DOCUMENT RESUME

ED 113 441 CE 004 888

TITLE	Career Preparation in Data Processing--Keypunch Operator, Key-To-Tape Operator, Key-To-Disk Operator. An Instructor's Guide.
INSTITUTION	New York State Education Dept., Albany. Bureau of Continuing Education Curriculum Development.; New York State Education Dept., Albany. Bureau of Secondary Curriculum Development.
PUB DATE	[75]
NOTE	43p.
EDRS PRICE	MF-$0.76 HC-$1.95 Plus Postage
DESCRIPTORS	*Business Education; Curriculum Guides; Data Processing; *Data Processing Occupations; *Electronic Data Processing; Post Secondary Education; Secondary Education; *Teaching Guides; Unit Plan

ABSTRACT

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 / THE STATE EDUCATION DEPARTMENT
BUREAU OF CONTINUING EDUCATION CURRICULUM DEVELOPMENT
BUREAU OF SECONDARY CURRICULUM DEVELOPMENT / ALBANY, NEW YORK 12234

THE UNIVERSITY OF THE STATE OF NEW YORK

Regents of The University (with years when terms expire)

1981 Theodore M. Black, A.B., Litt.D., LL.D., Pd.D., Chancellor
1987 Carl H. Pforzheimer, Jr., A.B., M.B.A., D.C.S., H.H.D., Vice Chancellor
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.
1986 Kenneth B. Clark, A.B., M.S., Ph.D., LL.D., L.H.D., D.Sc.
1983 Harold E. Newcomb, B.A.
1988 Willard A. Genrich, LL.B., L.H.D.
1982 Emlyn I. Griffith, A.B., J.D.
1977 Genevieve S. Klein, B.S., M.A.
1981 William Jovanovich, A.B., LL.D., Litt.D., L.H.D.
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

THE UNIVERSITY OF THE STATE OF NEW YORK

Regents of The University (with years when terms expire)

ck, A.B., Litt.D., LL.D., Pd.D., Chancellor	Sands Point
mer, Jr., A.B., M.B.A., D.C.S., H.H.D., Vice Chancellor	Purchase
an, Jr. LL.D., Litt.D.	Troy
LL.B.	Shelter Island
icato, M.D.	Brooklyn
nley, B.S., J.D., LL.D.	Glens Falls
k, A.B., M.S., Ph.D., LL.D., L.H.D., D.Sc.	Hastings on Hudson
nb, B.A.	Owego
ich, LL.B., L.H.D.	Buffalo
th, A.B., J.D.	Rome
ein, B.S., M.A.	Bayside
ich, A.B., LL.D., Litt.D., L.H.D.	Briarcliff Manor
all, B.S.	Irondequoit
a, B.A., J.D.	Bronx
, LL.B.	New York

versity and Commissioner of Education	Ewald B. Nyquist
missioner of Education	Gordon M. Ambach
for Elementary, Secondary, and Continuing Education	Thomas D. Sheldon
er for Instructional Services	William L. Bitner III
er for General Education and Curricular Services	Vivienne N. Anderson
f Curriculum Development	Gordon E. Van Hooft
tinuing Education Curriculum Development	Herbert Bothamley

er for Occupational and Continuing Education	Robert S. Seckendorf
f Occupational Education Instruction	Robert H. Bielefeld
iness Education	Hobart H. Conover

AN INSTRUCTOR'S GUIDE

CAREER PREPARATION IN DATA PROCESSING

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

B E

4

THE UNIVERSITY OF THE STATE OF NEW YORK / THE STATE EDUCATION DEPARTMENT

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 students 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

Contents

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 E in secondary schools and adult pr prepare individuals for employmen operators. The units in the cour

Unit 1 - Introduction to Pun Processing
Unit 2 - Nonbuffered Card Pu
Unit 3 - Punched Card Verifi
Unit 4 - Buffered Card Punch
Unit 5 - Key-to-Tape Data Re
Unit 6 - Key-to-Disk Data Re

Unit 1 should be used as an of the succeeding units. Unit 3 after Unit 2. Units 2, 4, 5, and contained" and include the necess Knowledge related to each specifi units do not build on the content other units and, therefore, may b sequence desired. Because of the buffered card punches, key-to-tap machines, students would understa better if they were presented aft

Time Required

The content for Unit 1 may b approximately 3 to 4 hours. Any

Introduction

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

urers of data processing equip-
ing their attention to the
. Firms that previously used
g systems can now afford to
cal automated system. Also,
ady using electronic computing
g direct data entry methods.
the use of data processing
oment of minicomputers and the
try systems have resulted in an
qualified operators of card-
ta recorders using magnetic

esigned 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

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 demonstra will be used mainly during the fi of the course. Plan to have at l feet of space for each work stati space is needed for storage of su materials.

Application in Secondary Schools

The content of this outline of instruction in courses of Auto and Office Practice when key-entr in local high schools and area oc The units selected will depend on available, the level of proficien the employment opportunities, and prevalent in the area.

An area center may offer a h key-entry devices including the c instructional units, but the cour include related content from Offi Automatic Data Processing. Such study should be submitted to the Curriculum Development for approv

Units of this course may be offerings as Office Practice and Processing when key-entry devices comprehensive high schools. Thes used as the content for short cou single-period course devoted to t key-entry devices. The units sel upon the equipment available and employment in the area.

Application in Adult Education

The units of this guide may

40 hours of instructional time
pupils have completed success-
-year typewriting course. This
skills as well as the operat-
Verifier operations, however
zed, 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
instructional time for the
roximately 20 hours per device.

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

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

one work station for each member
s is not possible due to
limitations, two work stations

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 accomodate 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:

Course Title	Units Included
Keypunching 1	1 and 2
Keypunching 2	3 and 4
Key-to-Tape Operation	5
Key-to-Disk Operation	6

Adult education instructors review the revised Office Practi how the course fits into the ove program. Also, Chapter IV, Teac Chapter V, Job Instruction Sheet insights relative to the plannin information to students. Copies syllabus may be obtained from th business education.

Classroom Management

In an installation that doe machines of a given type for eac system where one student acts as the second student operates the m When the buddy system is used, sh projects are recommended in orde observation time to a minimum. E are likely to result in little le observer and detract from the lea machine operator. Short time spa students exchange roles give the review and digest the material he provide short rest periods for th students may be started on differ rotation system.

Keyboard drilling is necessa speed and accuracy, however, it c boring task. To alleviate this, projects should be interspersed w sessions.

The use of simulators for ke ment is not recommended except as during keyboard familiarization. keys on a simulator is quite diff a keypunch and thus the use of su mildly effective. A typewriter w simulator also fails to give the

for a single course or a series of
2, and 3 would provide suitable
se in keypunch operation for a
h nonbuffered card punch machines

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

does not have enough machines of
date the entire class at one
achines will have to be taught
use the total instructional time
s is 90 to 120 hours, a series of
should be offered which would
on all machines at the same time.
e titles under such conditions
Device Operation 1, 2, and 3.

has enough machines of the
ndividual use, specialized course
y be offered. If the courses are
es, the following 30 to 40 hour
gested:

	Units Included
	1 and 2
	3 and 4
on	5
on	6

Adult education instructors from industry should review the revised Office Practices Syllabus to see how the course fits into the overall Office Practice program. Also, Chapter IV, Teaching Methods, and Chapter V, Job Instruction Sheets, might provide some insights relative to the planning and presenting of information to students. Copies of the revised syllabus may be obtained from the supervisor of business education.

Classroom Management

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

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

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

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 occuring in the field of data processing.

Instructors in adult programs may wish to adapt the teaching-learning conditions to their particular group, but the basic format of teaching principles through student involvement should prevail.

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 c firms; local schools and universi state, and Federal government age firms; oil and gasoline distribut houses and exchanges; and data pr bureaus.

Students who have acquired a knowledge and average keyboard sk of key-entry device can be easily operate other machines of a simil is no specific speed requirement look for when hiring key-entry de A wide range of speed is expected because the work varies from usin all alphabetic, or mixed data; jo simple to complex; and source doc formal, well organized presentati handwritten pieces of paper. Emp interested in hiring individuals and use the proper techniques. in complex jobs speed is virtuall new jobs where speed counts, they will develop with experience.

key-entry device relative to
raming.

nts are offered as a means of

t well in advance of the class
instructional materials
ffective presentation.
le use instructional aids
presentation.

f learning experiences in
nge the different levels of
es.

unities to provide for
mall group instruction.

ction flexible enough to
dent to gain the skills and
ired to achieve his specific

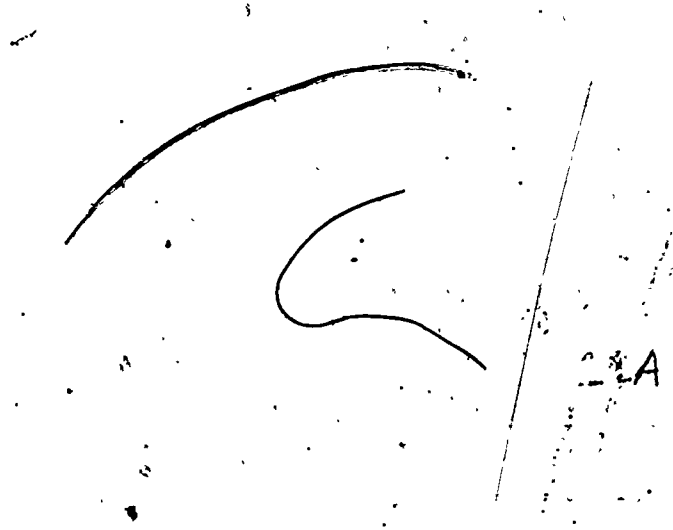
zines to keep up to date with
and developments that are
field of data processing.

ult programs may wish to adapt
conditions to their particular
ormat of teaching principles
ement should prevail.

ompletion of this course,
o find employment in any of
mercial and savings banks;

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 accoun
- 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 alphanu
- Identify and explain the function of the physical characteristics of magnetic tapes a
- Identify employment opportunities for data entry operators

CONTENT	TEACHING SUGGESTIONS
I. Punched Card Accounting	Explain briefly how firms use the punched car steadily increasing data involved in the oper businesses.
A. Card punches	Identify and explain the functions of the ya commonly used for punched card accounting.
B. Other data recorders 1. Key-to-tape 2. Key-to-disk	Demonstrate the automated data processing cyc realistic application such as a payroll, char checking account. Describe the operations th at each station in order to give the students functions of the various pieces of equipment.
C. Peripheral unit-record machines 1. Interpreter 2. Sorter 3. Reproducer 4. Collator 5. Accounting machine	Use a systems flow chart to reinforce the co data processing cycle. (Ref. G, pp. 33-41, 4 67-73)* Use films and transparencies to assist in pre topics. See page 36.
D. Computers (with card input)	Compare the processing of punched cards in a u installation with the processing techniques us computers. (Ref. H, pp. 75-87)

* Reference citations are shown on page 35.

INTRODUCTION TO PUNCHED CARD DATA PROCESSING

this unit, the student should be able to:

explain the function of the various machines used in punched card accounting
nit-record concept
explain the physical characteristics of a punched card
ules governing the recording of data in numeric, alphabetic, and alphanumeric fields
explain the function of the physical characteristics of magnetic tapes and disk records
oyment opportunities for data entry operators

T	TEACHING SUGGESTIONS
Accounting	Explain briefly how firms use the punched card in handling the steadily increasing data involved in the operation of their businesses.
hes	Identify and explain the functions of the various types of machines commonly used for punched card accounting.
a recorders o-tape o-disk	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.
l unit-record preter r ducer tor nting machine	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.
(with card input)	Compare the processing of punched cards in a unit record installation with the processing techniques used by electronic computers. (Ref. H, pp. 75-87)

are shown on page 35.

CONTENT	TEACHING SUGGESTIONS
II. Unit-Record Concept	
A. The punched card	Discuss the physical characteristics and desig
1. Physical characteristics	the standard 5081 card and several different t
a. Corner cuts	cards.
b. Edges and corners	
c. Stripes and colors	Discuss the characteristics and coding system
d. Columns and rows	punch card when the required data recorders ar
2. Card design	pp. 51-53; Ref. B, pp. 9-10)
a. Fields	
b. Factors to be considered	
B. Recording of Data	Explain how to record data onto cards.
1. Types of fields	
a. Numeric	Give a short manual simulation project to rein
b. Alphabetic	that govern the recording of data. Give stude
c. Alphanumeric (mixed)	have them rule lines that correspond to the fi
2. Rules for recording data	card. Ask students to pencil in data along th
a. Left-justification	illustrates the techniques of left-and right-h
b. Right-justification	and left-zero fill. (Ref. F, pp. 122-134)
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	Explain the various functions of a punched car
1. Recording (storage)	sample application previously used to illustra
2. Sorting	functions of a punched card.
3. Calculating	
4. Reporting	Explain how coding makes the recording and-pro
	more efficient.
	Have students start a glossary of data process
	terminology that is consistent with the field
	list throughout the course. See Glossary on p

TEACHING SUGGESTIONS

pt
ard
characteristics
r cuts
and corners
es and colors
ns and rows
gn
s
rs to be considered

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)

Data
fields
ic
betic
numeric (mixed)
recording data
justification
-justification
zero fill
rminology
order column
order column (units)
hundred's

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)

a punched card
(storage)

ng

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.

CONTENT	TEACHING SUGGESTIONS
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	Discuss the operation of key-to-tape and key- this time only if these devices are needed to with an individual machine for units 2 and/or 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.
E. Employment opportunities	Discuss the different types of businesses in employ data entry operators. Also, indicate range and promotional opportunities that are
F. Desirable characteristics of data entry operators	Emphasize that accuracy is of prime importanc speed and the attention to detail. Typewriti usually reduces the time needed to learn the devices. *If your installation does not have enough mac* *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

NT

TEACHING SUGGESTIONS

c tape and disk records
sical characteristics
Reflective spots
Coating
Header and trailer records
Tape marks
Interblock gaps
Density
ord design
Fields
Factors to be considered

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.

ent opportunities

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.

le characteristics of
try operators

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.

— • —

UNIT 2

NONBUFFERED CARD PUNCH MACHINES

f this ~~unit,~~ the student should be able to:

c and alphabetic data into original cards
punched cards

24A

Nonbuffered Card Punch Machines

- Correct error cards
- Design and create a program control card utilizing automatic skipping, automatic dupli 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	TEACHING SUGGESTIONS
I. Functions of a Card Punch	Explain and illustrate each function of a card Avoid detailed explanations at this time. Cov operating procedures at a later time.
A. Creating original records	
B. Adding data to records	Demonstrate card handling techniques such as j
C. Correcting records	
D. Duplicating records (remaking damaged records)	
II. Operating Features of a Card Punch Machine	Explain the operating features of nonbuffered If your installation has more than one type of the differences at each step. Do not go into keys and switches at this time. Refer to manu manuals for information on specific machines.
A. Main-line switch	
B. Card stations	Place a student at each machine and have him p functions as they are explained.
1. Hopper	
2. Card bed	
a. Punching station	
b. Reading station	
3. Stacker — automatic card feed stop	
C. Keyboard	Give students an opportunity to operate a card short time. This experience will give them a Select or design exercises and projects that e features which were discussed.
1. Numeric keys	
2. Alphabetic keys	
3. Special character keys	
4. Functional control keys	Point out that the normal shift of the keyboa when punching without program control. Show h key must be held down when punching digits.
a. Shift keys	
b. Release, register, feed	
c. Multipunch key	

Machines

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

TEACHING SUGGESTIONS

Card Punch
iginal records

to records

records

records
amaged records)

res of a Card Punch

witch

ns

d
ching station
ding station
automatic card
op

keys
tic keys
character keys
nal control keys
ft keys
ease, register, feed
tipunch key

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	TEACHING SUGGESTIONS
d. Duplicate key e. Error reset f. Left-zero g. Skip h. Alternate program (program 2)	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-re • Feed cards with the auto-feed switch positions • Print information along the top of a • Eject cards from the bed using the cl
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	Explain the operation of the column indicato release lever. Discuss program control at a Show how to position the program control leve punching.
G. Chip box and fuses	
III. Manual Keypunching A. Card feeding — Auto feed switch	Give a short assignment in order that student themselves with the various operating feature machine. Include in the assignment items suc • Duplication - with and without error c • Manual insertion of cards in both punc stations • Removal of cards from card stations us release lever.
B. Keyboard shifting 1. Alphabetic data 2. Numeric data	
C. Card stacking 1. Release key 2. Clear switch	Indicate the importance of concentrating on a proper techniques. Point out that speed will

TEACHING SUGGESTIONS

Duplicate key
Error reset
Left-zero
Skip
Alternate program (program 2)

e key

al control switches
feed
skip/dup
t
ram select
r

unit
mn indicator
ram drum
ram control card
wheels
ram control lever
sure-roll release lever

and fuses

nching
ding — Auto feed

shifting
abetic data
ric data

cking
se key
switch

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.

CONTENT	TEACHING SUGGESTIONS
IV. Numeric Keypunch Exercises	
A. Program unit with blank card	Have students mount a blank card on the program the numeric shift key.
B. Home keys	Check each student's work to see that correct f are being used for both alphabetic and numeric
C. Fingering	Select or design exercises which will familiari the numeric keyboard. Emphasize the importance using the correct fingering technique. Point o developing rhythm and indicate that speed will practice. (Ref. E)
V. Alphabetic Keyboard Exercises	
A. Home keys	Select or design exercises which will familiari the alphabetic keyboard. Emphasize the importa using the correct fingering techniques. (Ref. telephone directory)
B. Fingering	
VI. Program Control	
A. Program card function	
1. Automatic keyboard shifting	Use a short alphanumeric project in which the s perform each of the automatic functions to just program control. This project will show the st machine can elminate their shifting, skipping, chores.
2. Automatic skipping	
3. Automatic duplication	
4. Field definition	
B. Program unit	Demonstrate the techniques of mounting and dism control card.
1. Program drum	
2. Program control lever	Emphasize the importance of alining the card pi program drum. (Ref. A, p. 29)
3. Star wheels	
4. Program control card	Explain program 1. (Ref. H, pp. 45-47)
C. Program codes (program 1)	
1. 12 punch	
2. 11 punch	
3. Zero punch	
4. One punch	

Machine

TEACHING SUGGESTIONS

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

h Exercises
t with blank card

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.

oard Exercises

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)

d function
ic keyboard shifting
ic skipping
ic duplication
efinition

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 elminate their shifting, skipping, and duplicating chores.

t
drum
control lever
eels
control card

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

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

es (program 1)
h
h
nch
ch

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

CONTENT	TEACHING SUGGESTIONS
D. Program control card design 1. High-order column code 2. Balance of field codes	Select or design assignments that allow the program control proficiency. Use additional introduce each of the other functions. Afte familiar with the various functions, use a s which includes all the functions. (Ref. A,
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	Explain program 2 after students have attain in using program 1. (Ref. A, pp. 34-35, 37; Point out that the alternate program control • More than 80 columns are needed for d • More than one type of card is used in
VII. Keyboard Proficiency A. Numeric and alphabetic keyboard exercises	Emphasize the importance of accuracy, memori rhythm, and correct fingering techniques. D standards at the beginning of the practice s students become proficient, use timed exerci judging their competency. (Ref. A, pp. 13-3 Check to see that students are not watching drill and project sessions.
B. Application projects	Intersperse application projects with keyboa variety of jobs to stimulate achievement. Have students save the data cards they have projects in this section to use in the unit B, D, and E) Use an autotutorial system to help students speed. (Ref. Dart's Card-Punch Drills, if ava

TEACHING SUGGESTIONS

trol card design
der column code
of field codes

ch on keyboard

program control card
control lever
strip and handle
holes

rogram control

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

ency
alphabetic keyboard

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.

projects

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)

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

18A

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 mi verification project with a minimum speed of 5,000 strokes per hour

CONTENT	TEACHING SUGGESTIONS
	Students need keypunching skills and a knowled control for this unit.
I. Functions of a Card Verifier	Discuss the importance of accuracy relative to function of the card verifier.
	Point out the advisability of having the cards verified by another worker.
II. Operating Features	Explain and demonstrate the principles and ope
A. Main-line switch	card verifier. Limit the detailed explanation features of the verifier.
B. Card stations	
1. Card hopper	Show the passage of a card through the differe
2. Card bed	during the verifying operation.
a. Verifying station.	
b. Reading station	
3. Card stacker	
C. Keyboard	Relate the keyboard and functional controls of
1. Character keys	the controls and functions of the card punch m
2. Functional control keys	
a. Shift keys	Demonstrate how to verify a simple job using t
b. Release, register, feed	procedures associated with the different types
c. Ver/dup key	

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
nd numeric and alphabetic field definition
fy, and correct all existing errors in a deck of punched cards in a 15 minute timed
roject 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.

Card Verifier

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.

ures
switch

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

ons
opper
ed
rifying station
ading station
tacker

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

ter keys
ional control keys
ift keys
lease, register, feed
r/dup key

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.

CONTENT	TEACHING SUGGESTIONS
d. Error reset key (MP/ER) e. Skip key f. Alternate program (program 2)	Show how the error-reset key (MP/ER) is used board when an error is detected.
D. Error light	
E. Functional control switches 1. Auto feed 2. Auto skip/dup 3. Program select 4. Clear	Point out how automatic feeding is suspended card is detected.
F. Program unit 1. Column indicator 2. Program drum and program card 3. Program control lever 4. Pressure roll-release lever	Emphasize the importance of alining the card program drum. (Ref. A, p. 29) Show how the pressure-roll release lever is u cards.
III. Operating Principles A. Manual verification	Explain the difference between manual and aut punched cards.
B. Automatic verification	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
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	Have students verify cards containing a variet familiarize them with the different types of e they may encounter.

TEACHING SUGGESTIONS

ror reset key (MP/ER)
ip key
ternate program
rogram 2)

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

t

control switches
eed
kip/dup
n select

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

it
indicator
n drum and program

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

n control lever
re roll-release lever

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

ciples
fication

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

verification

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

tion
d locking
ight
g the error -
indicator
eset key (MP/ER)
rocedure

ion
otch
r notation on card

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

30A

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 t
after they have gained some proficiency in the
card verifier. Giving students too much inform
will tend only to confuse them. Include such t

- Use the functional controls when tempora
  interuptions occur instead of disengagin
  mechanism.
- Place single cards to be verified direct
  bed instead of the hopper.
- Use the verify/duplication key to space
  columns when the same columns are unpunc
  card or when there is no preceding card.

Have students verify the cards they produced fr
completed in unit 2. Also, new projects may be
students will punch a deck of cards and then ve

Assign different keypunching projects to teams
and then have them exchange decks for verificat
D, and E)

errors in a single
ip key
error fields
ase key
lete card remake

stions
erifying operation

erifying operation

e program reading

r blank columns

ingle card

board

automatic verification
rd

oficiency
ification projects

verification projects

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 interuptions 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, autom automatic skipping, and left-zero insertion
- Store a program and punch out to verify memory
- Punch numeric and alphabetic data using program control wi[illegible] automatic skipping, aut 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	TEACHING SUGGESTIONS
I. Functions of a Buffered Card Punch/Verifier	Demonstrate card handling techniques such as
A. Creating original records	Explain and demonstrate functions of the buf verifier. Place students at each of the dem
B. Adding data to punched records	and ask them to perform the function as it i
C. Correcting error records	out the basic differences among the various verifiers in your installation. Detailed ex
D. Duplicating records (remaking damaged cards)	operating procedures should be given after t to perform the basic functions.
E. Verifying punched cards	
II. Advantages of a Buffered Card Punch/Verifier	Discuss data storage when the card is comple immediate punching of a card on a nonbuffere
A. Capable of storing data	
B. Immediate error correction before punching	Demonstrate how an error may be corrected du operation. Point out how this operation sav materials.

BUFFERED CARD PUNCH/VERIFIERS

f this unit the student should be able to:

functions of the buffered card punch/verifier
rect) error cards
an existing card
reate a program card with numeric and alphabetic field definition, automatic duplication,
ipping, and left-zero insertion
ram and punch out to verify memory
c and alphabetic data using program control with automatic skipping, automatic duplication,
o insertion
k of punched cards using the procedures for single character correction, multiple errors in
ield correction), and entire record correction
imum speed of 5,000 strokes per hour with no more than 10 corrections in a 30-minute timed
assignment

TEACHING SUGGESTIONS

a Buffered Card
er
original records

ta to punched records

g error records

ng records
damaged cards)

punched cards

a Buffered Card
r
f storing data

error correction
nching

Demonstrate card handling techniques such as joggling 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.

CONTENT	TEACHING SUGGESTIONS
C. Immediate error correction during verification	Compare the three-operator system using nonbuf the two-operator system using buffered machine required for the operation and the handling of
D. Multiple program levels	Discuss the need for more than two program lev
E. High-speed card read-in	control has been introduced.
F. Single machine for both punch and verify operations	
G. Some overlap of operations	
III. Operating Features	Explain the operating features of the buffered
A. Main-line switch	in your installation. Use manufacturers' refe
B. Card stations	information relating to specific machines. Pr
1. Card hopper — input magazine	a summary sheet which shows these variations.
2. Punch station — visible station	
3. Auxiliary input	
4. Stacker switch	
C. Keyboard	Demonstrate only those controls which the stud
1. Character keys	using the machines.
a. Numeric arrangment	
b. Alphabetic arrangement	Assign projects that involve the basic control
c. Special characters	the other assignments introduce the additional
2. Functional control switches	a time. Avoid using large projects.
a. Punch/verify	
b. Print	Have students concentrate on the operating pro
c. Auto feed	on proficiency at this point. When the studen
d. Auto skip/dup	working knowledge of the machine's features, a
e. Clear	projects which will develop their proficiency.
f. Program mode dial	
3. Functional control keys and buttons	Demonstrate how to shift the keyboard when pro
a. Read	is not used. Point out that this operation va
b. Interpret	to machine.

rifiers.

rror correction
fication

ogram levels

card read-in

ine for both punch
operations

p of operations

res
witch

ns
pper — input magazine
tation — visible

ry input
switch

er keys
eric arrangment
habetic arrangement
cial characters
nal control switches
ch/verify
nt
o feed
o skip/dup
ar
gram mode dial
nal control keys
tons
d
erpret

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.

CONTENT	TEACHING SUGGESTIONS
c. Backspace (1) Character (2) Field (3) Record (home)	Show how to operate the various backspace key appropriate use for each key.
d. Left-zero control (right-justify)	Demonstrate how to clear memory in different Explain that memory is cleared to prevent the card being repeated on the following card.
e. Shift keys	
f. Feed, register, release (eject)	
g. Duplicate	
h. Multiple punch	
i. Program select	
j. Skip	
k. Verify correct (correct)	
4. Indicators	Explain the conditions which cause each of th to light up. Demonstrate how to correct each the device to normal operation.
a. Interlock	
b. Nonmatch	
c. Program 2	
d. Alphabetic shift	
IV. Manual Punching Operations	Assign a short project that involves all manua the next assignment include a field to be dupl students are familiar with the machines, use which include the special functions of remakir correcting error cards, and adding data to exi
A. Preparing for operation	
1. Fill hopper	
2. Main-line switch	
3. Clear card bed	
4. Set functional controls	
5. Clear data storage	Demonstrate how to clear data storage by usin clear switch.
6. Enter constant data	
a. Manual entry	
b. Master card entry	
c. Master card and manual entry	
B. Punching new data cards (no program)	Show how to investigate and correct card feedi as:
1. Feed card	• Cover over feed knives
2. Entering data-shifting	• Small pieces of cards from a previous j objects in transport feed mechanism
3. Punching out card	

NT

TEACHING SUGGESTIONS

Backspace
(1) Character
(2) Field
(3) Record (home)
Left-zero control
(right-justify)
Shift keys
Feed, register, release
(eject)
Duplicate
Multiple punch
Program select
Skip
Verify correct (correct)

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.

cators
Interlock
Nonmatch
Program 2
Alphabetic shift

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.

ng Operations
for operation
hopper
line switch
card bed
unctional controls
data storage
constant data
anual entry
aster card entry
aster card and
anual entry

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.

new data cards
am)
card
ing data-shifting
ing out card

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

CONTENT	TEACHING SUGGESTIONS
	• Damage to the 12- or 9-edge of a card
C. Remaking damaged cards 1. Loading data from old card 2. Feeding new card 3. Duplicating data 4. Punching out new card	Have students become proficient with punching manual and with program control, before going operations. Point out that punching skills ar a job, whereas, verifier operation is of only to an employer.
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	Have students become proficient using one type they start to operate another. Operating firs another tends to be confusing.
V. Numeric Keypunch Exercises A. Numeric shift 1. Program mode dial 2. Shift key	Assign projects which will familiarize student keyboard. Emphasize the importance of accurac fingering techniques.
B. Home keys	Point out the importance of accuracy and the d Indicate that speed will develop with practice
C. Fingering	Check to see that the students' eyes are on th not on the keyboard.
VII. Combined Alphabetic and Numeric Drills	Assign projects that combine the use of the nu keyboards.
VIII. Program Control A. Function of program card 1. Shifting 2. Automatic skipping 3. Automatic duplication 4. Field definition 5. Left-zero insertion	Assign a short project which involves the manu of the program functions. Then, introduce the control.

/Verifiers

TEACHING SUGGESTIONS

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

; damaged cards
ing data from old card
ing new card
icating data
hing out new 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 not of only secondary interest to an employer.

ng error cards
ing data from error card
ing new card
icating correct data
ng corrections manually
hing out new card

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.

unch Exercises
shift
ram mode dial
t key

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

s

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

g

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

habetic and Numeric

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

rol
of program card
ting
matic skipping
matic duplication
d definition
-zero insertion

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

CONTENT	TEACHING SUGGESTIONS
B. Codes for program card 1. First column of field 2. Balance of field coding 3. Last column code for left-zero fields	Assign a series of projects with each one int function such as: • Alpha and numeric fields, no blank fie • Alpha and numeric fields with auto ski • Skipping and duplicating • Left-zero insertion Assign projects that use several different fo students with program card preparation.
4. Alternate program codes a. Program 2 b. Multiple program levels	Discuss alternate program control. Point out that some machines have only two pr machines use different codes such as levels 12 program 1 and levels 4, 5, 6, and 7 for progra Other machines have the capability of storing programs at the same time. These machines use codes (12, 11, 0, and 1) but store the program memory locations. *Present both of the above concepts even though has only one type of machine.*
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.	Have students store several programs. Check t programs have been properly loaded.
D. Application projects	Assign projects that will help students develo using the functions of program control. (Ref. Ref. E)
IX. Keyboard Proficiency A. Numeric keyboard drills	Emphasize the importance of accuracy, memoriza rhythm, and correct fingering techniques. Do

TEACHING SUGGESTIONS

program card
column of field
e of field coding
olumn code for left-
ields

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.

te program codes
gram 2
tiple program levels

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.

program codes
g functional controls
ing program card
iary input)
g-in the card
ng out program to
proper loading.

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

n projects

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

ciency
yboard drills

Emphasize the importance of accuracy, memorization of the keyboard, rhythm, and correct fingering techniques. Do not set time

26A

CONTENT	TEACHING SUGGESTIONS
B. Alphabetic keyboard drills	standards at the beginning of the practice ses students become proficient, use timed exercise judging their competency. (Ref. A, pp. 13-21)
C. Application projects	Intersperse application projects with keyboard
	Use an autotutorial system to help students de (Ref. Dart's Card Punch Drills)
	Have students save the data cards they are mak verification section.
X. Verification	Explain the operation of verification. This t
A. Need	in a short time because most of the controls a
1. Accuracy of input	already been explained and used by the student
2. Time and money savings	operation.
B. Cycle	Contrast performing the operations of punching
1. Keypunch to verifier to keypunch for corrections	using separate machines with doing the same op machine. Emphasize the savings in time, money the operations performed on one machine.
2. Advantages of combined machine	
a. Fewer physical machines	
b. Only two operators involved	
c. Immediate card correction	
C. Operations	Have students verify the cards they produced i
1. Manual verifying	Ask students to exchange cards to simulate a p
2. Duplicate verifying	Most verifying jobs use program control; so it
3. Bypassing	to have any manual assignments.
4. Skipping	
D. Procedures	Have students concentrate on developing speed
1. Machine setup	they have a good working knowledge of the veri
a. Card input	Demonstrate how to:
b. Functional controls	• Load a master card when using automati
c. Program card	

/Verifiers

ic keyboard drills

ion projects

racy of input
and money savings

unch to verifier to
unch for corrections
ntages of combined
ine
Fewer physical machines
Only two operators
involved
Immediate card
correction
ns
al verifying
icate verifying
ssing
ping

es
ine setup
Card input
Functional controls
Program card

TEACHING SUGGESTIONS

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.

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

TEACHING SUGGESTIONS

- Suspend automatic verification for the group
- Correct errors

Have students verify cards containing errors t different types of error conditions which they

KEY-TO-TAPE DATA RECORDERS

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 prog automatic skipping, automatic duplication, left-zero insertion, and numeric and alphab
- Verifty a prerecorded reel of tape using single character correction and field correct
- Search a reel of tape and change data in an existing record, add data behind a specifi out an existing record
- Design, enter, and verify a program which contains numeric and alphabetic field defini 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 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.

detection
ror light
yboard locking
try procedure
ror correction
) single character correction
) field correction
) record correction
) auxiliary input
ch
ror-free card
rrected card

UNIT 5

KEY-TO-TAPE DATA RECORDERS

this unit, the student should be able to:

nction of key-to-tape data recorders
nload, and dismount a reel of tape proficiently
and alphabetic data onto a reel of magnetic tape manually and with program control using
ping, automatic duplication, left-zero insertion, and numeric and alphabetic field definition
ecorded 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
record
and verify a program which contains numeric and alphabetic field definition, automatic
natic duplication, and left-zero insertion
m speed of 6,000 strokes per hour with no more than 10 corrections in a 30-minute timed
ssignment

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 insepct 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 af learned how to operate card punch machines. T data recording and machine functions are easie presented in this order.

Discuss briefly the various operations that c with the key-to-tape system. Detailed explana 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 machi items as:
- Procedure for changing individual reco
- Method of inspecting data

Demonstrate and explain the functions of the key-to-tape machines. Some of the terminolog may vary with machines but the concepts remai of the device. Refer to the individual manuf manuals for specific operating procedures.

Explain, with each operation, the function of and other functional controls and indicators. controls which are needed for the operation b as the students progress, present the additio and indicators which apply to the next operat

rders

ntry
cation

of key-to-tape

input
capacity
record sequence
chine doing work of two

ges of key-to-tape

ulty in altering
dual records
ity to visibly
t data

the Key-to-Tape

er unit
and takeup reels
nd write head
n columns

er control panel
l off switch
load and unload buttons
l counter

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.

CONTENT	TEACHING SUGGESTIONS
C. Memory and control unit 1. Data buffers 2. Program buffers 3. Control unit	Demonstrate how data and programs remain in me information is entered
D. Keyboard 1. Functional control switches a. Mode switch b. Program switch c. Auto release switch d. Auto dup/skip e. Data/prog switch	Discuss the basic function of each area of the panel including: • Mode setup • Inquiry • Machine status
2. Display panel a. Character display b. Column indicator c. Status indicators	Show how to translate machine coded displays.
3. Character keys 4. Functional controls keys a. Shift b. Backspace c. Error d. Left-zero e. Duplicate f. Program 1 and 2	Explain the meaning of the various error indic corrective procedures necessary for each situa Demonstrate the use of the functional control used to record data. Point out the interlocking condition on some m backspace key is used.
III. Key-to-Tape Operations A. Data entry 1. Recording original data 2. With and without program control	Define each of the functions briefly. Detaile wait until the students start specific operati Relate the various key-to-tape operations to s performed on card punch machines.
B. Data verify	*Encourage students to use the operator's refer supplied by the various manufacturers when set for different operations.*
C. Search	
D. Program entry	
E. Program verify	

TEACHING SUGGESTIONS

d control unit
buffers
am buffers
ol unit

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

ional control switches
ode switch
rogram switch
uto release switch
uto dup/skip
ata/prog switch
ay panel
haracter display
olumn indicator
tatus indicators
ter keys
onal controls keys
hift
ckspace
rror
ft-zero
plicate
rogram 1 and 2

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.

erations

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

ing original data
nd without program
l

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.

y

try

rify

CONTENT	TEACHING SUGGESTIONS
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	Demonstrate the techniques for handling tape s cleaning, and loading. Explain the variations different machines. Have students practice loading and unloading r they become proficient tape handlers.
V. Manual Data-Entry Procedures A. Functional Controls 1. Mode switch 2. Auto release 3. Auto dup/skip 4. Program switch	Describe the purposes and operation of: • Auto release in off position • Auto-dup/skip in off position • Program in zero (off) position
B. Data entry 1. Keyboard shifting 2. Record release	Have students enter data into the memory. As entered, have students backspace and examine for each column to give them practice in deco
C. Termination of operation 1. Tape mark 2. Rewinding the tape 3. Unloading and dismounting	Explain the function of the tape mark at the
D. Application project	Assign a short project that uses all types of numeric, and mixed) such as a simple name and students to become familiar with the operatin machine.
VI. Tape Search A. Purpose 1. Alter data 2. Continue operation 3. Delete data	Explain the necessity for a search operation. procedures used for tape with those used for Discuss the purpose of the record identifier. codes with alphabetic fields relative to leng

orders

and Dismounting
n window

d takeup reels

write head

and unload buttons

y/switch

ntry Procedures
l Controls
switch
release
dup/skip
am switch

y
ard shifting
d release

on of operation
mark
ding the tape
ding and dismounting

on project

data
nue operation
e data

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

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.

CONTENT	TEACHING SUGGESTIONS
B. Functional controls 1. Mode switch 2. Auto release 3. Auto dup/skip 4. Program switch	Emphasize the need to "space fill" all colum the identifier does not occupy.
C. Operational procedures 1. Record identifier 2. Releasing to search 3. Verifying found record	Demonstrate the operating procedure. Show wh record is not found. Explain why the tape must be backspaced and r verifying the found record.
VII. Numeric and Alphabetic Keyboard Exercises	Assign projects that will provide practice in and familiarization with the numeric and alph Emphasize the importance of accuracy and corr techniques. Point out that speed will come w (Ref. A and E)
VIII. Program Control A. Function 1. Field definition 2. Automatic skip and dup control 3. Automatic left-zero insertion	Have students use the manual project which th show the advantages of program control. Demonstrate how program control saves time an accuracy by automatically shifting the keyboa duplicating data, and determining the number in front of a number.
B. Program codes 1. First column of field 2. Balance of field	Explain how the first column program code sta automatic functions and denotes the beginning Explain the function of the balance of field shifting).
C. Program design 1. Record description form 2. Program layout	Assign projects that give students practice i description forms and designing program layou different applications.
D. Program entry 1. Functional controls 2. Entry operation	

TEACHING SUGGESTIONS

l controls
switch
release
dup/skip
am switch

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

al procedures
d identifier
sing to search
ying found record

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.

lphabetic Keyboard

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)

l

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

definition
tic skip and dup
tic left-zero
ion

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.

des
column of field

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

e of field

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

sign
description form
m layout

Assign projects that give students practice in filling out record description forms and designing program layouts using several different applications.

try
onal controls
operation

CONTENT	TEACHING SUGGESTIONS
E. Program verification 1. Functional controls 2. Procedure a. Error detection b. Error correction	Demonstrate how to correct an error.
IX. Data Entry Using Program Control A. Program design and entry	Use the projects that the students did for pro basis for practice in verifying and storing pr Review how to design a program and enter it in
B. Operational procedures 1. Functional controls 2. Entry procedure 3. Termination of operation	Discuss the setup for the first record of a jo of the records. Demonstrate the use of the shift, left-zero, s
C. Application projects	Use the same project for program control that previously did manually. This will help reinf on the advantages of program control.
X. Data Verification with Program Control A. Program design and entry	Explain the need for verification.
B. Operating procedure 1. Functional controls	Demonstrate how to start the operation by firs into memory.
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	Explain and demonstrate how to correct a singl errors in a field. Explain how to erase the error record before record on the tape.
3. Termination of operation	

ders

ification
nal controls
re
or detection
or correction

g Program Control
ign and entry

procedures
nal controls
rocedure
tion of operation

projects

on with Program

ign and entry

rocedure
nal controls

ation procedure
or detection
or correction
Single character
Entire field
-of-record procedure
No error
Corrected record
tion of operation

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	TEACHING SUGGESTIONS
C. Application projects	Have the students verify the project they use program control. Additional practice can co future data entry projects.
XI. Keyboard Proficiency A. Numeric and alphabetic keyboard drills	Emphasize the importance of accuracy, memoriz rhythm, and correct fingering techniques. Do at the beginning of the practice sessions. A proficient, use timed exercises as a way of j (Ref. A, pp. 13-21)
B. Application projects	Use an autotutorial system to help students d (Ref. Dart's Card Punch Drills)

KEY-TO-DISK DATA RECORDERS

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, aut 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 inse
- Design a record format layout that contains automatic skipping and duplicating, left and numeric and alphabetic field definition and enter the format through the keystati
- Attain a minimum speed of 6,000 strokes per hour with no more than 10 corrections in verify assignment

TEACHING SUGGESTIONS

projects

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

iency
alphabetic
ilds

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)

projects

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

— • —

UNIT 6

KEY-TO-DISK DATA RECORDERS

his unit, the student should be able to:

ction of key-to-disk recorders
and alphabetic data using numeric and alphabetic field definition, automatic skipping, cation, and left-zero insertion
on in write, read, and verify modes
append operation
of 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
n speed of 6,000 strokes per hour with no more than 10 corrections in a 30-minute timed unit-
nt

CONTENT	TEACHING SUGGESTIONS
I. Introduction	Discuss briefly the various operations that ca
A. Functions	a key-to-disk system. Detailed explanations c
1. Creating new records	the specific topic is taught.
2. Modifying existing records	
3. Verifying existing records	
B. Advantages	Point out the advantages of a computer control
1. Computer controlled	to checking errors, coordinating functions, ar
2. Automatic format control	
3. Quiet operation	Compare the noise level of the key-to-disk sys
4. Large capacity	keypunch machine.
5. Some overlap of operations	
6. Simplified handling of media	Show how the total operation is speeded up be
7. Statistical feedback	does not handle any media.
II. Components of the Key-to-Disk System	Discuss how to initialize the system at the s
A. Supervisor station	
1. Console	Show a few sample production reports that can
2. Printer	supervisor station.
3. Tape unit	
4. System residence disk	Demonstrate and explain the data flow cycle f
5. Computer	tape.
B. Keystation	Discuss the various types of keystation that
1. Display unit	different machines.
2. Keyboard	
III. Keystation Concepts	Give a short demonstration of each operating
A. Operating modes	an understanding of the capabilities of the s
1. Write	explanations should be given when the differe
2. Read	are taught.
3. Verify	
B. Variable record length	Compare the advantages of a variable length r
	fixed length concept of cards.
C. Automatic format control	Relate the term program to format when descri
1. Keyboard shifting	

rders

g new records
ng existing records
ng existing records

r controlled
ic format control
peration
apacity
verlap of operations
fied handling of media
ical feedback

he Key-to-Disk System
station

hit
residence disk
er

unit
rd

epts
modes

ecord length

format control
rd shifting

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 superviser 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.

CONTENT	TEACHING SUGGESTIONS
2. Automatic functions	Explain the concept of prestoring the formats a number to identify each.
D. Keystation setup 1. Operator number 2. Batch number 3. Format number	Explain the need for using identifying numbe batch, and format. Assign a permanent numbe have him use this number for his operator, ba number. This method will minimize students i other.
	Explain with the aid of a chalkboard diagram on a disk and how the computer keeps track of
IV. Operating Features of Keystation A. Display unit 1. Power switch 2. Screen adjustments 3. Screen displays	Show how to adjust the video screen for comfo Show the various messages that may appear on explain in detail about each message at this
B. Keyboard 1. Indicators 2. Mode keys 3. Functional control keys 4. Data keys	Explain briefly the operation of the keyboard be already familiar with many of the function previous machines. If this is the first mach detailed explanations for the operations that key or 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	Enter the format for the first few assignment can concentrate on becoming familiar with the keystation. Introduce the various functions of a record f 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

omatic functions

ion setup
rator number
ch number
mat number

eatures of Keystation
unit
er switch
een adjustments
een displays

d
icators
e keys
ctional control keys
a keys

Operations (write mode)
ch
ning the keystation
ering data
First record of the batch
Balance of the batch
ing the batch

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 interferring 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.

CONTENT	TEACHING SUGGESTIONS
B. Batch append 1. Reopening a batch 2. Adding records 3. Closing the batch	Point out that the computer keeps track of th each batch entered so that only the batch num for a batch append operation. List the stude supervisor's printer so students can check th
	List the batch before and after it has been a
VI. Functions of the Read Mode A. Examine data just written	Have students change to read mode while enter the write mode and examine the data already r disk. Show students how to backspace to the
B. Examine data being verified	batch and how to read forward.
C. Independent read mode to scan a batch which has been closed	
VII. Automatic Format Control A. Functions 1. Record layout 2. Physical characterics of field 3. Control of automatic operation	Compare the functions of a record format with on a keypunch.
B. Designing a record format 1. Format layout form 2. Field descriptors	Assign a series of exercises so that the stud familiar with all the design functions.
C. Entering a record format through the keystation 1. Making corrections	Explain alternate format control at a later t Show how to correct an error if it is detecte • During the entry of the codes • After the field has been entered
2. Assigning a format number	List each format on the supervisor station p purpose. Cancel each format so the students numbers for all the exercises.
VIII. Verify Mode A. Functions	Have students record a batch of data. Then, demonstrate each of the functions performed

ders

d
ng a batch
records
the batch

e Read Mode
a just written

a being verified

read mode to scan
ch has been closed

t Control

layout
l characterics of

of automatic operation

record format
layout form
escriptors

record format
keystation
corrections

ng a format number

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.

37
A

CONTENT	TEACHING SUGGESTIONS
1. Checking for accuracy 2. Search operation a. Modify a record b. Delete a record c. Insert a record d. Continue an operation	Discuss the need for the search operation. S impractical to start at the beginning of a ba
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	Demonstrate the use of the reset and backspac correcting errors. Show how to close the keystation in mid-batch procedure would be used. Emphasize the impor the batch open when the keystation is unatten
IX. Keystation Operator Proficiency A. Numeric keyboard drills B. Alphabetic keyboard drills	Emphasize the importance of accuracy, memoriz rhythm, and correct fingering techniques. Do at the beginning of the practice sessions. A become proficient, use timed exercises as a w competency. (Ref. A, pp. 13-21)
C. Application projects 1. Alternate format control 2. Special features a. Auto-balance b. Check-digit control	Intersperse application projects with keyboar Take statistical reports from the supervisor students' progress in speed and accuracy. Ha each drill and project. Use an autotutorial system to help students d (Ref. Dart's Card Punch Drills)

TEACHING SUGGESTIONS

g for accuracy
operation
ify a record
ete a record
ert a record
tinue an operation

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

procedures
the batch
ng the record
or detection
or correction
Single character
Entire field
the batch

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.

ator Proficiency
board drills

keyboard drills

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)

projects
te format control
features
o-balance
ck-digit control

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 botton 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 rerecording.

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 inst

Coding: Assigning of letters, dig identify or classify data.

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

Common language: Code language or machines can "interpret."

Corner cut: A diagonal cut at one corners of a punched card. A a deck of cards uses this cor sure that the cards are all f

Data processing: The basic functi recording, classifying, sorti and transmitting information.

Duplication: The automatic punchi one card into the next, norma a card punch.

Field: One or more columns reser recording of data of a speci

File: A collection of related re a unit. When processing punc deck of cards related to the

Glossary

at the botton of the program drum
he drum into the socket of the

field which contains letters

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

ssing: A process where data are
minimum of human intervention.
ends on recording original
such a way that further use can
ithout later rerecording.

ss in which work is done with a
al effort, usually including
lf-control.

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

rt of a card processing machine
s to be processed are placed.

part of a card processing machine
s enter after they are processed.

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 insti
machine to perform certain

Program drum: A cylindrical dru
program card is fastened.

Program unit: The complete mecha
punch which holds the progr

Punching position: One of the 1
column into which a hole ma

Punching station: The place on
holes are punched into the

Reading station: The place on a
the holes punched into the

Record: A collection of related
processing punched cards, a
record.

Recording media: Punched cards,
magnetic disk or other mate
are recorded to be used as
cessing system.

Record format: A layout that sh
and physical characteristics
a record.

Reproducing: Punching data autom
set of cards into another se

Selecting: The process of extrac
of cards only those that co
desired data.

Sequencing: The process of arran
alphabetic or numeric order.

ical representation of a sequence
using a set of conventional

ifying or bringing together of
by a sorting machine.

nical, magnetic, electric, and
ces used for processing data.

which enters a machine for the
g processed or to aid in

ing on a card data that have been
.

e that a machine can "interpret."

nput/output device and storage
cular disk is coated with a
is capable of being magnetized.
ed as magnetic spots on tracks

nput/output device and storage
strip of tape is coated on one
stance that can be magnetized.
corded as magnetic spots along
ape.

g in sequence two sets of cards.

edge of the card parallel with
aing positions.

produced by a data processing
in the form of magnetic tape,
punched cards, or documents.

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 chec of data which is recorded.

Verifier: A machine which is usec accuracy of recorded data.

Unit record: A record in which a ing each item in a transactic one card.

Zone punch: One of the top three in a card column (12, 11 or

41

ied by manufacturers to assist
cient operation of electronic
nt.

at arranges or classifies
cording to a definite plan.

original paper on which are
ails of a transaction.

e automatic process of punching
ing data summarized from a

A machine used for the printing
on punched cards. It is also
ing machine.

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

(A) Bux, W. E. *Key-punch training course;* 3d ed. New Rochelle, N.Y. South-Western Publishing Co. 1975.

(B) Cashman, T. J. & Keys W. J. *Data processing;* 2d ed. New York, N.Y. McGraw-Hill Book Co. 1974.

(C) Crawford, F. R. *Introduction to data processing.* Englewood Cliffs, N.J. Prentice-Hall, Inc. 1968.

(D) Hanson, P. L. *Keypunching;* 2d ed. Englewood Cliffs, N.J. Prentite-Hall, Inc. 1970.

(E) International Business Machines. *Card punch practice exercises.* New York, N.Y. The Corporation. 1970.

(F) Walsh, J. E. & others. *Principles of data processing.* New York, N.Y. Pitman Publishing Corp. 1968.

(G) Wanous S. J., Wanous, E. E., & Wagner, G. E. *Fundamentals of data processing.* New Rochelle, N.Y. South-Western Publishing Co. 1971.

(H) ____ *Introductory data processing;* 2d ed. New Rochelle, N.Y. South-Western Publishing Co. 1973.

REFERENCE BOOKS

Cashman, T. J. & Keys, W. J. *in data processing.* Fulle Araheim Publishing Co. 19

Clow, Cletus & others. *Punc processing system;* 2d ed. McGraw-Hill Book Co. 1975

International Business Machi *IBM punched card data proc* The Corporation. 1971.

Keys, W. J. & Cashman, T. J. *data processing.* New York Book Co. 1968.

____ & Powell, C. H. *Handbo operations.* San Francio, Press. 1970.

Pactor, Paul & Kargilis, Geor *machine operation,* book 1. McGraw-Hill Book Co. 1968

____ *Card-punch machine ope* New York, N.Y. McGraw-Hil

Prosser, W. R. & Beldecos, H *projects.* Baltimore, Md.

Bibliography

REFERENCE BOOKS

unch training course;
chelle, N.Y.
Publishing Co. 1975.

Keys W. J. *Data processing;*
rk, N.Y. McGraw-Hill Book

Introduction to data processing.
fs, N.J. Prentice-Hall, Inc.

eypunching; 2d ed. Englewood
Prentice-Hall, Inc. 1970.

siness Machines. *Card punch*
ises. New York, N.Y. The
1970.

thers. *Principles of data*
ew York, N.Y. Pitman
p. 1968.

nous, E. E., & Wagner, G. E.
f data processing: New Rochelle,
stern Publishing Co. 1971.

y data processing; 2d ed. New
South-Western Publishing Co.

Cashman, T. J. & Keys, W. J. *Practice projects in data processing.* Fullerton, Calif. Araheim Publishing Co. 1970.

Clow, Cletus & others. *Punched-card data processing system;* 2d ed. New York, N.Y. McGraw-Hill Book Co. 1975.

International Business Machines. *Introduction to IBM punched card data processing.* New York, N.Y. The Corporation. 1971.

Keys, W. J. & Cashman, T. J. *Basic principles of data processing.* New York, N.Y. McGraw-Hill Book Co. 1968.

____ & Powell, C.H. *Handbook of modern keypunch operations.* San Franscio, Calif. Canfield Press. 1970.

Pactor, Paul & Kargilis, George. *Card-punch machine operation,* book 1. New York, N.Y. McGraw-Hill Book Co. 1968.

____ *Card-punch machine operation,* book 2. New York, N.Y. McGraw-Hill Book Co. 1973.

Prosser, W. R. & Boldecos, H.J. *Keypunch projects.* Baltimore, Md. H. M. Rowe Co. 1971.

Science Research Associates Inc. *Principles of business data processing;* 2d ed. Chicago, Ill. The Corporation. 1974.

Van Ness, R. G. *Principles of punched card data processing;* rev ed. New York, N.Y. Business Press. 1967.

Wanous, S. J., Wanous, E. E., & Hughes, A. E. *Introduction to automated data processing.* New Rochelle, N.Y. South-Western Publishing Co. 1975.

FILMS

Data processing: introduction. Coronet. 1972. 14 min. sound. color. Purchase - Coronet Films. Rent - Syracuse Films.

Data processing: introductory principles. Sterling. 14 min. sound. color. Purchase - Sterling Educational Films. Rent - Business Education Films.

Printing card punch. Sterling. 13 min. sound. color. Purchase - Sterling Educational Films. Rent - Business Education Films.

Programming the keypunch. Sterling. 13 min. sound. color. Purchase - Sterling Educational Films. Rent - Business Education Films.

TRANSPARENCIES

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

Basic punched card operations. Inc. one transparency. Purc Transparencies, Inc.

Card fields. United Transparen transparency. Purchase - Uni Inc.

Data processing system. Unite two transparencies. Purchase Inc.

Numeric sorting. United Transp one transparency. Purchase Inc.

PROGRAMED INSTRUCTIONAL UNITS

Card punch drills for Dart Syst Associates, Inc. four exerci Cardinal Associates, Inc.

IBM Printing card punch series Cardinal Associates, Inc. 12 Cardinal Associates, Inc.

ssociates Inc. *Principles of* *rocessing;* 2d ed. Chicago, ration. 1974.

Principles of punched card data ed. New York, N.Y. 1967.

nous, E. E., & Hughes, A. E. *automated data processing.* Y. South-Western Publishing

introduction. Coronet. 1972. color. Purchase - Coronet Syracuse Films.

introductory principles. in. sound. color. Purchase - ional Films. Rent. - Business

ch. Sterling. 13 min. sound. e - Sterling Educational Business Education Films.

eypunch. Sterling. 13 min. Purchase - Sterling ms. Rent - Business Education

g. United Transparencies, Inc. y. Purchase - United Transparencies,

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.

Numeric sorting. United Transparencies, Inc., one transparency. Purchase - United Transparencies, Inc.

PROGRAMED INSTRUCTIONAL UNITS

Card punch drills for Dart System. Cardinal Associates, Inc. four exercises. Purchase - Cardinal Associates, Inc.

IBM Printing card punch series for Dart System. Cardinal Associates, Inc. 12 lessons. Purchase - Cardinal Associates, Inc.