? _____

_____

Why is this method used? _____

_____

_____

e) Can the quality of source recording be controlled for optical reading? _____

_____

III. Error Problems

A) List the causes of error and approximate % of total documents.

	Cause of Error	% of Total Documents
1.	_____	_____
2.	_____	_____
3.	_____	_____

4. _____ _____

5. _____ _____

TOTAL _____

B) Is this error rate considered to be a major factor needing improvement? _____

_____

C) What percentage of recorded data is key verified? _____

D) How much can the key verification be reduced by programmed balancing of fields, self check number routines, and other edit routines? _____

_____

_____

IV. File Access and Turn Around Time

A) Can the amount of data keyed be reduced by having access to systems files at the data entry station? _____

_____

_____

B) How important is fast response to data input in this application? _____

_____

_____

TO WHOM? _____

_____

WHY? _____

_____

V. Is the cost of inputting data the prime motivation for improving data entry in this application? _____

_____

If not, explain: _____

_____

TURN AROUND

Application Name _____

Department Name _____

I. Method now used to prepare the turn-around document _____

_____

II. Daily Volume (documents received) _____

_____

SELECTED PRODUCT SOLUTION
(Name of Product)

Best (.4) _____

2nd (.3) _____

3rd (.2) _____

4th (.1) _____

Daily Volume
Char/Day _____
(thousands)

III. How is variable data recorded? _____

_____

IV. How many characters/document? _____

Alpha _____

Numeric _____

V. Can the recording of variable data be controlled for optical reading? _____

_____

VI. What % of the variable data is key verified? _____

_____

VII. Is the cost of inputting data the prime motivation for improving data entry in this application? _____

_____

If not, explain: _____

_____

_____

_____

_____

TURN AROUND

Definition: Turn around documents are defined as those documents originated in the data processing installation and returned to update the master file. 96

Examples: Telephone and utility bills, meter reading, stock picking tickets, drivers license renewal applications and subscription renewals are examples of turn around document applications. 97

Characteristics: All needed identification for re-entry is on the document. The record can be all numeric. Addition of quantitative information may be required. A small amount of information is provided per message. 98 100 101

Input Methods:

Punched Cards - Cards can be punched by the system punch and printed on a 408 or 1404 printer. Change data would be keypunched. 103 104

Card and Paper-Printed Documents - These documents can be prepared on a 407 or 1403 printer or the Model C or Selectric typewriter for input to an IBM 1418, 1428, 1287, or 1282 optical reader. Variable or change data can be pencil marked or hand printed for 1287 input. 105 106

Marked Documents - These documents can be prepared on an IBM 1443, 2203, or 1403 printer. Change data can be marked for input via 1231, 1232, 1418, 1428, 1287, and 1282 optical readers. 107 108

SPECIAL ADVANCED PREPARATION

Application Name _____

Department Name _____

I. How are the documents prepared? _____

_____

_____

II. What is the daily volume? _____

_____

SELECTED PRODUCT SOLUTION
(Name of Product)

Best (.4) _____

2nd (.3) _____

3rd (.2) _____

4th (.1) _____

Daily Volume
Char/Day _____
(thousands)

III. How many characters/document? _____

_____

IV. Is the identifier all numeric? _____

If not, explain: _____

_____

_____

_____

_____

V. How are the documents processed? _____

_____

SPECIAL ADVANCED PREPARATION

Definition: Special industry or application-oriented media.

Examples: MICR, Dennison tags, tub files, and OCR preprinted documents. 134

Characteristics: The documents are prepared in advance in anticipation of future entry into the system. 135

The time lapse between preparation and re-entry is unimportant. 136

The identifier can be all numeric.

A small amount of information is recorded in each message.

Input Methods:

Punched Cards - Tub files would be punched in advance by the system punch, keypunched and interpreted, or reproduced. 140

Printed Documents - Would normally be printed on-line by the 1403 printer for later input via the IBM 1428, 1418, 1282, or 1287 optical readers. 141

MICR - Documents printed in advance, or printed on the 1445 printer, are read by the 1412 or 1419 magnetic character readers. 142

INQUIRY/RESPONSE

Application Name _____

Department Name _____

I. What is the volume of inquiries/day? _____

_____

Alpha _____

Numeric _____

SELECTED PRODUCT SOLUTION
(Name of Product)

Best (.4) _____

2nd (.3) _____

3rd (.2) _____

4th (.1) _____

Daily Volume
Char/Day _____
(thousands)

II. How many characters per average reply? _____

III. Is hard copy of the inquiry required? _____

IV. Is immediate response required? _____

V. Are the inquiry requests now handwritten or typed? _____

_____

INQUIRY/RESPONSE:

Definition: Inquiry/response can be defined as interrogation and possible updating of the master file with immediate response. 144

Examples: Airline reservation systems, bank teller systems, and management information systems. 145

Characteristics: May or may not require document preparation.

The identifier can be all numeric in some applications. 147

There will be a small amount of information in the input message with output messages varying from small to large. 148

Input Methods:

Remote or Local - Inquiries are best handled by on-line displays 2260/2848 or Keyboard Printer Terminals 2740, 2741, and 1050. Special purpose terminals such as 1060's will be used too. 150 151

Slow Response Inquiries can be processed with any of the key entry methods. 152

FILE CONVERSION

Application Name _____

Department Name _____

I. Nature & Volume of Data

A. How many documents are to be converted? _____

B. How many documents/Day? _____

SELECTED PRODUCT SOLUTION
(Name of Product)

Best (.4) _____

2nd (.3) _____

3rd (.2) _____

4th (.1) _____

Daily Volume
Char/Day _____
(thousands)

C. Average Number of Characters per document _____

D. Percentage of Alpha Data _____

E. What type of activity will be expected on this file after conversion?

_____

_____

II. Error Problems

A. List the cause of errors and the approximate % of total documents:

	Cause of Error	% of Total Documents
1.	_____	_____
2.	_____	_____
3.	_____	_____
4.	_____	_____
5.	_____	_____
	TOTAL	_____

B. What % of data is key verified? _____

C. Can programmed validation and edit programs reduce key verification? _____

_____

If so, how much: _____

_____

D. Has proofing of a machine print out vs. the source been considered?

III. Is the cost of converting the file the prime motivation for improving Data Entry in this application?

If not, explain:

FILE CONVERSION

Definition: File conversion will be defined as the conversion of files now processed manually, into machine processable form. 154

Examples: A driver's license file, library file, insurance group claims file, and title insurance file are good examples of the type of input that falls into this category. 155

Characteristics: High percentage of alphabetic information.

Long records are usually more than one punched card.

The information is completely proofed or verified either by rekeying or by sight. 158

Source documents are relatively poor.

Error correction and resolution is a bigger problem than with the established file. 160

Input Methods:

On line displays or keyboard printer terminals are applicable if the job is large enough. 162

DATA TEXT terminals and 2741 terminals with ATS Type II Program support have application in file conversion. 163

TEXTUAL INFORMATION

Application Name _____

Department Name _____

What is the volume in number of lines of data per day?

_____

How many characters/line? _____

Is this application completely on-line? _____

SELECTED PRODUCT SOLUTION
(Name of Product)

Best (.4) _____

2nd (.3) _____

3rd (.2) _____

4th (.1) _____

Daily Volume
Char/Day _____
(thousands)

Is hard copy of input required? _____

Is sight verification of input adequate? _____

What improvements are required in this application? _____

_____

_____

_____

_____

TEXTUAL INFORMATION

Definition: Alpha-numeric information which will be entered into a processing system for editing, storage, updating and output. 165

Examples: Examples of textual information are proposal preparation, legislative drafts, equipment specifications, and other internal business publications. 166

Characteristics: High percentage of alphabetic information.

Long variable records.

No fixed fields.

Insertion and deletion of information within a record which changes the position of information within the record. 170

Sight verification is applicable.

Input Methods:

On-line displays (IBM 2260/2848 and keyboard printer (2741) terminals. The 2741 is program supported by ATS/360 Type II program. 173 174

DATA TEXT terminals provide an on line text processing service at the lowest cost where a small number of terminals are required. 175

The OPD Magnetic Tape Selectric Typewriter (MTST) records off-line on a tape cartridge. Editing, updating, and inserting information can be done off line. The IBM 2495 Tape Cartridge Reader reads the cartridge into the system.

JOB NAME	Daily Volume in Characters	24, 26, 29 Card Punches	2740-41 1050 KB Prtr. Terminal	2260 Display Station	1231-32 Mark Reader	1282 Optical Reader Card Punch	1428 Alpha Numeric Optical Reader	1285 Optical Reader	1287 Optical Reader	50 Magnetic Data Inscriber
Sheet TOTAL Cust. TOTAL										

DATA ENTRY PRODUCT

Minimum Acceptance Criteria Matrix

Machine Type	Very Likely	Likely	Doubtful	Very Doubtful	Prod. Accept. Summary Totals
24, 26, 29	–	–	–	–	
50	192	96	48	24	
2740, 2741, 1050	384	192	96	48	
2260DE	384	192	96	48	
1231-32	38	19	9.6	4.8	
1282	192	96	38	14	
1428	230	115	48	38	
1285	144	72	38	24	
1287	192	96	48	24.	

APPENDIX III

BATCHED DATA ENTRY USING THE IBM 2260 DISPLAY STATION

ABSTRACT

This sample proposal is being distributed as a supplement to the Data Entry Marketing Guide, to assist you in the preparation of proposals which utilize the 2260 Display Station for batched online data entry. While this proposal was written for a particular customer, the methods of data entry discussed, the advantages to be gained, the job instructions, and the job description sheet requirements apply to many customers and should aid you in exploring all aspects of the 2260 data entry system before you write your proposal.

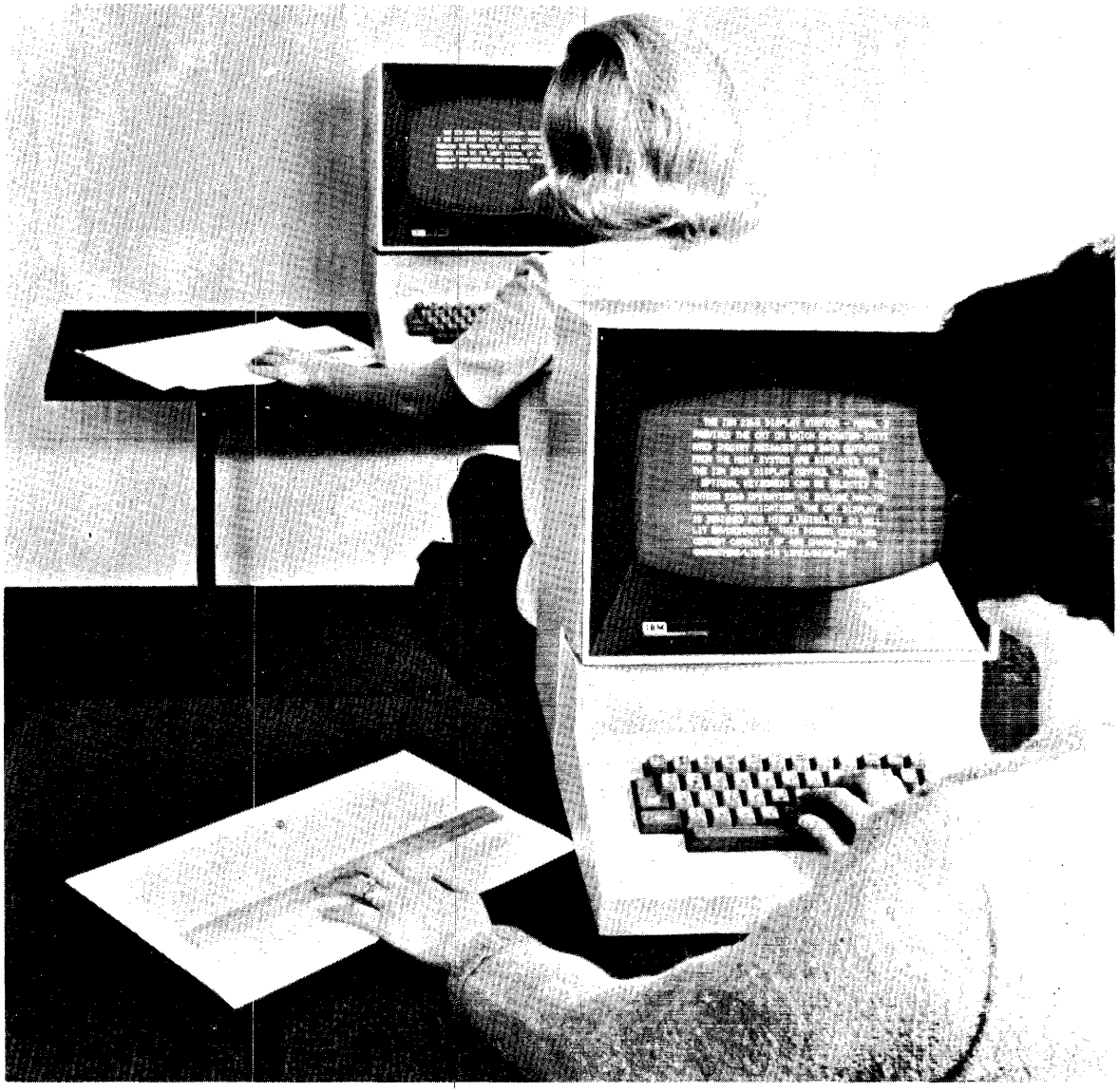


Figure 1 - IBM 2260 Display Station

OUTLINE AND SCOPE OF THE PROPOSAL

The first section is a brief non-technical review of the entire system and its advantages. The second section offers a graphic example of how the system will work. The third section will provide a detailed, technical coverage of the major system aspects.

SECTION I . . . THE SYSTEM IN BRIEF

- -The need
- -How it works
- -Advantages
- -Cost breakdown

SECTION II . . . HOW THE SYSTEM WORKS

- -Description of the machine
- -Start-up
- -Original entry and error correction
- -Batched balancing
- -Verification
- -Status reports
- -End of job

SECTION III . . . THE SYSTEM IN DETAIL

- -DATA Entry and control
- -Restructuring and validation features
- -Record structure
- -System outputs
- -Methods of program control
- -Detailed advantages
- -Proposed configuration
- -Specific savings
- -Implementation objectives

SECTION I - THE SYSTEM IN BRIEF

It is axiomatic to say that a problem must be recognized and articulated before a solution is possible. This section briefly covers the problem, the solution, and the appropriateness of the solution to the problem.

THE NEED

Today, in data processing, the entering of data generally centers around the punched card as batched entry or remote terminals as direct entry to a primary up-date program. Remote terminal entry is able to provide early error detection and quick access, but can be expensive due to its heavy use of the central processing unit, its file interruption characteristics, and the programming needed. While punched card batched entry is less expensive and less sophisticated it is often awkward, slow, and error-prone because of its frequent queues, transcriptions, human interpretations, batch delays, and inadequate error control techniques.

In card-oriented systems delays from several days to several weeks occur from the instant the last transaction of a batch is entered on a reporting document until the transaction enters a primary data processing program. Cumulative delays are not the fault of any one group. They result from inter-and intra-department procedures needed to maximize human effectiveness and maintain proper controls. (See Figure 2)

When this situation is recognized and an attempt is made to correct its short-comings, often the only reasonable alternative seems to be an on-line system with a user inquiring from a remote terminal directly into the primary update program and getting immediate responses.

While many systems today are adequate in report format and processing schedule, they may lack full usefulness due to input delays and errors. The Batched Data Entry System using the 2260 is a very reasonable alternative that can greatly improve existing systems.

The programs for this system will be designed to take information from any point in its path from conception to just prior to its primary file update, batch the information in usable, verified and validated form, and finally, on request, provide the information to the primary data processing program.

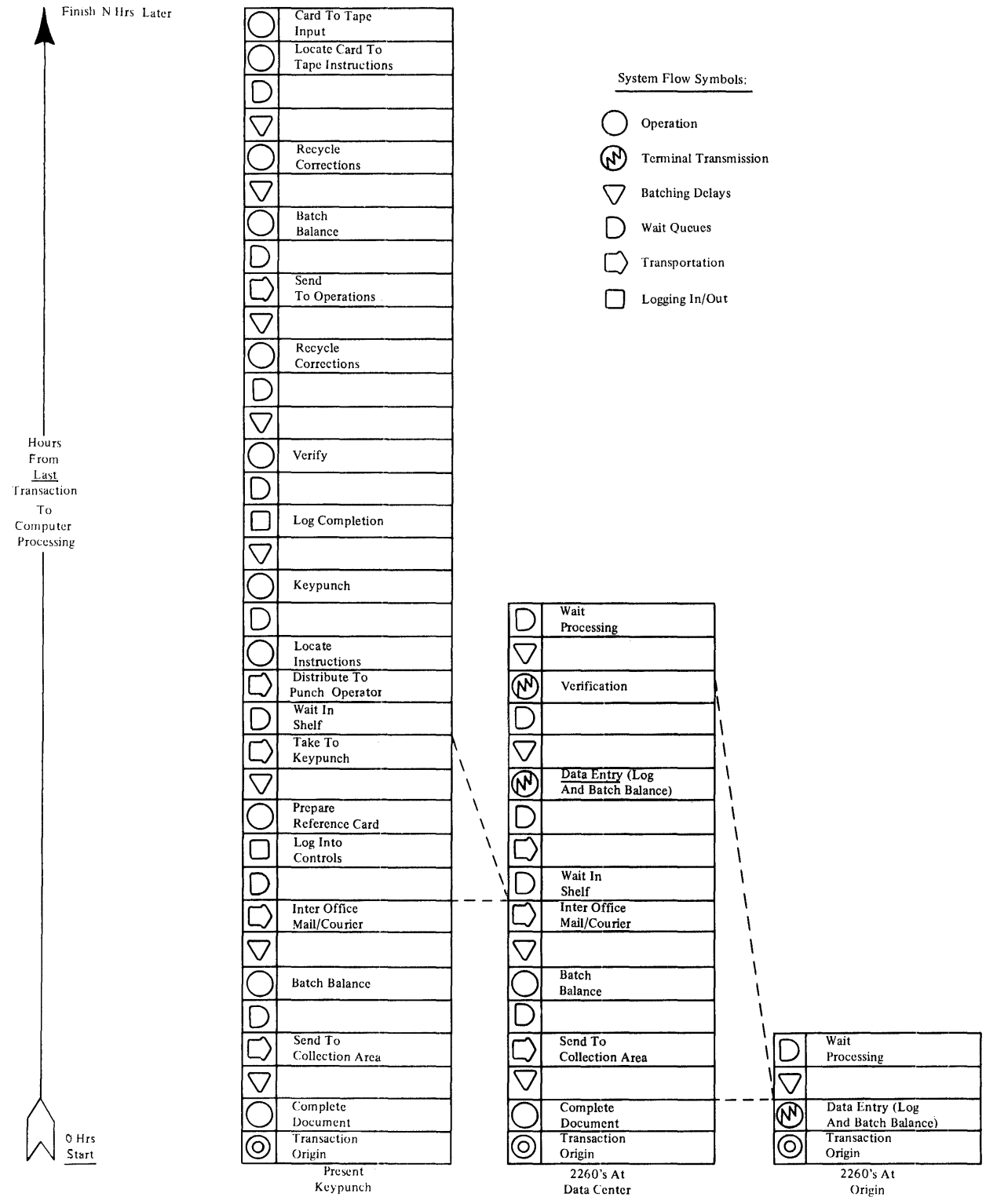


Figure 2 - Data Flow Comparisons

INTRODUCTION

The IBM 2260 Display Station has opened a whole new realm of data entry and display, and provides to a large data processing installation, an economic, rapid, sophisticated means of greatly improving turnaround and reliability of data entering and leaving it.

This report proposes a batched data entry system using the 2260. The 2260 display stations would replace keypunches and verifiers, and would provide fast response through a generalized program for formatting, validating, batch balancing, verification, error control and error correction. Customers may submit their data more directly, in less time, with improved control and at a lower cost.

The system provides an outstanding interim step between current card entry and eventual on-line entry to a primary update program. The concept is simple, direct, and provides significant advantages with a minimal conversion effort. The low conversion effort will be required not only from the current method to the proposed 2260, but even more important, later, from this system to remote customer terminals utilizing totally an on-line entry system.

The use of 2260 batched data entry will not only save money, but more significantly, it will greatly improve data throughput, add substantially to the integrity of reports, and provide an excellent base for expansion and growth.

HOW THE SYSTEM WORKS

IBM 2260 Display Stations use a keyboard for input and a television screen to display output, can replace keypunches and verifiers as a means of readying data for computer processing. The 2260 will be controlled by a computer, to take advantage of the computer's speed, logic, and storage. Data entered into the terminal, whether locally or at a remote customer location, can be validated, restructured, available for correction, stored until needed, and set up for further processing.

Thus, time-consuming decisions and checks now made by keypunch operators will be done by the computer at high speed and with greater reliability. Also many post keypunch operations such as batch balancing, collecting statistics, manual logging of cards, manual transportation of cards, storage of cards, specialized card-to-tape programs, card retention, and statistical reports, will either be eliminated or done by the computer.

Essentially the 2260 will be able to provide high-speed entry, allow control over that entry, and give excellent output flexibility.

ADVANTAGES

The 2260 Batched Data Entry System will provide a wide range of distinct advantages that includes flexibility, simplicity of operation, standardization, more stringent control, reduced effort, greatly improved throughput, and reduced labor requirements.

The 2260 terminal operated under control of the generalized computer program, will provide one device for both "punching" and verification and will eliminate the need for cards. It will also allow the display of instructions and error messages, thus causing less operator fatigue than current equipment, and allowing faster keying.

The generalized computer control program used with the 2260 will include the following:

1) a means of easily adding or changing individual job entry specifications without re-programming,
2) accepts any length record,
3) highly uniform validity checking,
4) current and reliable statistical and status reports,
5) batch balancing,
6) error listings,
7) eliminates error card re-cycle,
8) reduces verification.

Finally, the system will allow a noticeable reduction in personnel and lower skill requirements of those operating the system.

COST BREAK DOWN (REFER TO SECTION III FOR DETAILS)

Monthly Basis:	Now	Proposed
Computer costs (Model 30 to Model 40)	$ 9,506	$ 18,355
Entry Devices (keypunches to 2260's)	4,364	4,632
Labor	52,440	38,640
Other Estimated costs	9,340	0
Total cost	75,650	61,627
Net Savings		14,023
Annual Savings		168,276

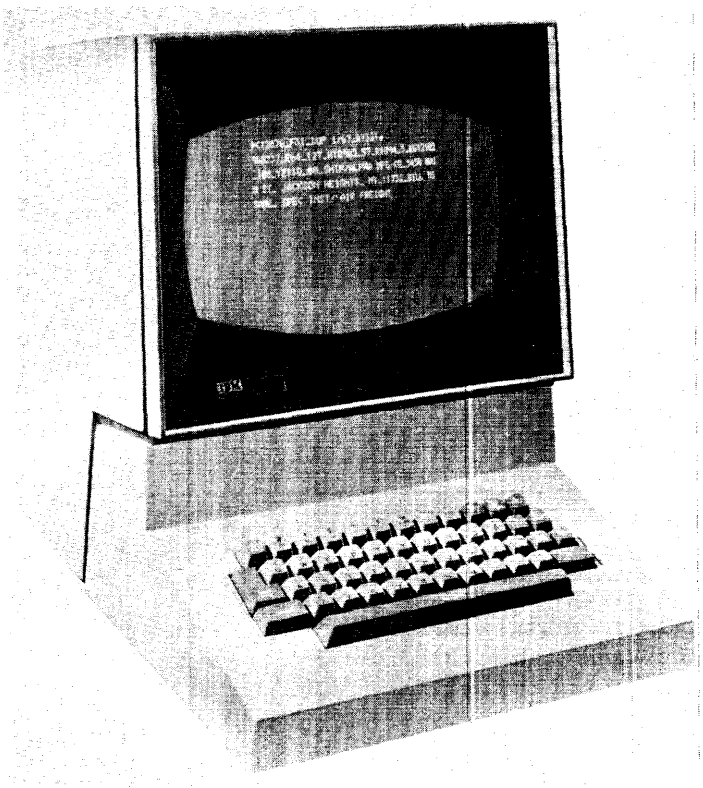
SECTION II - HOW THE SYSTEM WORKS

In this section a representative store's requisition is used to demonstrate how the data entry operator would get her job instructions, and how she would enter the data through the 2260 from the documents supplied her. The sample entry will cover initial input, error detection and correction, batch balancing of the data during input and finally how verification will be handled.

Before going into the sample entry, however, some additional information on the 2260 will be needed. (See Figure 3.)

The IBM 2260 Display Station provides a rapid and efficient method of entering a high volume of information into IBM System/360. The system can accept, validate, reformat and store data entered through the 2260 under program control. The display station can also be used to create files, and to add, remove or change information previously stored. The IBM 2848 Display Control Models 21 and 22 provide control and buffer storage for 2260s attached to a System/360.

Alphameric information may be entered through the keyboard and projected on the direct-view display screen.



- Available in two display formats:
  240 characters in 6 rows, 40 per row.
  480 characters in 12 rows, 40 per row.
- Data entry keyboard--alphameric (numeric inset)
- Keyboard and display screen are fully buffered so that all units may operate independently of the computer.
- Operator or program controlled keyboard release
- Each model displays up to 64 different alphameric characters and special symbols.
- 1/4" character size
- Visual image can be adjusted to suit individual preference.
- Optional non-destructive cursor permits backspacing, forward spacing, and up and down positioning of the cursor without erasing.
- Optional display line addressing feature permits line selection of the display starting location under computer control.
- Optional keyboards
  Alphameric (top row is numeric)
  Numeric
- One optional IBM 1053 Printer may be attached to the 2848 Display Control.

Figure 3 - Proposal Insert

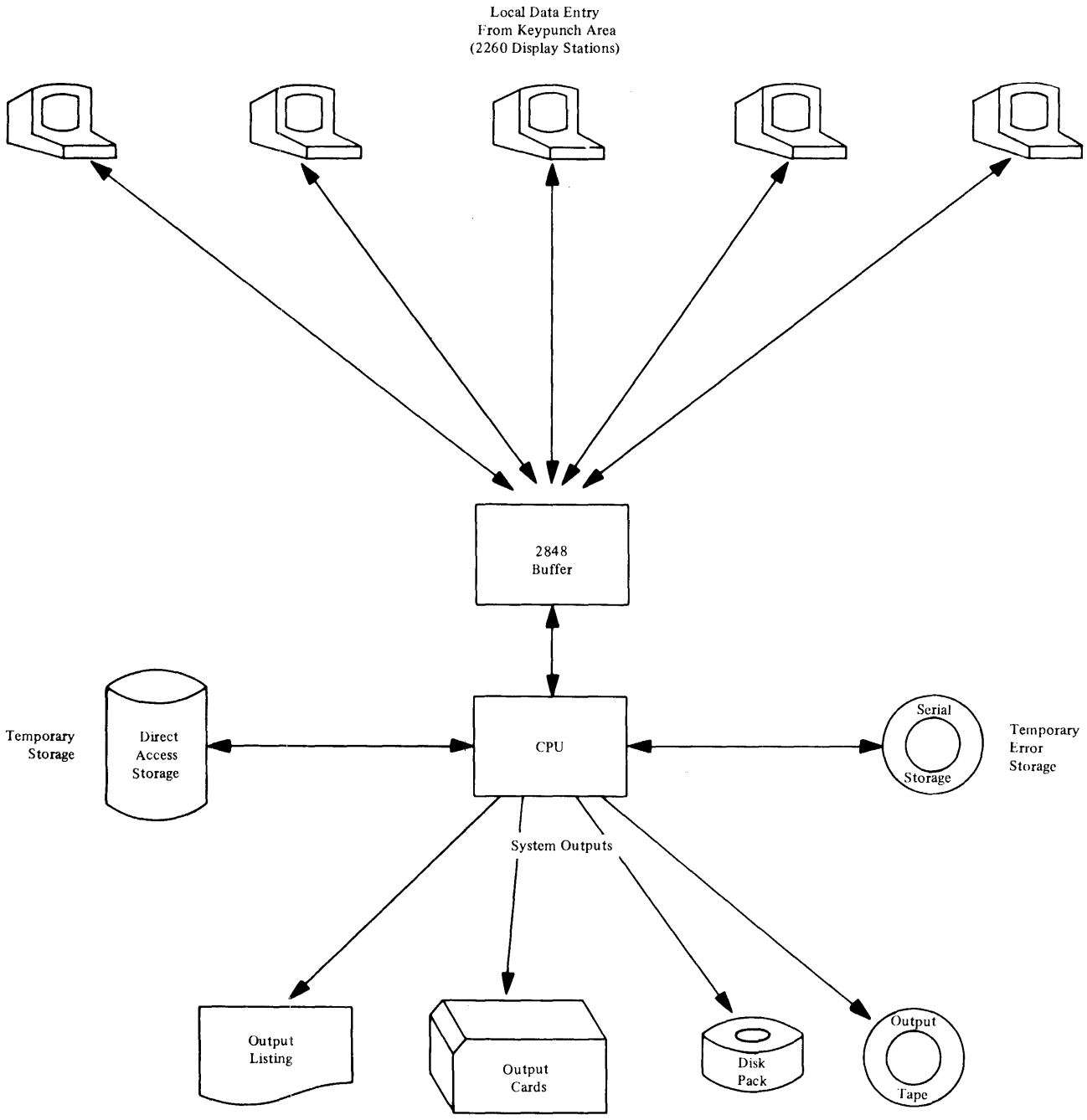


Figure 4 - Suggested Configuration

STARTING THE JOB

In the following illustrations, representative 2260 CRT screens will be shown. On the screens, characters or words coming from the computer will be shown with no underline; characters or words typed on the screen either to modify or add data to a display on its way to the computer will be underlined.

The "HEADING" appears on all displays as line 1 and provides a method of exchanging job information between the computer and operator. When an operator wants to start up in the morning or begin a new job during the day, she will modify the "HEADING" as follows:

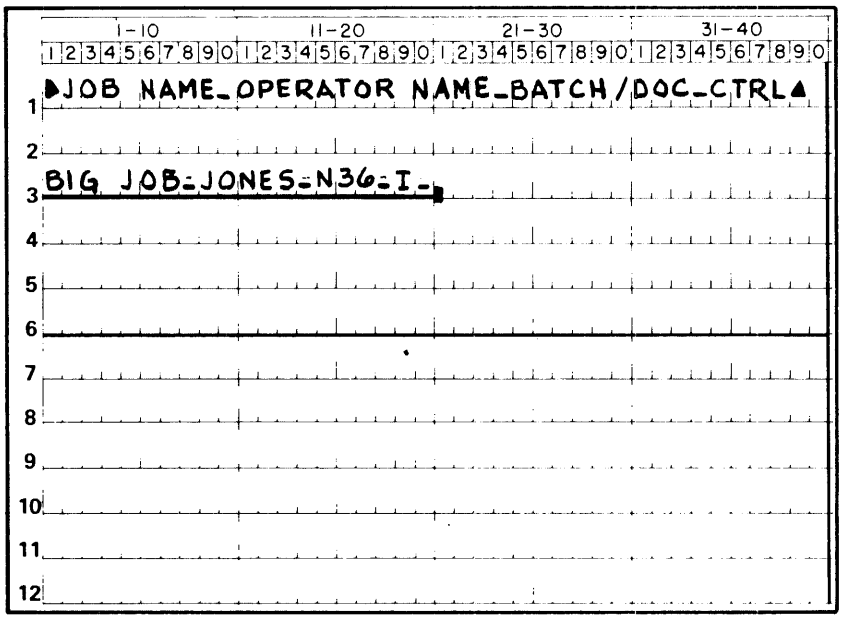


Figure 5

In the first field on line 3 enter job number or name. The next field is the operator's number or name. The Batch No. would then be entered in the Batch/DOC field. The "I" is a control code which tells the computer what is needed or is to be done. . . in this case, the operator is asking for an INSTRUCTIONAL DISPLAY on BIGJOB.

After the operator has completed the HEADING (line 1) for her new job, she depresses the "ENTER" key on the 2260. . . and, in this example, gets her job entry instructions back from the computer (Lines 3 through 7).

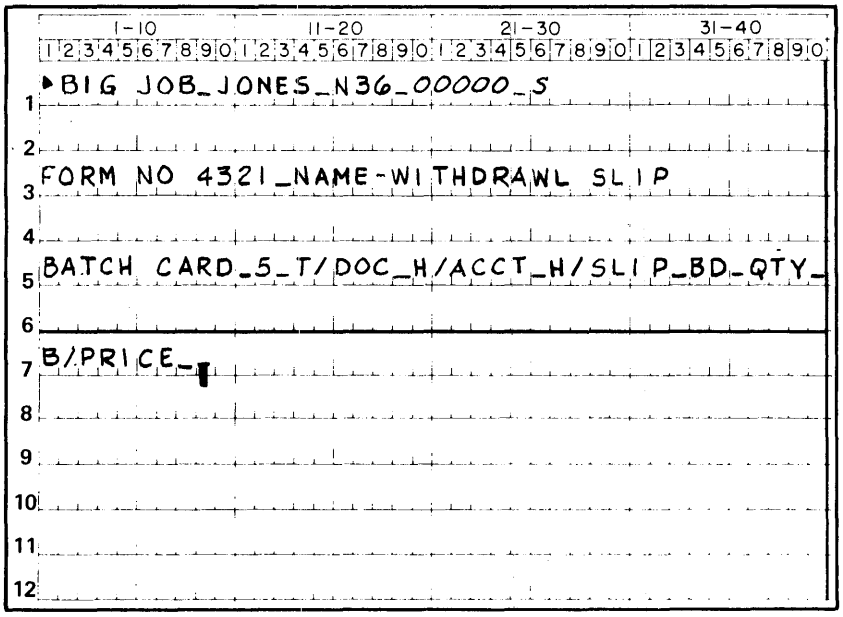


Figure 6

The operator notes this display then acknowledges by pressing the "ENTER" key. The "S" control code tells her the next display will be the "Start of Batch Display". The operator receives and completes it by entering the information from the batch card.

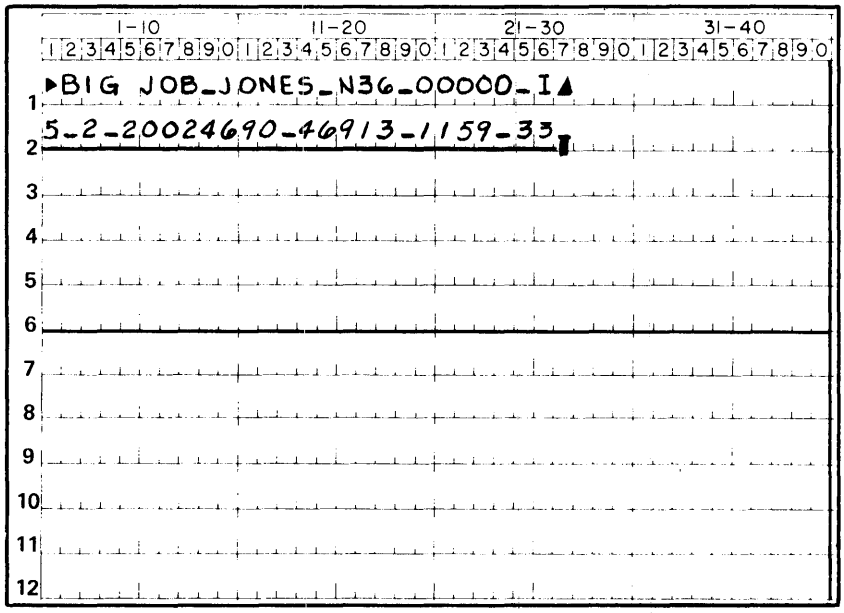


Figure 7

The operator enters the total number of documents to be punched, hash totals for account number and slip number, and batch totals for distributed quantity and unit price,just as indicated by her instructions.

The "I" control code (line 1) tells the operator that the next display will be further instructions.

The format displayed will show the fields to be entered for the header and trailer records.

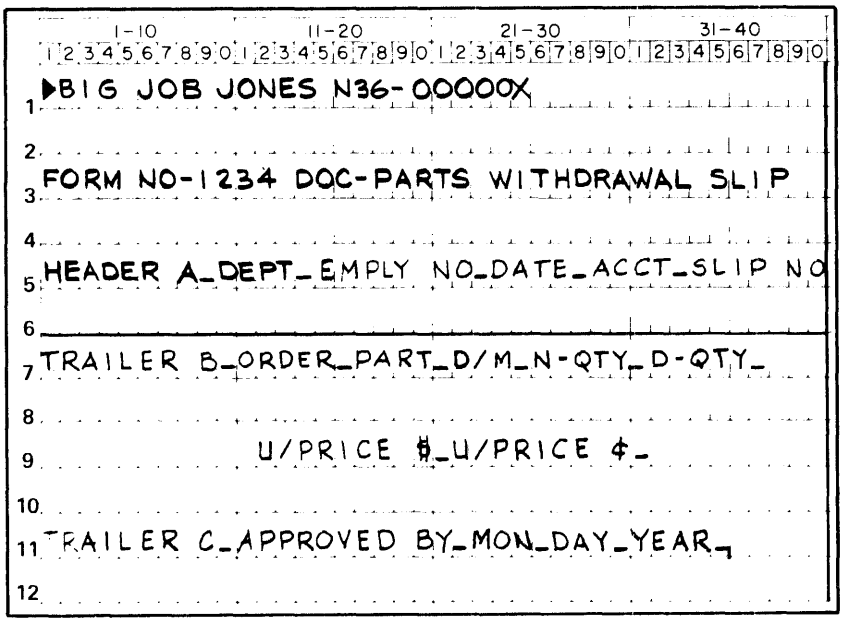


Figure 8

The top line is the HEADING with control code for the next type of operation or display. In this case, "X" indicates the next display will begin parts withdrawal slip data entry.

The second line describes the document. The remaining lines describe the entry, giving the type, the record identification codes "A", "B", and "C", and the order of the fields to be entered.

The field marks (_) indicate the end of a field, thus allowing the operator to vary the size of her field up to its maximum length. Thus, "2" can be entered into a ten-position quantity field simply as "2_".

The job is now ready for entry. The operator returns the "Start of Batch Display" by pressing the enter key and is ready to input her documents.

PARTS WITHDRAWAL SLIP

NO. 23456

THE BEST COMPANY – ANYWHERE

DEPT. NO.	REQUISITIONED BY	EMPLOYEE NO.	DATE REQ.	ACCOUNT NO.
389	Nick Black	777731	9-20-8	100-12345

PARTS NEEDED				PARTS DISTRIBUTED	
JOB ORDER	PART NUMBER	U/M	QTY.	QTY.	UNIT PRICE
32791	XYZ 1000001	EACH	1	1	30 00
32791	KRP-765432	DOZ	10	5	2 00
36666	9721	EACH	1000		03

APPROVED BY	RECEIVED BY	EMPLOYEE NO.	DATE REC.
Joe White	Nick Black	777731	9-21-7

BEST FORM 1234

Figure 9

Will be entered as follows:

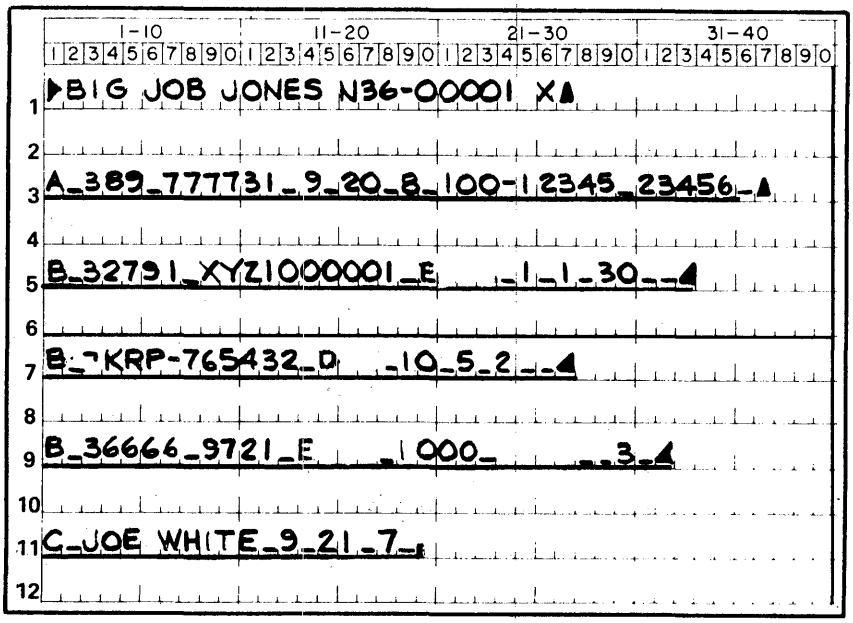


Figure 10

Note that during entry of the second "B" trailer the Dup Mark (¬) follows the Field Mark. This means that the job number (32791) in the previous trailer record is to be duped in the second "B" trailer.

Also note, in the heading the record number was incremented automatically by the computer. At some point in the future, if an operator wants to return to this entry, it will only be necessary to enter a control code of "R", batch number "N36" and a record number of "00001", and the computer will retrieve the display.

The operator presses the enter key and is then ready to enter another document:

PARTS WITHDRAWAL SLIP

NO. 23457

THE BEST COMPANY - ANYWHERE

DEPT. NO.	REQUISITIONED BY	EMPLOYEE NO.	DATE REQ.	ACCOUNT NO.
709	Gene Green	777732	9-21-8	100-12345

PARTS NEEDED				PARTS DISTRIBUTED	
JOB ORDER	PART NUMBER	U/M	QTY.	QTY.	UNIT PRICE
38888	732-B	D	150	150	1.00
38888	758-12	M	3	3	.50

APPROVED BY	RECEIVED BY	EMPLOYEE NO.	DATE REC.
Joe White	Joe White	777732	9-21-7

BEST FORM 1234

Figure 11

As follows:

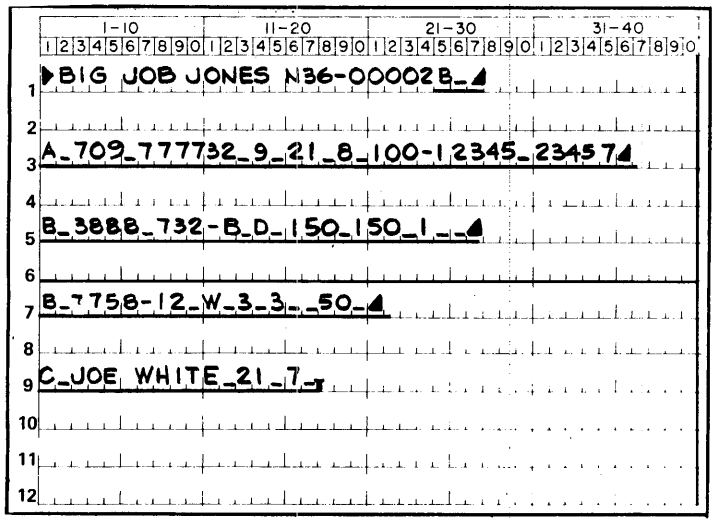


Figure 12

The operator changes the control code to "B" to indicate she has completed her batch, enters the data, then presses the "ENTER" key. OOPS. . . . . an error display is returned by the computer.

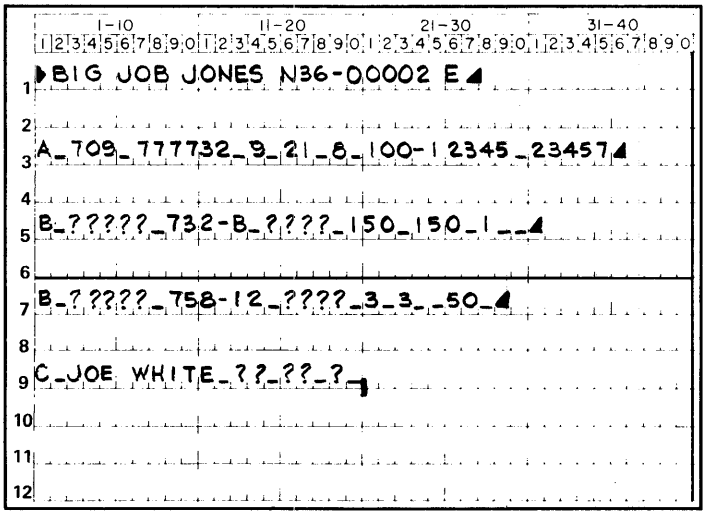


Figure 13

All positions found to be in error by the computer are filled with question marks.

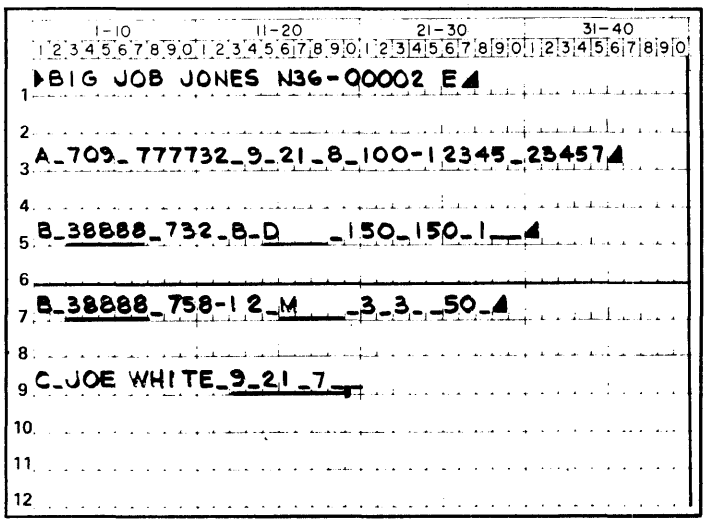


Figure 14

In the first "B" trailer, the order number was too small and the unit of measure did not find an equal in a table check. The order number was corrected, but the unit of measure could not be.

In the second "B" trailer, because the order number was duped in, it had to be corrected. Also the unit of measure had been mis-entered and was corrected.

In the "C" trailer, the field following "JOE WHITE" had a 21 which exceeds the maximum number of months in the year and the trailer had an insufficient number of fields as indicated by a question mark in the last field location. In this case, the error had to be corrected by re-entering the data from "JOE WHITE" on to the end of the record.

The corrected display is now returned to the computer, and the computer will pick up where it left off, by showing the end of batch display.

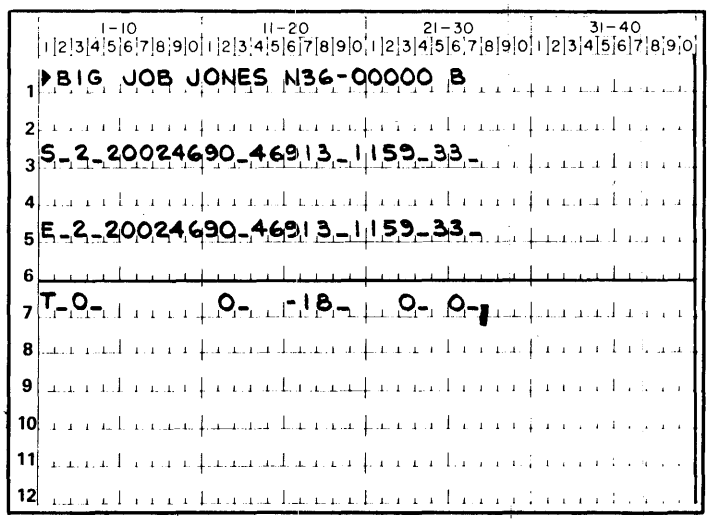


Figure 15

This end of Batch display shows that "SLIP NO" batch total is out of balance by 18. The operator has two options:

1. CONTROLS DEPARTMENT LOCATES PROBLEM

   The operator will call for a print out on either the 1403 attached to the computer or a local 1053 attached to the 2848 control unit using her control code. She will give the listing along with the documents to the Controls Department so they may locate the error and return it to the operator for correction and re-entry with the 2260.

2. OPERATOR LOCATES PROBLEM

   The operator may back up through her entries and look for the error herself. When it is located, she would correct it and return to the "End of Batch" display and see if it fully corrects the problem.

For the purpose of this example we will assume the operator passed through her entries until she discovered her error, corrected it, then returned to an "End of Batch" display to assure herself that the correction had been taken and that it was all that was needed.

VERIFICATION

Verification would be essentially the same as original entry. The operator would start by getting her instructions and entering the batch number.

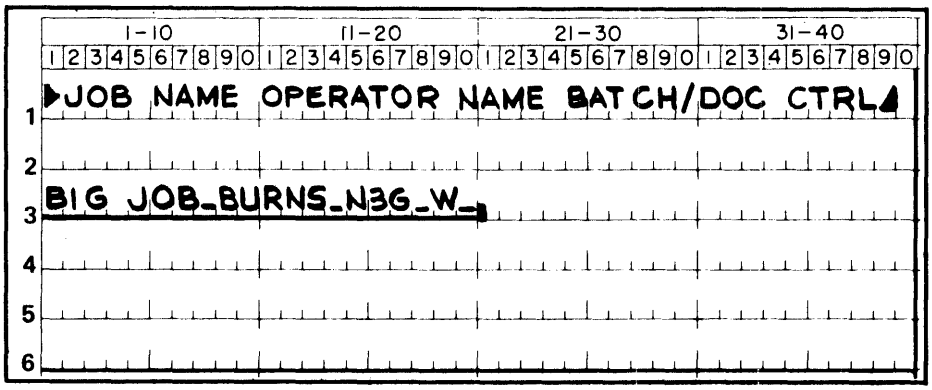


Figure 16

Control code "W" indicates that the operator wants verification instructions for "BIGJOB".

She presses the "ENTER" key and gets:

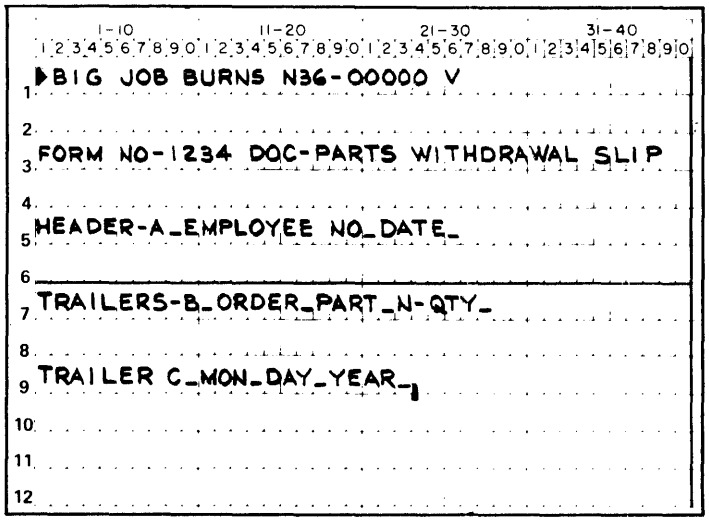


Figure 17

If the instructions for original entry and verification are compared, it will be noticed that many fields entered originally are not verified.

Fields are eliminated from verification either because they have already been effectively verified by being batch balanced, table checked, or parameter checked, or because they lack enough significance to warrant verification.

From this point on, verification will be processed just as if it were original entry. When a field does not match that originally entered, an error display will appear and the operator will have an opportunity to review the field and correct it.

STATUS REPORTS

During job entry, or after, the keypunch supervisor can inquire as to the status of the job and the effectiveness of her people.

As an example, if the keypunch supervisor had four girls working on BIGJOB and she needed to take two of them off for another job, she would find information as to their relative speeds valuable. With that kind of information, she could determine who should stay on "BIGJOB".

Her inquiry would go this way:

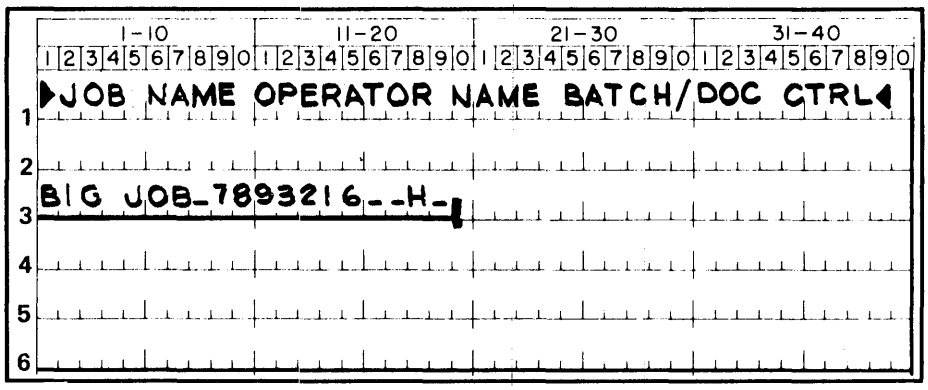


Figure 18

Here the operator indicates the job, then her privileged identification number which allows her access to the confidential information, and finally a control code "H" for the type of report she wants. She presses her "ENTER" key and gets:

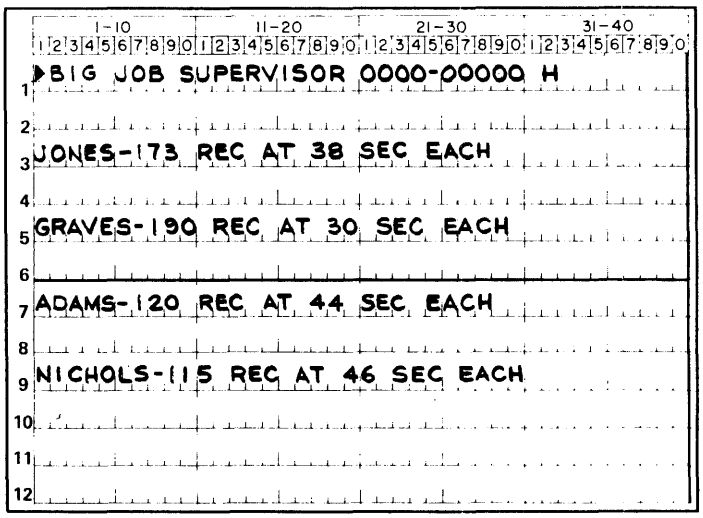


Figure 19

With this information available to her she would probably remove Adams and Nichols from the job and leave the others to finish BIGJOB.

END OF JOB

The Batched Data Entry System's control program can be flexible enough to create either one or multiple records from the preceding input; transferring control fields and other data from one record to another as requested by the programmer without the knowledge, much less the concern, of the entry operator.

When a job is done, that is after verification, a list of all records containing invalid data would be prepared either locally in the keypunch area on the 1053 printer or in a less local area on the 1403 high-speed printer. These error lists could be returned to the customer almost immediately so he can return his corrections before the job is sent to its primary program.

The computer's control program will be instructed through program specifications on how to handle errors and verifications. Also it will be impossible for a job to go on to its primary program until it has been properly verified according to its specific job parameters.

Further details on how these specifications are prepared and how the control program will keep track of each record's status can be found in Section III of the proposal.

The intent of this section is to provide more detailed information on how specific aspects of the system may be designed, and supporting evidence to justify the system's installation.

DATA ENTRY AND CONTROL

Heading Control

To provide a means of communication between the operator and the computer for control and reference, a heading will appear at the top of all displays. This "heading" will consist of the following:

Job Number (JB) - to identify the job being currently worked on.

Operator's Number (OP) - to identify the operator entering the data. Both this and the job number, above, will also allow gathering of statistics about the speed and frequency of entry.

Entry Serial Number - or record number that will consist of the job batch number and an incremented record identification. By the use of the control code and the serial number, an operator may return to any previously entered record.

Control Code - character that provides the operator a means of informing the Control Program what the next entry or display will be. As an example: it will enable return to instructions or previously entered records.

List of Codes:

Code	Request
X	Original entry
V	Verify entry
C	Error correction entry
I	Instructions display, original entry
W	Instructions display, verification entry
E	Error display
F	Print last error only
G	Print out all errors
M	Monitor display, original entry
N	Monitor display, verification entry
R	Record recall display
S	Start of batch entry
B	End of batch display
P	Print of batch listing

List of Codes: (Continued)

Code	Request
D,H,K,L, Q,T,Z	Statistical displays
J	End of job display

Sample Heading

BIGJOB JONES 0001-00005

Displays/Messages

To provide the operator with information, previously entered records or errors, the following displays will be available:

Instructional Display

Will be used to give the operator the necessary information on batch control, data entry, and error correction techniques unique to a particular job. The Instructional Display may be sufficient to eliminate the need for the operator to find additional instructions in a local manual file. The instructions for data entry will probably be the most variable and will include special notes, source document form numbers, the order of the data to be entered, record codes, record levels, and types of error messages. This display cannot be modified by the operator.

Monitor Display

Will be used at the option of authorized personnel to modify job specifications. For example, if the job usually comes out on magnetic tape and for a one-time request, it is needed on cards, then the operator can designate this by modifying the monitor display to inform the control program of a change in requirements. The display can be modified.

Entry Displays

Will consist only of the control heading with an incremented record identification number. Under the control heading, the data for entry will be keyed.

Error Display

If an error is found in the data entered by the control program's validation routines, the invalid data will be displayed for correction with its error message. This display can either follow directly after entry or at the end of a batch.

Batch Display

At the beginning of a batch the operator enters the batch control data like any other record. At the end of the batch, the operator signifies, through the control code, "end of batch", and the control program balance, how much out of balance it is.

Statistical Displays

When an authorized employee requests, through the terminal, specific status or historical information, the authorized employee will receive the information from the statistical display. For example, the keypunch supervisor may want to know the progress of a job, or how long a particular operator

is taking on a job, which jobs are complete, or average times of past jobs to estimate her labor requirements for dispatching.

Data Entry

Data Entry is the method used to enter data on the Entry Display for record input. It can be done in either fixed or free form, but in either case certain conventions must be adhered to.

Record Identifier Convention

The record must be identified by a character which always appears in the same location. As a matter of convenience, this will always be the first field of the record and will appear in the left-most position of each record.

Specific Entry Conventions

In certain cases, especially free-form input, characters will be needed to convey field characteristics. Where these characters have significance, care must be taken not to include the same characters in the data.

Field Separator Symbols:

The field mark (_) is used to indicate field boundaries. It is possible to use some other symbol for this purpose, but the function is essential.

Duplicate Field Symbols:

In the illustration, the Dup Mark (¬) indicated a duplicated field. This special character would be recognized by the control program and would cause the previous record information to be inserted in the record.

Free Form Entry

In this case data would be entered in a free form style where the length of a field would be governed by significance, and the fields would be separated by field separators. Dup Marks would be used to indicate duplicated fields. This method could be of substantial benefit where there are large fields with variations in significant data.

Data Re-Entry for Comparision (Verification)

To provide re-entry for verification, data may be re-entered using the correct "Control Code" and it will be compared selectively field-by-field to the originally entered data. When specified, no record can be used until the required fields have been verified. Not all fields within a record must be verified to consider the record properly examined.

Examples:

Since batch balancing is performed during original entry, there should be no requirement to verify the balanced fields.

If fields have their individual parameter of table checks, again there should be no need to verify the field.

Some fields don't require complete accuracy -- descriptions, names (not used for control), and historic but otherwise non-pertinent data.

Finally, control fields that are automatically duped by the control program need not be confirmed.

Entry to Correct Errors

Because each record is uniquely identified, errors which cannot be corrected by the operator during original entry, can be listed on a local 1053 or the 1403 System Printer and distributed to the customer. When the listing is returned with the corrections indicated, the record containing the error can be recalled and displayed by entering the job, batch, and serial number. Once the record is displayed, it can be corrected and returned to the file.

CONTROL PROGRAM RESTRUCTURING AND VALIDATION FEATURES

Restructuring

Often data has to be restructured to provide data in the correct form for the primary program. Restructuring will consist of field edit, record reformatting, and record modifications.

Field Edit

Each incoming field will be examined according to set parameters, then allowed to stay unchanged, manipulated to conform to requirements, or tagged as an "error" field (see Validation, below). Example: pre-zeroing a number field.

Record Reformatting

As each field is segregated and examined, it is placed in its final record in a location determined by its input sequence. It should be noted that the input sequence need not conform to the final record format. This ability to reformat should prove a substantial aid in organizing the input to conform to the source document.

Record Modifications

After the fields are placed in their final format, the record will be examined by the program, then character and field modifications will be made according to requirements. Example: If a certain field is greater than ten dollars and "X" appears in another field, then change the transaction code to "B".

Validation

Error control is maintained by several devices. Batch balancing and verification have already been discussed and are important parts of our generalized program, yet another important feature is field validation. Field validation examines the data as it relates to either absolute or relative criteria. Examples of absolute criteria are as follows:

Alphameric numeric (type of characters)
Field size (number of significant characters)
Existence (non-blank characters)
Limits (within prescribed range of values)
Table reference for matching entry
Check digit (algorithmic verification)

RECORD STRUCTURE

Up to this point we have discussed data entry, displays/messages covering the entry, restructuring the input, and its validation. It is appropriate at this point to describe the appearance of the record we have built.

It should be recognized that with 2260 data entry we can develop a much larger record than can be placed on a punched card. To provide maximum versatility, the control program will generate each record with three distinct sections: a data section, a working section, and a statistics section. For the most part only the data section with its control fields will be sent to the primary program, but at the option of the programmer, the working section and statistics section may be considered part of the usable record.

Data Section

This section is simply the record developed for the primary program just as it is needed for that program.

Working Section

This section is an optional section composed of three fields:

Temporary Working Field/Area

This is a space provided to hold data during adjustments of the record.

Error and Verification Field

This is a field in which every byte corresponds to a field in the data section. This is the field reference to certify the data section for use in the primary program. If a particular bit is turned on in any byte, it indicates that either the corresponding field has not been verified or it has a prohibitive error and should not be used.

Sort Field

Defined in length on the "Batched Data Entry Description Sheet" (Figure 1), is a single field provided for sorting.

Statistics Section

This is a mandatory section composed of the following fields:

Job number

Record number

Batch number

Record serial number

Original entry operator number

Verifying entry operator number

Original entry date

Verified entry date

Original entry time in milliseconds

Verified entry time in milliseconds

Number of errors discovered during verification, that were corrected.

Number of errors discovered by validation, that were corrected.

SYSTEM OUTPUTS

System outputs fall into two groups: the finished records ready for the primary program, and reports regarding incomplete and finished records

Finished Records

Finished records may be provided on any one or more of the definable devices in either sorted or unsorted form. These devices include, but are not limited to:

Magnetic tapes

Disk packs

Punched cards

Printed documents

Reports Concerning The Records

These reports will be used to better control future input, correct existing input, provide status information, and provided statistical information. These reports include the following:

Error Listing

This listing is generated on 1053 or 1403 at the end of a batch. This listing is to be referenced to the department with the source document for error correction. The listings will be returned with corrections so that the stored entries can be corrected before use by the primary program.

Batch Balance Listing

This is a listing of all transactions in/out-of-balance batch condition. The listing is to be used by the Control Section in finding the out-of-balance condition and having it corrected.

Job Status Report

This report is for the supervisor and the Control Section. The status reports indicate job status information, consisting of:

Completed records/batches

Records/batches waiting verification

Records/batches waiting error correction

Last activity

Total records/batches on file

Average entry time for original entry and verification

Operator Effectiveness Report

This report is for supervisors to provide information as to relative rates and accuracy of operators.

Job Analysis Report

This report gives supervisors and the Control Section information on error rate, entry rate, and other pertinent data of job flow.

METHODS OF PROGRAM CONTROL

The control program will contain all pertinent instructions for each job in table form and will receive its specifications from a series of specification records provided by the systems analyst or programmer called "Control Instructions". When a keypunch operator notifies the computer she is ready to work on a particular job, the program will retrieve the instruction list, call the routines necessary to perform the instructions, set up these routines in and out of line, pull in the necessary tables needed for validation, and notify the keypunch operator to start. As noted before, the keypunch supervisor should have the ability to modify certain portions of the job according to current needs, for example whether the ready data should end up sorted on tape or unsorted on the disk.

The control program can initially be set up using the following records:

Keypunch Operator's Set-Up Control Instructions

These control instructions contain all valid operator numbers. These numbers will each generate an area in which statistics for each operator will be accumulated and form the base for Effectiveness Reports.

Table Control Instructions

These control instructions provide tables against which incoming data is to be checked. The type of field comparison and what table is to be used for each field will be described on the instructions prepared from the "Batched Data Entry Description Sheet". (See Figure 20.)

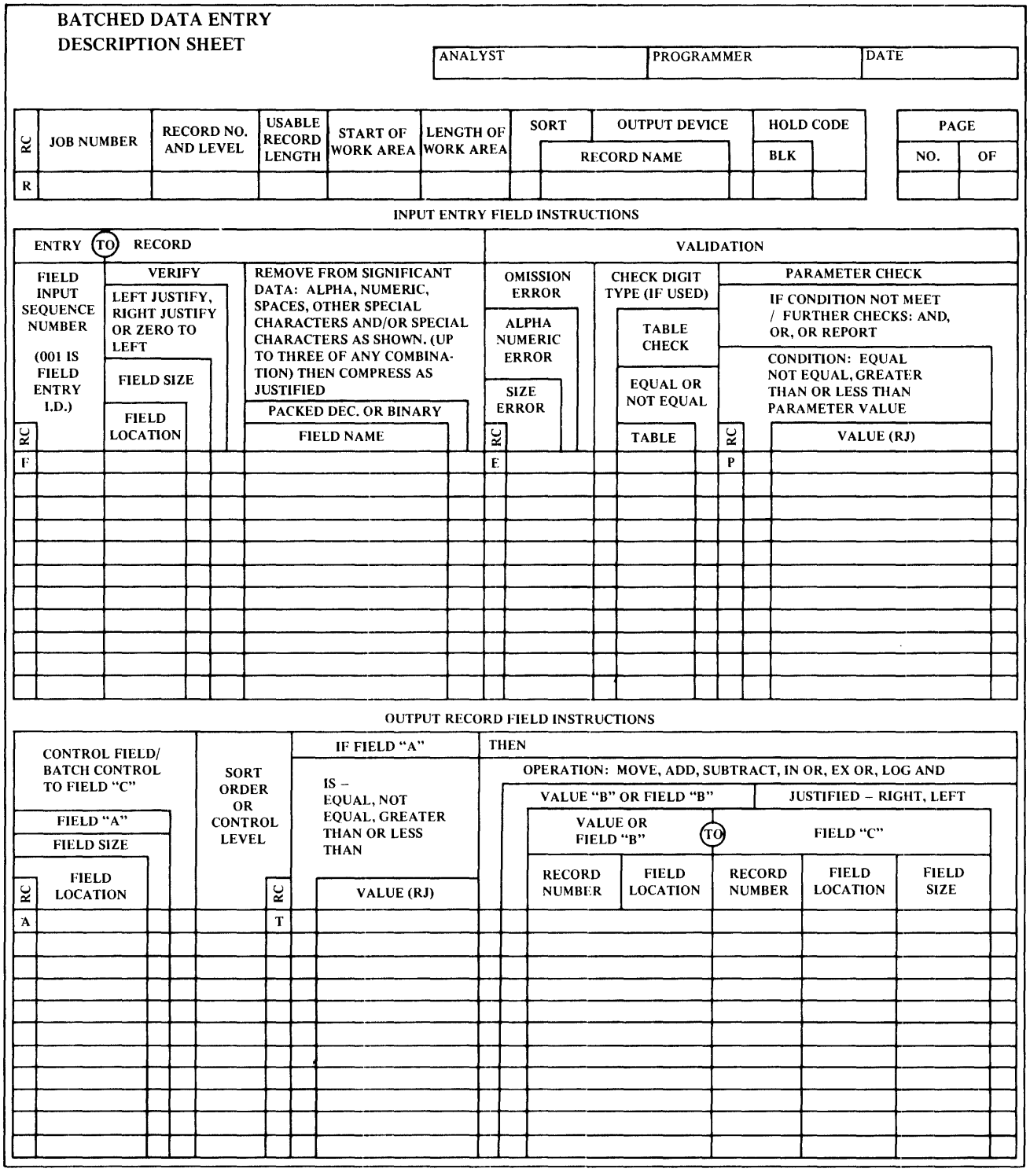
Job Set-Up Control Instructions

These control instructions provide basic set-up specifications, instructions for the 2260 display station operator, and prepare a base for specific record specifications.

"Record" Specification Control Instructions

These control instructions have the necessary information needed to control data entry, error listing, batch listing, field and record manipulation, and data storage. For a detailed outline of these specifications, see the "Batch Data Entry Description Sheet". (Figure 19)

To illustrate how these control instructions will work to provide the control program with the necessary information to build its records from the incoming data entry, a sample MICRIC job has been selected and translated on to the "Batch Data Entry Description Sheet". (See Figures 21-28.)



BATCHED DATA ENTRY
DESCRIPTION SHEET

ANALYST	PROGRAMMER	DATE

RC	JOB NUMBER	RECORD NO. AND LEVEL	USABLE RECORD LENGTH	START OF WORK AREA	LENGTH OF WORK AREA	SORT	OUTPUT DEVICE	HOLD CODE	PAGE	
							RECORD NAME	BLK	NO.	OF
R										

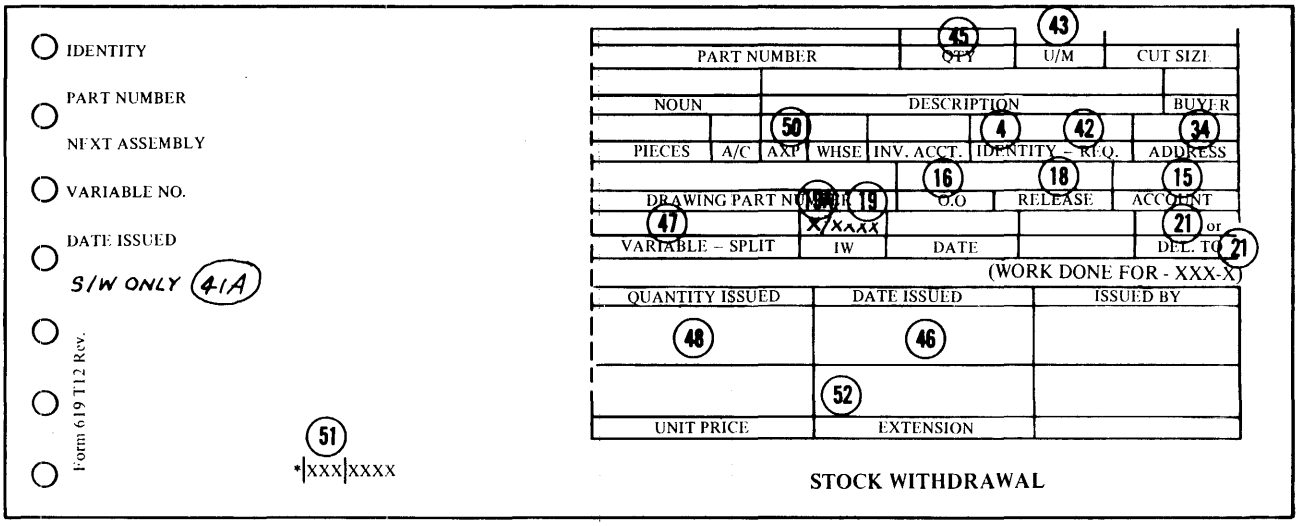
INPUT ENTRY FIELD INSTRUCTIONS

ENTRY (TO) RECORD						VALIDATION					
FIELD INPUT SEQUENCE NUMBER (001 IS FIELD ENTRY I.D.)	VERIFY: LEFT JUSTIFY, RIGHT JUSTIFY OR ZERO TO LEFT	FIELD SIZE	FIELD LOCATION	REMOVE FROM SIGNIFICANT DATA: ALPHA, NUMERIC, SPACES, OTHER SPECIAL CHARACTERS AND/OR SPECIAL CHARACTERS AS SHOWN. (UP TO THREE OF ANY COMBINATION) THEN COMPRESS AS JUSTIFIED	PACKED DEC. OR BINARY		OMISSION ERROR	ALPHA NUMERIC ERROR	SIZE ERROR	CHECK DIGIT TYPE (IF USED)	TABLE CHECK	EQUAL OR NOT EQUAL	PARAMETER CHECK: IF CONDITION NOT MEET / FURTHER CHECKS: AND, OR, OR REPORT	CONDITION: EQUAL NOT EQUAL, GREATER THAN OR LESS THAN PARAMETER VALUE
RC				FIELD NAME		RC			TABLE		RC	VALUE (RJ)
F						E					P	

OUTPUT RECORD FIELD INSTRUCTIONS

CONTROL FIELD/ BATCH CONTROL TO FIELD "C"				SORT ORDER OR CONTROL LEVEL	IF FIELD "A"	THEN					
FIELD "A"					IS – EQUAL, NOT EQUAL, GREATER THAN OR LESS THAN	OPERATION: MOVE, ADD, SUBTRACT, IN OR, EX OR, LOG AND					
FIELD SIZE						VALUE "B" OR FIELD "B"			JUSTIFIED – RIGHT, LEFT		
RC	FIELD LOCATION			RC	VALUE (RJ)	VALUE OR FIELD "B"		(TO)	FIELD "C"		
						RECORD NUMBER	FIELD LOCATION	RECORD NUMBER	FIELD LOCATION	FIELD SIZE	
A				T							

Figure 20



Form 619 T12 Rev.

Document Keypunched
Using the Following
Procedures
From MIC-RIC

Figure 21

TITLE: REQUIREMENTS INVENTORY CONTROL
ISSUED REQUIREMENTS

SOURCE DOCUMENTS:
STOCK WITHDRAWAL, FORM 619-T-12 REV.
MAT'L REQUISITION, FORMS 71-K and 73-Z

GENERAL INFORMATION:
PUNCH A BATCH CONTROL CARD FOR EACH BATCH.
ON ACCOUNT 0917, PUNCH DETAIL CARDS 1 AND 2;
ON ALL OTHERS PUNCH DETAIL CARD 1 ONLY.

K.P. PROCEDURE NO.	D-0518
K.P. CHARGE NO.	5559-4
D.P. NO.	619-T-12 Rev, 71-K, 73-Z
TAB CARD FORM	610-C-106 Batch Control, 610-C-109 – Detail.

ITEM	COLS	NO. COLS	FIELD	SOURCE	A/N	PUNCH CODE	SPECIAL INSTRUCTIONS
			BATCH CONTROL CARD Punch a batch Control Card for each batch after completing detail cards for batch, and place in front of corresponding deck of detail cards. Where Quantity and/or Dollars in excess of field capacity, punch Multiple batch cards. Item count, Dollars and Quantity to be adjusted totals when rejected documents in batch, otherwise use Customer Compiled figures.				
1	1-5	5	Blank	–	–	–	
2	6-9	4	Account	Trans	N	*	ZTL
3	10-12	3	Transaction Code	Trans	A/N	*	Must be 3 digits
4	13	1	Control "X"	Const	N	*	Punch minus sign
5	14-16	3	Batch No.	Trans	N	*	ZTL
6	17-58	42	Blank	–	–	–	
7	59-62	4	Item Count	Trans	N	*	ZTL
8	63-70	8	Dollars	Trans	N	BN	ZTL – Credits, punch minus sign overpunch in Col. 70.
9	71-76	6	Quantity	Trans	N	BN	ZTL – Credits, punch minus sign overpunch in Col 76.
10	77-80	4	Blank	–	–	–	

Figure 22

BATCHED DATA ENTRY DESCRIPTION SHEET

ANALYST	PROGRAMMER	DATE
JOE FURY	JOHN BIT	6/6/66

RC	JOB NUMBER	RECORD NO. AND LEVEL	USABLE RECORD LENGTH	START OF WORK AREA	LENGTH OF WORK AREA	SORT	OUTPUT DEVICE RECORD NAME		HOLD CODE BLK		PAGE NO.	PAGE OF
R	MIC RIC	30000	80	81	20	S	BATCH-CARD	T	0	B	1	1

INPUT ENTRY FIELD INSTRUCTIONS

ENTRY (TO) RECORD

FIELD INPUT SEQUENCE NUMBER (001 IS FIELD ENTRY I.D.)	VERIFY: LEFT JUSTIFY, RIGHT JUSTIFY OR ZERO TO LEFT	FIELD SIZE	FIELD LOCATION	REMOVE FROM SIGNIFICANT DATA: ALPHA, NUMERIC, SPACES, OTHER SPECIAL CHARACTERS AND/OR SPECIAL CHARACTERS AS SHOWN. (UP TO THREE OF ANY COMBINATION) THEN COMPRESS AS JUSTIFIED	PACKED DEC. OR BINARY FIELD NAME	VALIDATION: OMISSION ERROR RC	ALPHA NUMERIC ERROR	SIZE ERROR	CHECK DIGIT TYPE (IF USED) TABLE CHECK	EQUAL OR NOT EQUAL	TABLE	PARAMETER CHECK: IF CONDITION NOT MEET / FURTHER CHECKS: AND, OR, OR REPORT	CONDITION: EQUAL NOT EQUAL, GREATER THAN OR LESS THAN PARAMETER VALUE RC		VALUE (RJ)	
F	1	13	1		CARD CODE	E						P	E	-	
F	2	10	3	V	TRANS							P	E	H59	0
												P	E	H60	0
												P	E	H50	R
F	3	6	4	RV	ACCT	E	SNO								
F	4	14	3	RV	BATCH	E	SNO								
F	5	59	4	R	ITEMS							P	G	0	R
F	6	63	8	R	DOLLARS	AO	E	SNO							
F	7	71	6	R	TOT QTY		E	SNO							
F	8	50	1	R	JE CLASS		E	SNO							

OUTPUT RECORD FIELD INSTRUCTIONS

CONTROL FIELD/ BATCH CONTROL TO FIELD "C" FIELD "A" FIELD SIZE			SORT ORDER OR CONTROL LEVEL	IF FIELD "A" IS – EQUAL, NOT EQUAL, GREATER THAN OR LESS THAN			THEN OPERATION: MOVE, ADD, SUBTRACT, IN OR, EX OR, LOG AND		VALUE "B" OR FIELD "B"		JUSTIFIED – RIGHT, LEFT VALUE OR FIELD "B" (TO) FIELD "C"			
RC	FIELD LOCATION			RC		VALUE (RJ)			RECORD NUMBER	FIELD LOCATION	RECORD NUMBER	FIELD LOCATION	FIELD SIZE	
A	63	8		T	L	0	M	V		-	30000	70	1	
A	71	6		T	L	0	M	V		-	30000	76	1	
A	6	7	C											
A	14	3	C											
A	50	1	C											

Figure 23

ITEM	COLS	NO. COLS	FIELD	SOURCE	A/N	PUNCH CODE	SPECIAL INSTRUCTIONS
			DETAIL CARD 1				
34	1-5	5	Cat. Addr.	Doc	N	*	ZTL
1	6-9	4	Inv. Account	Trans	N	*	ZTL
2	10-12	3	Trans. Code	Trans	A/N	*	Punch H50, H59, or H60
3	13	1	Card Code	Const	N	*	Punch "1"
41	14-16	3	Batch No.	Trans	A/N	*	ZTL
41A	17	1	S/W Only	Doc	N	BN	If S/W Only punch minus sign
45	18-22	5	Allocated Qty.	Doc	N	SPC	H60 – Leave blank All others – ZTL – BN – If 6 digit use col 17.
42	23-26	4	Req. No.	Doc	N	BN	ZTL
18	27-30	4	Release	Doc	N	ZN	ZTL
16	31-34	4	G.O.	Doc	N	*	ZTL
15	35-38	4	Ledger Account	Doc	N	*	ZTL
4	39-45	7	Identity	Doc	A/N	*	ZTL – On H60 replace first position with Z if 71K or 73Z doc.
43	46-49	4	Unit of Measure	Doc	A	*	L/ADJ
44	50	1	J.E. Class	Trans	A/N	BN	
19	51-54	4	IW Day	Doc	A/N	BN	Col 51-53 – Num – 3 middle digits if 4 num. digits. 54 – Alpha – BN
19A	55	1	IW Day	Doc	N	SPC	If 4 digit IW day shown, punch 1st digit. If 3 digit IW day, punch "1" unless IW day is 001 in which case punch "0". If no IW day – leave blank.
20	55	1	Purch. Labor Code	Doc	A	SPC	Punch minus sign overpunch in col 55 if doc. stamped "Purchased Labor". Leave blank if not stamped.
50	56	1	A-X-P Code	Doc	A	*	
			H50 – H59				
51	57-59	3	Prepared Date	Doc	N	BN	ZTL – On 619-T-12 punch first 3 digits to right of asterisk *.
			H60				
51	57-59	3	Family Index	Doc	N	SPC	ZTL – Must be shown or lined out. Blank if lined out.
21	60-62	3	Stores	Doc	N	*	On 619-T-12 Rev punch "Work Done For, if shown, if not, punch "Del. To".
47	63-69	7	Variable No.	Doc	A/N	*	ZTL
48	70-75	6	Issue Quantity	Doc	N	BN	ZTL – On H59 punch "Allocated Qty" Item 45
46	76-80	5	Issue Date	Doc	N	BN	Col 76-77 – Mo. – ZTL 78-79 – Day – ZTL 80 – Year On H59 – Leave blank

Figure 24

BATCHED DATA ENTRY DESCRIPTION SHEET

ANALYST	PROGRAMMER	DATE
JOE FURY	JOHN BIT	6/6/66

RC	JOB NUMBER	RECORD NO. AND LEVEL	USABLE RECORD LENGTH	START OF WORK AREA	LENGTH OF WORK AREA	SORT	OUTPUT DEVICE / RECORD NAME		HOLD CODE / BLK		PAGE NO.	PAGE OF
R	MICRIC	31000	80	81		S	DETAIL CARD 1	T	0	1	1	2

INPUT ENTRY FIELD INSTRUCTIONS

ENTRY (TO) RECORD							VALIDATION							
	FIELD INPUT SEQUENCE NUMBER (001 IS FIELD ENTRY I.D.)	VERIFY: LEFT JUSTIFY, RIGHT JUSTIFY OR ZERO TO LEFT / FIELD SIZE / FIELD LOCATION			REMOVE FROM SIGNIFICANT DATA: ALPHA, NUMERIC, SPACES, OTHER SPECIAL CHARACTERS AND/OR SPECIAL CHARACTERS AS SHOWN. (UP TO THREE OF ANY COMBINATION) THEN COMPRESS AS JUSTIFIED / PACKED DEC. OR BINARY / FIELD NAME		OMISSION ERROR / ALPHA NUMERIC ERROR / SIZE ERROR		CHECK DIGIT TYPE (IF USED) / TABLE CHECK / EQUAL OR NOT EQUAL / TABLE		PARAMETER CHECK: IF CONDITION NOT MEET / FURTHER CHECKS: AND, OR, OR REPORT / CONDITION: EQUAL NOT EQUAL, GREATER THAN OR LESS THAN PARAMETER VALUE		
RC						RC					RC		VALUE (RJ)	
F	1	13	1		CARD CODE	E					P	E	1	
F	2	17	6	Z	QTY	E	SN							
F	3	96	4	L	U/M	E	SO		UOM	E				
F	4	56	1	LV	AXP	E	SAO							
F	5	39	7	ZV	ID	E	SO							
F	6	23	4	ZV	REQ	E	SN							
F	7	1	5	ZV	ADDRESS	E	SNO							
F	8	31	4	ZV	G.O	E	SNO							
F	9	27	4	ZV	REALEASE	E	SN							
F	10	35	4	Z	ACCOUNT	E	SNO		ACT	E				

OUTPUT RECORD FIELD INSTRUCTIONS

CONTROL FIELD/ BATCH CONTROL TO FIELD "C"				SORT ORDER OR CONTROL LEVEL	IF FIELD "A"			THEN							
	FIELD "A" FIELD SIZE / FIELD LOCATION				IS – EQUAL, NOT EQUAL, GREATER THAN OR LESS THAN / VALUE (RJ)			OPERATION: MOVE, ADD, SUBTRACT, IN OR, EX OR, LOG AND		VALUE "B" OR FIELD "B" / VALUE OR FIELD "B" (TO) FIELD "C"			JUSTIFIED – RIGHT, LEFT		
RC					RC					RECORD NUMBER	FIELD LOCATION	RECORD NUMBER	FIELD LOCATION	FIELD SIZE	
A	1	5	C		T										
A	10	3			T	E	H60	M	V			31000	18	5	
A	17	1			T	G		M	V			31000	17	1	
A	10	3			T	E	H60	M	F	31000	89	31000	57	3	
A	10	3			T	E	H59	M	F	31000	18	31000	71	5	
A	10	3			T	E	H59	M	F			31000	76	5	

Figure 25

BATCHED DATA ENTRY DESCRIPTION SHEET

ANALYST	PROGRAMMER	DATE
JOE FURY	JOHN BIT	6/6/66

RC	JOB NUMBER	RECORD NO. AND LEVEL	USABLE RECORD LENGTH	START OF WORK AREA	LENGTH OF WORK AREA	SORT	OUTPUT DEVICE / RECORD NAME		HOLD CODE BLK		PAGE NO.	PAGE OF
R	MIC RIC	31000	80	81	20	S	DETAIL CARD 1	T	0	1	2	2

INPUT ENTRY FIELD INSTRUCTIONS

ENTRY (TO) RECORD								VALIDATION							
FIELD INPUT SEQUENCE NUMBER (001 IS FIELD ENTRY I.D.)	VERIFY: LEFT JUSTIFY, RIGHT JUSTIFY OR ZERO TO LEFT	FIELD SIZE		REMOVE FROM SIGNIFICANT DATA: ALPHA, NUMERIC, SPACES, OTHER SPECIAL CHARACTERS AND/OR SPECIAL CHARACTERS AS SHOWN. (UP TO THREE OF ANY COMBINATION) THEN COMPRESS AS JUSTIFIED		OMISSION ERROR		CHECK DIGIT TYPE (IF USED)		PARAMETER CHECK: IF CONDITION NOT MEET / FURTHER CHECKS: AND, OR, OR REPORT		
RC	FIELD LOCATION			PACKED DEC. OR BINARY / FIELD NAME		RC	ALPHA NUMERIC ERROR / SIZE ERROR	TABLE CHECK / EQUAL OR NOT EQUAL / TABLE		RC	CONDITION: EQUAL NOT EQUAL, GREATER THAN OR LESS THAN PARAMETER VALUE / VALUE (RJ)	
F	11	63	7 ZV	VARIABLE		E	SO			P		
F	12	85	5 RV	I W	0	E	S					
F	13	60	3 RV	DEL TO		E	S					
F	14	82	3 RV	WORK /FOR		E	S					
F	15	17	1 LV	S/N								
F	16	70	6 ZV	R - ISSUED		E	SN					
F	17	76	5 LV	D - ISSUED	0	E	SN					
F	18	57	3 V	PREPARED		E	N					
F	19	89	3 V	FAMILY		E	SN					
F	20	90	1 V	P-L-C								

OUTPUT RECORD FIELD INSTRUCTIONS

CONTROL FIELD/ BATCH CONTROL TO FIELD "C": FIELD "A" RC	FIELD "A" FIELD LOCATION	FIELD "A" FIELD SIZE		SORT ORDER OR CONTROL LEVEL	IF FIELD "A" IS – EQUAL, NOT EQUAL, GREATER THAN OR LESS THAN: RC		VALUE (RJ)	THEN OPERATION: MOVE, ADD, SUBTRACT, IN OR, EX OR, LOG AND	VALUE "B" OR FIELD "B" JUSTIFIED – RIGHT, LEFT	VALUE OR FIELD "B" (TO) FIELD "C": RECORD NUMBER	FIELD LOCATION	RECORD NUMBER	FIELD LOCATION	FIELD SIZE
A	13	1	B		T							30000	59	4
A	17	6	B		T							30000	71	6
A	82	3			T	G	0	M	F	31000	82	31000	60	3
A	85	1			T			M	F	31000	85	31000	55	1
A	85	2			T	L	10	M	V		1	31000	55	1
A	85	4			T	E	001	M	V		0	31000	55	1
A	86	3						M	F	31000	86	31000	51	3
A	6	4	C		T	E	H50	M	F	31000	70	31000	90	6
A	90	1			T	G	X	L	V		–	31000	55	1

Figure 26

ITEM	COLS	NO. COLS	FIELD	SOURCE	A/N	PUNCH CODE	SPECIAL INSTRUCTIONS
			Detail Card 2 If account on Transmittal is 0917, punch Card 2				
34	1-5	5	Cat. Addr.	Doc	N	*	ZTL
1	6-9	4	Inv. Account	Trans	N	*	ZTL
2	10-12	3	Transaction Code	Trans	A/N	*	Punch "H50", "H59", or "H60"
3	13	1	Card Code	Const	N	*	Punch "2"
41	14-16	3	Batch No.	Trans	A/N	*	ZTL
52	17-25	9	Value	Doc	N	SPC	Col 17-23 Dollars ZTL – ZN 24-25 Cents, first 2 digits H59 – Leave Blank H50 – with zero issue qty – leave blank. All others must have.
53	26-80	55	Blank	–	–	–	

Figure 27

BATCHED DATA ENTRY DESCRIPTION SHEET

ANALYST	PROGRAMMER	DATE
JOE FURY	JOHN BIT	6/6/66

RC	JOB NUMBER	RECORD NO. AND LEVEL	USABLE RECORD LENGTH	START OF WORK AREA	LENGTH OF WORK AREA	SORT	OUTPUT DEVICE / RECORD NAME		HOLD CODE / BLK		PAGE NO.	PAGE OF
R	MIC RIC	31100	80	81	20	S	DETAIL CARD 2	T	0	1	1	1

INPUT ENTRY FIELD INSTRUCTIONS

ENTRY (TO) RECORD

RC	FIELD INPUT SEQUENCE NUMBER (001 IS FIELD ENTRY I.D.)	VERIFY: FIELD LOCATION	VERIFY: FIELD SIZE	VERIFY: LEFT JUSTIFY, RIGHT JUSTIFY OR ZERO TO LEFT	REMOVE FROM SIGNIFICANT DATA: ALPHA, NUMERIC, SPACES, OTHER SPECIAL CHARACTERS AND/OR SPECIAL CHARACTERS AS SHOWN. (UP TO THREE OF ANY COMBINATION) THEN COMPRESS AS JUSTIFIED — PACKED DEC. OR BINARY / FIELD NAME	VALIDATION: OMISSION ERROR RC	OMISSION ERROR: ALPHA NUMERIC ERROR	OMISSION ERROR: SIZE ERROR	CHECK DIGIT TYPE (IF USED): TABLE CHECK	CHECK DIGIT TYPE (IF USED): EQUAL OR NOT EQUAL	CHECK DIGIT TYPE (IF USED): TABLE	PARAMETER CHECK: IF CONDITION NOT MEET / FURTHER CHECKS: AND, OR, OR REPORT	PARAMETER CHECK: CONDITION: EQUAL NOT EQUAL, GREATER THAN OR LESS THAN PARAMETER VALUE: RC	PARAMETER CHECK: VALUE (RJ)
F	1	13	1		CARD CODE	E						P	E	2
F	2	17	9	Z	VALUE	E	N							

OUTPUT RECORD FIELD INSTRUCTIONS

CONTROL FIELD/ BATCH CONTROL TO FIELD "C": FIELD "A" RC	FIELD "A" FIELD LOCATION	FIELD "A" FIELD SIZE		SORT ORDER OR CONTROL LEVEL	IF FIELD "A" IS – EQUAL, NOT EQUAL, GREATER THAN OR LESS THAN: RC	VALUE (RJ)	THEN: OPERATION: MOVE, ADD, SUBTRACT, IN OR, EX OR, LOG AND	VALUE "B" OR FIELD "B"	JUSTIFIED – RIGHT, LEFT	VALUE OR FIELD "B" (TO) FIELD "C": RECORD NUMBER	FIELD LOCATION	RECORD NUMBER	FIELD LOCATION	FIELD SIZE	
A	13	1			T	2	M	V		1		31100	81	1	
A	81	1	B		T							30000	59	4	
A	17	9	B		T							30000	63	8	R
A	10	3			T	E	M	V	000000000			31100	17	9	
A	90	6			T	L	1	M	V	000000000		31100	17	9	

Figure 28

SYSTEM ADVANTAGES

Flexibility

Generalized Program

a. One-time programming for all jobs, present and future.
b. Individual job specifications can be easily changed.

Display Monitor

This device allows rapid change in output specifications for all jobs.

Variable Length Records

Up to 240 characters with 2848-21
Up to 480 characters with 2848-22
Even larger record sizes are possible by chaining.

One Device for Both Original Entry and Later Verification

This will reduce the need to have additional machines to handle capacity situations, and accordingly, will prevent the bottleneck on large jobs coming through.

Simplicity and Standardization

Readily Accessible Instructions

Instructions are available quickly and simply through terminals, with no delay in waiting for manual search for detailed, often complicated, instructions.

Free-Form Entry

Free-form entry allows for simplified instructions.

No Cards

No cards to buy and store.

Uniform Validity Checking

Anyone can easily determine the validity checks performed on a job without reading lengthy documentation or reviewing pages of coding.

Control

The 2260 Display Station Data Entry System provides current, statistically accurate information on job flow and entry speeds.

Job Status Report

Waiting, Partly Complete, and Completed Job Logs will be far more current. These are available on the 1053 printer or supervisor's 2260 Display Station.

Job Analysis Report

This report gives daily, weekly, and quarterly error rates and entry speed averages by job(s).

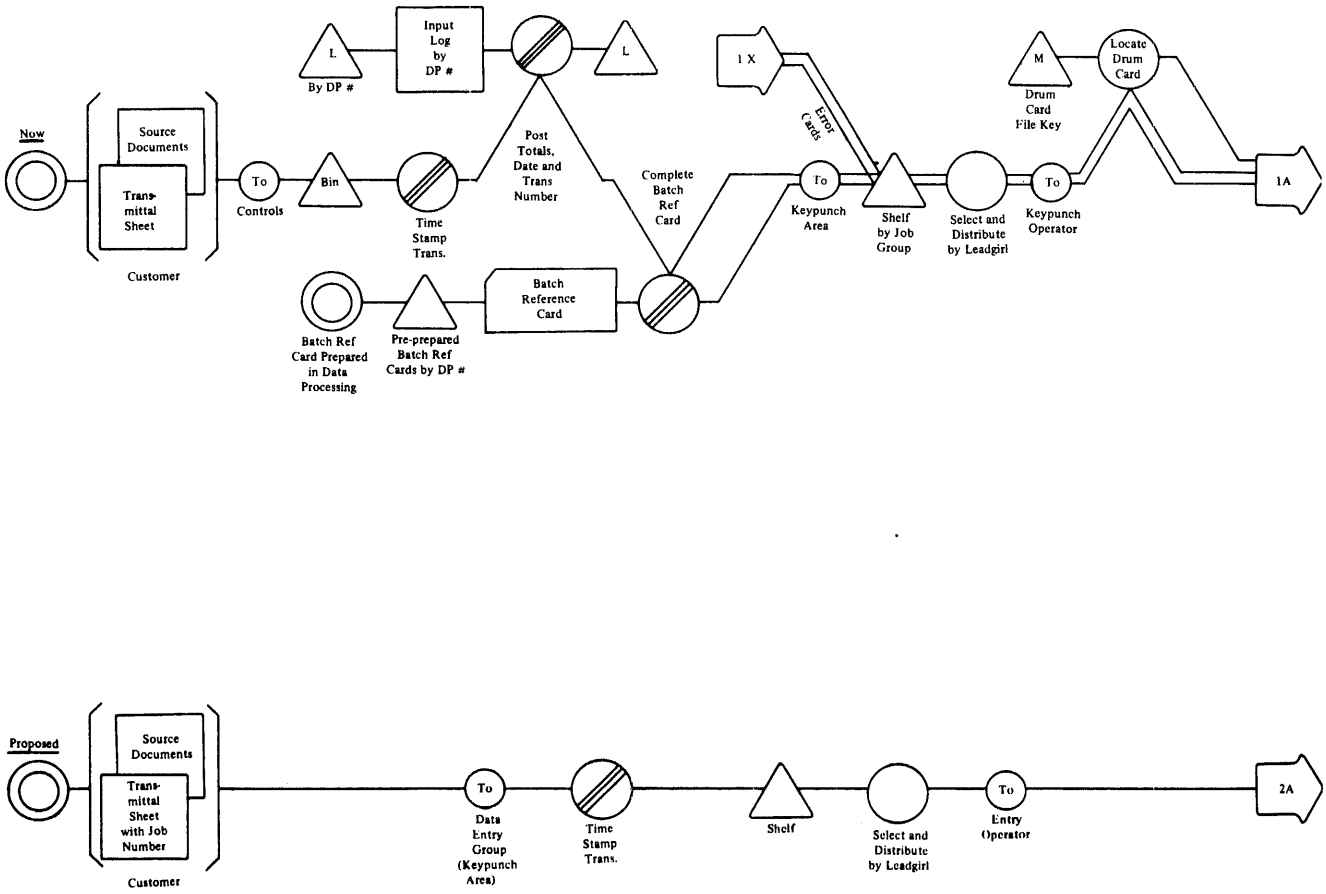


Figure 29 - General Keypunch & Operations Flow

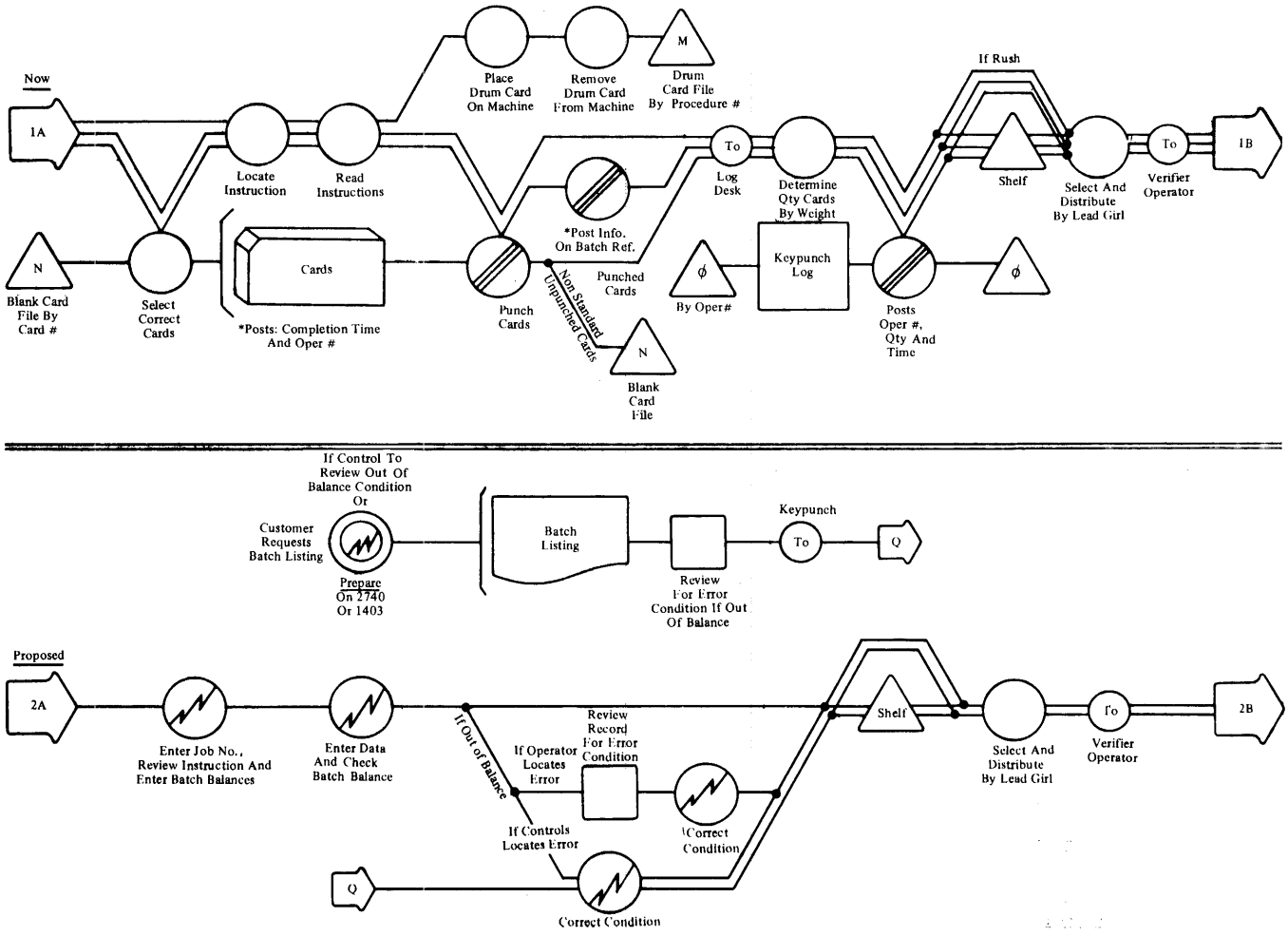


Figure 30 - General Keypunch & Operations Flow

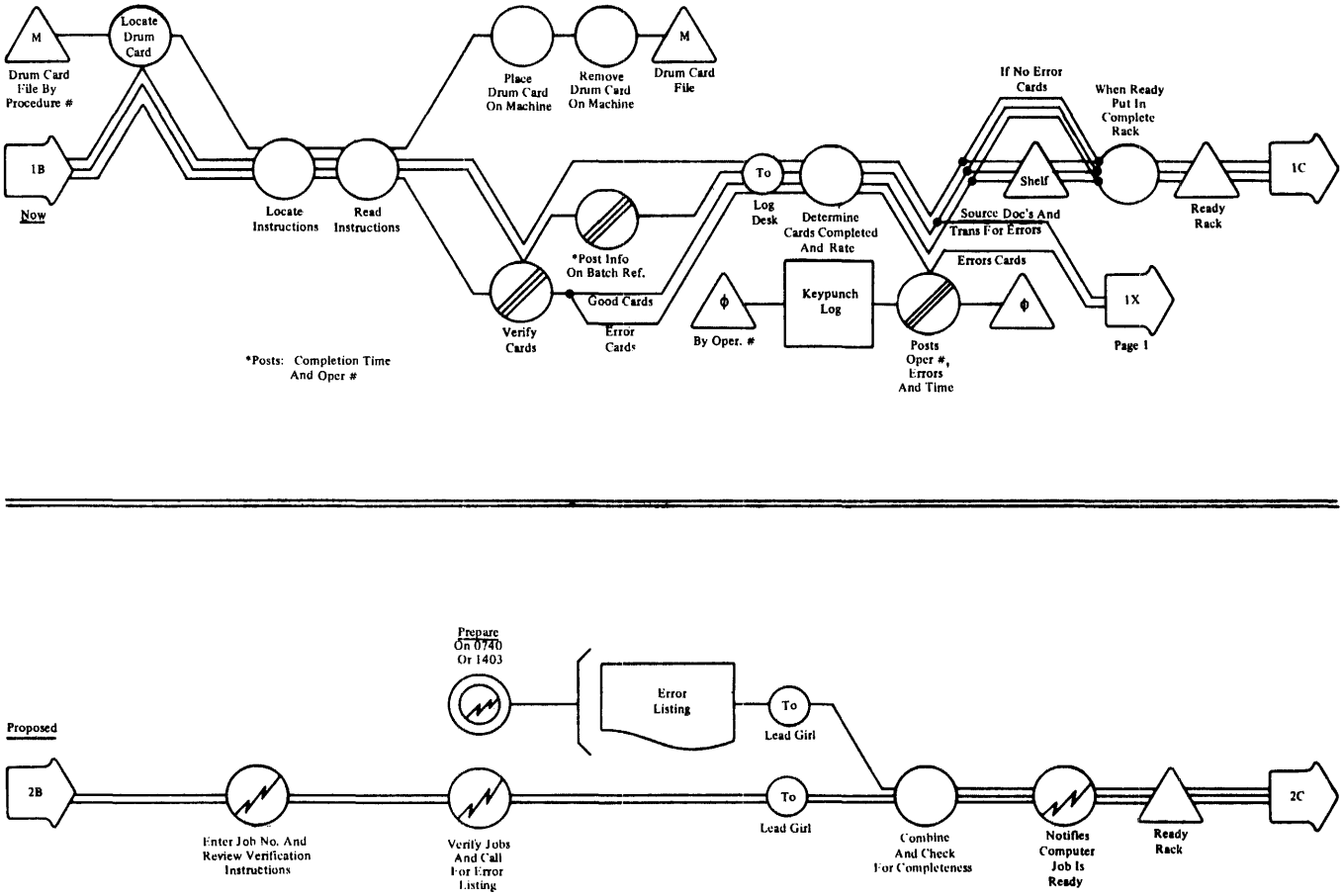


Figure 31

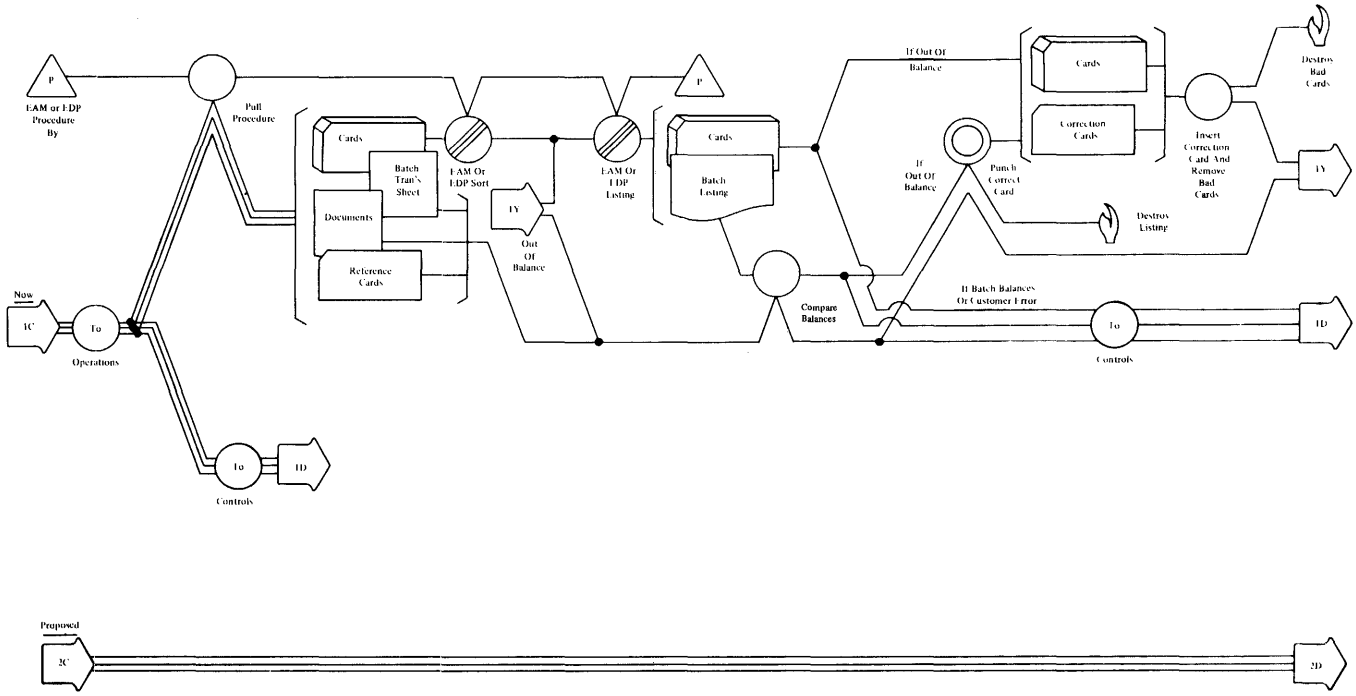


Figure 32

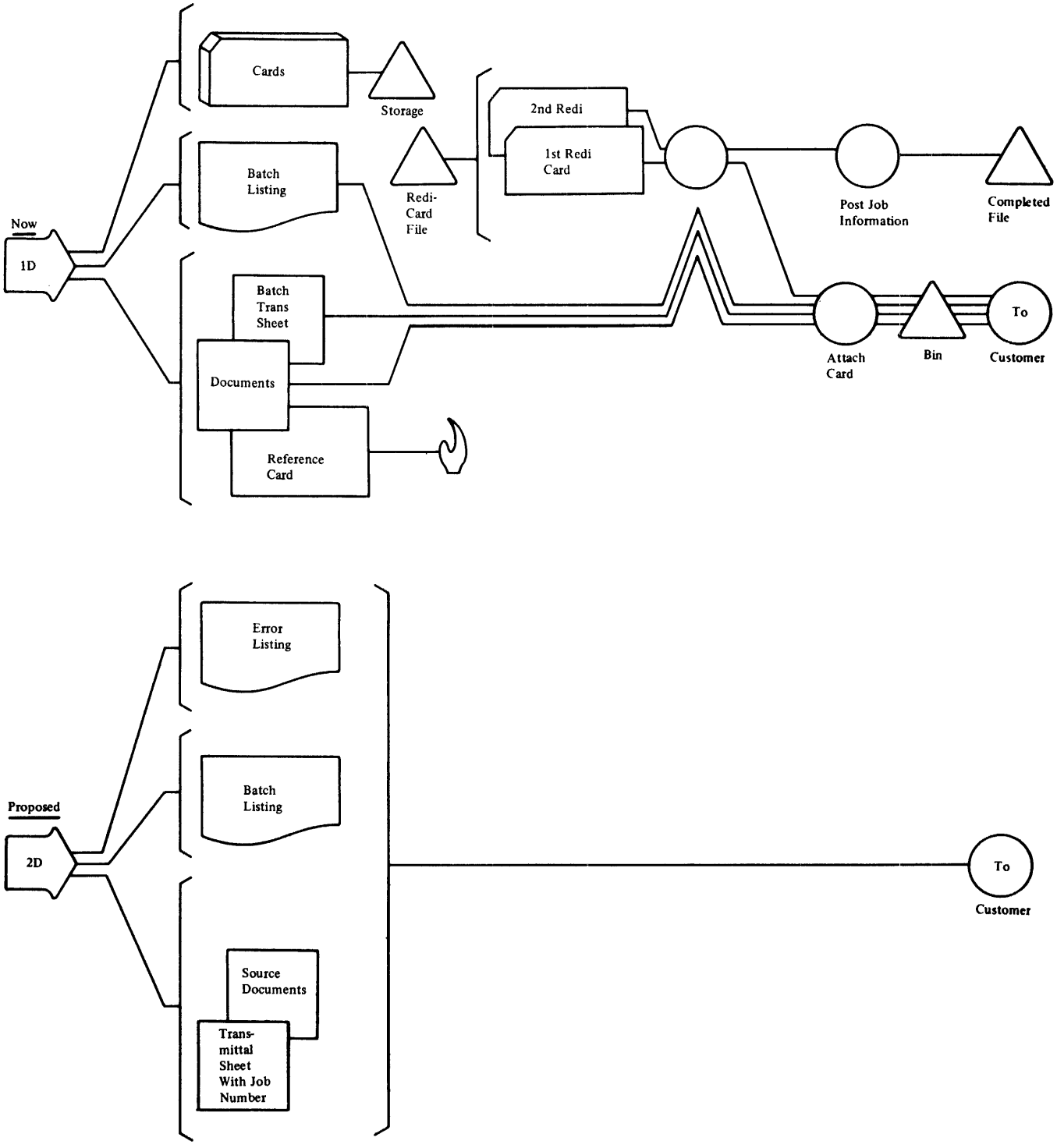


Figure 33

Operator Effectiveness Report

This report gives weekly and monthly operator error rate and entry speed averages by operator.

Significantly Fewer Batch Delays

Batched delay and wait queues are reduced. Once a batch has been entered and verified, it is immediately ready for use. Since the logging and batch balancing routines are part of the input process, these and other related operations no longer cause a delay, and throughput is substantially increased. (See Figures 29 thru 33)

Throughput Improvement

If the point of data entry is moved back to the customer's batch balancing area, or even to the point of transaction origin, there should be an even greater improvement in throughput, and listings prepared from these transactions will have the advantage of much more current information.

Early Error Detection and Correction

Because most errors can be caught at input, rather than during a separate validation program several days or weeks later, the integrity of reports can be greatly improved. On weekly or monthly jobs the customer can get, correct, and return his corrected listings, so that the records can be corrected before their use in the primary program.

No Looking for Work

Computer operators need not come to keypunch looking for jobs. The jobs will be available to them locally and listed by job number.

Ease of Batch Balancing

Automatic batch balancing at the time of entry will save 190 hours per month of 083 and 087 time, and 70 hours per month of 360/Model 30 and 1460 time.

No Card Re-cycle

During the verification of records, errors that are discovered by the verifier operator can be corrected by her thus saving the re-cycle of error cards. This should provide a three to five percent improvement in operator time. The saving would be realized not only from the ease of correcting the error, but from the time wasted in handling a small batch of corrections.

Faster Keying

Currently there is a significant difference between keypunch and verification rates. Verification is now faster because operators do not have to be cautious about generating an error. Also, tests indicate that when an operator is able to backspace on a 2740 to correct an error, her speed increases. Again, she need not slow down to prevent keying errors. There will be no delays due to card handling or mechanical machine operations. We feel it is therefore reasonable to suggest that by using the 2260 with its backspace correction ability, a twenty percent improvement in operator rate can be realized. It might also be noted that an operator has a further guarantee of a CPU validating her entry.

Easier Data Pickup

Data can be picked up from a source document in the same order as it appears on that document. Also because of the ability of the Batched Data Entry System to allow greater record length and its program flexibility, most "If . . . . . then" decisions now performed by the keypunch operators in translating a source document to a punched card will not need to be done.

Reduced Verification Time

It will be possible to substantially reduce verification time by:

a. Original entry validation

b. Eliminating the verification of previous batched balance fields

c. Eliminating descriptive or non-essential fields

d. Eliminating duplicated fields in trailer records which have been automatically duplicated by the program.

Easier Duplication

Because control fields, in many cases, can be automatically inserted from one record to the next, we can substantially reduce the need for field duplication.

Reduce Keypunch Labor

If we accumulate all of the percentage estimates involving reduced effort, there is an optimistic potential of forty-five percent less labor required when the data entry system is used. We feel a pessimistic prediction should be about twenty-six percent, and our labor savings are based on that percentage.

PROPOSED MACHINE AND LABOR CONFIGURATION TO ACCOMPLISH THE TASK

Computer Configuration

We recommend that a System/360-Model 40 be installed to replace a currently installed System/360-Model 30D to handle both the Batched Data Entry System and the present Model 30 workload. The following features will be necessary:

Model 40 using a partitioned memory divided into 16K and 115K. The latter to be used for the Batched Data Entry System.

Model 40 having all the I/O and CPU features of the Model 30 it replaces.

Model 40 also includes those features necessary to support the Data Entry System.

Personnel Needs For Data Entry

We estimate that the following reductions in entry personnel can be made:

Area	Shift	Personnel Now	Personnel Proposed
Main Location	1	22	16
	2	27	20
	3	6	5
Engineering	1	10	7
	2	11	8
Totals		76	56
People Saved			20
		(100%)	(74%)

Other Reductions In Effort

Other reductions will be possible, but are more difficult to predict.

Stockroom and Controls

Area	Shift	Hours/Month Now	Hours/Month Proposed
Stockroom	1	520	455
	2	170	165
Controls Logging & Balancing	1	200	150
	2	200	150
	3	200	150
Totals		1,290	1,070
Hours/Month Saved			220

Programming

Because the Batched Data Entry System eliminates writing card-to-tape, batch balancing, and input validation programs, there will be an estimated 1/2 or 1% savings in total systems and programming effort.

$$\frac{\text{55 Programmers x 167 hours/month}}{\text{.005 effort factor}} = \text{46 hours/month saved}$$

SPECIFIC COST BREAKDOWN

Suggested Computer Configuration Changes

Device/Feature	Description	Current Model 30 System	Proposed Model 40 System
2030D	16K Processing Unit	$1,830.00	$
2040H	131K Processing Unit		6,590.00
	Decimal Arithmetic	25.00	118.00
	Floating Point Arithmetic	51.00	103.00
	Selector Channel - 1st	221.00	360.00
	Selector Channel - 2nd		335.00
	1051 Attachment	77.00	
	1401/1440/1460 Compat-Basic	232.00	515.00
	1402/1403 Attachment	41.00	
	1401 Compat-Console Inq. Sta.	15.00	
	1401 Compat-Magnetic Tape on Selector Channel	51.00	
	Programmed Mode Switch	20.00	
	1401 Compat-Column Binary	31.00	
	1052 Adapter		232.00
	Storage Protection		155.00
1051	Control Unit-On Line & Home	60.00	
	Special Features	25.00	
1052	Printer-Keyboard	65.00	65.00
2821	Control Unit	1,000.00	1,000.00
	Special Features	180.00	180.00
8065	2540 Compatibility Attchmt	N/C	N/C
1403	Printer - 1100 LPM Train	900.00	900.00
1416	Print Train	100.00	100.00
2540	Card/Read/Punch	680.00	680.00
2401-3	Magnetic Tape (4 units)	3,240.00	3,240.00
2401-3	Magnetic Tape (1 unit)		810.00
2803-1	Tape Control	670.00	670.00
	Special Features	95.00	95.00
2841	Storage Control for 2311		540.00
2311-1	Disk Storage Device (3 units)		1,770.00
		$9,506.00	$18,355.00

Entry Device Changes

Qty	System/Feature	Description	Current	Proposed
	2260	CRT Terminal	$	$
2	2848-21	Display Control		1,500
2	5340	Non-Dest. Cursor Adptr		20
16	5341	Non-Dest. Cursor		80
2	4787	Line Addressing		20
32	2260	Display Terminals		1,952
16	3368	2260 Adapters		960
2	3868	Expansion Unit		100
				4,632
		Cards(1300K per month)	1,300	
	029	Keypunch (24)	1,624	
	059	Verifier (20)	1,440	
			$4,364	

Estimated Entry Personnel Reductions

Operators Now (76 @ $690.00)	$52,440	
Operators Proposed (56 @ $690.00)		$38,640
	$66,310	$61,627

Savings From A, B, and C Above

Estimated Monthly Savings from in equipment and entry personnel.	$4,683

Other Potential Savings

1. 190 hours of 083 and 087 hours saved at $14.00 per hour	$2,660
2. 70 hours of Model 30/1460 hours saved at $70.00 per hour	4,900
3. 220 hours of personnel hours saved at $6.00 per hour	1,320
4. 46 hours of reduced programming saved at $10.00 per hour	460
	9,340

Total Over-All Estimated Savings

1. Per month	$14,023
2. Per year	$168,276

SYSTEM IMPLEMENTATION OBJECTIVES

Early Implementation

Immediate steps should be taken to audit and then implement the objectives of this proposal. Because of the relatively long delivery schedule for the devices needed to implement the objectives, all supporting equipment should be placed on order at once to assure delivery when the system is ready to go.

Installed 2260's Will Expedite System

IBM 2260's currently on order should be set aside for testing the system during programming, and to gain experience on CRT devices. Adequate utilization of the 2260 in testing should allow an easier transition from keypunching to the Data Entry System.

Phased Delivery

Schedule the delivery of the 2260's on a "phased-basis", probably stretching delivery over a six to nine month interval. Plan to get the Model 40 in several months in advance of the 2260 so that experience can be gained using the partitioned memory.

Necessary To Redesign One Problem Job

In a situation where the system is designed so that keypunch adds data to a pre-punched card, redesign of that system will be necessary. The only significant job of that type might be Payroll. If Payroll is to be incorporated into the Data Entry System, it will need input redesign.

IBM'S Role

When called upon, IBM will be pleased to provide guidance in the implementation of the Batched Data Entry System.

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