The outline presents six units of instruction for use in secondary schools and adult education programs to help prepare students with basic typewriting skills for employment as data entry operators. The units are: (1) introduction to punched card data processing, (2) nonbuffered card punch machines, (3) punched card verifiers, (4) buffered card punch/verifiers, (5) key-to-tape data recorders, and (6) key-to-disk data recorders. They are designed for use as follows: unit one as an introduction to any of the other units, unit three to follow unit two, and units two, four, five, and six, which do not build on the content of the other units, to be used in any sequence. Objectives for each unit are stated in behavioral terms. A two-column format lists topics necessary for an adequate presentation on the left and teaching methods on the right with textbook page references. A description is provided of instruction time required, facilities, application in secondary and adult education programs, classroom management, general teaching suggestions, and expected outcomes for the entire course. Also included are a three-page glossary and a 30-item bibliography of textbooks, references, films, transparencies, and programed instructional units. (Author/MS)
AN INSTRUCTOR'S GUIDE

CAREER PREPARATION IN DATA PROCESSING

KEYPUNCH OPERATOR
KEY-TO-TAPE OPERATOR
KEY-TO-DISK OPERATOR
THE UNIVERSITY OF THE STATE OF NEW YORK

Regents of the University (with years when terms expire)

1978 Alexander J. Allan, Jr., LL.D., Litt.D.
1980 Joseph T. King, LL.B.
1981 Joseph C. Indelicato, M.D.
1979 Francis W. McGinley, B.S., J.D., LL.D.
1983 Harold E. Newcomb, B.A.
1988 Willard A. Genrich, LL.B., L.H.D.
1982 Emlyn I. Griffith, A.B., J.D.
1977 Geneviye S. Klein, B.S., M.A.
1976 Mary Alice Kendall, B.S.
1984 Jorge L. Batista, B.A., J.D.
1982 Louis E. Yavner, LL.B.

President of The University and Commissioner of Education

Executive Deputy Commissioner of Education

Deputy Commissioner for Elementary, Secondary, and Continuing Education

Associate Commissioner for Instructional Services

Assistant Commissioner for General Education and Curricular Services

Director, Division of Curriculum Development

Chief, Bureau of Continuing Education Curriculum Development

Assistant Commissioner for Occupational and Continuing Education

Director, Division of Occupational Education Instruction

Chief, Bureau of Business Education
### Regents of The University (with years when terms expire)

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>University or Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ewald B. Nyquist</td>
<td>University and Commissioner of Education</td>
<td></td>
</tr>
<tr>
<td>Gordon M. Ambach</td>
<td>Commissioner of Education</td>
<td></td>
</tr>
<tr>
<td>Thomas D. Sheldon</td>
<td>for Elementary, Secondary, and Continuing Education</td>
<td></td>
</tr>
<tr>
<td>William L. Bitner III</td>
<td>for Instructional Services</td>
<td></td>
</tr>
<tr>
<td>Vivienne N. Anderson</td>
<td>for General Education and Curricular Services</td>
<td></td>
</tr>
<tr>
<td>Gordon E. Van Hooft</td>
<td>for Curriculum Development</td>
<td></td>
</tr>
<tr>
<td>Herbert Bothamley</td>
<td>for Continuing Education Curriculum Development</td>
<td></td>
</tr>
<tr>
<td>Robert S. Seckendorf</td>
<td>for Occupational and Continuing Education</td>
<td></td>
</tr>
<tr>
<td>Robert H. Bielefeld</td>
<td>of Occupational Education Instruction</td>
<td></td>
</tr>
<tr>
<td>Hobart H. Conover</td>
<td>for Business Education</td>
<td></td>
</tr>
</tbody>
</table>

### University and College Presidents

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>University or Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>James B. Engler</td>
<td>Chancellor</td>
<td>State University of New York</td>
</tr>
<tr>
<td>James A. Millikan</td>
<td>President</td>
<td>State University of New York</td>
</tr>
<tr>
<td>Alice C. Bailey</td>
<td>President</td>
<td>State University of New York</td>
</tr>
<tr>
<td>John J. Prior</td>
<td>President</td>
<td>State University of New York</td>
</tr>
<tr>
<td>David N. Edgerton</td>
<td>President</td>
<td>State University of New York</td>
</tr>
<tr>
<td>John E. Clendenin</td>
<td>President</td>
<td>State University of New York</td>
</tr>
<tr>
<td>John E. Clendenin</td>
<td>President</td>
<td>State University of New York</td>
</tr>
<tr>
<td>John E. Clendenin</td>
<td>President</td>
<td>State University of New York</td>
</tr>
<tr>
<td>John E. Clendenin</td>
<td>President</td>
<td>State University of New York</td>
</tr>
<tr>
<td>John E. Clendenin</td>
<td>President</td>
<td>State University of New York</td>
</tr>
<tr>
<td>John E. Clendenin</td>
<td>President</td>
<td>State University of New York</td>
</tr>
<tr>
<td>John E. Clendenin</td>
<td>President</td>
<td>State University of New York</td>
</tr>
<tr>
<td>John E. Clendenin</td>
<td>President</td>
<td>State University of New York</td>
</tr>
</tbody>
</table>
AN INSTRUCTOR'S GUIDE

CAREER PREPARATION
IN DATA PROCESSING

KEYPUNCH OPERATOR
KEY-TO-TAPE OPERATOR
KEY-TO-DISK OPERATOR
Foreword

In today's sophisticated business environment, managers are seeking methods to speed up the process of collecting information and feeding it to the electronic computers for processing. Manufacturers of data processing equipment have responded to the needs of business by developing machines that store huge volumes of data and process them at high speeds. The capacities of these large computing systems require the data to be recorded very rapidly with 100 percent accuracy. As a result, the data entry operations field has grown and methods have diversified to keep step with the demands of the industry. The content of this publication may be used in secondary schools and adult education programs to assist in preparing individuals who wish to enter the data entry field or to upgrade personnel already working in the data processing area.

The development of materials designed to train workers for the field of data processing was initiated by Hobart H. Conover, Chief, Bureau of Business Education. Appreciation is expressed to Carl Appey, data processing instructor, Nassau County BOCES, Westbury, for preparing the instructional materials. Assistance relating to content was provided by Ronald W. Wing, associate in the Bureau of Business Education. The project was coordinated and the manuscript prepared for publication by Nelson S. Maurer, associate in the Bureau of Continuing Education Curriculum Development.

HERBERT BOTHAMLEY, Chief  
Bureau of Continuing Education  
Curriculum Development

GORDON E. VAN HOOFT, Director  
Division of Curriculum Development
Message to the Instructor

Career Preparation in Data Processing is part of a cluster of occupational preparation related to the field of data processing. The principles and practices outlined in this guide are particularly important for persons who wish to enter the field of data entry operations or for individuals who wish to upgrade their present skills. The content builds on a base of elementary understandings and permits the student to apply his knowledge and refine his skills at each step of the educational process. Throughout the various units, the student's progress should be evaluated in terms of the specific performance objectives.

The program may also be used as part of the occupational preparation for data processing clerical personnel. Secondary and adult students who are learning about or have experience in data processing can use the basic skills to develop a specialization that will be useful in their career development.

The instructor is urged to use this outline with his students in relation to their stage of development. Individual and small group learning activities should be utilized and improved upon with experience. While we feel that the elements of a successful program are contained in this publication, please let us know where future improvements can be made.

HOBART H. CONOVER, Chief
Bureau of Business Education

ROBERT H. BIELEFELD, Director
Division of Occupational Education Instruction
Contents

Foreword ........................................ ii
Message to the Instructor ....................... iii
Introduction ..................................... 1
  Purposes of Course ........................... 1
  Course Description .......................... 1
  Time Required ................................ 1
  Format of Guide ................................ 2
  Facilities ...................................... 2
  Application in Secondary Schools .......... 2
  Application in Adult Education ............. 2
  Classroom Management ....................... 3
  Teaching Suggestions ....................... 4
  Expected Outcomes ........................... 4

Unit 1 - Introduction to Punched Data Processing ...
Unit 2 - Nonbuffered Card Punch ............... 
Unit 3 - Punched Card Verifiers ............... 
Unit 4 - Buffered Card Punch/Verifier ...... 
Unit 5 - Key-to-Tape Data Recorder ........ 
Unit 6 - Key-to-Disk Data Recorder ......... 
Glossary ....................................... 
Bibliography ...................................
## Contents

<table>
<thead>
<tr>
<th>Unit</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit 1</td>
<td>Introduction to Punched Card Data Processing</td>
<td>5</td>
</tr>
<tr>
<td>Unit 2</td>
<td>Nonbuffered Card Punch Machines</td>
<td>7</td>
</tr>
<tr>
<td>Unit 3</td>
<td>Punched Card Verifiers</td>
<td>12</td>
</tr>
<tr>
<td>Unit 4</td>
<td>Buffered Card Punch/Verifiers</td>
<td>15</td>
</tr>
<tr>
<td>Unit 5</td>
<td>Key-to-Tape Data Recorders</td>
<td>21</td>
</tr>
<tr>
<td>Unit 6</td>
<td>Key-to-Disk Data Recorders</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>Glossary</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>Bibliography</td>
<td>35</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Page</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>ii</td>
<td>Source</td>
</tr>
<tr>
<td>iii</td>
<td>Table of Contents</td>
</tr>
<tr>
<td>1</td>
<td>Unit 1</td>
</tr>
<tr>
<td>1</td>
<td>Unit 2</td>
</tr>
<tr>
<td>1</td>
<td>Unit 3</td>
</tr>
<tr>
<td>2</td>
<td>Unit 4</td>
</tr>
<tr>
<td>2</td>
<td>Unit 5</td>
</tr>
<tr>
<td>2</td>
<td>Unit 6</td>
</tr>
<tr>
<td>2</td>
<td>Glossary</td>
</tr>
<tr>
<td>4</td>
<td>Bibliography</td>
</tr>
</tbody>
</table>
Introduction

The electronic data processing industry affects the lives of many people. The growth of the industry has been phenomenal. In 1970 there were about 40,000 computers in use and it has been estimated that the number will more than double in the next few years.

Lately, manufacturers of data processing equipment have been directing their attention to the small business market. Firms that previously used manual data processing systems can now afford to convert to an economical automated system. Also, larger companies already using electronic computing equipment are adopting direct data entry methods. Thus, the increase in the use of data processing equipment, the development of minicomputers and the adoption of direct entry systems have resulted in an increased demand for qualified operators of card-punch machines and data recorders using magnetic tape and disks.

Purposes of Course

This course is designed to assist in the preparation of individuals for employment as data entry operators. Persons already performing clerical functions can use this course to upgrade their skills in order to gain a more profitable position. Also, people wishing to supplement their income may use this course to gain the skills necessary to obtain part-time employment.

Course Description

Career Preparation in Data Entry prepares individuals for employment as data entry operators. The units in the course:

- **Unit 1** - Introduction to Punch Processing
- **Unit 2** - Nonbuffered Card Punch
- **Unit 3** - Punched Card Verification
- **Unit 4** - Buffered Card Punch
- **Unit 5** - Key-to-Tape Data Recording
- **Unit 6** - Key-to-Disk Data Recording

Unit 1 should be used as an introduction to the succeeding units. Unit 2 should be used after Unit 2. Units 3, 4, 5, and 6 are contained and include the necessary knowledge related to each specific function. Other units do not build on the content of the preceding units and, therefore, may be presented in any sequence desired. Because of the nature of the buffered card punches, key-to-tape machines, students would understand the material better if they were presented after Unit 2.

Time Required

The content for Unit 1 may be presented in approximately 3 to 4 hours. Any
Introduction

Data processing industry affects people. The growth of the industry in 1970 there were about 40,000 it has been estimated that the double in the next few years.

Users of data processing equiping their attention to the. Firms that previously used g systems can now afford to cal automated system. Also, ady using electronic computing direct data entry methods.

The use of data processing amount of minicomputers and the ry systems have resulted in an qualified operators of card- data recorders using magnetic

designed to assist in the duals for employment as data sons already performing clerical course to upgrade their skills re profitable position. Also, plement their income may use he skills.necessary to obtain

Course Description

Career Preparation in Data Processing may be used in secondary schools and adult programs to help prepare individuals for employment as data entry operators. The units in the course include:

Unit 1 - Introduction to Punched Card Data Processing
Unit 2 - Nonbuffered Card Punch Machines
Unit 3 - Punched Card Verifiers
Unit 4 - Buffered Card Punch/Verifiers
Unit 5 - Key-to-Tape Data Recorders
Unit 6 - Key-to-Disk Data Recorders

Unit 1 should be used as an introduction for any of the succeeding units. Unit 3 should be presented after Unit 2. Units 2, 4, 5, and 6 are "self-contained" and include the necessary skills and knowledge related to each specific machine. These units do not build on the contents contained in other units and, therefore, may be taught in any sequence desired. Because of the complex nature of buffered card punches, key-to-tape, and key-to-disk machines, students would understand Units 4, 5, and 6 better if they were presented after Units 1 and 2.

Time Required

The content for Unit 1 may be presented in approximately 3 to 4 hours. Any one of the subsequent
Introduction

units will need 30 to 40 hours of instructional time per machine provided pupils have completed successfully at least a half-year typewriting course. This includes the keyboard skills as well as the operation of the verifier. Verifier operations, however, should not be emphasized, because employers give this type of work to their more experienced people and use the newly hired workers as data-entry operators.

When the nonbuffered card punch machines are taught first, the students have an easier time adjusting to the more sophisticated buffered card punches, key-to-tape, and key-to-disk devices. This procedure reduces the instructional time for the other machines to approximately 20 hours per device.

Format of Guide

The two-column format is designed to assist in the planning and instructing process. The topics necessary for an adequate presentation are given in the left-hand column. Teaching methods and suggestions for making the presentation more effective are given in the right-hand column. Also, selected references are listed here with the complete citations given in the bibliography under the heading of Textbooks found on page 35.

At the top of each unit are listed the general objectives which are stated in terms of the activities that the student is able to do as a result of the instruction. The standards of achievement should be at least the minimum proficiency necessary for entry employment as data-entry operators.

Facilities

There should be one work station for each member of the class. If this is not possible due to economic or physical limitations, two work stations for every three members should be. There should be a group demonstrator machine, which will be used mainly during the first half of the course. Plan to have at least 4 feet of space for each work station because space is needed for storage of supplies and materials.

Application in Secondary Schools

The content of this outline of instruction in courses of Auto and Office Practice when key-entry devices are used mainly during the first half of the course. Plan to have at least 4 feet of space for each work station because space is needed for storage of supplies and materials.

An area center may offer a key-entry devices unit in courses of Auto and Office Practice when key-entry devices are used mainly during the first half of the course. Plan to have at least 4 feet of space for each work station because space is needed for storage of supplies and materials.

Units of this course may be offerings as Office Practice and Auto and Office Practice when key-entry devices are used mainly during the first half of the course. Plan to have at least 4 feet of space for each work station because space is needed for storage of supplies and materials.

Application in Adult Education

The units of this guide may
400 hours of instructional time pupils have completed success-
year typewriting course. This
skills as well as the operat-
operations, however
ecognized, because employers give this
more experienced people and use
rs as data entry operators.

ered card punch machines are
dents have an easier time
sophisticated buffered card
and key-to-disk devices. This
structional time for the
proximately 20 hours per device.

ormat is designed to assist in
cting process. The topics
uate presentation are given
in. Teaching methods and
n the right-hand column. Also,
listed here with the complete
bibliography under the heading
page 35.

ch unit are listed the general
stated in terms of the
udent is able to do as a result
The standards of achievement
minimum proficiency necessary
as data entry operators.

for every three members should be considered minimal.
There should be a group demonstration area which
will be used mainly during the first few sessions
of the course. Plan to have at least 36 square
feet of space for each work station. Additional
space is needed for storage of supplies and teaching
materials.

Application in Secondary Schools

The content of this outline is suited for units
of instruction in courses of Automatic Data Processing
and Office Practice when key-entry devices are taught
in local high schools and-area occupational centers.
The units selected will depend on the equipment
available, the level of proficiency to be achieved,
the employment opportunities, and job standards
prevalent in the area.

An area center may offer a half-year course in
key-entry devices including the content of these
instructional units, but the course also needs to
include related content from Office Practice and/or
Automatic Data Processing. Such a proposed course of
study should be submitted to the Bureau of Secondary
Curriculum Development for approval.

Units of this course may be included in such
offerings as Office Practice and Automatic Data
Processing when key-entry devices are taught in
comprehensive high schools. These units also may be
used as the content for short courses of a half-year,
single-period course devoted to the operation of
key-entry devices. The units selected will depend
upon the equipment available and opportunities for
employment in the area.

Application in Adult Education

The units of this guide may be used in an adult
education program for a single course or a series of courses. Units 1, 2, and 3 would provide suitable content for a course in keypunch operation for a school equipped with nonbuffered card punch machines and verifiers.

Unit 1, 2, 3, and 4 may be used in schools equipped with nonbuffered, buffered, and verifier card punch machines. These four units require approximately 60 to 80 hours of instruction. Because most adult education courses are from 30 to 40 hours in length, it is recommended that two courses be offered and the adult students be encouraged to follow one course with the other. When only one course is offered, the level of productive speed will be lower because some of the time usually devoted to proficiency development will have to be sacrificed.

When a school does not have enough machines of each type to accommodate the entire class at one time, the various machines will have to be taught concurrently. Because the total instructional time needed for all units is 90 to 120 hours, a series of three combinations should be offered which would provide instruction on all machines at the same time. The suggested course titles under such conditions would be, Key-Entry Device Operation 1, 2, and 3.

When a school has enough machines of the various types for individual use, specialized course for each machine may be offered. If the courses are not offered in series, the following 30 to 40 hour combination are suggested:

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Units Included</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keypunching 1</td>
<td>1 and 2</td>
</tr>
<tr>
<td>Keypunching 2</td>
<td>3 and 4</td>
</tr>
<tr>
<td>Key-to-Tape Operation</td>
<td>5</td>
</tr>
<tr>
<td>Key-to-Disk Operation</td>
<td>6</td>
</tr>
</tbody>
</table>

Adult education instructors review the revised Office Practice book to determine how the course fits into the overall program. Also, Chapter IV, Teaching Aids, and Chapter V, Job Instruction Sheets, provide insights relative to the planning and presentation of information to students. Copies of the syllabus may be obtained from the business education department.

Classroom Management

In an installation that does not have enough machines of a given type for each course, one student acts as a buddy for the second student operating the machine. When the buddy system is used, short projects are recommended in order to reduce observation time to a minimum. These projects are likely to result in little participation by the observer and detract from the learning process of the machine operator. Short time spans for students exchange roles give the observer time to review and digest the material before projects are given. The total instructional time needed for all units is 90 to 120 hours, and students may be started on different systems.

Keyboard drilling is necessary to improve speed and accuracy, however, it can be a boring task. To alleviate this, keyboard drilling is interspersed with short rest periods and projects.

The use of simulators for keyboard familiarization is not recommended except during keyboard familiarization. A typewriter key simulator is quite different from a keypunch and thus the use of such simulators is quite different. A typewriter key simulator also fails to provide the necessary feedback.
for a single course or a series of
2, and 3 would provide suitable
es in keypunch operation for a
nonbuffered card punch machines

and 4 may be used in schools
4ffered, buffered, and verifier
. These four units require
80 hours of instruction. Because
5ourses are from 30 to 40 hours
commended that two courses be
it students be encouraged to
ith the other. When only one
leve of productive speed
use some of the time usually
ancy development will have to be

Adult education instructors from industry should
text of the revised Office Practices Syllabus to see
how the course fits into the overall Office Practice
rogram. Also, Chapter IV, Teaching Methods, and
Chapter V, Job Instruction Sheets, might provide some
ights relative to the planning and presenting of
formation to students. Copies of the revised
yllabus may be obtained from the supervisor of
usiness education.

Classroom Management

In an installation that does not have sufficient
ichines of a given type for each student, a buddy
ystem where one student acts as an observer while
he second student operates the machine may be used.
hen the buddy system is used, short instructional
jects are recommended in order to keep the
bervation time to a minimum. Extended idle periods
re likely to result in little learning for the
observer and detract from the learning process of the
achine operator. Short time spans where the two
udents exchange roles give the observer time to
view and digest the material he has covered and
vide short rest periods for the operator. Also,
udents may be started on different machines in a
otation system.

Keyboard drilling is necessary to develop
speed and accuracy, however, it can become a tedious,
boring task. To alleviate this, "live," work-type
jects should be interspersed with the drill
essions.

The use of simulators for keyboard skill develop-
ent is not recommended except as a possible tool
during keyboard familiarization. The touch of the
es on a simulator is quite different from that on
keypunch and thus the use of such a machine is only
ildly effective. A typewriter with a key-
simulator also fails to give the student any feel
Introduction

for the operation of a key-entry device relative to card movement and programing.

Teaching Suggestions

The following points are offered as a means of improving instruction.

- Review each unit well in advance of the class and obtain the instructional materials needed for an effective presentation. Whenever possible use instructional aids to clarify the presentation.

- Use a variety of learning experiences in order to challenge the different levels of student abilities.

- Take all opportunities to provide for individual or small group instruction.

- Keep the instruction flexible enough to permit each student to gain the skills and knowledges required to achieve his specific goals.

- Read trade magazines to keep up to date with new information and developments that are occurring in the field of data processing.

Expected Outcomes

Upon successful completion of this course, graduates can expect to find employment in any of such businesses as commercial and savings banks; utility companies; airlines and firms; local schools and universities; state, and Federal government agencies; oil and gasoline distributors; and exchanges; and data processing bureaus.

Students who have acquired knowledge and average keyboard skills of key-entry device can be easily operate other machines of a similar type. There is no specific speed requirement look for when hiring key-entry devices. A wide range of speed is expected because the work varies from using all alphabetic, or mixed data; jobs simple to complex; and source documents formal, well organized presentations; handwritten pieces of paper. Employers interested in hiring individuals and use the proper techniques. In complex jobs, speed is virtually new jobs where speed counts, they will develop with experience.
Utility companies; airlines and other transportation firms; local schools and universities; municipal, state, and Federal government agencies; manufacturing firms; oil and gasoline distributors; stock brokerage houses and exchanges; and data processing services bureaus.

Students who have acquired a good working knowledge and average keyboard skills on one type of key-entry device can be easily trained to operate other machines of a similar type. There is no specific speed requirement which employers look for when hiring key-entry device operators. A wide range of speed is expected and accepted because the work varies from using all numeric, all alphabetic, or mixed data; jobs range from simple to complex; and source documents vary from formal, well organized presentations to informal, handwritten pieces of paper. Employers are interested in hiring individuals who are accurate and use the proper techniques. They realize that in complex jobs speed is virtually impossible; in new jobs where speed counts, they know that speed will develop with experience.
INTRODUCTION TO PUNCHED CARD DATA PROCESSING

OBJECTIVES:

At the conclusion of this unit, the student should be able to:

- Identify and explain the function of the various machines used in punched card accounting
- Explain the unit-record concept
- Identify and explain the physical characteristics of a punched card
- Explain the rules governing the recording of data in numeric, alphabetic, and alphanumerical formats
- Identify and explain the function of the physical characteristics of magnetic tapes
- Identify employment opportunities for data entry operators

CONTENT

Punched Card Accounting

A. Card punches

B. Other data recorders
   1. Key-to-tape
   2. Key-to-disk

C. Peripheral unit-record machines
   1. Interpreter
   2. Sorter
   3. Reproducer
   4. Collator
   5. Accounting machine

D. Computers (with card input)

TEACHING SUGGESTIONS

Explain briefly how firms use the punched card method to handle the steadily increasing data involved in the operation of businesses.

Identify and explain the functions of the various machines commonly used for punched card accounting.

Demonstrate the automated data processing cycle with a realistic application such as a payroll, checking account. Describe the operations that take place at each station in order to give the students an understanding of the functions of the various pieces of equipment.

Use a systems flow chart to reinforce the concept of the data processing cycle. (Ref. G, pp. 33-41, 467-73)*

Use films and transparencies to assist in presenting the topics. See page 36.

Compare the processing of punched cards in a data processing installation with the processing techniques used by computers. (Ref. H, pp. 75-87)

* Reference citations are shown on page 35.
UNIT 1

INTRODUCTION TO PUNCHED CARD DATA PROCESSING

In this unit, the student should be able to:

1. Explain the function of the various machines used in punched card accounting.
2. Explain the unit-record concept.
3. Explain the physical characteristics of a punched card.
4. Explain the rules governing the recording of data in numeric, alphabetic, and alphanumeric fields.
5. Explain the function of the physical characteristics of magnetic tapes and disk records.
6. Explain opportunities for data entry operators.

TEACHING SUGGESTIONS

Accounting

Explain briefly how firms use the punched card in handling the steadily increasing data involved in the operation of their businesses.

Identify and explain the functions of the various types of machines commonly used for punched card accounting.

Demonstrate the automated data processing cycle with a simple but realistic application such as a payroll, charge account, or checking account. Describe the operations that are being performed at each station in order to give the students a basic idea of the functions of the various pieces of equipment.

Use a systems flow chart to reinforce the concepts of the automated data processing cycle. (Ref. G, pp. 33-41, 44-48; Ref. H, pp. 52-63, 67-73)*

Use films and transparencies to assist in presenting the various topics. See page 36.

Compare the processing of punched cards in an unit record installation with the processing techniques used by electronic computers. (Ref. H, pp. 75-87)

*Note: Page numbers may be approximate.
II. Unit-Record Concept
   A. The punched card
      1. Physical characteristics
         a. Corner cuts
         b. Edges and corners
         c. Stripes and colors
         d. Columns and rows
      2. Card design
         a. Fields
         b. Factors to be considered
   B. Recording of Data
      1. Types of fields
         a. Numeric
         b. Alphabetic
         c. Alphanumeric (mixed)
      2. Rules for recording data
         a. Left-justification
         b. Right-justification
         c. Left-zero fill
      3. Field terminology
         a. High-order column
         b. Low-order column (units)
         c. Ten's, hundred's
   C. Functions of a punched card
      1. Recording (storage)
      2. Sorting
      3. Calculating
      4. Reporting

TEACHING SUGGESTIONS

Discuss the physical characteristics and design of the standard 5081 card and several different types of cards.

Discuss the characteristics and coding system of the punch card when the required data recorders are provided (pp. 51-53; Ref. B, pp. 9-10).

Explain how to record data onto cards.

Give a short manual simulation project to reinforce the techniques of filling in the card. Ask students to pencil in data along the rule lines that correspond to the fields on the card. (Ref. F, pp. 122-134)

Explain the various functions of a punched card.

Explain how coding makes the recording and processing of data more efficient.

Have students start a glossary of data processing terminology that is consistent with the field list throughout the course. See Glossary on page 13.
TEACHING SUGGESTIONS

Discuss the physical characteristics and design of a card by using the standard 5081 card and several different types of predesigned cards.

Discuss the characteristics and coding system of the 96-column punch card when the required data recorders are available. (Ref. A, pp. 51-53; Ref. B, pp. 9-10)

- Explain how to record data onto cards.
  - Give a short manual simulation project to reinforce the rules that govern the recording of data. Give students blank cards and have them rule lines that correspond to the field in a punched card. Ask students to pencil in data along the 12 edge which illustrates the techniques of left-and right-hand justification and left-zero fill. (Ref. F, pp. 122-134)

- Explain the various functions of a punched card. Refer to the sample application previously used to illustrate each of the functions of a punched card.

- Explain how coding makes the recording and processing of data more efficient.

- Have students start a glossary of data processing terms using terminology that is consistent with the field. Add items to this list throughout the course. See Glossary on pages 32 to 34.
D. Magnetic tape and disk records
1. Physical characteristics
   a. Reflective spots
   b. Coating
   c. Header and trailer records
   d. Tape marks
   e. Interblock gaps
   f. Density
2. Record design
   a. Fields
   b. Factors to be considered

E. Employment opportunities

F. Desirable characteristics of data entry operators

TEACHING SUGGESTIONS

Discuss the operation of key-to-tape and key-to-
this time only if these devices are needed to
with an individual machine for units 2 and/o-

Explain the physical characteristics of magne-
(Ref. D, pp. 184, 195-199)

Explain the factors that influence the design
such as control fields, sorting consideration
length.

Discuss the different types of businesses in-
employ data entry operators. Also, indicate
range and promotional opportunities that are

Emphasize that accuracy is of prime importan-
speed and the attention to detail. Typewriti-
usually reduces the time needed to learn the
devices.

If your installation does not have enough ma-
type for each student, implement a rotation s
instruction to accommodate the different devi

NONBUFFERED CARD PUNCH MACHINES

OBJECTIVES:

At the conclusion of this unit, the student should be able to:

- Punch numeric and alphabetic data into original cards
- Add data to punched cards
Nonbuffered Card Punch Machines

TEACHING SUGGESTIONS

Discuss the operation of key-to-tape and key-to-disk machines at this time only if these devices are needed to provide each student with an individual machine for units 2 and/or 4.

Explain the physical characteristics of magnetic tape and disks. (Ref. D, pp. 184, 195-199)

Explain the factors that influence the design of tapes and records such as control fields, sorting considerations, and maximum length.

Discuss the different types of businesses in the local area that employ data entry operators. Also, indicate the present salary range and promotional opportunities that are available.

Emphasize that accuracy is of prime importance, followed by speed and the attention to detail. Typewriting proficiency usually reduces the time needed to learn the operation of key-entry devices.

If your installation does not have enough machines of the required type for each student, implement a rotation system and adjust your instruction to accommodate the different devices.

Nonbuffered Card Punch Machines

Of this unit, the student should be able to:

- Convert numeric and alphabetic data into original cards
- Punch cards
Nonbuffered Card Punch Machines

- Correct error cards
- Design and create a program control card utilizing automatic skipping, automatic duplication, and alphabetic field definition
- Use a program card to control the punching of data
- Attain 95% accuracy in a 15-minute timed numeric keypunch project with a minimum speed per hour

CONTENT

I. Functions of a Card Punch
   A. Creating original records
   B. Adding data to records
   C. Correcting records
   D. Duplicating records (remaking damaged records)

II. Operating Features of a Card Punch Machine
   A. Main-line switch
   B. Card stations
      1. Hopper
      2. Card bed
         a. Punching station
         b. Reading station
      3. Stacker — automatic card feed stop
   C. Keyboard
      1. Numeric keys
      2. Alphabetic keys
      3. Special character keys
      4. Functional control keys
         a. Shift keys
         b. Release, register, feed
         c. Multipunch key

TEACHING SUGGESTIONS

Explain and illustrate each function of a card punch.
Avoid detailed explanations at this time. Cover operating procedures at a later time.

Demonstrate card handling techniques such as:

- Explain the operating features of nonbuffered machines.
- If your installation has more than one type of machine, discuss the differences at each step. Do not go into details about keys and switches at this time. Refer to manuals for information on specific machines.

Place a student at each machine and have him punch short projects. This experience will give them a feeling for the features which were discussed.

Give students an opportunity to operate a card punch machine short time. This experience will give them an understanding of the machine when punching without program control. Show them that the shift key must be held down when punching digits.
Machines

te a program control card utilizing automatic skipping, automatic duplication, and numeric field definition
ard to control the punching of datady in a 15-minute timed numeric keypunch project with a minimum speed of 5000 strokes.

TEACHING SUGGESTIONS

Explain and illustrate each function of a card punch machine. Avoid detailed explanations at this time. Cover the actual operating procedures at a later time.

Demonstrate card handling techniques such as joggling and fanning.

Explain the operating features of nonbuffered card punch machines. If your installation has more than one type of machine, point out the differences at each step. Do not go into detail about all the keys and switches at this time. Refer to manufacturers' reference manuals for information on specific machines.

Place a student at each machine and have him perform the various functions as they are explained.

Give students an opportunity to operate a card punch machine for a short time. This experience will give them a sense of accomplishment. Select or design exercises and projects that emphasize the use of features which were discussed.

Point out that the normal shift of the keyboard is alphabetic when punching without program control. Show how the numeric shift key must be held down when punching digits.
CONTENT

d. Duplicate key
e. Error reset
f. Left-zero
g. Skip
h. Alternate program (program 2)

D. Backspace key

E. Functional control switches
   1. Auto feed
   2. Auto skip/dup
   3. Print
   4. Program select
   5. Clear

F. Program unit
   1. Column indicator
   2. Program drum
   3. Program control card
   4. Star wheels
   5. Program control lever
   6. Pressure-roll release lever

G. Chip box and fuses

III. Manual Key punching
   A. Card feeding - Auto feed switch
   B. Keyboard shifting
      1. Alphabetic data
      2. Numeric data
   C. Card stacking
      1. Release key
      2. Clear switch

TEACHING SUGGESTIONS

Show how to do the following:
- Add an algebraic sign to a numeric fi character by combining punches
- Repeat using the duplicate key
- Unlock the keyboard with the error-reset
- Feed cards with the auto-feed switch
- Print information along the top of a
- Eject cards from the bed using the cl

Explain the operation of the column indicator
release lever. Discuss program control at a

Show how to position the program control lever
punching.

Give a short assignment in order that student
themselves with the various operating features
machine. Include in the assignment items su
- Duplication - with and without error o
- Manual insertion of cards in both punch
   stations
- Removal of cards from card stations us
   release lever.

Indicate the importance of concentrating on a
proper techniques. Point out that speed wil
TEACHING SUGGESTIONS

Show how to do the following:

- Add an algebraic sign to a numeric field or create a special character by combining punches
- Repeat using the duplicate key
- Unlock the keyboard with the error-rest or backspace key
- Feed cards with the auto-feed switch in the ON and OFF positions
- Print information along the top of a card
- Eject cards from the bed using the clear switch

Explain the operation of the column indicator and pressure-roll release lever. Discuss program control at a later time.

Show how to position the program control lever for manual punching.

Give a short assignment in order that students might familiarize themselves with the various operating features of the card punch machine. Include in the assignment items such as:

- Duplication with and without error correction
- Manual insertion of cards in both punching and reading stations
- Removal of cards from card stations using the pressure-roll release lever.

Indicate the importance of concentrating on accuracy and using the proper techniques. Point out that speed will improve with practice.
Nonbuffered Card Punch Machine

CONTENT

IV. Numeric Keypunch Exercises
A. Program unit with blank card
B. Home keys
C. Fingering

V. Alphabetic Keyboard Exercises
A. Home keys
B. Fingering

VI. Program Control
A. Program card function
   1. Automatic keyboard shifting
   2. Automatic skipping
   3. Automatic duplication
   4. Field definition
B. Program unit
   1. Program drum
   2. Program control lever
   3. Star wheels
   4. Program control card
C. Program codes (Program 1)
   1. 12 punch
   2. 11 punch
   3. Zero punch
   4. One punch

TEACHING SUGGESTIONS

Check each student's work to see that correct
are being used for both alphabetic and numeric

Select or design exercises which will familiarize
the numeric keyboard. Emphasize the importance
using the correct fingering technique. Point out
developing rhythm and indicate that speed will
practice. (Ref. E)

Have students mount a blank card on the program
the numeric shift key.

Select or design exercises which will familiarize
the alphabetic keyboard. Emphasize the importa
using the correct fingering techniques. (Ref. 
telephone directory)

Use a short alphanumeric project in which the
perform each of the automatic functions to just
program control. This project will show the st
machine can eliminate their shifting, skipping,
chores.

Demonstrate the techniques of mounting and dis
control card.

Emphasize the importance of alining the card pr
program drum. (Ref. A, p. 29)

Explain program 1. (Ref. H., pp. 45-47)
TEACHING SUGGESTIONS

Check each student's work to see that correct fingering techniques are being used for both alphabetic and numeric key punching.

Select or design exercises which will familiarize the students with the numeric keyboard. Emphasize the importance of accuracy and using the correct fingering technique. Point out the need of developing rhythm and indicate that speed will improve with practice. (Ref. E)

Have students mount a blank card on the program drum to avoid using the numeric shift key.

Select or design exercises which will familiarize the students with the alphabetic keyboard. Emphasize the importance of accuracy and using the correct fingering techniques. (Ref. E, and local telephone directory)

Use a short alphanumeric project in which the student must manually perform each of the automatic functions to justify the use of the program control. This project will show the students how the machine can eliminate their shifting, skipping, and duplicating chores.

Demonstrate the techniques of mounting and dismounting a program control card.

Emphasize the importance of aligning the card properly on the program drum. (Ref. A, p. 29)

Explain program 1. (Ref. H, pp. 45-47)
CONTENT

D. Program control card design
   1. High-order column code
   2. Balance of field codes

E. Program switch on keyboard

F. Mounting a program control card
   1. Program control lever
   2. Clamping strip and handle
   3. Alining holes

G. Alternate program control (program 2)
   1. 4 punch
   2. 5 punch
   3. 6 punch
   4. 7 punch

VII. Keyboard Proficiency
A. Numeric and alphabetic keyboard exercises

B. Application projects

TEACHING SUGGESTIONS

Select or design assignments that allow the program control proficiency. Use additional introduce each of the other functions. After familiar with the various functions, use a set which includes all the functions. (Ref. A,

Explain program 2 after students have attained in using program 1. (Ref. A, pp. 34-35, 37;

Point out that the alternate program control

- More than 80 columns are needed for data
- More than one type of card is used in

Emphasize the importance of accuracy, memory, rhythm, and correct fingering techniques. Do standards at the beginning of the practice session. If students become proficient, use timed exercises judging their competency. (Ref. A, pp. 13-3

Check to see that students are not watching drill and project sessions.

intersperse application projects with keyboard variety of jobs to stimulate achievement.

Have students save the data cards they have projects in this section to use in the unit of B, D, and E)

Use an autotutorial system to help students speed. (Ref. Dart's Card Punch Drills, if avai
Nonbuffered Card Punch Machines

TEACHING SUGGESTIONS

Select or design assignments that allow the students to develop program control proficiency. Use additional assignments to introduce each of the other functions. After students have become familiar with the various functions, use a summary assignment which includes all the functions. (Ref. A, pp. 22-29, 30-34)

Select or design assignments that allow the students to develop program control proficiency. Use additional assignments to introduce each of the other functions. After students have become familiar with the various functions, use a summary assignment which includes all the functions. (Ref. A, pp. 22-29, 30-34)

Explain program 2 after students have attained a degree of proficiency in using program 1. (Ref. A, pp. 34-35, 37; Ref. H, pp. 45-47)

Point out that the alternate program control is used when:
- More than 80 columns are needed for data storage
- More than one type of card is used in the same batch

Explain program 2 after students have attained a degree of proficiency in using program 1. (Ref. A, pp. 34-35, 37; Ref. H, pp. 45-47)

Point out that the alternate program control is used when:
- More than 80 columns are needed for data storage
- More than one type of card is used in the same batch

Emphasize the importance of accuracy, memorization of the keyboard, rhythm, and correct fingering techniques. Do not set time standards at the beginning of the practice sessions. As the students become proficient, use timed exercises as a way of judging their competency. (Ref. A, pp. 13-31)

Emphasize the importance of accuracy, memorization of the keyboard, rhythm, and correct fingering techniques. Do not set time standards at the beginning of the practice sessions. As the students become proficient, use timed exercises as a way of judging their competency. (Ref. A, pp. 13-31)

Check to see that students are not watching the keyboard during the drill and project sessions.

Check to see that students are not watching the keyboard during the drill and project sessions.

Intersperse application projects with keyboard drills to provide a variety of jobs to stimulate achievement.

Intersperse application projects with keyboard drills to provide a variety of jobs to stimulate achievement.

Have students save the data cards they have created from the projects in this section to use in the unit on verifying. (Ref. A, B, D, and E)

Have students save the data cards they have created from the projects in this section to use in the unit on verifying. (Ref. A, B, D, and E)

Use an autotutorial system to help students develop rhythm and speed. (Ref. Dart's Card Punch Drills, if available)

Use an autotutorial system to help students develop rhythm and speed. (Ref. Dart's Card Punch Drills, if available)
UNIT 3

PUNCHED CARD VERIFIERS

OBJECTIVES

At the conclusion of this unit, the student should be able to:

- Locate and correct errors in punched cards using the error notch as a guide
- Verify a deck of punched cards using program control with automatic skipping, automatic duplication, and numeric and alphabetic field definition
- Locate, identify, and correct all existing errors in a deck of punched cards in a 15 minute verification project with a minimum speed of 5,000 strokes per hour

CONTENT

I. Functions of a Card Verifier

II. Operating Features
   A. Main-line switch
   B. Card stations
      1. Card hopper
      2. Card bed
         a. Verifying station
         b. Reading station
      3. Card stacker
   C. Keyboard
      1. Character keys
      2. Functional control keys
         a. Shift keys
         b. Release, register, feed
         c. Ver/dup key

TEACHING SUGGESTIONS

Students need keypunching skills and a knowledge of control for this unit.

Discuss the importance of accuracy relative to function of the card verifier.

Point out the advisability of having the cards verified by another worker.

Explain and demonstrate the principles and operation of the card verifier. Limit the detailed explanation of features of the verifier.

Show the passage of a card through the different stations during the verifying operation.

Relate the keyboard and functional controls of the controls and functions of the card punch machine.

Demonstrate how to verify a simple job using the procedures associated with the different types of operations.
Punched Card Verifiers

This unit, the student should be able to:

Rect errors in punched cards using the error notch as a guide of punched cards using program control with automatic skipping, automatic verify and numeric and alphabetic field definition, and correct all existing errors in a deck of punched cards in a 15 minute timed project with a minimum speed of 5,000 strokes per hour.

Teaching Suggestions

Students need keypunching skills and a knowledge of program control for this unit.

Discuss the importance of accuracy relative to punched cards and the function of the card verifier.

Point out the advisability of having the cards of one operator verified by another worker.

Explain and demonstrate the principles and operating features of the card verifier. Limit the detailed explanations to the unique features of the verifier.

Show the passage of a card through the different card stations during the verifying operation.

Relate the keyboard and functional controls of the verifier to the controls and functions of the card punch machines.

Demonstrate how to verify a simple job using the various retry procedures associated with the different types of machines.
d. Error reset key (MP/ER)
e. Skip key
f. Alternate program (program 2)

D. Error light

E. Functional control switches
1. Auto feed
2. Auto skip/dup
3. Program select
4. Clear

F. Program unit
1. Column indicator
2. Program drum and program card
3. Program control lever
4. Pressure roll-release lever

III. Operating Principles
A. Manual verification
B. Automatic verification
C. OK notch
D. Error detection
   1. Keyboard locking
   2. Error light
   3. Locating the error - column indicator
   4. Error reset key (MP/ER)
   5. Retry procedure
E. Error notation
   1. Error notch
   2. Operator notation on card

Show how the error-reset key (MP/ER) is used
board when an error is detected.

Point out how automatic feeding is suspended
program card is detected.

Emphasize the importance of alining the card program drum. (Ref. A, p. 29)

Show, how the pressure-roll release lever is used for cards.

Explain the difference between manual and automatic punched cards.

Demonstrate the operation of a card verifier

- Automatic card feeding
- Error-free card (OK notch)
- Error detection
  - Three attempts to verify
  - Error notch
  - Operator notation on error card
- With program control
- Without program control

Have students verify cards containing a variety of data to familiarize them with the different types of errors they may encounter.
TEACHING SUGGESTIONS

Show how the error-reset key (MP/ER) is used to unlock the keyboard when an error is detected.

Point out how automatic feeding is suspended when an error card is detected.

Emphasize the importance of aligning the card properly on the program drum. (Ref. A, p. 29)

Show how the pressure-roll release lever is used to remove jammed cards.

Explain the difference between manual and automatic verification of punched cards.

Demonstrate the operation of a card verifier including:

- Automatic card feeding
- Error-free card (OK notch)
- Error detection
  - Three attempts to verify
  - Error notch
  - Operator notation on error card
- With program control
- Without program control

Have students verify cards containing a variety of errors to familiarize them with the different types of error conditions that they may encounter.
Punch Card Verifiers

CONTENT

3. Multiple errors in a single field-skip key
4. Multiple error fields
   a. Release key
   b. Complete card remake

IV. Operating Suggestions
A. Starting a verifying operation
B. Stopping a verifying operation
C. Engaging the program reading mechanism
D. Spacing over blank columns
E. Feeding a single card
F. Locking keyboard
G. Suspending automatic verification on first card

V. Verification Proficiency
A. Numeric verification projects
B. Alphabetic verification projects

TEACHING SUGGESTIONS

Suggest tips that students may use to improve their skills after they have gained some proficiency in the card verifier. Giving students too much information will tend only to confuse them. Include such teaching suggestions:
- Use the functional controls when temporary interruptions occur instead of disengaging the mechanism.
- Place single cards to be verified directly on the bed instead of the hopper.
- Use the verify/duplication key to space columns when the same columns are impuned to the card or when there is no preceding card.

Have students verify the cards they produced from completed in unit 2. Also, new projects may be assigned different keypunching projects to teams and then have them exchange decks for verification D, and E.)
Suggest tips that students may use to improve their performance after they have gained some proficiency in the operation of the card verifier. Giving students too much information at one time will tend only to confuse them. Include such tips as:

- Use the functional controls when temporary changes or interruptions occur instead of disengaging the reading mechanism.
- Place single cards to be verified directly into the card bed instead of the hopper.
- Use the verify/duplication key to space over unpunched columns when the same columns are unpunched in the preceding card or when there is no preceding card.

Have students verify the cards they produced from the assignments completed in unit 2. Also, new projects may be assigned where students will punch a deck of cards and then verify them.

Assign different keypunching projects to teams of two students and then have them exchange decks for verification. (Ref. A, B, D, and E)
BUFFERED CARD PUNCH/VERIFIERS

OBJECTIVES:

At the conclusion of this unit the student should be able to:

- Explain the functions of the buffered card punch/verifier
- Repunch (correct) error cards
- Add data to an existing card
- Design and create a program card with numeric and alphabetic field definition, automatic skipping, and left-zero insertion
- Store a program and punch out to verify memory
- Punch numeric and alphabetic data using program control with automatic skipping, automatic skipping, and left-zero insertion
- Verify a deck of punched cards using the procedures for single character correction, one field (field correction), and entire record correction
- Attain a minimum speed of 5,000 strokes per hour with no more than 10 corrections in punch-verify assignment

CONTENT

I. Functions of a Buffered Card Punch/Verifier
   A. Creating original records
   B. Adding data to punched records
   C. Correcting error records
   D. Duplicating records (remaking damaged cards)
   E. Verifying punched cards

II. Advantages of a Buffered Card Punch/Verifier
   A. Capable of storing data
   B. Immediate error correction before punching

TEACHING SUGGESTIONS

Demonstrate card handling techniques such as
Explain and demonstrate functions of the buffered card punch/verifier. Place students at each of the dem
and ask them to perform the function as it is out the basic differences among the various verifiers in your installation. Detailed ex
operating procedures should be given after the
Discuss data storage when the card is complete
Demonstrate how an error may be corrected du
operation. Point out how this operation save ma
Buffered Card Punch/Verifiers

If this unit the student should be able to:

- Functions of the buffered card punch/verifier
- Rect (rect) error cards
- An existing card
- Create a program card with numeric and alphabetic field definition, automatic duplication, and left-zero insertion
- Ram and punch out to verify memory
- Load and alphabetic data using program control with automatic skipping, automatic duplication, and insertion
- Of punched cards using the procedures for single character correction, multiple errors in field correction, and entire record correction
- Minimum speed of 5,000 strokes per hour with no more than 10 corrections in a 30-minute timed assignment

TEACHING SUGGESTIONS

- Demonstrate card handling techniques such as jogging and fanning.
- Explain and demonstrate functions of the buffered card punch/verifier. Place students at each of the demonstration machines and ask them to perform the function as it is explained. Point out the basic differences among the various types of card punch/verifiers in your installation. Detailed explanations of the operating procedures should be given after the students know how to perform the basic functions.
- Discuss data storage when the card is complete as contrasted to the immediate punching of a card on a nonbuffered machine.
- Demonstrate how an error may be corrected during the punching operation. Point out how this operation saves both time and materials.
Buffered Card Punch/Verifiers

CONTENT

C. Immediate error correction during verification
D. Multiple program levels
E. High-speed card read-in
F. Single machine for both punch and verify operations
G. Some overlap of operations

III. Operating Features
A. Main-line switch
B. Card stations
   1. Card hopper — input magazine
   2. Punch station — visible station
   3. Auxiliary input
   4. Stacker switch
C. Keyboard
   1. Character keys
      a. Numeric arrangement
      b. Alphabetic arrangement
      c. Special characters
   2. Functional control switches
      a. Punch/verify
      b. Print
      c. Auto feed
      d. Auto skip/dup
      e. Clear
      f. Program mode dial
   3. Functional control keys and buttons
      a. Read
      b. Interpret

TEACHING SUGGESTIONS

Compare the three-operator system using nonbuffered machines with the two-operator system using buffered machines required for the operation and the handling of errors. Discuss the need for more than two program levels as automatic control has been introduced.

Explain the operating features of the buffered card punch in your installation. Use manufacturers' reference information relating to specific machines. Prepare a summary sheet which shows these variations.

Demonstrate only those controls which the student will use in using the machines.

Assign projects that involve the basic controls, and assign other assignments introducing the additional controls one at a time. Avoid using large projects.

Have students concentrate on the operating procedures necessary to construct proficiency at this point. When the student has a working knowledge of the machine's features, assign projects which will develop their proficiency.

Demonstrate how to shift the keyboard when the machine is not used. Point out that this operation will affect the machine.
TEACHING SUGGESTIONS

Compare the three-operator system using nonbuffered machines with the two-operator system using buffered machines as to time required for the operation and the handling of the cards.

Discuss the need for more than two program levels after program control has been introduced.

Explain the operating features of the buffered card punch/verifiers in your installation. Use manufacturers' reference manuals for information relating to specific machines. Prepare and distribute a summary sheet which shows these variations.

Demonstrate only those controls which the students need to begin using the machines.

Assign projects that involve the basic controls first. Then, have the other assignments introduce the additional controls a few at a time. Avoid using large projects.

Have students concentrate on the operating procedures rather than on proficiency at this point. When the students have a good working knowledge of the machine's features, assign exercises and projects which will develop their proficiency.

Demonstrate how to shift the keyboard when program control is not used. Point out that this operation varies from machine to machine.
c. Backspace
   (1) Character
   (2) Field
   (3) Record (home)
d. Left-zero control
   (right-justify)
e. Shift keys
f. Feed, register, release (eject)
g. Duplicate
h. Multiple punch
i. Program select
j. Skip
k. Verify correct (correct)

4. Indicators
   a. Interlock
   b. Nonmatch
c. Program 2
d. Alphabetic shift

IV. Manual Punching Operations
A. Preparing for operation
   1. Fill hopper
   2. Main-line switch
   3. Clear card bed
   4. Set functional controls
   5. Clear data storage
   6. Enter constant data
      a. Manual entry
      b. Master card entry
c. Master card and manual entry

B. Punching new data cards
   (no program)
   1. Feed card
   2. Entering data-shifting
   3. Punching out card

TEACHING SUGGESTIONS

Show how to operate the various backspace keys, and appropriate use for each key.

Demonstrate how to clear memory in different ways.

Explain that memory is cleared to prevent the same card being repeated on the following card.

Explain the conditions which cause each of the indicators to light up. Demonstrate how to correct each indicator to return the device to normal operation.

Assign a short project that involves all manual punching operations. The next assignment should include a field to be duplicated. Make sure students are familiar with the machines, use programs which include the special functions of replacing, correcting error cards, and adding data to existing cards.

Demonstrate how to clear data storage by using the clear switch.

Show how to investigate and correct card feed problems:
  - Cover over feed knives
  - Small pieces of cards from a previous job
  - Objects in transport feed mechanism
TEACHING SUGGESTIONS

Show how to operate the various backspace keys. Identify the appropriate use for each key.

Demonstrate how to clear memory in different types of machines. Explain that memory is cleared to prevent the data for one card being repeated on the following card.

Explain the conditions which cause each of the operating indicators to light up. Demonstrate how to correct each problem and return the device to normal operation.

Assign a short project that involves all manual punching. Have the next assignment include a field to be duplicated. After students are familiar with the machines, use additional projects which include the special functions of remaking damaged cards, correcting error cards, and adding data to existing cards.

Demonstrate how to clear data storage by using the skip key or clear switch.

Show how to investigate and correct card feeding failures such as:

- Cover over feed knives
- Small pieces of cards from a previous jam or other foreign objects in transport feed mechanism
Buffered Card Punch/Verifiers

CONTENT

C. Remaking damaged cards
   1. Loading data from old card
   2. Feeding new card
   3. Duplicating data
   4. Punching out new card

D. Correcting error cards
   1. Loading data from error card
   2. Feeding new card
   3. Duplicating correct data
   4. Keying corrections manually
   5. Punching out new card

V. Numeric Keypunch Exercises
   A. Numeric shift
      1. Program mode dial
      2. Shift key
   B. Home keys
   C. Fingering

VII. Combined Alphabetic and Numeric Drills

VIII. Program Control
   A. Function of program card
      1. Shifting
      2. Automatic skipping
      3. Automatic duplication
      4. Field definition
      5. Left-zero insertion

TEACHING SUGGESTIONS

• Damage to the 12- or 9-edge of a card

Have students become proficient with punching manual and with program control, before going operations. Point out that punching skills are a job, whereas, verifier operation is of only to an employer.

Have students become proficient using one type they start to operate another. Operating first another tends to be confusing.

Assign projects which will familiarize students keyboard. Emphasize the importance of accuracy fingering techniques.

Point out the importance of accuracy and the Indicate that speed will develop with practice.

Check to see that the students' eyes are on the not on the keyboard.

Assign projects that combine the use of the nu keyboards.

Assign a short project which involves the man of the program functions. Then, introduce the control.
TEACHING SUGGESTIONS

- Damage to the 12- or 9-edge of a card

Have students become proficient with punching operations, both manual and with program control, before going into the verifier operations. Point out that punching skills are necessary to obtain a job, whereas, verifier operation is of only secondary interest to an employer.

Have students become proficient using one type of machine before they start to operate another. Operating first one machine then another tends to be confusing.

Assign projects which will familiarize students with the numeric keyboard. Emphasize the importance of accuracy and correct fingering techniques.

Point out the importance of accuracy and the development of rhythm. Indicate that speed will develop with practice.

Check to see that the students' eyes are on the source document and not on the keyboard.

Assign projects that combine the use of the numeric and alphabetic keyboards.

Assign a short project which involves the manual performance of each of the program functions. Then, introduce the function of program control.
CONTENT

B. Codes for program card
1. First column of field
2. Balance of field coding
3. Last column code for left-zero fields
4. Alternate program codes
   a. Program 2
   b. Multiple program levels

C. Storage of program codes
1. Setting functional controls
2. Inserting program card (auxiliary input)
3. Reading-in the card
4. Punching out program to verify proper loading

D. Application projects

IX. Keyboard Proficiency
A. Numeric keyboard drills

TEACHING SUGGESTIONS

Assign a series of projects with each one introducing a function such as:
- Alpha and numeric fields, no blank fields
- Alpha and numeric fields with auto skipping
- Skipping and duplicating
- Left-zero insertion

Assign projects that use several different formats to help students with program card preparation.

Discuss alternate program control.

Point out that some machines have only two program levels while others use different codes such as levels 12 for program 1 and levels 4, 5, 6, and 7 for program 2.

Other machines have the capability of storing eight programs at the same time. These machines use codes (12, 11, 0, and 1) but store the programs in memory locations.

Present both of the above concepts even though most students have only one type of machine.

Have students store several programs. Check to see that the programs have been properly loaded.

Assign projects that will help students develop the functions of program control. (Ref. E)

Emphasize the importance of accuracy, memorization, rhythm, and correct fingering techniques. Do
TEACHING SUGGESTIONS

Assign a series of projects with each one introducing a new function such as:

- Alpha and numeric fields, no blank fields
- Alpha and numeric fields with auto skipping
- Skipping and duplicating
- Left-zero insertion

Assign projects that use several different formats to familiarize students with program card preparation.

Discuss alternate program control.

Point out that some machines have only two program levels. These machines use different codes such as levels 12, 11, 0, and 1 for program 1 and levels 4, 5, 6, and 7 for program 2.

Other machines have the capability of storing up to six different programs at the same time. These machines use the same program codes (12, 11, 0, and 1) but store the programs in different memory locations.

Present both of the above concepts even though your installation has only one type of machine.

Have students store several programs. Check to see that the programs have been properly loaded.

Assign projects that will help students develop proficiency in using the functions of program control. (Ref. A, pp. 29-32; Ref. E)

Emphasize the importance of accuracy, memorization of the keyboard, rhythm, and correct fingering techniques. Do not set time...
Buffered Card Punch/Verifiers

CONTENT

B. Alphabetic keyboard drills

C. Application projects

X. Verification
   A. Need
      1. Accuracy of input
      2. Time and money savings
   B. Cycle
      1. Keypunch to verifier to keypunch for corrections
      2. Advantages of combined machine
         a. Fewer physical machines
         b. Only two operators involved
         c. Immediate card correction
   C. Operations
      1. Manual verifying
      2. Duplicate verifying
      3. Bypassing
      4. Skipping
   D. Procedures
      1. Machine setup
         a. Card input
         b. Functional controls
         c. Program card

TEACHING SUGGESTIONS

standards at the beginning of the practice session; students become proficient, use timed exercises judging their competency. (Ref. A, pp. 13-21)

Intersperse application projects with keyboard drills.

Use an autotutorial system to help students develop standards (Ref. Dart's Card Punch Drills)

Have students save the data cards they make in the verification section.

Explain the operation of verification. This task can be done in a short time because most of the controls are already been explained and used by the student in other operations.

Contrast performing the operations of punching cards using separate machines with doing the same operation on a combined machine. Emphasize the savings in time, money, and the operations performed on one machine.

Have students verify the cards they produce.

Ask students to exchange cards to simulate a production situation. Most verifying jobs use program control, so it is not necessary to have any manual assignment.

Have students concentrate on developing speed and accuracy; they have a good working knowledge of the verifying equipment.

Demonstrate how to:
   - Load a master card when using automatic
Verifiers

TEACHING SUGGESTIONS

Intersperse application projects with keyboard drills.

Use an autotutorial system to help students develop rhythm and speed.
(Ref. Dart's Card Punch Drills)

Have students save the data cards they are making for use in the verification section.

Explain the operation of verification. This topic may be covered in a short time because most of the controls and features have already been explained and used by the students in the punching operation.

Contrast performing the operations of punching and verifying using separate machines with doing the same operations using one machine. Emphasize the savings in time, money, and space by having the operations performed on one machine.

Have students verify the cards they produced in the punching section.

Ask students to exchange cards to simulate a practical situation.

Most verifying jobs use program control, so it is not necessary to have any manual assignments.

Have students concentrate on developing speed and accuracy after they have a good working knowledge of the verifier.

Demonstrate how to:

* Load a master card when using automatic verification
CONTENT

2. Error detection
   a. Error light
   b. Keyboard locking
   c. Retry procedure
   d. Error correction
      (1) single character correction
      (2) field correction
      (3) record correction
      (4) auxiliary input

3. OK notch
   a. Error-free card
   b. Corrected card

OBJECTIVES:

At the conclusion of this unit, the student should be able to:

- Explain the function of key-to-tape data recorders
- Mount, load, unload, and dismount a reel of tape proficiently
- Record numeric and alphabetic data onto a reel of magnetic tape manually and with program
  automatic skipping, automatic duplication, left-zero insertion, and numeric and alphabetic
- Verify a prerecorded reel of tape using single character correction and field correction
- Search a reel of tape and change data in an existing record, add data behind a specific
  output an existing record
- Design, enter, and verify a program which contains numeric and alphabetic field definitions,
  skipping, automatic duplication, and left-zero insertion
- Attain a minimum speed of 6,000 strokes per hour with no more than 10 corrections in a
  record-verify assignment

TEACHING SUGGESTIONS

- Suspend automatic verification for the group
- Correct errors

Have students verify cards containing errors to different types of error conditions which they
Key-to-Tape Data Recorders

TEACHING SUGGESTIONS

- Suspend automatic verification for the first card of a group
- Correct errors

Have students verify cards containing errors to show them the different types of error conditions which they may encounter.

Unit 5

Key-to-Tape Data Recorders

In this unit, the student should be able to:

- Understand the function of key-to-tape data recorders
- Load, and dismount a reel of tape proficiently
- Record numeric and alphabetic data onto a reel of magnetic tape manually and with program control using single character correction, automatic duplication, left-zero insertion, and numeric and alphabetic field definition
- Record a new reel of tape using single character correction and field correction of tape and change data in an existing record, add data behind a specific record, and blank a record
- Verify a program which contains numeric and alphabetic field definition, automatic duplication, and left-zero insertion
- Operate at a speed of 6,000 strokes per hour with no more than 10 corrections in a 30-minute timed assignment.
Key-to-Tape Data Recorders

CONTENT

I. Introduction
   A. Functions
      1. Data entry
      2. Verification
   B. Advantages of key-to-tape machines
      1. Faster input
      2. Larger capacity
      3. Stable record sequence
      4. One machine doing work of two
   C. Disadvantages of key-to-tape machines
      1. Difficulty in altering individual records
      2. Inability to visibly inspect data

II. Components of the Key-to-Tape Machine
   A. Tape handler unit
      1. Supply and takeup reels
      2. Read and write head
      3. Vacuum columns
   B. Tape handler control panel
      1. On and off switch
      2. Tape load and unload buttons
      3. Record counter

TEACHING SUGGESTIONS

Introduce the topic of key-to-tape machines after learned how to operate card punch machines. The data recording and machine functions are easily presented in this order.

Discuss briefly the various operations that come with the key-to-tape system. Detailed explanation when the specific topic is taught.

Discuss the advantages of key-to-tape machines items as:
- Speed of input
- Capacity
- Key punch and verifier operations

Discuss the disadvantages of key-to-tape machines items as:
- Procedure for changing individual records
- Method of inspecting data

Demonstrate and explain the functions of the key-to-tape machines. Some of the terminology may vary with machines but the concepts remain the same. Refer to the individual manufacturer's manuals for specific operating procedures.

Explain, with each operation, the function of the controls and indicators. As the students progress, present the additional and indicators which apply to the next operation.
TEACHING SUGGESTIONS

Introduce the topic of key-to-tape machines after students have learned how to operate card punch machines. The concepts of data recording and machine functions are easier to understand when presented in this order.

Discuss briefly the various operations that can be performed with the key-to-tape system. Detailed explanations can be given when the specific topic is taught.

Discuss the advantages of key-to-tape machines including such items as:

- Speed of input
- Capacity
- Key punch and verifier operations

Discuss the disadvantages of key-to-tape machines including such items as:

- Procedure for changing individual records
- Method of inspecting data

Demonstrate and explain the functions of the various components of key-to-tape machines. Some of the terminology used in the outline may vary with machines but the concepts remain the same regardless of the device. Refer to the individual manufacturers' reference manuals for specific operating procedures.

Explain, with each operation, the function of the keyboard switches and other functional controls and indicators. Include only those controls which are needed for the operation being presented. Then, as the students progress, present the additional controls, switches, and indicators which apply to the next operation.
C. Memory and control unit
   1. Data buffers
   2. Program buffers
   3. Control unit

D. Keyboard
   1. Functional control switches
      a. Mode switch
      b. Program switch
      c. Auto release switch
      d. Auto dup/skip
      e. Data/prog switch
   2. Display panel
      a. Character display
      b. Column indicator
      c. Status indicators
   3. Character keys
   4. Functional control keys
      a. Shift
      b. Backspace
      c. Error
      d. Left-zero
      e. Duplicate
      f. Program 1 and 2

III. Key-to-Tape Operations
A. Data entry
   1. Recording original data
   2. With and without program control
B. Data verify
C. Search
D. Program entry
E. Program verify

TEACHING SUGGESTIONS
Demonstrate how data and programs remain in memory after information is entered.

Discuss the basic function of each area of the machine panel including:
   - Mode setup
   - Inquiry
   - Machine status

Show how to translate machine coded displays.

Explain the meaning of the various error indicators and corrective procedures necessary for each situation.

Demonstrate the use of the functional control keys used to record data.

Point out the interlocking condition on some machines, such as when the backspace key is used.

Define each of the functions briefly. Detail the procedure and wait until the students start specific operations.

Relate the various key-to-tape operations to the key operations performed on card punch machines.

Encourage students to use the operator's manual, which is supplied by the various manufacturers when set up for different operations.
Key-to-Tape Data Recorders

TEACHING SUGGESTIONS

Demonstrate how data and programs remain in memory until new information is entered.

Discuss the basic function of each area of the keyboard control panel including:
- Mode setup
- Inquiry
- Machine status

Show how to translate machine coded displays.

Explain the meaning of the various error indicators and show the corrective procedures necessary for each situation.

Demonstrate the use of the functional control keys when they are used to record data.

Point out the interlocking condition on some machines when the backspace key is used.

Define each of the functions briefly. Detailed explanations should wait until the students start specific operations.

Relate the various key-to-tape operations to similar functions performed on card punch machines.

Encourage students to use the operator's reference guides that are supplied by the various manufacturers when setting up the machines for different operations.
Key-to-Tape Data Recorders

CONTENT

IV.

Tape Mounting and Dismounting
A. Slide-down window
B. Supply and takeup reels
C. Read and write head
D. Vacuums
E. Tape load and unload buttons
F. Rewind key/switch

V.

Manual Data-Entry Procedures
A. Functional Controls
   1. Mode switch
   2. Auto release
   3. Auto dup/skip
   4. Program switch
B. Data entry
   1. Keyboard shifting
   2. Record release
C. Termination of operation
   1. Tape mark
   2. Rewinding the tape
   3. Unloading and dismounting
D. Application project

VI.

Tape Search
A. Purpose
   1. Alter data
   2. Continue operation
   3. Delete data

TEACHING SUGGESTIONS

Demonstrate the techniques for handling tape cleaning, and loading. Explain the variations different machines.

Have students practice loading and unloading as they become proficient tape handlers.

Describe the purposes and operation of:
- Auto release in off position
- Auto-dup/skip in off position
- Program in zero (off) position

Have students enter data into the memory. As entered, have students backspace and examine for each column to give them practice in decoding.

Explain the function of the tape mark at the end of the tape.

Assign a short project that uses all types of numeric, and mixed) such as a simple name and students to become familiar with the operating machine.

Explain the necessity for a search operation. procedures used for tape with those used for tape

Discuss the purpose of the record identifier. codes with alphabetic fields relative to length.
Orders and Dismounting procedures

1 Controls

Controls

Entry Procedures

Switch

Revenue

Dup/Skip

Dup/Skip

Auto Release - in off position

Auto-Dup/Skip - in off position

Program in zero (off) position

Have students enter data into the memory. As each character is entered, have students backspace and examine the character display for each column to give them practice in decoding.

Explain the function of the tape mark at the end of the data file.

Assign a short project that uses all types of fields (alphabetic, numeric, and mixed) such as a simple name and address file to allow students to become familiar with the operating features of the machine.

Explain the necessity for a search operation. Compare the search procedures used for tape with those used for punched cards.

Discuss the purpose of the record identifier. Compare numeric codes with alphabetic fields relative to length and uniqueness.

TEACHING SUGGESTIONS

Demonstrate the techniques for handling tape such as stacking, cleaning, and loading. Explain the variations that exist for different machines.

Have students practice loading and unloading reels of tape until they become proficient tape handlers.

Describe the purposes and operation of:

- Auto release in off position
- Auto-dup/skip in off position
- Program in zero (off) position
CONTENT

B. Functional controls
1. Mode switch
2. Auto release
3. Auto dup/skip
4. Program switch

C. Operational procedures
1. Record identifier
2. Releasing to search
3. Verifying found record

VII. Numeric and Alphabetic Keyboard Exercises

VIII. Program Control
A. Function
1. Field definition
2. Automatic skip and dup control
3. Automatic left-zero insertion

B. Program codes
1. First column of field
2. Balance of field

C. Program design
1. Record description form
2. Program layout

D. Program entry
1. Functional controls
2. Entry operation

TEACHING SUGGESTIONS

Emphasize the need to "space fill" all columns except the identifier does not occupy.

Demonstrate the operating procedure. Show what happens when a record is not found.

Explain why the tape must be backspaced and how to verify the found record.

Assign projects that will provide practice in and familiarization with the numeric and alphabetic keyboard.

Emphasize the importance of accuracy and correct answering techniques. Point out that speed will come with practice (Ref. A and E).

Have students use the manual project which they have completed to show the advantages of program control.

Demonstrate how program control saves time and adds accuracy by automatically shifting the keyboard, duplicating data, and determining the number of characters in front of a number.

Explain how the first column program code standardizes automatic functions and denotes the beginning of a code field.

Explain the function of the balance of field (Code B77)

Assign projects that give students practice in designing program descriptions and program layout for different applications.
TEACHING SUGGESTIONS

Emphasize the need to "space fill" all columns of the record that the identifier does not occupy.

Demonstrate the operating procedure. Show what happens when the record is not found.

Explain why the tape must be backspaced and read again before verifying the found record.

Assign projects that will provide practice in operating procedures and familiarization with the numeric and alphabetic keyboards. Emphasize the importance of accuracy and correct fingering techniques. Point out that speed will come with practice. (Ref. A and E)

Have students use the manual project which they did previously to show the advantages of program control.

Demonstrate how program control saves time and results in improved accuracy by automatically shifting the keyboard, skipping, and duplicating data, and determining the number of zeroes to be placed in front of a number.

Explain how the first column program code starts and stops the automatic functions and denotes the beginning of the next field.

Explain the function of the balance of field codes (keyboard shifting).

Assign projects that give students practice in filling out record description forms and designing program layouts using several different applications.
Key-to-Tape Data Recorders

CONTENT

E. Program verification
   1. Functional controls
   2. Procedure
      a. Error detection
      b. Error correction

IX. Data Entry Using Program Control
A. Program design and entry

B. Operational procedures
   1. Functional controls
   2. Entry procedure
   3. Termination of operation

C. Application projects

X. Data Verification with Program Control
A. Program design and entry

B. Operating procedure
   1. Functional controls
   2. Verification procedure
      a. Error detection
      b. Error correction
         (1) Single character
         (2) Entire field
      c. End-of-record procedure
         (1) No error
         (2) Corrected record
   3. Termination of operation

TEACHING SUGGESTIONS

Demonstrate how to correct an error.

Use the projects that the students did for program control previously did manually. This will help reinforce the advantages of program control.

Explain how to erase the error record before recording on the tape.

Explain how to start the operation by first recording on the tape.

Discuss the setup for the first record of a job of the records.

Review how to design a program and enter it in the program control.

Explain the need for verification.

Explain and demonstrate how to correct a single error in a field.

Explain how to correct an error.
TEACHING SUGGESTIONS

Demonstrate how to correct an error.

Use the projects that the students did for project design as a basis for practice in verifying and storing programs. (Ref. G)

Review how to design a program and enter it into memory.

Discuss the setup for the first record of a job and for the balance of the records.

Demonstrate the use of the shift, left-zero, skip, and release keys.

Use the same project for program control that the students previously did manually. This will help reinforce the points made on the advantages of program control.

Explain the need for verification.

Demonstrate how to start the operation by first reading the record into memory.

Explain and demonstrate how to correct a single error and multiple errors in a field.

Explain how to erase the error record before rewriting the correct record on the tape.
CONTENT

C. Application projects

XI. Keyboard Proficiency
   A. Numeric and alphabetic keyboard drills
   B. Application projects

OBJECTIVES:

At the conclusion of this unit, the student should be able to:

- Explain the function of key-to-disk recorders
- Record numeric and alphabetic data using numeric and alphabetic field definition, automatic duplication, and left-zero insertion
- Open a keystation in write, read, and verify modes
- Perform a batch append operation
- Verify a batch of data using single character correction and field correction
- Open a batch in verify mode and make a search, delete a record, change data, and insert
- Design a record format layout that contains automatic skipping and duplicating, left and numeric and alphabetic field definition and enter the format through the keystation
- Attain a minimum speed of 6,000 strokes per hour with no more than 10 corrections in verify assignment

TEACHING SUGGESTIONS

Have the students verify the project they use program control. Additional practice can continue with future data entry projects.

Emphasize the importance of accuracy, memory, rhythm, and correct fingering techniques. Do not delay the beginning of the practice sessions. At proficient, use timed exercises as a way of improving.

(Ref. A, pp. 13-21)

Use an autotutorial system to help students.

(Ref. Dart's Card Punch Drills)

KEY-TO-DISK DATA RECORDERS
TEACHING SUGGESTIONS

Have the students verify the project they used previously for program control. Additional practice can come from verifying future data entry projects.

Emphasize the importance of accuracy, memorization of the keyboard, rhythm, and correct fingering techniques. Do not set time standards at the beginning of the practice sessions. As the students become proficient, use timed exercises as a way of judging their competency. (Ref. A, pp. 13-21)

Use an autotutorial system to help students develop rhythm and speed. (Ref. Dart's Card Punch Drills)

UNIT 6

KEY-TO-DISK DATA RECORDERS

In this unit, the student should be able to:

- Understand the operation of key-to-disk recorders and alphabetic data using numeric and alphabetic field definition, automatic skipping, insertion, and left-zero insertion.
- Work in write, read, and verify modes.
- Append data using single character correction and field correction.
- Verify mode and make a search, delete a record, change data, and insert a record.
- Format layout that contains automatic skipping and duplicating, left-zero insertion, alphabetic field definition and enter the format through the keystation.
- Speed of 6,000 strokes per hour with no more than 10 corrections in a 30-minute timed unit.
Key-to-Disk Data Recorders

CONTENT

I. Introduction
A. Functions
   1. Creating new records
   2. Modifying existing records
   3. Verifying existing records
B. Advantages
   1. Computer controlled
   2. Automatic format control
   3. Quiet operation
   4. Large capacity
   5. Some overlap of operations
   6. Simplified handling of media
   7. Statistical feedback

II. Components of the Key-to-Disk System
A. Supervisor station
   1. Console
   2. Printer
   3. Tape unit
   4. System residence disk
   5. Computer
B. Keystation
   1. Display unit
   2. Keyboard

III. Keystation Concepts
A. Operating modes
   1. Write
   2. Read
   3. Verify
B. Variable record length
C. Automatic format control
   1. Keyboard shifting

TEACHING SUGGESTIONS

Discuss briefly the various operations that can be performed on a key-to-disk system. Detailed explanations of the specific topic can be given when the operation is taught.

Point out the advantages of a computer controlled system to checking errors, coordinating functions, and speeding up the total operation. The key-to-disk system does not handle any media.

Discuss how to initialize the system at the supervisor station.

Show how the total operation is speeded up compared to a keypunch machine.

Show a few sample production reports that can be generated by the system.

Demonstrate and explain the data flow cycle for keystation and tape.

Discuss the various types of keystation that are used on different machines.

Give a short demonstration of each operating mode to ensure an understanding of the capabilities of the system. Detailed explanations should be given when the different keystation operations are taught.

Compare the advantages of a variable length record to the fixed length concept of cards.

Relate the term program to format when describing automatic format control.
TEACHING SUGGESTIONS

Discuss briefly the various operations that can be performed with a key-to-disk system. Detailed explanations can be given when the specific topic is taught.

Point out the advantages of a computer controlled system relative to checking errors, coordinating functions, and reporting statistics.

Compare the noise level of the key-to-disk system with a keypunch machine.

Show how the total operation is speeded up because the operator does not handle any media.

Discuss how to initialize the system at the supervisor station.

Show a few sample production reports that can be obtained at the supervisor station.

Demonstrate and explain the data flow cycle from keystation to tape.

Discuss the various types of keystation that are available on different machines.

Give a short demonstration of each operating mode to give students an understanding of the capabilities of the system. Detailed explanations should be given when the different operating modes are taught.

Compare the advantages of a variable length record system with the fixed length concept of cards.

Relate the term program to format when describing this function.
2. Automatic functions

D. Keystation setup
1. Operator number
2. Batch number
3. Format number

IV. Operating Features of Keystation
A. Display unit
1. Power switch
2. Screen adjustments
3. Screen displays

B. Keyboard
1. Indicators
2. Mode keys
3. Functional control keys
4. Data keys

V. Data-Entry Operations (write mode)
A. New batch
1. Opening the keystation
2. Entering data
   a. First record of the batch
   b. Balance of the batch
3. Closing the batch

TEACHING SUGGESTIONS

Explain the concept of pre-storing the format a number to identify each.

Explain the need for using identifying numbers, batch, and format. Assign a permanent number to each operator, batch, number. This method will minimize students from other.

Explain with the aid of a chalkboard diagram on a disk and how the computer keeps track of

Explain briefly the operation of the keyboard. Be already familiar with many of the function of previous machines. If this is the first machine, detailed explanations for the operations that key or keys.

Enter the format for the first few assignment can concentrate on becoming familiar with the keystation.

Introduce the various functions of a record of projects involving:
- Alphabetic and numeric data
- Skipping
- Auto duplication
- Left-zero insertion

Explain the special features such as auto-bal control after the students have attained keys.
TEACHING SUGGESTIONS

Explain the concept of prestoring the formats on disks and assigning a number to identify each.

Explain the need for using identifying numbers for each operator, batch, and format. Assign a permanent number to each student and have him use this number for his operator, batch, and format number. This method will minimize students' interfering with each other.

Explain with the aid of a chalkboard diagram the location of items on a disk and how the computer keeps track of data during processing.

Show how to adjust the video screen for comfortable viewing.

Show the various messages that may appear on the screen. Do not explain in detail about each message at this time.

Explain briefly the operation of the keyboard. Students' should be already familiar with many of the functional controls from previous machines. If this is the first machine taught, hold the detailed explanations for the operations that utilize the specific key or keys.

Enter the format for the first few assignments so that the students can concentrate on becoming familiar with the operation of the keystation.

Introduce the various functions of a record format by using a series of projects involving:
- Alphabetic and numeric data
- Skipping
- Auto duplication
- Left-zero insertion

Explain the special features such as auto-balance and check-digit control after the students have attained keystation proficiency.
Key-to-Disk Data Recorders

CONTENT

B. Batch append
   1. Reopening a batch
   2. Adding records
   3. Closing the batch

VI. Functions of the Read Mode
A. Examine data just written
B. Examine data being verified
C. Independent read mode to scan a batch which has been closed

VII. Automatic Format Control
A. Functions
   1. Record layout
   2. Physical characteristics of field
   3. Control of automatic operation
B. Designing a record format
   1. Format layout form
   2. Field descriptors
C. Entering a record format through the keystation
   1. Making corrections
   2. Assigning a format number

VIII. Verify Mode
A. Functions

TEACHING SUGGESTIONS

Point out that the computer keeps track of the each batch entered so that only the batch number for a batch append operation. List the students supervisor's printer so students can check the list the batch before and after it has been a

Have students change to read mode, while enter the write mode and examine the data already on disk. Show students how to backspace to the batch and how to read forward.

Compare the functions of a record format with on a keypunch.

Assign a series of exercises so that the students familiar with all the design functions.

Explain alternate format control at a later time.

Show how to correct an error if it is detected:
   - During the entry of the codes
   - After the field has been entered

List each format on the supervisor station purpose. Cancel each format so the students numbers for all the exercises.

Have students record a batch of data. Then, demonstrate each of the functions performed
TEACHING SUGGESTIONS

Point out that the computer keeps track of the format number for each batch entered so that only the batch number need be given for a batch append operation. List the students' batches on the supervisor's printer so students can check the data visually.

List the batch before and after it has been appended.

Have students change to read mode while entering a batch in the write mode and examine the data already released onto the disk. Show students how to backspace to the beginning of the batch and how to read forward.

Compare the functions of a record format with that of a program card on a keypunch.

Assign a series of exercises so that the students will become familiar with all the design functions.

Explain alternate format control at a later time.

Show how to correct an error if it is detected:

- During the entry of the codes
- After the field has been entered

List each format on the supervisor station printer for checking purpose. Cancel each format so the students can reuse the same numbers for all the exercises.

Have students record a batch of data. Then, use that batch to demonstrate each of the functions performed in the verify mode.
CONTENT

1. Checking for accuracy
2. Search operation
   a. Modify a record
   b. Delete a record
   c. Insert a record
   d. Continue an operation

B. Operational procedures
   1. Opening the batch
   2. Verifying the record
      a. Error detection
      b. Error correction
         (1) Single character
         (2) Entire field
   3. Closing the batch

IX. Keystation Operator Proficiency
A. Numeric keyboard drills
B. Alphabetic keyboard drills
C. Application projects
   1. Alternate format control
   2. Special features
      a. Auto-balance
      b. Check-digit control

TEACHING SUGGESTIONS

Discuss the need for the search operation. Show how impractical it is to start at the beginning of a batch.

Demonstrate the use of the reset and backspace procedures for correcting errors.

Show how to close the keystation in mid-batch. Emphasize the importance of the batch open when the keystation is unattended.

Emphasize the importance of accuracy, memorization, rhythm, and correct fingering techniques. Do not begin the practice sessions. Do not become proficient, use timed exercises as a way to improve competency. (Ref. A, pp. 13-21)

Intersperse application projects with keyboard drills.

Take statistical reports from the supervisor to students' progress in speed and accuracy. Have students use each drill and project.

Use an autotutorial system to help students determine their progress. (Ref. Dart's Card Punch Drills)
TEACHING SUGGESTIONS

Discuss the need for the search operation. Show how it is impractical to start at the beginning of a batch each time.

Demonstrate the use of the reset and backspace-field key when correcting errors.

Show how to close the keystation in mid-batch. Explain when this procedure would be used. Emphasize the importance of never leaving the batch open when the keystation is unattended.

Emphasize the importance of accuracy, memorization of the keyboard, rhythm, and correct fingering techniques. Do not set time standards at the beginning of the practice sessions. As the students become proficient, use timed exercises as a way of judging their competency. (Ref. A, pp. 13-21)

Intersperse application projects with keyboard drills.

Take statistical reports from the supervisor station to gauge students' progress in speed and accuracy. Have students verify each drill-and project.

Use an autotutorial system to help students develop rhythm and speed. (Ref. Dart's Card Punch Drills)
Glossary

Alining pin: A pin at the bottom of the program drum for inserting the drum into the socket of the machine.

Alphabetic field: A field which contains letters and spaces only.

Alphameric (Alphanumeric) field: A field which can contain any combination of valid characters (letters, digits, special characters, spaces).

Automated data processing: A process where data are handled with a minimum of human intervention. The process depends on recording original information in such a way that further use can be made of it without later re-recording.

Automation: A process in which work is done with a minimum of manual effort, usually including feedback and self-control.

Card column: One of the 80 vertical divisions of a card, normally accommodating one letter, digit, or special character.

Card hopper: The part of a card processing machine into which cards to be processed are placed.

Card stacker: The part of a card processing machine into which cards enter after they are processed.

Code: A short representation of a numerical information or instruction.

Coding: Assigning of letters, digits, special characters and spaces to identify or classify data.

Column indicator: A device which indicates the next column to be punched.

Common language: Code language or notation which all machines can "interpret."

Corner cut: A diagonal cut at one corner of a punched card. A deck of cards uses this corner cut to ensure that the cards are all oriented the same way.

Data processing: The basic function of recording, classifying, sorting, and transmitting information.

Duplication: The automatic punching of one card into the next, normally a card punch.

Field: One or more columns reserved for recording of data of a specific nature.

File: A collection of related records on magnetic or punched cards, stored as a unit. When processing punched or magnetic cards, a file is a deck of cards related to the data processing system.
Glossary

at the bottom of the program drum
the drum into the socket of the
field which contains letters

eric) field: A field which can
combination of valid characters
, special characters, spaces).

issing: A process where data are
minimum of human intervention.
ends on recording original
such a way that further use can
without later rerecording.

ss' in which work is done with
al effort, usually including
lf-control!

the 80 vertical divisions of a
accommodating one letter, digit,
acter.

art of a card processing machine
is to be processed are placed.

art of a card processing machine
is enter after they are process.

Code: A short representation of alphabetic or
numerical information or instructions.

Coding: Assigning of letters, digits, or both to
identify or classify data.

Column indicator: A device which shows the
next column to be punched.

Common language: Code language or media that various
machines can "interpret."

Corner cut: A diagonal cut at one of the two upper
corners of a punched card. A person handling
a deck of cards uses this corner cut to make
sure that the cards are all facing the same way.

Data processing: The basic functions of the office:
recording, classifying, sorting, manipulating,
and transmitting information.

Duplication: The automatic punching of data from
one card into the next, normally performed on
a card punch.

Field: One or more columns reserved for the
recording of data of a specific nature.

File: A collection of related records treated as
a unit. When processing punched cards, a
deck of cards related to the same job is a file.
Flowchart: A graphical representation of a sequence of operations, using a set of conventional symbols.

Grouping: The classifying or bringing together of related records by a sorting machine.

Hardware: The mechanical, magnetic, electric, and electronic devices used for processing data.

Input: Information which enters a machine for the purpose of being processed or to aid in processing.

Interpreting: Printing on a card data that have been punched into it.

Machine code: A code that a machine can "interpret."

Magnetic disk: An input/output device and storage media. The circular disk is coated with a substance that is capable of being magnetized. Data are recorded as magnetic spots on tracks on the disk.

Magnetic tape: An input/output device and storage media. A mylar strip of tape is coated on one side with a substance that can be magnetized. The data are recorded as magnetic spots along the length of tape.

Merging: Interfiling in sequence two sets of cards.

9-edge: The bottom edge of the card parallel with the "nine" punching positions.

Output: The results produced by a data processing system, usually in the form of magnetic tape, magnetic disk, punched cards, or documents.

Program card: A card which instatiates a machine to perform certain tasks.

Program drum: A cylindrical drum in which a program card is fastened.

Program unit: The complete mechanical unit which holds the program cards while a program is being read or processed.

Punching position: One of the 10 columns into which a hole may be punched.

Punching station: The place on a card where holes are punched into the card.

Reading station: The place on a reading drum where the holes punched into the card are read.

Record: A collection of related data, usually in the form of magnetic tape, magnetic disk, or punched cards, or documents.

Recording media: Punched cards, magnetic disk or other media are recorded to be used as input to a processing system.

Record format: A layout that shows the logical and physical characteristics of a record.

Reproducing: Punching data automatically from one set of cards into another set of cards.

Selecting: The process of extraction of cards only those that contain the desired data.

Sequencing: The process of arranging data in alphabetic or numeric order.
Program card: A card which instructs a card punch machine to perform certain automatic functions.

Program drum: A cylindrical drum upon which the program card is fastened.

Program unit: The complete mechanism on the card punch which holds the program drum.

Punching position: One of the 12 divisions of a card column into which a hole may be punched.

Punching station: The place on a card punch where holes are punched into the card.

Reading station: The place on a card punch where the holes punched into the card may be read.

Record: A collection of related fields. When processing punched cards, a single card is a record.

Recording media: Punched cards, magnetic tape, magnetic disk or other materials onto which data are recorded to be used as input to a data processing system.

Record format: A layout that shows the arrangement and physical characteristics of the fields in a record.

Reproducing: Punching data automatically from one set of cards into another set of cards.

Selecting: The process of extracting from a stack of cards only those that contain certain desired data.

Sequencing: The process of arranging cards in either alphabetic or numeric order.
Software: Aids supplied by manufacturers to assist the user in efficient operation of electronic computer equipment.

Sorter: A machine that arranges or classifies punched cards according to a definite plan.

Source document: The original paper on which are recorded the details of a transaction.

Summary punching: The automatic process of punching one card containing data summarized from a group of cards.

Tabulating machine: A machine used for the printing of data recorded on punched cards. It is also called an accounting machine.

12-edge: The top edge of a punch.

Verification: The process of checking of data which is recorded.

Verifier: A machine which is used for checking accuracy of recorded data.

Unit record: A record in which all items in a transaction are recorded on one card.

Zone punch: One of the top three punch positions in a card column (12, 11 or 10).
ied by manufacturers to assist efficient operation of electronic
ut.
that arranges or classifies according to a definite plan.
original paper on which are mails of a transaction.
the automatic process of punchinging data summarized from a
A machine used for the printing on punched cards. It is also

12-edge: The top edge of a punch card.

Verification: The process of checking the accuracy of data which is recorded.

Verifier: A machine which is used to check the accuracy of recorded data.

Unit record: A record in which all the data concerning each item in a transaction are punched into one card.

Zone punch: One of the top three punching positions in a card column (12, 11, or X, and 0).
Bibliography

TEXTBOOKS


REFERENCE BOOKS


Bibliography

REFERENCE BOOKS


**FILMS**


**TRANSPARENCIES**

*Alphabetic sorting.* United Transparencies, Inc. one transparency. Purchase - United Transparencies, Inc.

**PROGRAMED INSTRUCTIONAL UNITS**


Hous, E. E., & Hughes, A. E. *Automated data processing*. Y. South-Western Publishing


color. Purchase - Coronet Syracuse Films.


*Typing*; Sterling. 13 min. sound. Purchase - Sterling Educational Business Education Films.

*Typing punch*; Sterling. 13 min. Purchase - Sterling

ms. Rent - Business Education

*Basic punched card operations*. United Transparencies, Inc. one transparency. Purchase - United Transparencies, Inc.

*Card fields*. United Transparencies, Inc. one transparency. Purchase - United Transparencies, Inc.

*Data processing system*. United Transparencies, Inc. two transparencies. Purchase - United Transparencies, Inc.


*Programed Instructional Units*


United Transparencies, Inc. Purchase - United Transparencies;