

Friden



Technical Manual for

2300 FLEXOWRITER **automatic writing machine** SERIES



Price \$2.00

Published by



FRIDEN
Sales Promotion Department
31 Prince Street
Rochester, New York 14607

Technical Manual for

2300

FLEXOWRITER *

automatic writing machine SERIES

Copyright 1966 by FRIDEN

*A Trademark of FRIDEN

FOREWORD

Since their first introduction in 1951, FLEXOWRITER automatic writing machines have taken the lead in the field of source data automation. Now in the fourth generation, the 2300 series of FLEXOWRITER writing machines have kept pace with this rapidly expanding field.

Developed through these years of experience, 2300 series automatic writing machines are available for every repetitive writing application, and every source data automation need. Up-to-date engineering and modern styling make these machines ideally suited to any office decor.

The 2301 FLEXOWRITER writing machine is the most sophisticated unit in the series. Its flexibility and adaptability to systems applications, coupled with the ability to connect a variety of auxiliary input and output units, have given it wide acceptance among modern business and industry.

For those who do not need the ultimate in capability, the 2302 FLEXOWRITER writing machine provides unusual flexibility in handling routine applications. Any of the auxiliary input units may be cable-connected to provide additional flexibility.

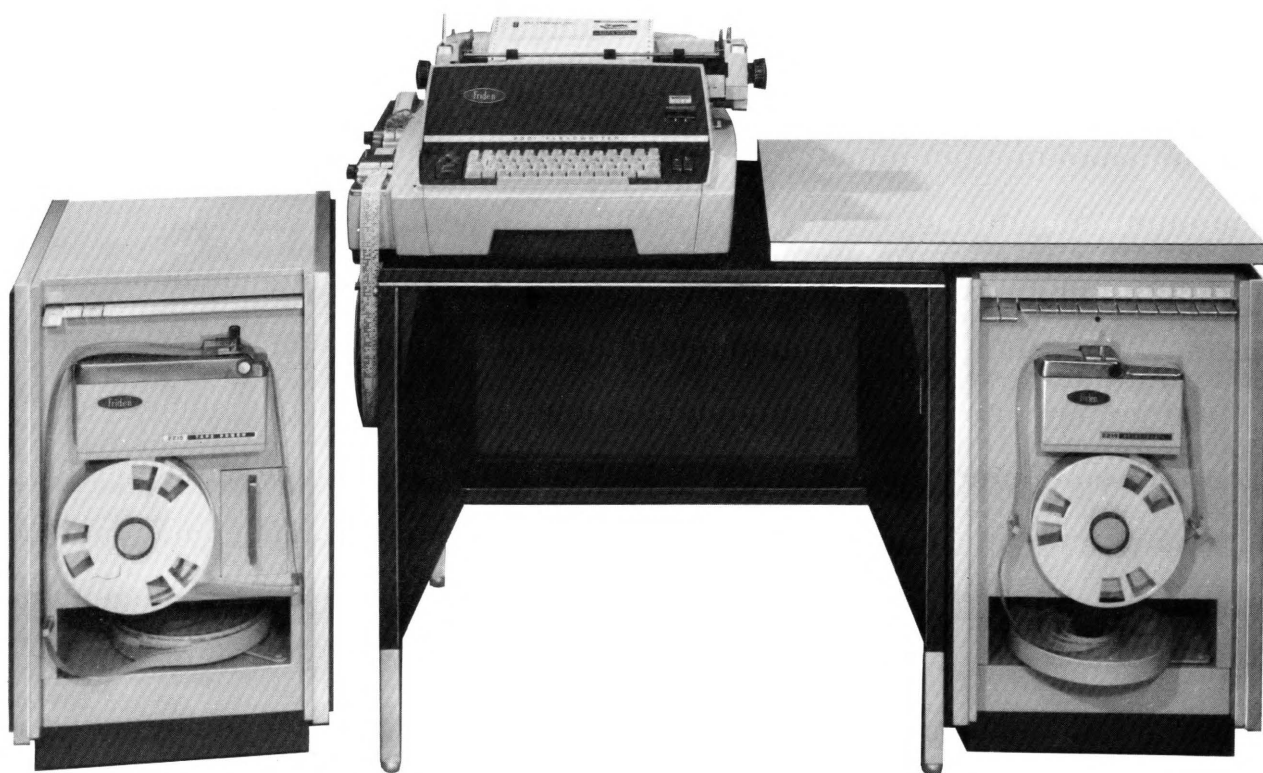
Repetitive writing jobs are easily handled with the 2303 and 2304 writing machines. The 2304 provides proportionally-spaced type styles, suitable to "executive" letterwriting and offset master preparation.

All units come equipped with a removable terminal connector to customize these machines for individual applications. Automatic writing speed on all 2300 series machines, through the medium of punched paper tape, edge-punched cards or tab cards, is at the rate of 145 words per minute.

This manual describes the specifications, operating features, terminal connector wiring and programming methods for all machines. Immediately following a general section, there is an individual section on each of the 2300 series writing machines. Information found in this manual should prove helpful to operators, programmers and systems specialists alike.

TABLE OF CONTENTS

| | | | |
|------------------------------------|----|---------------------------------------|----|
| SECTION I INTRODUCTION | | Auxiliary Functions | 19 |
| General | 1 | Terminal Connector | 20 |
| Model Designations | 1 | Programming | 25 |
| SECTION II SPECIFICATIONS | | Preliminary Approach. | 26 |
| General | 3 | Writing Machine Specifications . . . | 26 |
| Components | 3 | Programming Explanation. | 28 |
| Operating Speeds | 3 | Input/Output Connectors. | 34 |
| Control | 3 | SECTION V 2302 WRITING MACHINE | |
| Carriage | 4 | General | 35 |
| Keyboard. | 6 | Input/Output Versatility | 35 |
| Switches | 7 | Keyboard. | 35 |
| Console Panel | 7 | Switches | 36 |
| Terminal Connector | 8 | Type Styles | 37 |
| Ribbon | 8 | Punch Control | 37 |
| Tape Used | 8 | Console Panel | 37 |
| Code System. | 8 | Field Switch Control. | 38 |
| Tape Supply | 9 | Manual Control Keys | 38 |
| Machine Desk | 10 | Auxiliary Functions | 39 |
| SECTION III CUSTOMIZING FEATURES | | Terminal Connector | 40 |
| General | 11 | Programming | 44 |
| Edge-Punched Card Reader/Punch . | 11 | Preliminary Approach. | 45 |
| Automatic Card Reader | 11 | Writing Machine Specifications . . . | 46 |
| Pin Feed Platens | 12 | Programming Explanation. | 48 |
| Electric Line Finder | 12 | Input Connector | 52 |
| Flexofeed | 12 | SECTION VI 2303/2304 WRITING MACHINES | |
| SECTION IV 2301 WRITING MACHINE | | General | 53 |
| General | 13 | Keyboard. | 53 |
| Input/Output Versatility | 13 | Switches | 56 |
| Keyboard. | 13 | Console Panel | 56 |
| Switches | 14 | Manual Control Keys | 56 |
| Type Styles | 15 | Terminal Connector | 57 |
| Keyboard Punch Control. | 15 | Programming | 59 |
| Field Punch Control. | 16 | Preliminary Approach. | 59 |
| Skip Tab | 16 | Program Explanation | 60 |
| Console Panel | 17 | APPENDIX | |
| Manual Control Keys | 18 | Publications and Education | 63 |



2301 FLEXOWRITER automatic writing machine (with optional edge card punch and reader) on Desk, with Selective Reader and Auxiliary Tape Punch.

SECTION I

INTRODUCTION

GENERAL

FLEXOWRITER automatic writing machines produce high quality, typewritten documents, either from manual keyboard operation, or automatically from coded punched tape, edge-punched cards or Hollerith coded tab cards. In addition, writing machines can cause selective code punching of tapes or cards as a by-product of document preparation. Several models are available for repetitive writing tasks, data processing applications, or both.

This manual describes the 2300 FLEXOWRITER automatic writing machine series, the various models, and features common to all units. Additional sections describe and illustrate each model individually.

MODEL DESIGNATIONS

There are four models of the 2300 series of FLEXOWRITER automatic writing machines, described below.

2301 (PROGRAMATIC* Model). This model encompasses the full range of programming features and capabilities, including selective punch control, automatic and manual non print, tape skip, field punch control, skip tab, and auxiliary input and output unit con-

nectors. One auxiliary input and one output connector is provided.

2302 (PROGRAMATIC Model). This model includes the basic programming features of selective punch control, manual non print, two field switches for programming purposes, and an auxiliary input connector.

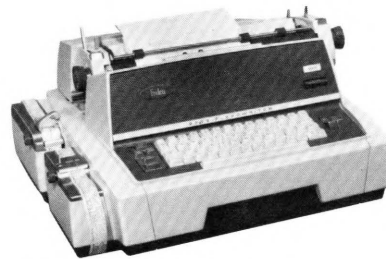
2303. Intended for repetitive writing assignments, this model includes a monospacing writing machine, tape punch and tape reader.

2304. While basically the same unit as the 2303, the 2304 differs in that it is a proportional spacing machine, designed for executive letter writing applications. A carbon ribbon mechanism is standard on this unit.

The frontispiece illustrates the appearance of the 2301 with machine desk and auxiliary input and output units. Figure 1 shows the appearance of the 2302 and 2303 FLEXOWRITER writing machines. Tape only reader and punch is standard on all models of the 2300 series. However, all can come equipped with edge-punched card reader and punch. 2301 and 2302 writing machines can be equipped with a Hollerith-coded, deck-fed, tab card auxiliary reader as optional equipment.



2302 FLEXOWRITER
automatic writing machine



2303 FLEXOWRITER
automatic writing machine

Figure 1. 2302 and 2303 Automatic Writing Machines.

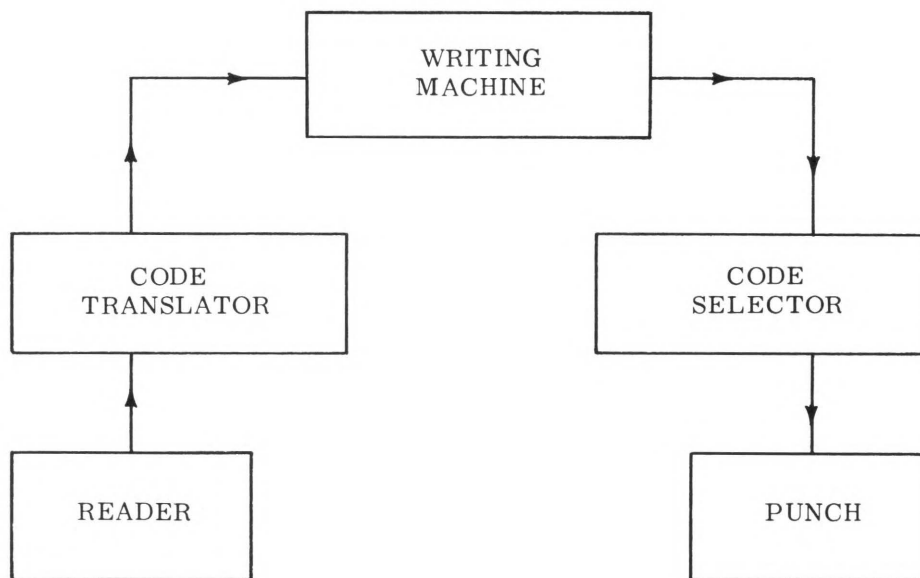
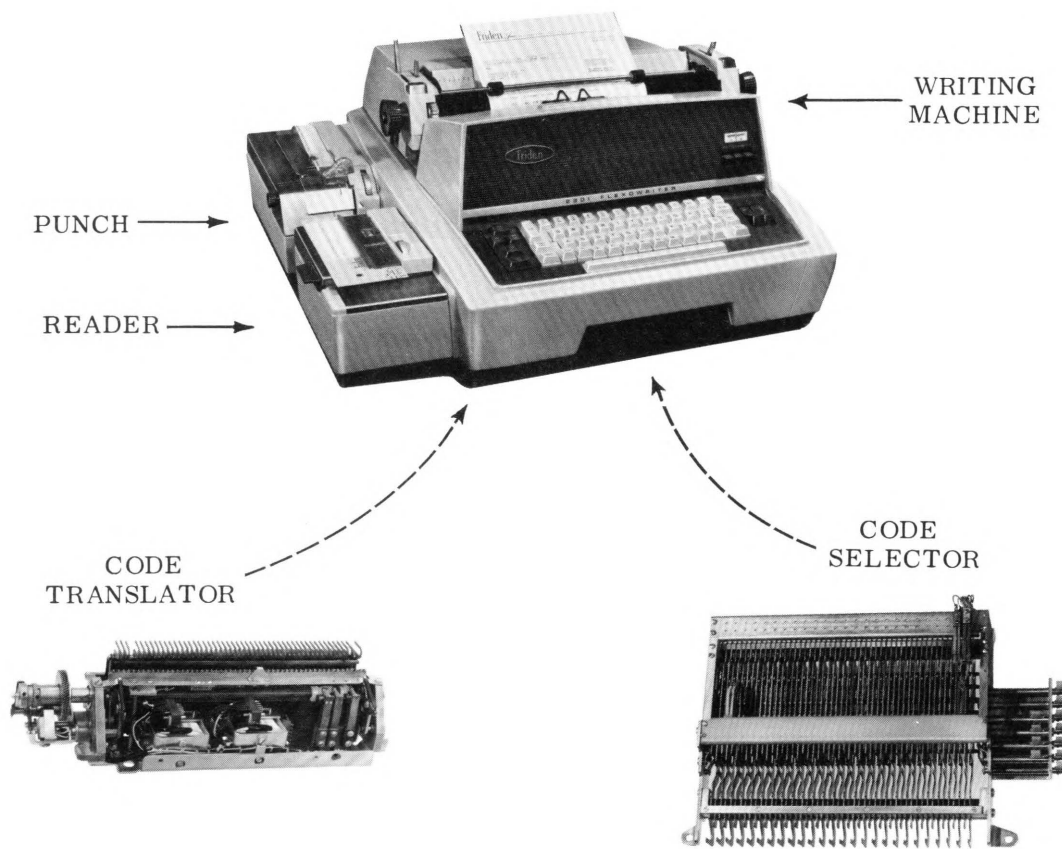


Figure 2. 2300 Series Components, Illustrated.

SECTION II

SPECIFICATIONS

GENERAL

To provide for maximum flexibility and reliability, the 2300 series of FLEXOWRITER automatic writing machines were designed and engineered as heavy duty units. These heavy duty characteristics enable the machines to withstand many years of sustained high-speed operation.

Information contained in this section describes the specifications common to all 2300 series writing machines; individual model characteristics are described in subsequent sections. Below is a list of general specifications for the writing machines:

- Power - 110-115 volt, 60 Cycle AC
- Weight - 105 lbs. (approximately)
- Size - 22-1/2" Length, 10" high,
22-3/4" wide
- Color - Dark Gray, Sandalwood

COMPONENTS

Five basic components make up the 2300 series of automatic writing machines (see figure 2): the reader, code translator, writing machine, code selector, and punch.

Reader. Mechanically senses codes punched in tape or cards, and converts each code into a series of electrical impulses which are sent to the code translator.

Code Translator. Converts the electrical impulses from the reader into a mechanical action of the writing machine to cause a key-lever to be operated.

Writing Machine. Contains the power supply, the keylevers, and all necessary equipment to allow 2300 series units to write a document and perform other functions.

Code Selector. When a keylever on the machine is activated, either manually or

automatically by action of the code translator, the code selector converts this action into a series of electrical impulses which are sent to the punch.

Punch. If the punch is on at the time these impulses are received, the code assigned to that keylever may be punched (depending upon other machine controls).

In the 2300 series, this sequence is considered to be the normal reading/punching mode of operation. However, on some models, certain functions may alter or by-pass this sequence.

OPERATING SPEEDS

Reading (code sensing) speed of 2300 series writing machines is 730 codes per minute. This will provide automatic typing of documents at the rate of 145 (five-letter) words per minute.

The keyboard can be manually operated to cause code punching at a speed of 1000 codes per minute, or approximately 200 words per minute. In addition, it will handle any two successive keylever operations occurring at the rate of 1200 per minute.

CONTROL

Specific operation of the 2300 series writing machines is controlled from the keyboard, a removable terminal connector, and a removable field switch (2301 and 2302 only) and tab rack (see figure 3).

Keyboard. All manual entries and operator control of machine functions are handled through keyboard operation.

Terminal Connector. A 50-point terminal connector is located under the rear cover. The capacity of this connector varies, according to the writing machine model, and a description is included in each unit section.

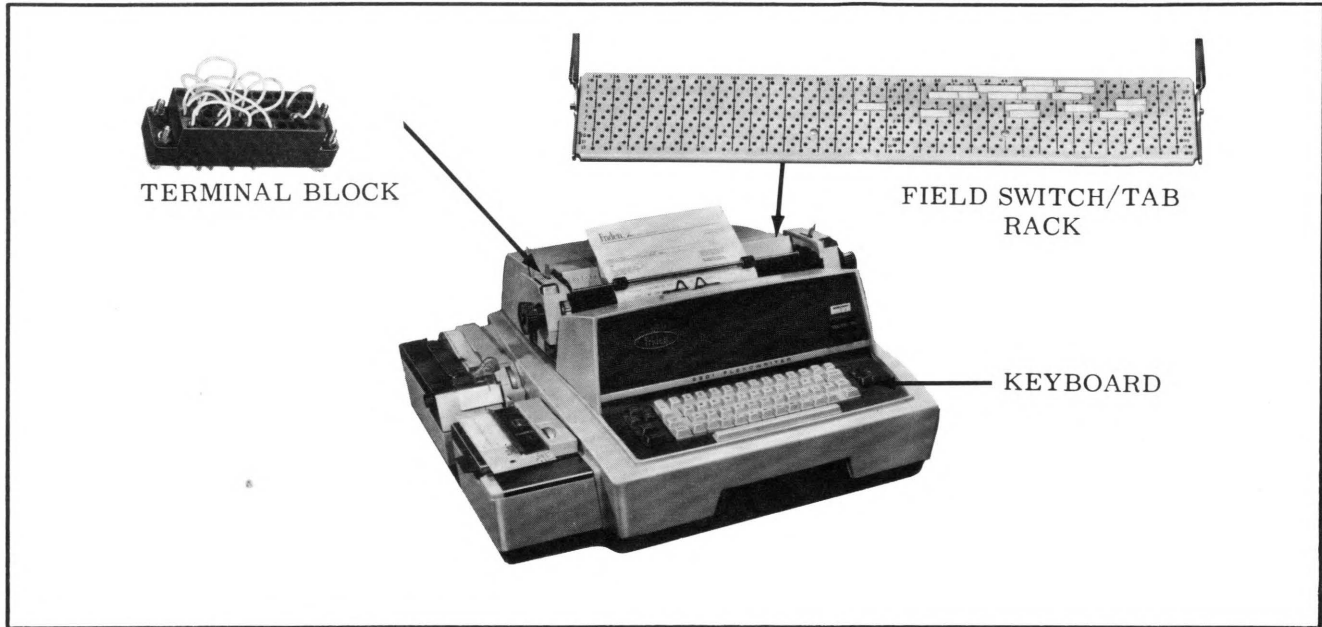


Figure 3. 2301 (with Optional Edge-Punched Card Reader and Punch) Control Features.

Field Switch/Tab Rack. All 2300 series machines have a removable tab rack for the manual placement of tab stops along its length. (Tabulation is further described on page 6.) However, racks on the 2301 and 2302 also provide for the modification or initiation of certain machine functions. A complete description of the capacity and uses of field switches is described in Section IV (2301), and in Section V (2302).

CARRIAGE

A 16-inch carriage (see figure 4) is standard on 2300 series writing machines, although a 20-inch carriage is available as an optional feature. The following chart lists the maximum paper size and writing line for both carriage lengths.

| CARRIAGE LENGTH | MAXIMUM PAPER SIZE | MAXIMUM WRITING LINE |
|-----------------|--------------------|----------------------|
| 16" | 14 3/16" | 13 9/16" |
| 20" | 18 3/16" | 17 9/16" |

Following, are the various standard features located on the carriage:

Carriage Release Buttons. Located on both

sides of the carriage. When depressed, they allow the carriage to be moved freely, and to be manually positioned at any point to the right of the margin stop.

Margin Stop. Fixes the extreme point of right carriage movement. The margin stop may be manually set at any letter space along the margin rack.

Paper Release Lever. When moved from its rear position to the front position, all pressure on the platen is released, and the paper in the platen moves freely. This lever is normally used to adjust horizontal alignment of forms as they are inserted into the writing machine platen.

Multiple Copy Control Lever. Moves the platen back and forth to compensate for the thickness of multiple documents and carbons. As a general rule, this lever should be in the forward position (toward the operator), when at least one thickness of paper is being typed. Advance the lever for additional thicknesses, as needed to prevent unwanted embossing.

Platen. Supplied in various sizes and degrees of hardness for different types of document preparation.

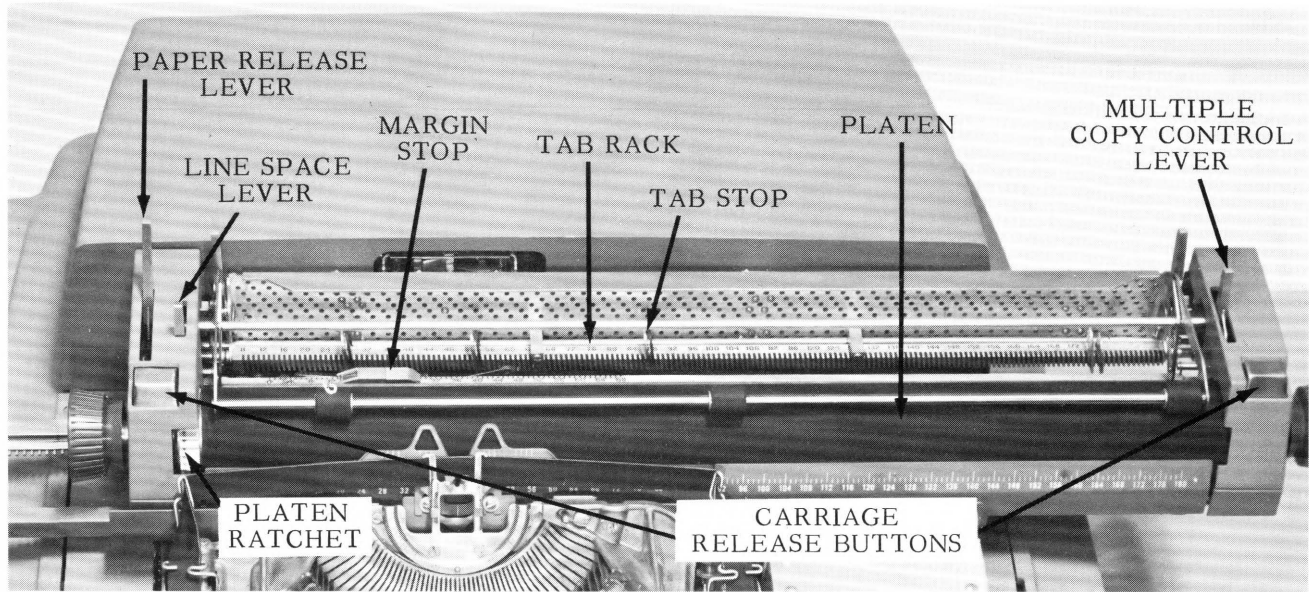


Figure 4. Carriage Showing Standard Features.

Platen Ratchet. Controls the vertical line spacing of type on the document. A 33-tooth ratchet is standard, and gives six lines to the inch. However, platens are available in a variety of ratchet spacing, giving more or less lines to the vertical inch.

To select the correct platen ratchet for other than standard line spacing, the chart shown in figure 5 is used. First count (or select) the number of lines in 10 inches of copy. Then move the decimal point one place to the left, and find the nearest number on the chart. The platen ratchet part number is located in the first column on the same line as the number selected.

Certain platen ratchets are interchangeable. Additional platens with different ratchets are purchased to provide a variety of line spacing for different applications. Below is a list of interchangeable ratchets:

29, 33, 38, 44, and 49
36, 39, and 40
50, 51, 52, and 57
55 and 58
62 and 66

Line Space Lever. Selects single and double line spacing.

Tab Rack. Provides for right to left carriage movement to predetermined points. The tab rack is part of the removable field switch rack, as tabulating positions often change with the application. Tabulation is initiated by the TAB keylever (see page 6), and is terminated by the manual placement of tab stops along this rack. Tab stops may be placed at any letter space position along this rack, but the minimum movement must be at least two letter spaces. Further information is given with the description of the TAB keylever.

| PLATEN RATCHET PART NUMBER | NO. OF TEETH | 1 TOOTH | 2 TEETH | 3 TEETH | 4 TEETH | 5 TEETH |
|-------------------------------------|-----------------|------------|------------|------------|------------|------------|
| 1042527 | 27 | 4.91 | 2.46 | 1.64 | | |
| 1042529 | 29 | 5.28 | 2.64 | 1.76 | | |
| 1042533 | 33 | 6.00 | 3.00 | 2.00 | | |
| 1042536 | 36 | 6.55 | 3.27 | 2.18 | | |
| 1042538 | 38 | 6.91 | 3.46 | 2.30 | | |
| 1042539 | 39 | 7.09 | 3.55 | 2.37 | | |
| 1042540 | 40 | 7.28 | 3.64 | 2.43 | | |
| 1042544 | 44 | | 4.00 | 2.66 | 2.00 | |
| 1042544 | | 8.00 | 4.00 | 2.66 | | |
| 1042548 | 48 | | 4.37 | 2.91 | | 1.75 |
| 1042549 | 49 | | 4.46 | 2.97 | | 1.78 |
| 1042550 | 50 | | 4.55 | 3.03 | 2.27 | |
| 1042551 | 51 | | 4.64 | 3.09 | 2.32 | |
| 1042552 | 52 | | 4.73 | 3.15 | 2.37 | |
| 1042555 | 55 | | 5.00 | 3.33 | 2.50 | |
| 1042557 | 57 | | 5.18 | 3.46 | 2.59 | |
| 1042558 | 58 | | 5.28 | 3.52 | 2.64 | |
| 1042559 | 59 | | 5.37 | 3.58 | 2.68 | |
| 1042562 | 62 | | 5.64 | 3.76 | 2.82 | |
| 1042566 | 66 | | 6.00 | 4.00 | 3.00 | |

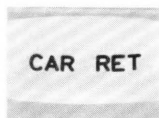
Figure 5. Platen Ratchet Chart.

KEYBOARD

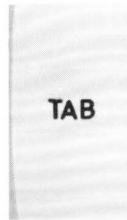
Keyboards vary according to individual models, and each will be explained in detail in subsequent sections. Figure 6 shows a keyboard layout with keys common to all 2300 series units.

Either a single case or a double case keyboard is available for each model. The standard single case keyboard provides for typing of capital alphabetic characters only, numbers and special characters. The double case keyboard provides for typing of both capital and small alphabetic characters, as well as numbers and special characters. In both variations, the keyboard is divided into two parts: printing and format control keylevers, and manual control keys.

Printing and Format Control Keylevers. There are 45 keylevers capable of causing either the printing of alpha-numeric and special characters, or a related machine function. While printing characters will vary according to the model, each keyboard may have six format control keylevers including the space bar. These are as follows:



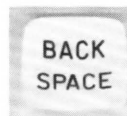
CAR RET (Carriage Return) - When operated manually, or automatically by the Carriage Return code, this keylever causes the carriage to return to the left margin. The document is indexed for one or two line spaces, depending upon the setting of the line space lever (see figure 4).



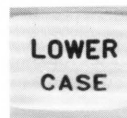
TAB - Manual or automatic operation of the TAB keylever causes right to left carriage movement at high speed. Termination is determined by the placement of tab stops in the tab rack (see figure 4).



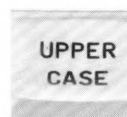
Operation of the space bar, either manually or automatically, causes the carriage to move one letter space forward (right to left).



BACK SPACE - (not on 2301) Operation of this keylever, either manually or automatically, causes the carriage to move one letter space in reverse (left to right).



LOWER CASE - On double case keyboards, this keylever shifts the type basket to the lower case position. Those alpha-numeric and special characters in the lower case position can then be typed. Since these differ according to the machine model, each keyboard will be explained in subsequent sections.



UPPER CASE - On double case keyboards, this keylever shifts the type basket to the upper case position. Those alpha-numeric and

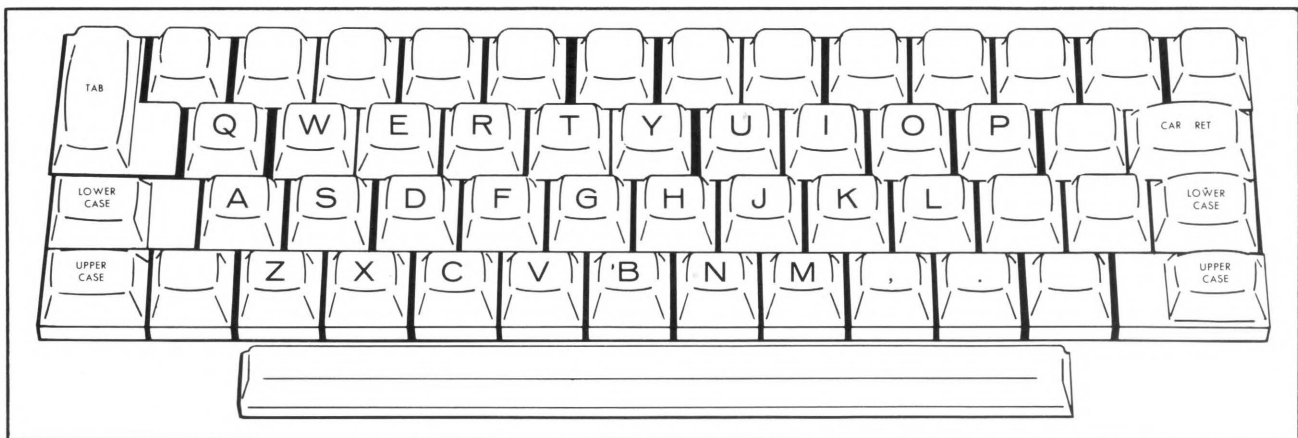


Figure 6. Standard 2300 Series Keyboard

special characters in the upper case position can then be typed. Since these will differ according to the machine model, each keyboard is explained in subsequent sections.

Duplicate LOWER CASE and UPPER CASE keylevers are provided on both sides of the keyboard. While the standard type basket contains both upper and lower case characters, it may be ordered (or field modified) so as to be locked always in one shift position. Where this modification has been done, manual or automatic operation of the case shift keylevers will not shift the type basket. Keylever tops are ordinarily replaced with different caps reading "I" (lower case) and "II" (upper case).

Manual Control Keys. This group of keys, located at the extreme left of the keyboard, (see figure 7) is used for manual control of automatic writing machine operations. A maximum of five switches may be included in this group. While these may vary according to the model, three of these switches are common to all 2300 series units.



Figure 7. Manual Control Keys (2301).

START READ - When touched and released, starts the reading action in the writing machine reader. Holding this switch depressed, temporarily stops the reading action until it is released, allowing the operator to pulse codes through the reader one at a time.



STOP READ - When touched, all action of the writing machine reader will stop.



TAPE FEED - Feeds tape through the punch for as long as this key is held depressed. The punch does not have to be on for this function to occur. TAPE FEED is used to provide leader and trailer strips for punched tape. It can also be used to delete incorrect codes.

SWITCHES

There are two manually-operated, butterfly-type switches (see figure 8) located at the extreme right of the keyboard.

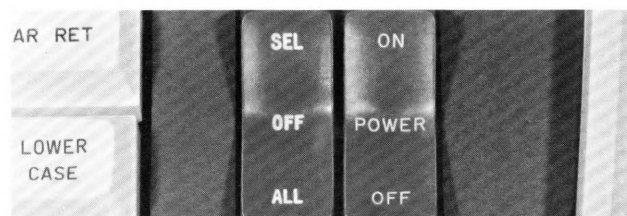


Figure 8. Switches (2302).

Power. Depending upon the model designation, this is either a two or a three-position switch. Its essential purpose is to turn power on or off in the automatic writing machine.

Punch Control. Also dependent upon the model designation, this is a two or a three-position switch, used to control the tape punching mode of the writing machine.

CONSOLE PANEL

This panel (see figure 9) is located at the right side of the machine, above the power and punch control switches. It contains at least one indicator light, and from one to three program modification switches.

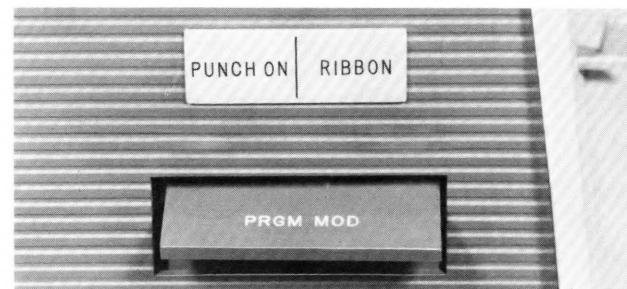


Figure 9. Console Panel (2304).

Indicator Light(s). All 2300 series units will have at least one indicator light which glows when the integral punch is on. Other indicator lights are used on certain models to indicate the condition of an auxiliary output unit. These other lights are explained in subsequent sections.

Program Modification Switch(es). All 2300 series units will have at least one program modification switch. A maximum of three locking-type or momentary switches can be located in this area. These switches are used to provide for minor program changes through terminal connector wiring. Since the use and capability of these switches will differ with each writing machine model, they are described specifically in subsequent sections of this manual.

TERMINAL CONNECTOR

A removable terminal connector (see figure 10) is located under the rear cover of all 2300 FLEXOWRITER writing machine series. This connector, 2 9/16 inches by 3/4 inches, contains four rows of hubs (holes), alternating between 12 and 13 hubs in each row, for a total of 50 hubs. It is wired for the purpose of qualifying certain machine functions. Its capacity varies with the writing machine model, and an explanation including wiring concepts is described in Sections IV, V, and VI.

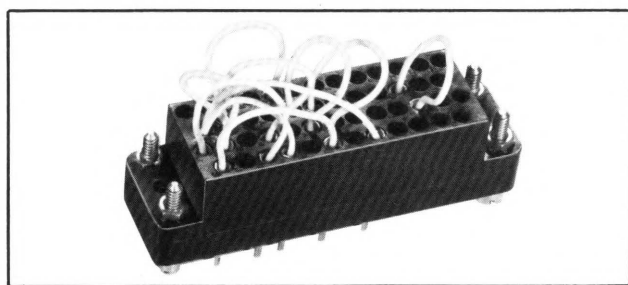


Figure 10. Terminal Connector.

RIBBON

Each FLEXOWRITER writing machine, except the 2304, comes equipped with a black-inked nylon ribbon. The ribbon is 18 yards long, and has special strength, long wearing qualities, and rapid ink recovery. Other ribbons for special applications are available.

A carbon ribbon mechanism is standard on the 2304 FLEXOWRITER writing machine. The standard carbon ribbon is 900 feet long, and has a polyethelene base. It provides clear, sharp images for all forms of composition work. Other carbon ribbons are available for special applications.

A manually-operated three-position switch, the ribbon position lever, is located on the right side of the machine. This switch is used to select between the upper and lower halves of fabric ribbon: The center position disengages the ribbon for stencil and other master preparation.

TAPE USED

A one-inch wide tape (see figure 11) is used and is punched with an eight-unit code. Tapes of various materials are supplied by FRIDEN, INC. Code hole positions are numbered 8-7-6-5-4-3-2-1 from left to right across the width of the tape. Feed holes assure positive positioning of the tape in the reader and punch. They are located between the third and fourth code holes, .394 inches from the right (guide) edge of the tape, and are in line with the code holes.

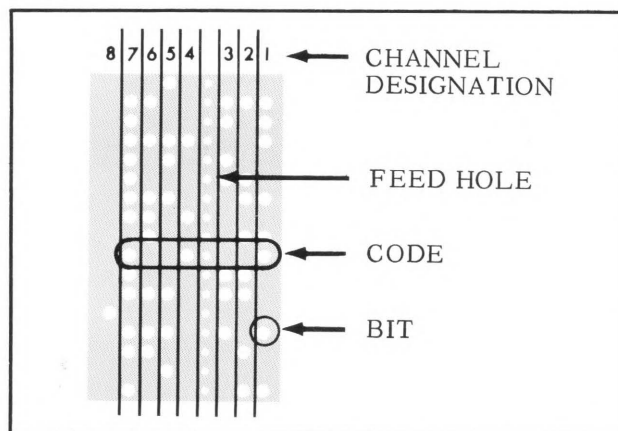


Figure 11. 8-Channel Punched Tape.

CODE SYSTEM

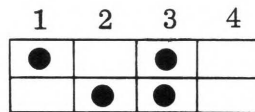
The 8-channel code, used by 2300 FLEXOWRITER writing machine series, is a binary-coded decimal system. It is often referred to as a common-language code, as it is compatible with a variety of machines, manufactured by FRIDEN, INC., and many other data processing machine manufac-

turers. Eight-channel punched tape, produced on the 2300 series, may be used to operate tape-to-card converters, be transmitted over private and leased wire systems, be used for conversion to other code structures, control machine tools, and it may operate automatic plate embossing machines, and a variety of other data processing equipment. This coding system features 256 code combinations available, and is applicable to odd-count parity systems.

256 Code Combinations. In any binary type code, there are two conditions, either a hole is punched, or no hole is punched for each code hole position (channel). For example, if a 1-channel tape existed, there could be only two possible code combinations, either the presence or the absence of a hole.



A 2-channel tape would have four possible code combinations:



Similarly, a 3-channel tape would have eight possible code combinations; 4-channel tape, 16; 5-channel tape - 32; 6-channel tape - 64; 7-channel tape - 128; and in 8-channel tape there are 256 possible code combinations.

The code for any character or function is made up of a combination of punching in the eight channels. For instance, the code for the letter "A" is a combination of punching in channels 1, 6, and 7.

A code chart, listing all of the 8-channel codes is located on page 66 of this manual.

Odd-Count Parity. Of the 256 possible code combinations, only 65 are actually used in the 2300 series of FLEXOWRITER writing machines (code chart, page 66). Each of the codes used is made up of an odd number of code holes (bits). Punched tape from 2300 series writing machines is designed to be

used with machines employing odd-count parity checking circuits. This is a method of determining the validity of codes. Valid codes will have an odd number of bits (one, three, five or seven); invalid codes will have an even number (two, four, six or eight).

The tape punch on all 2300 series writing machines has a high degree of reliability. If for any reason, a mechanical malfunction should occur that could cause one of the punch pins to fail to operate, an even number of code bits would be punched. Odd-count parity circuitry provides a check against mechanical failure of the punch. This circuitry is available on all models, either as a standard feature on the 2301, or as an optional feature on the other models.

TAPE SUPPLY

Tape is supplied to the punch from a special holder on the back of the machine, or from a source outside the machine. The latter can be the machine desk described in this section, or some other appliance for this purpose. In any case, tape feeds from a roll, approximately 1000 feet in length, through the punch unit. Several checks provide positive feeding and registration during this process (see figure 12).



Figure 12. 2301 on Desk-Rear View with Left Desk Top Removed.

Tape Guide. Serves to provide a smooth, even flow of tape to the punch. It prevents kinks or tears from occurring as tape is being fed from the supply spool.

Tape Tension Arm. Acts as a safeguard against tape feeding failure due to obstructions in feeding. If the tape should become obstructed, or when a certain pre-set tension is exceeded, this arm will cause the machine to become locked against further operation until corrective measures are taken by the operator.

Tape Hold Down Arm. Provides sufficient pressure against the tape in the punch to insure positive engagement of the feed holes with the feeding mechanism. If this arm is not closed, the keyboard will lock until the situation is corrected.

Keylever Interlock. This feature prevents the accidental manual operation of more than one keylever at a time. It insures that codes cannot be overlapped or punched on top of each other.

Electrical Accuracy Check. If the keyboard is operated in any manner that might cause inaccurate punching, this feature will cause the keyboard to become locked against further operation. Touching TAPE FEED (a manual control switch) will restore normal operation.

MACHINE DESK

A steel desk (see figure 13) with wear-resistant Formica top and satin-finished alumi-

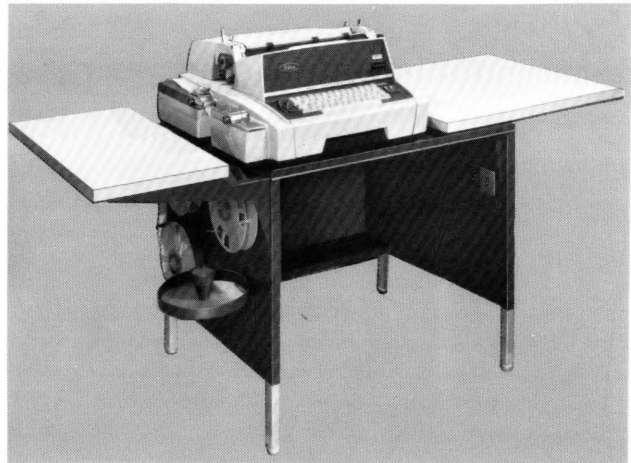


Figure 13. The 2301 on Machine Desk.

num trim is optional equipment. This desk was designed especially for the 2300 series of FLEXOWRITER writing machines, and contains electrical provision for all tape handling equipment and auxiliary input/output units. The desk is 24 1/2 inches deep, 63 11/16 inches wide with both desk tops. Height from the floor to the machine is 25 9/16 inches. The left desk top (optional) is removable to expose tape handling equipment. This equipment consists of a tape supply spool, unwinder, powered rewind reel, and a removable bin to hold edge cards.

Two switches are provided: a master switch for the 2300 writing machines and all connected equipment, and a separate switch for the powered rewind reel. Figure 12 shows a rear view of the machine desk with the left desk top removed.

SECTION III

CUSTOMIZING FEATURES

GENERAL

Provisions have been built into the 2300 series units to permit customizing these machines to meet particular application requirements. There are several optional features which may be incorporated into any of these units. This section describes these optional features.

EDGE-PUNCHED CARD READER/PUNCH

An edge-punched card reader and/or punch can be installed on any writing machine in place of the standard tape only reader and punch. Figure 14 illustrates the appearance of these units. Both reader and punch can use either tape or edge-punched cards.

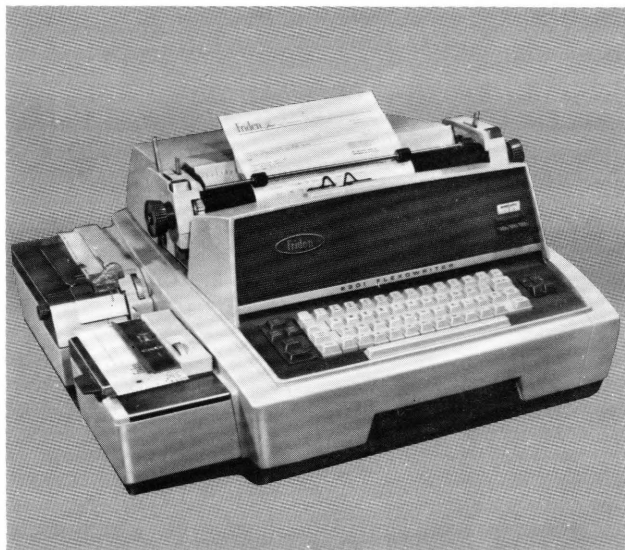


Figure 14. 2301 with Edge-Punched Card Reader and Punch.

Edge-punched cards are encoded along one or two edges with the same 8-channel code as is punched into tape. Speed of insertion and simplified filing methods, make edge-punched unit record cards particularly well adapted to systems applications. For letter-writing applications, edge-punched cards can be used to contain paragraphs and standard information.

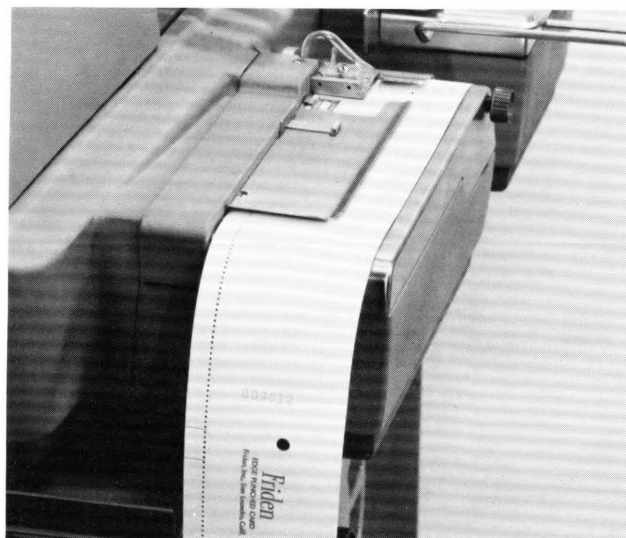


Figure 15. Edge Card Punch (Rear View).

With edge-cards in the punch (see figure 15), the TAPE FEED key operates in a slightly different manner. Touching and releasing this key will cause the next edge card to advance to the first punching position, punching feed holes only.

This means that edge cards cannot be corrected in the same manner as tape. TAPE FEED cannot be used. Instead, wrong codes are overpunched with the "C" keylever and the AUX CODE switch. This will insure deletion of any code.

With tape in the punch, the TAPE FEED switch operates normally. It punches the Tape Feed (Delete) code continuously, as long as it is held depressed.

AUTOMATIC CARD READER

The 2313 Automatic Card Reader (see figure 16), is a specialized unit which reads standard Hollerith coded punched cards, causing automatic operation of the connected writing machine. It is equipped with a card feed system which provides automatic feeding and ejection. In addition, the design of the

unit allows hand feeding of single cards, or large decks of cards by the operator.

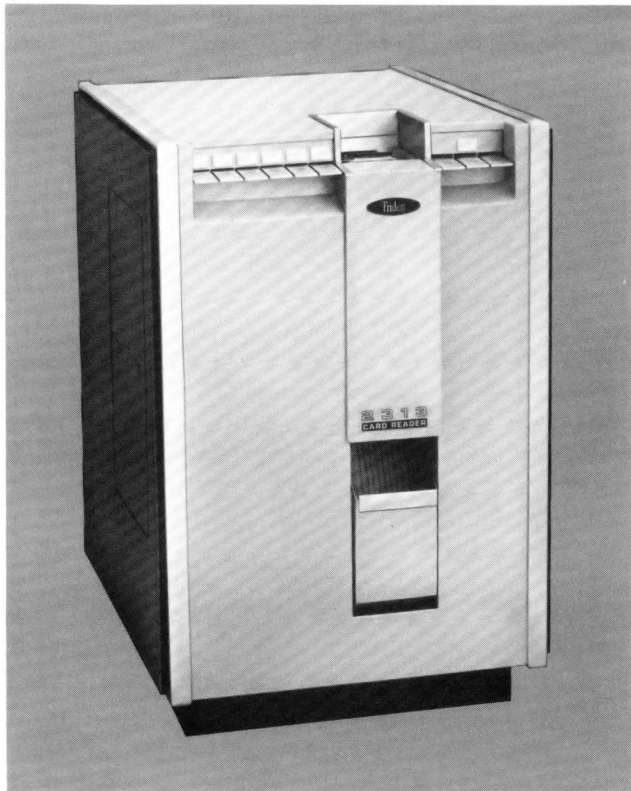


Figure 16. 2313 Automatic Card Reader.

Basically, the automatic system consists of feeding cards from a 200 card capacity hopper to a reader that translates the Hollerith code to the writing machine language, causing automatic typing and other machine functions. Cards are then ejected from the reader to a 200 card capacity stacker.

Further flexibility is provided because the 2313 Automatic Card Reader can be connected to the writing machine in either of two ways. It can be connected to a special connector on the machine stand and functions as the standard tape reader. In this manner, it operates as an integral reading unit. Or, it can be connected to the auxiliary input connector (on the 2301 and 2302 only) to operate as an auxiliary reading unit.

Program flexibility is provided through the removable program control cylinder and removable terminal block. Both are located within the unit, and can easily be inserted or removed by the operator.

Four separate programs can be had on the control cylinder. Cards can be coded so there is automatic switching from one program to another. As a result, the 2313 Automatic Card Reader can accept four different card formats, intermixed in random fashion, and process each format according to a different program.

PIN FEED PLATENS

These platens are available for factory or field installation. They are special in that they have retractable pins at either end to accommodate continuous forms that are perforated on both sides to match the pins. Designed by many different forms companies to fit specific applications, the forms themselves are usually made up of multiple copies interleaved with carbon paper.

Positive registration is the main advantage provided by the use of pin feed platens. The writing areas match exactly on the original and all carbon copies. Also, the operator does not have to align each form separately.

A 33-tooth ratchet is standard on all pin feed platens, giving six lines to the vertical inch. However, 44, 55, and 66-tooth ratchets are available for these platens.

ELECTRIC LINE FINDER

An electric line finder may be installed. It includes the pin feed platen, and is used to simplify the handling of continuous forms. An electric motor powers platen movement so that only one operation is necessary to move from one writing line to the next, wherever it is located on the form.

FLEXOFEED

The Flexofeed by FRIDEN makes use of the standard platen, but allows both continuous and standard forms of different widths to be used, interchangeably. When the Flexofeed is in position on the carriage, continuous forms, perforated on both sides, may be used. Otherwise it is easily detached to accommodate standard forms. The Flexofeed is hand-adjustable to any width form.

SECTION IV

2301 WRITING MACHINE

GENERAL

The 2301 FLEXOWRITER automatic writing machine (see figure 17) is the most sophisticated unit within the 2300 series. It offers a full range of programming capabilities that make this unit easily adaptable to the most irregular and complex business paperwork requirements. Included as standard features on this model are selective punch control by code and carriage position, manual and automatic non print, tape skip, skip tab, and input/output connector facilities.

All of the general specifications of the 2300 series, described in Section II, apply to the 2301 writing machine. This section describes the specific operating features of the 2301.

INPUT/OUTPUT VERSATILITY

Either of two readers are available as component parts of the 2301. A tape reader is

standard, while an edge-punched card reader is optional. Manual input is by operation of the writing machine keyboard.

Either of two punches provide punched tape output. An integral tape punch is standard; and edge card punch is optional. Output in the form of a printed document is part of 2301 operation.

In addition, the 2301 contains an input and an output connector for cable-connecting auxiliary input and output units, either separately or simultaneously for further flexibility. There is a variety of different auxiliary input and output units available. Combinations of these provide a wide range of application flexibility.

KEYBOARD

Two basic keyboard variations are available. Figure 18 illustrates the standard double case keyboard arrangement. Forty-

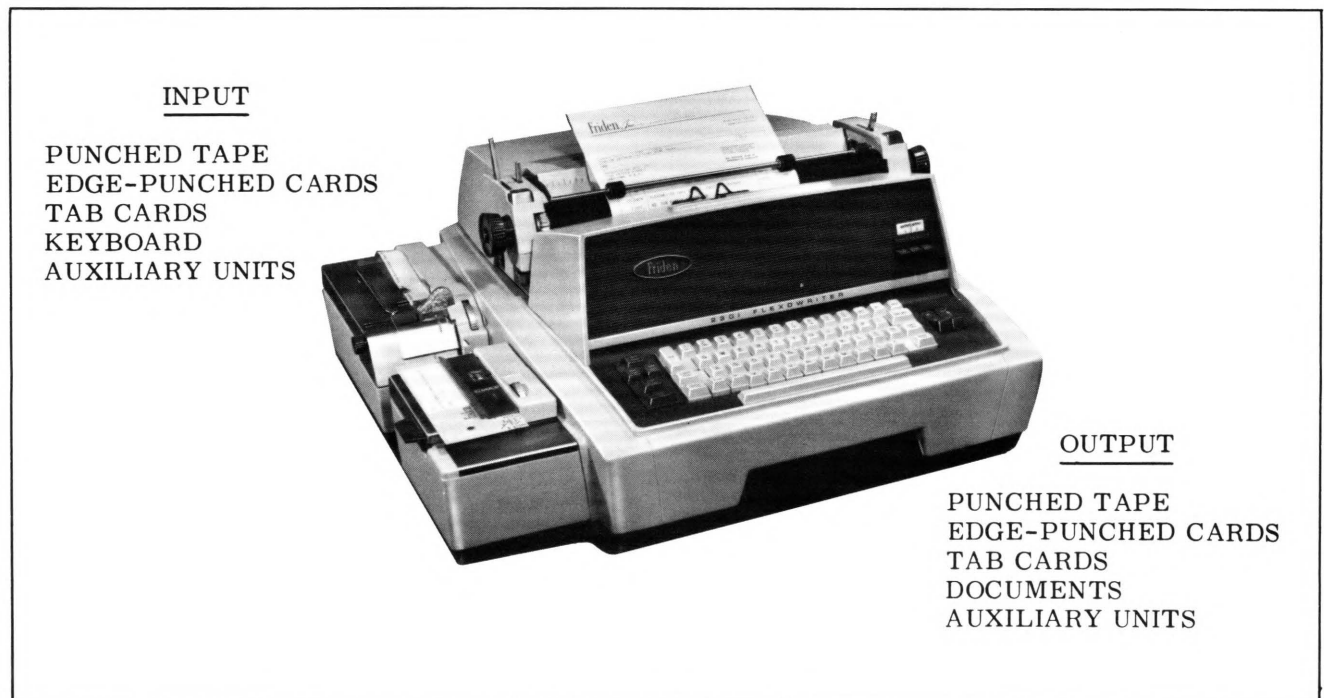


Figure 17. 2301 FLEXOWRITER Writing Machine.



Figure 18. 2301 Keyboard (Double Case).

two printing keylevers are available for use. Conversion to a single case keyboard is accomplished by mechanically locking the type basket in the upper case position. Figure 19 illustrates the single case keyboard with the appropriate keybutton caps.

SWITCHES

Two manually-operated, butterfly switches are located at the extreme right of the keyboard (see figure 18).

Power. This switch has three positions, ON, OFF, and CP. The ON and OFF positions serve to turn the power on and off in the 2301. The CP position is a variation of the on condition, and causes certain characters to

print, but not to punch codes under any conditions. The keylevers affected by this condition are the lower case special characters where they differ from what is printed in the upper case position (i. e., ! @ # \$ = % ? * () " ; : _).

This feature is used when the 2301 is preparing tape for use in other data processing machines that do not recognize a case shift condition. Since the code is the same, such machines cannot distinguish between an @ and a 2, for example.

Punch Control. This is a three-position switch that controls operation of the integral punch. These positions are as follows:

ALL - When in this position, the punch is

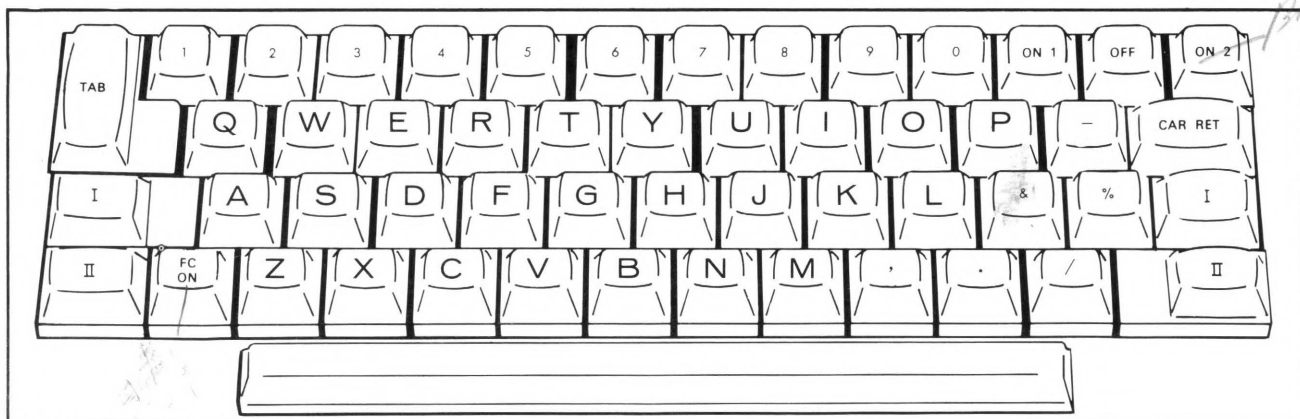


Figure 19. 2301 Keyboard, Single Case (Illustration).

SEL (select) - In this position, the punch will be normally off, but may be turned on and off by manual or automatic operation of the ON 1 and OFF keylevers, and certain conditions of field punch control, initiated by the FC ON keylever.

TYPE STYLES

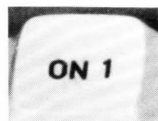
Keyboards, as shown in figures 18 and 19, are available in different type styles. All styles listed below have a .300 shift motion and can be used for single case or double case operation.

Systems #310
Pica #310
Pica Gothic #310
Elite #312

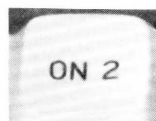
Of these four styles, three are 10 pitch, that is, they provide 10 typewritten characters to the horizontal inch. One style, Elite #312, is 12 pitch, and provides 12 typewritten characters to the horizontal inch.

KEYBOARD PUNCH CONTROL

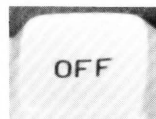
Three keylevers on the 2301 control operation of either or both the integral punch and auxiliary cable-connected output unit.



ON 1 - Turns on the integral punch when the punch control switch is in the SEL (select) position.



ON 2 - Turns on the auxiliary output unit when the punch control switch is in the SEL (select) position.

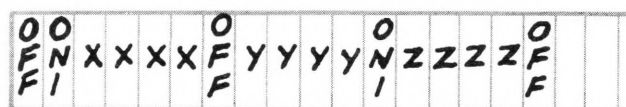


OFF - Turns off the integral punch and the auxiliary output unit when the punch control switch is in the SEL (select) position.

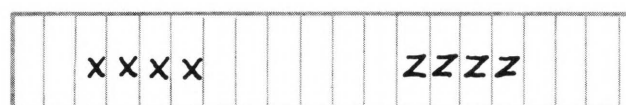
These three keylevers operate to punch codes only, when the punch control switch is in the ALL position. They operate to perform their function only, and do not punch codes in the SEL (select) position. And they are inoperative when the punch control switch is in the OFF position.

Illustrations that follow show the effect of keyboard punch control, when the punch control switch is in the SEL (select) position. Codes are read vertically, from left to right.

Read In 2301 Reader

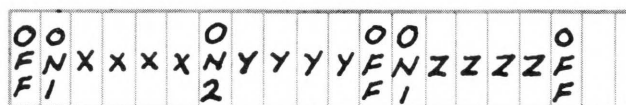


Punched At 2301 Punch



The following assumes an auxiliary punch in connected to the 2301.

Read In 2301 Reader



Punched At 2301 Punch



Punched At Auxiliary Output Unit



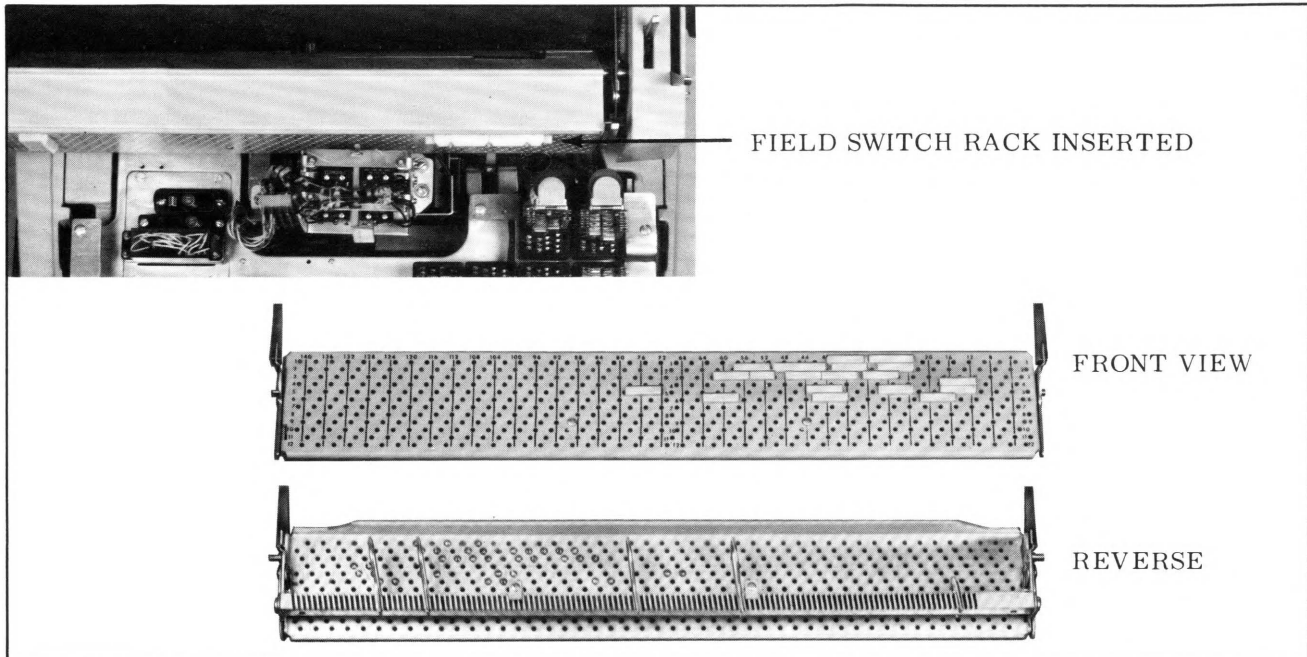


Figure 20. Field Switch Rack.

FIELD PUNCH CONTROL

In addition to keylever punch control, both the 2301 integral punch and the auxiliary output unit may be controlled for selective punching by the position of the writing machine carriage. This control of the punches by carriage position is referred to as field punch control, and is accomplished through use of the field switch/tab rack (see figure 20), on the writing machine carriage.

This rack (removable) is part of the carriage and moves with the carriage. Its purpose is to initiate, control and/or modify some machine functions, in conjunction with terminal connector wiring.

There are 12 channels (horizontal rows), six of which are used, along this rack. Actuators are placed in these channels. As the carriage moves from left to right, these actuators come into contact with stationary field switches. Operation of these field switches activates certain machine functions.

Four of these channels are assigned to field punch control, as follows:

- Channel 3 - Integral Punch On (On 1)
- Channel 4 - Integral Punch Off (Off 1)

Channel 5 - Auxiliary Output Unit On (On 2)

Channel 6 - Auxiliary Output Unit Off (Off 2)



Operation of the FC ON keylever, when the punch control switch is in the SEL (select) position, either manually or automatically, will place the 2301 in a field punch control condition. When in this condition, actuators placed in channels 3, 4, 5, and 6 will perform their specific functions. When the punch control switch is in the ALL position, this keylever operates to punch the FC ON code only. In the SEL (select) position it operates to perform its function only. And in the OFF position, it is inoperative.

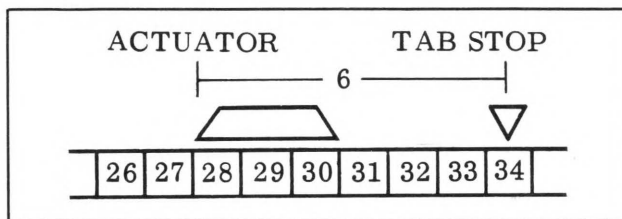
On the 2301, field punch control may be initiated regardless of any previous punch control condition. That is, whether the punch is on or off under keylever punch control. However, operation of the OFF keylever, either manually or automatically, terminates the field punch control condition.

SKIP TAB

Normally, when the TAB keylever is operated, either manually or automatically,

tabulation will terminate on the next tab stop (refer to page 5). However, through a combination of field switch and terminal connector wiring, it is possible to cause tabulation to bypass tab stops and terminate at any pre-determined tab stop. This function is called skip tab. Generally, two codes and one field switch are used. One assigned function code initiates the skip tab condition. The next Tab code read after this code causes tabulation to the pre-selected tab stop position.

Placement of an actuator along channels 1 or 2 determines which tab stop will terminate tabulation. The actuator must be at least three characters long, and must be placed so that the first character position is at least six character positions from the selected tab stop. The following illustration shows actuator and tab stop placement for a skip tab function.



CONSOLE PANEL

Two indicating lights and three panel switches are located on this panel (see figure 21).

Indicating Lights. These indicating lights glow under certain machine conditions, and are described as follows:

OUTPUT 1 - Glows whenever the integral punch is on.

OUTPUT 2 - Glows whenever the cable-connected auxiliary output unit is on.

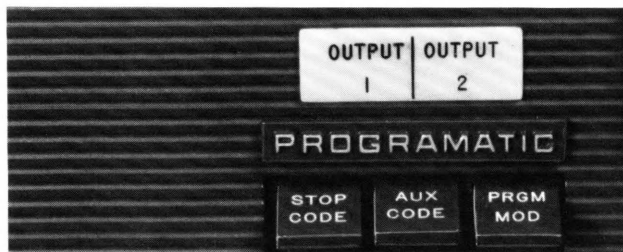
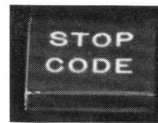
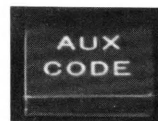


Figure 21. Console Panel

Panel Switches. These three switches are manually operated, and perform the following functions:



STOP CODE - A momentary, self-restoring switch, when operated, it causes punching of the Stop code (1-2-4). This will only occur if the integral punch and/or the auxiliary output unit are on at the time. When this code is read in the 2301 reader, it will cause the reading action to stop. Regardless of whether the punch is on, the Stop code will not re-perforate under automatic operation, during normal reading conditions.



AUX CODE - Also a momentary, self-restoring switch, it is used to punch certain special function codes. To be operative, this switch must be used in conjunction with a keylever. If the punch is on, holding AUX CODE depressed, and operating a keylever, will cause the 3 and 4 code holes to be added to the code punched by the keylever.

The single exception to this, is operation of AUX CODE and the numeric 8 keylever, which causes code holes 2 and 5 to be added. This exception allows the PI 1 (2-4-5) code to be punched from one operation.

Any code created by a combination of keylever and panel switch operation will not reproduce itself in the punch when read in the reader. Only codes produced by keylever operation will do so. All other codes, punched by a panel switch, a combination of panel switch/keylever operation, or created by overpunching, will not reproduce, and are referred to as non-reproducing codes.



PRGM MOD (Program Modification) - This is a locking-type switch that must be manually restored to its normal position after operation. It is used to modify certain machine functions through terminal connector wiring.

Program modification switches can also be used to add the 8th bit to any other code when depressed. These are normally used as Address codes with the SELECTADATA* selective reader.

MANUAL CONTROL KEYS

These are a group of five keys located to the left of the keyboard (see figure 22). They are manually operated to control writing machine functions. Through terminal connector wiring, some of these functions can be modified. The following describes the function of each of these keys.

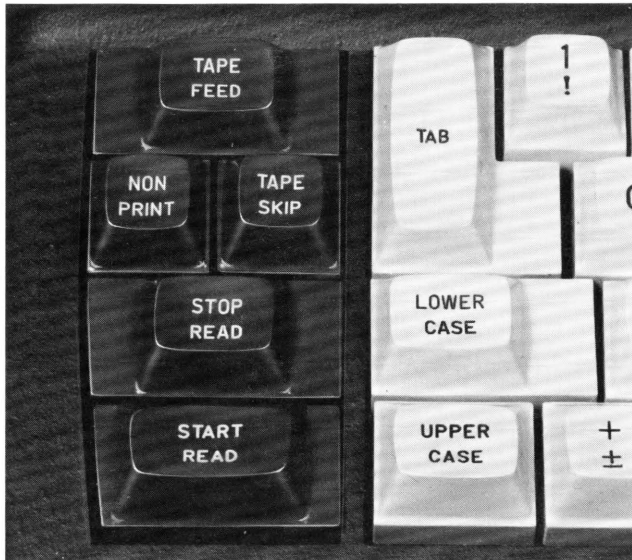


Figure 22. Manual Control Keys.

START READ START READ. When touched and released, this key starts the reading action of the integral reader. Holding this key depressed, temporarily stop the reading action until it is released, allowing the operator to pulse codes through the reader one at a time. This switch can be rendered inoperative at pre-determined carriage positions through use of the field switch/tab rack and terminal connector wiring.

STOP READ STOP READ. When touched, all action of the reader will stop. This key functions not only when the writing machine is in a normal reading mode of operation, but also when it is reading in either manual non print or tape skip conditions. If this key is used to stop the reading action while in manual non print or tape skip, those functions can only be reinitiated by touching their respective manual control keys.



NON PRINT. When touched and released, the writing machine goes into the manual non print condition and begins reading. During this condition, codes read in the reader will be reproduced at the punch (if on). No printing or other machine function will occur. The only function operable in manual non print is the reader stop function.

A hub is available on the terminal connector which permits limited selection of a code to cause the manual non print function. The code selected will always reproduce itself first, before terminating the manual non print condition. Manual non print may also be stopped by touching STOP READ. To re-instate the condition, the operator must again touch NON PRINT. Manual non print is used primarily for reproducing and updating punched tapes and edge-punched cards.



TAPE SKIP. When this key is touched and released, the 2301 will go into a tape skip condition and begin reading. During this condition, no printing, code punching or other machine function will occur. The unit restores to a normal read condition, when a code designated at the Tape Skip Restore code is read. A hub is available on the terminal connector which permits limited selection of a code to cause the tape skip restore function. The tape skip function is used when areas of a tape or card are to be used sometimes, and by-passed other times.

Tape skip may also be terminated by touching STOP READ. To re-instate the condition, the operator must again touch TAPE SKIP.

In the standard 2301, only the tape skip restore function is operable during the tape skip condition. However, carriage return and reader switching functions are available as optional features.



TAPE FEED. Touching this key causes tape to feed through the punch for as long as it is held depressed. The punch does not have to be in an on condition for this function to occur. TAPE FEED is used to

provide both leader and trailer strips for output punched tapes. It is also used to delete incorrect codes. The Tape Feed or Delete code is 1-2-3-4-5-6-7, and is non-reproducing, when read.

AUXILIARY FUNCTIONS

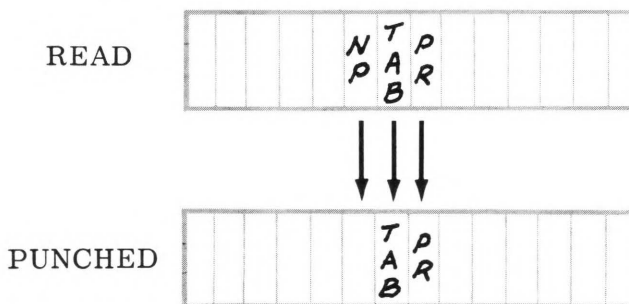
There is a series of codes for the 2301 that, when translated (read), will initiate, terminate, or cause other functions of the writing machine. Through terminal connector wiring, limited selection of codes to cause these auxiliary functions is possible. However, the chart below shows the typical functions assigned to these codes, and how they are punched.

| FUNCTION | AUX CODE PLUS |
|-------------------|---------------|
| Auto. Non Print | Space Bar |
| Print Restore | Zero |
| Tape Skip Restore | 1 |
| Switch | 2 |
| Data Select | 3 |
| AID | J |
| Form Feed | L |
| PI 1 | 8 |

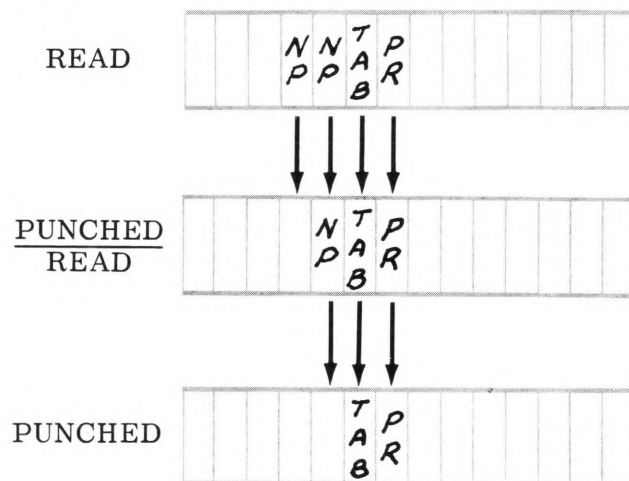
Automatic Non Print. Initiates the automatic non print condition when read. During this condition, the reader will continue reading codes, and all codes read will be reproduced in the punch (if on). No printing or other machine function will occur. Automatic non print is generally used to reproduce codes for a later operation. The condition restores to normal reading upon sensing the Print Restore code.

The Non Print code itself is non-reproducing. This means that codes punched in an automatic non print condition will perform normally when that tape (or card) is read. For example, the Tab code does not function when read in an automatic non print condition, and it is desirable to reproduce this code into the tape being punched. When that tape is read in a later operation, the Tab code is to cause its normal function. The

following is normal programming (coding) for this condition to occur by means of automatic non print. (Codes are abbreviated and are written vertically in these charts.) Assume the punch is on when these codes are read in all cases.



To continue this illustration further, assume that the Tab code is not to function until one more level of reproduction. In this case, two Non Print codes are used in the original tape, as:



In this illustration, note that the Non Print code that initiates the automatic non print condition does not reproduce. However, once the condition has been established, all codes will reproduce, including any additional Non Print codes. In order to carry the function through additional levels, one Non Print code is added to the original tape for each level. This method of code reproduction cannot be used if the number of levels cannot be determined.

Print Restore. This code restores the automatic non print condition to a normal read

Tape Skip Restore. When sensed in the reader, the Tape Skip Restore code (TSR) terminates the tape skip condition, and restores the 2301 to a normal read condition. While the 1-3-4 code is normally designated as the Tape Skip Restore code, limited selection is possible by terminal connector wiring. For example, it is possible to wire the Carriage Return code to terminate the tape skip condition, producing, in effect, a line skip function.

TERMINAL CONNECTOR

The terminal connector consists of 50 holes, called hubs, arranged in four rows. These hubs either emit or accept electrical impulses carried by wires inserted into them. Any hub may be located by an alphabetic reference, i.e., A, b, EE. Of the 50 hubs on the 2301 terminal connector, 35 are assigned as standard. the remaining 15 are used for optional and customizing features.

| | |
|--------------|---|
| Exit - | These hubs emit electrical impulses. |
| Entry - | These hubs accept electrical impulses. |
| Qualifying - | Hubs that control both exit and entry conditions. |

| | | | | | | | | | | | | | | | | | | | | |
|----------------|----------------------------------|----------------------------------|--|--|-----------|---|--|---|---|---------------------|---|---|--|--|---------------------|--|--|--|----------------------------------|-------------------------|
| <p>C MINUS</p> | <p>H C</p> <p>M N</p> <p>S T</p> | <p>W C</p> <p>a N</p> <p>e T</p> | <p>k SKP TAB OFF (2301)</p> <p>r SKP TAB ON (2301)</p> | <p>v KBD UNLOCK EXIT</p> <p>z KBD UNLOCK ENTRY</p> | <p>DD</p> | <p>EXIT</p> <p>A START READ SW</p> <p>E STOP CODE</p> | <p>K CAR RET</p> <p>P FF CODE</p> <p>U SW CODE</p> | <p>Y NP CODE</p> <p>c PR CODE</p> <p>h AID CODE</p> | <p>n DS CODE</p> <p>t PI 1 CODE</p> <p>x TSR CODE</p> | <p>BB</p> <p>FF</p> | <p>ENTRY</p> <p>D START READ</p> <p>J STOP READ</p> | <p>N CARD FEED</p> <p>T RDR SW</p> <p>X NON PRINT</p> | <p>b PRINT RES</p> <p>f</p> <p>m</p> <p>REPRO PR IN NP</p> | <p>s MNP STP</p> <p>w TAPE SKIP RES (2301)</p> | <p>AA</p> <p>EE</p> | <p>B</p> <p>ADD 8</p> <p>F</p> <p>PRGM MOD</p> | <p>L C</p> <p>R N</p> <p>V T</p> <p>PRGM MOD</p> | <p>z SEL PICK</p> <p>d SEL DROP</p> <p>j C</p> | <p>p N</p> <p>u T</p> <p>y C</p> | <p>cc N</p> <p>hh T</p> |
|----------------|----------------------------------|----------------------------------|--|--|-----------|---|--|---|---|---------------------|---|---|--|--|---------------------|--|--|--|----------------------------------|-------------------------|

20

Selectors. The extreme right and left rows of the terminal connector contain three vertically adjacent qualifying hubs called selectors. A selector is a switch or relay that routes an electrical impulse along one of two possible paths, a normal path or a transferred path.

Each selector contains one set of common (C), normal (N), and transfer (T) hubs. Internal wiring connects the common hub to the normal hub. Therefore, a wire carrying an electrical impulse into the common hub, will emit from the normal hub. However, when the selector is energized (transferred), the connection between common and normal hubs is broken, and a connection is established between the common and transfer hubs. Therefore, an electrical impulse wired into the common hub of an energized selector, will emit from the transfer hub. This condition continues until the selector is de-energized (dropped). Then the connection between common and normal hubs is re-established. Figure 25 illustrates a selector in the normal and transferred condition.

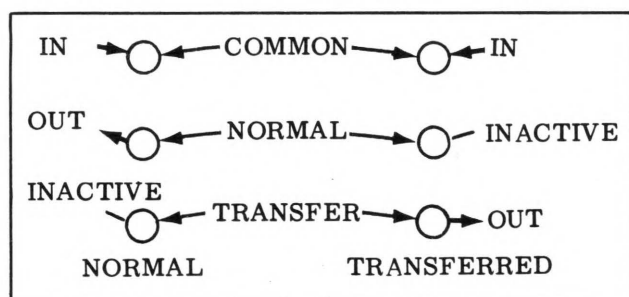


Figure 25. Selector (Illustrated).

Function Code Hubs. The following codes have been made available for functional assignments (see figure 26).

Each of these hubs is an exit hub and will emit an impulse every time the corresponding code is read in the reader. In order for these codes to cause their associated machine function, each must be wired to the corresponding machine entry hub. However, alternate selections can be made, and one code can be wired to cause more than one function, if desired. For example, Print Restore may be wired to cause both print restore and tape skip restore functions.

| CODE | CONFIGURATION | | | | | | HUB LOCATION |
|------|---------------|---|---|---|---|---|--------------|
| | 8 | 7 | 6 | 5 | 4 | 3 | |
| STOP | | | | | 4 | 2 | E |
| CR | 8 | | | | | | K |
| FF | | 7 | | | 4 | 3 | P |
| SW | | | | | 4 | 3 | U |
| NP | | | | 5 | 4 | 3 | Y |
| PR | | | 6 | | 4 | 3 | c |
| AID | | 7 | | 5 | 4 | 3 | h |
| DS | | | | 5 | 4 | 3 | n |
| PI-1 | | | | 5 | 4 | 2 | t |
| TSR | | | | | 4 | 3 | 1 |

Figure 26. Function Code Hubs.

There are five code exit hubs that have no corresponding functional entry hubs. These are CR (Carriage Return), FF (Form Feed), AID (Address Identification), DS (Data Select), and PI 1.

Each hub will emit an electrical impulse when the corresponding code is read. And each will perform its function if the correct accessory is on the 2301, or the applicable auxiliary input unit is connected. Exceptions to this are the carriage return and PI 1 hubs. Carriage return always performs its assigned function, and may be wired to cause any other function, such as tape skip restore, for example. PI 1 may be wired to cause any function, in place of, or in addition to the normal code assignment. Any of these six hubs may be used for any function, if there is no conflict with an accessory device or auxiliary input unit.

Machine Function Hubs. The following are the machine function entry hubs for the 2301 (figure 27).

| FUNCTION | HUB LOCATION |
|-------------------|--------------|
| STOP READ | J |
| CARD FEED | N |
| READER SWITCH | T |
| NON PRINT | X |
| PRINT RESTORE | b |
| MANUAL NP STOP | s |
| TAPE SKIP RESTORE | w |

Figure 27. Machine Function Hubs.

STOP READ ENTRY (J) - Causes the reader stop function. When wired from the STOP

CODE EXIT (E), every time the Stop code is read, reading will stop. This occurs under normal read conditions only, and does not apply to either tape skip or automatic non print conditions.

CARD FEED ENTRY (N) - When an edge card punch is substituted for the standard tape punch on the 2301, impulsing this hub causes a card feed function. Any of the function code exit hubs, except CR (Carriage Return) may be wired to the CARD FEED ENTRY hub. Once this function has been initiated, it causes continuous feed hole only punching, until terminated by operation of the card feed micro-switch.

NOTE: On the 2301 it is not necessary to turn on the punch before initiating the card feed function. However, a Tape Feed code (1-2-3-4-5-6-7) must precede the code assigned to the card feed function. This buffer code assures completion of any previous punching operation. The CARD FEED ENTRY hub must never be impulsed when tape is used in the punch. This condition will cause occasional feed hole punching to occur.

Manual operation of the TAPE FEED switch can always be used to initiate the card feed function in the normal manner.

READER SWITCH ENTRY (T) - Used only when a cable-connected auxiliary input unit is attached to the 2301. When impulsed, normally from the SWITCH CODE EXIT hub (U), a reader switch function will result. That is, the reader, either integral or auxiliary, sensing this code will stop, and the other reader will immediately commence reading codes.

NON PRINT ENTRY (X) - When impulsed, normally from the NON PRINT EXIT hub (Y), the 2301 will go into an automatic non print reading condition.

PRINT RESTORE ENTRY (b) - When the 2301 is in an automatic non print condition, impulsing this hub, usually from the PRINT RESTORE EXIT hub (c), will return the 2301 to a normal read condition.

MANUAL NON PRINT STOP ENTRY (s) - This hub, when impulsed, terminates the manual non print condition. Any of the function code hubs can be used to cause this function. If the STOP CODE EXIT hub (E) is used, operation will be identical to FLEXOWRITER writing machines, Models SPS and SPD, and other equipment employing these models as the basic writing machine.

TAPE SKIP RESTORE ENTRY (w) - When the 2301 is in a tape skip reading condition, impulsing this hub, usually from the TAPE SKIP RESTORE EXIT hub (x), will restore the 2301 to a normal reading condition.

Other hubs. The following describes other hubs, not otherwise classified:

START READ EXIT (A) and ENTRY (D) - When wired together, operation of the START READ switch will cause the 2301 reader to begin reading. This function may be further qualified by wiring through field switch 1 or 2, in order to disable the start read function at given carriage positions.

REPRODUCE PRINT RESTORE IN NON PRINT (f, m) - When these two hubs are wired together, the Print Restore code will reproduce into the output tape, providing the 2301 is in an automatic non print condition. Absence of this connection permits the Print Restore code to terminate the automatic non print condition without reproduction into the output tape.

Note: If any other code is wired to cause the print restore function, this code will always be reproduced in an automatic non print condition.

ADD 8 (B, F) - When these hubs are connected, and the program modification switch is in the operated position (down), the eighth bit will be added to the code punched by any operated keylever or panel switch. This enables address codes to be punched for use with the SELECTADATA selective reader connected to the 2301.

PROGRAM MODIFICATION (L,R,V) - In addition to the address code punching capa-

bility, these three hubs provide a selector associated with the program modification switch. Hub L is the common, hub R the normal, and hub V is the transfer. When the program modification switch is in the normal (up) condition, hubs L and R are connected. When in the operated (down) position, hubs L and V are connected.

Normally, either the selector or the address code punching capability is used, seldom together. The selector may be used to cause recognition of a second Stop code, temporarily alter the tape skip function to line skip, or any similar either/or type function.

MINUS (C) - Provides a constant source of electrical impulses whenever there is power in the writing machine. These are usually employed to provide impulses modified through selectors.

FIELD SWITCHES (H, M, S and W, a, e) - These are two selectors, connected to field switch 1 (H, M, S) and field switch 2 (W, a, e). Hubs H and W are common hubs, M and a are normal, and S and e are transfer. When an actuator comes into contact with one of these field switches, the common and transfer hubs are internally connected. When an actuator is not in contact, the common and normal hubs are internally connected. Field switch hubs are often used for the purpose of blocking the start read function, or for termination of a skip tab condition.

Note: There is no internal wiring that qualifies the operation of these hubs. They will operate not only during normal carriage escapement, but also during the machine functions of carriage return and tabulation.

SKIP TAB ON (r) - Any functional code exit may be wired to this hub in order to condition the 2301 for a skip tab function.

SKIP TAB OFF (k) - This hub must receive an electrical impulse wired from MINUS (C) through a field switch selector to terminate the skip tab condition.

Customizing Features. Fifteen additional hubs on the terminal connector are for special customizing and optional features (see figure 28). These are described as follows:

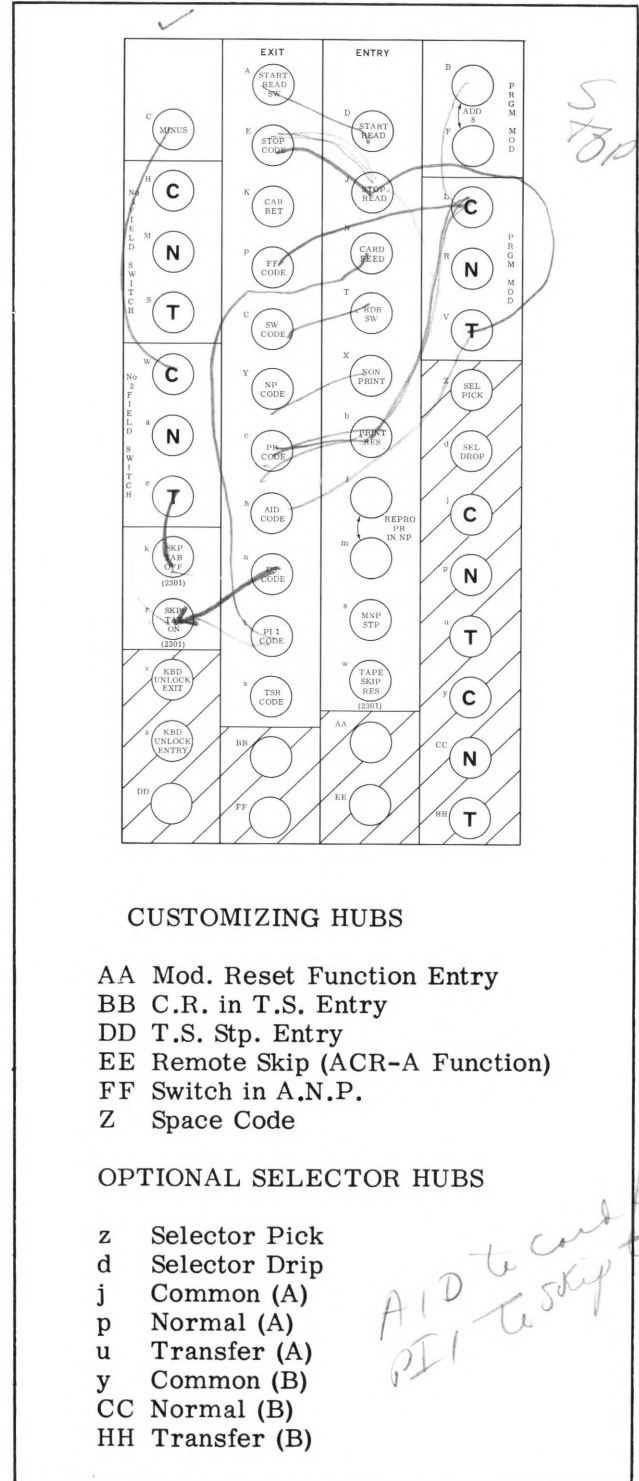


Figure 28. Customizing Hubs.

OPTIONAL SELECTOR (z, d, j, p, u, y, CC, and HH) - This selector has two independent sets of common, normal and transfer hubs, j, p, u, and y, CC, HH. The selector becomes transferred when hub z is impulsed, and remains in that condition until hub d is impulsed, after which it returns to normal condition.

KEYBOARD UNLOCK EXIT (v) - (Optional) with this option, strict discipline of operator entry is possible in a limited number of fields on a document. Generally wired through a selector, this hub is used in conjunction with a field switch to block operator entry at certain points. To unlock the keyboard, a circuit must be completed to the KEYBOARD UNLOCK ENTRY hub. (Z).

KEYBOARD UNLOCK ENTRY (Z) - (Optional) Used in conjunction with the KEYBOARD UNLOCK EXIT (v), a circuit must be completed between these two for the keyboard to become unlocked. For example, figure 29 below illustrates how a disciplined entry wiring operates. Hubs are shown out of their normal position for clarity.

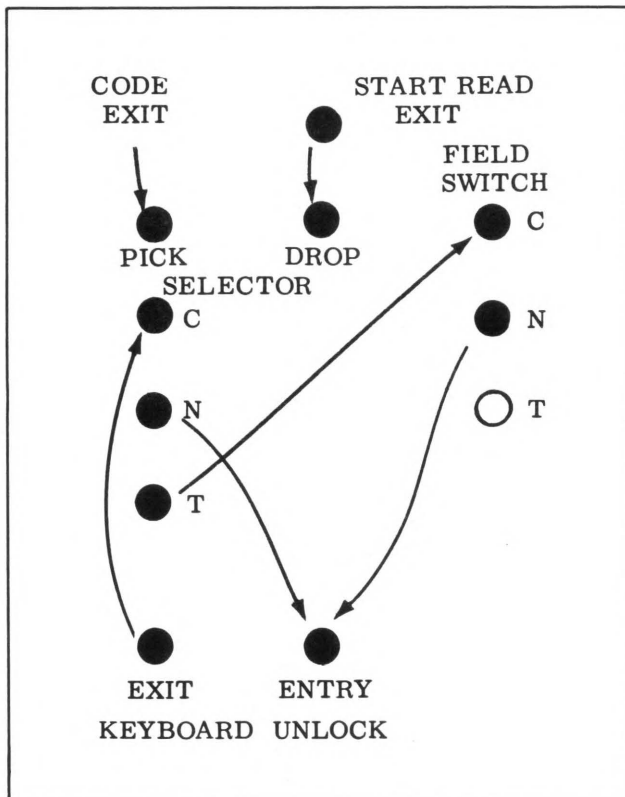


Figure 29. Keyboard Unlock Wiring Example.

In figure 29, under normal conditions, the keyboard remains unlocked. However, before each disciplined field, a code is read that picks the selector. In this transferred condition, the keyboard is still unlocked as long as the selected field switch is unoperated. When an actuator, placed at the end of the disciplined entry field, contacts the field switch, the circuit is broken, and the keyboard becomes locked. At this point, the only way the keyboard can become unlocked, is for the operator to touch START READ. This action drops the selector (returns it to a normal condition).

Note: There are several ways of causing this same effect. However, whatever the means used to break the connection between the KEYBOARD UNLOCK EXIT and ENTRY hubs, operation of START READ, NON PRINT or TAPE SKIP panel switches will unlock the keyboard, even though not specifically wired to do so, as in the illustration shown in figure 29.

CUSTOMIZING HUBS (AA, BB, DD, EE, FF) - These five hubs are available for additional customizing of the 2300 series units, as may be required by specific applications. As such, they are reserved for such functions as reader switching during automatic non print, recognition of Carriage Return codes during tape skip, disabling parity check during a non print condition, and others.

Note: While certain modifications of machine functions are possible through standard terminal connector wiring, and still others are available as options, it must be understood that the standard 2301 contains fixed wiring for the following:

1. Field switches 3, 4, 5 and 6 for control of the integral punch and an auxiliary output unit.
2. Punch control keylevers ON 1, ON 2, FC ON and OFF.
3. Fixed circuitry for the Tab Card Punch Control Unit 2316.

PROGRAMMING

In general, programming is the planning on paper, of the details of an application. It consists of a step-by-step breakdown of all machine, and operator functions.

The following paragraphs describe a program for the 2301 FLEXOWRITER automatic writing machine. It is not intended to be comprehensive, nor is it meant to suggest any application limitations. However, knowledge of the methods employed here, will enable the user to gain maximum benefit from the 2301 and any input or output units.

To illustrate the basic principles of programming, this section will illustrate a purchase order being prepared on the 2301, equipped with edge-punched card reader and punch. Purchase order writing involves the use of constant, repetitive data for each vendor and each item purchased, as name,

address, product code, item description, unit price, and shipping information. Constant data for each vendor, and each item is encoded into edge-punched cards. These permit automatic, error-free typing of this information, and provide for simple card filing methods.

Figure 30 illustrates the system. Vendor and item edge-punched cards contain all constant, unchanging data about the vendor and items to be purchased. These cards are read in the writing machine, and with manual entry of current or variable information, produce the typed purchase order. At the same time, a by-product tape called the select tape, is punched, containing only a portion of the data typed on the purchase order. This tape is then converted to tab cards, which, after further automatic processing produce the commitment report.

Shown in figure 31 is the purchase order form. Manual entries are shaded. All else

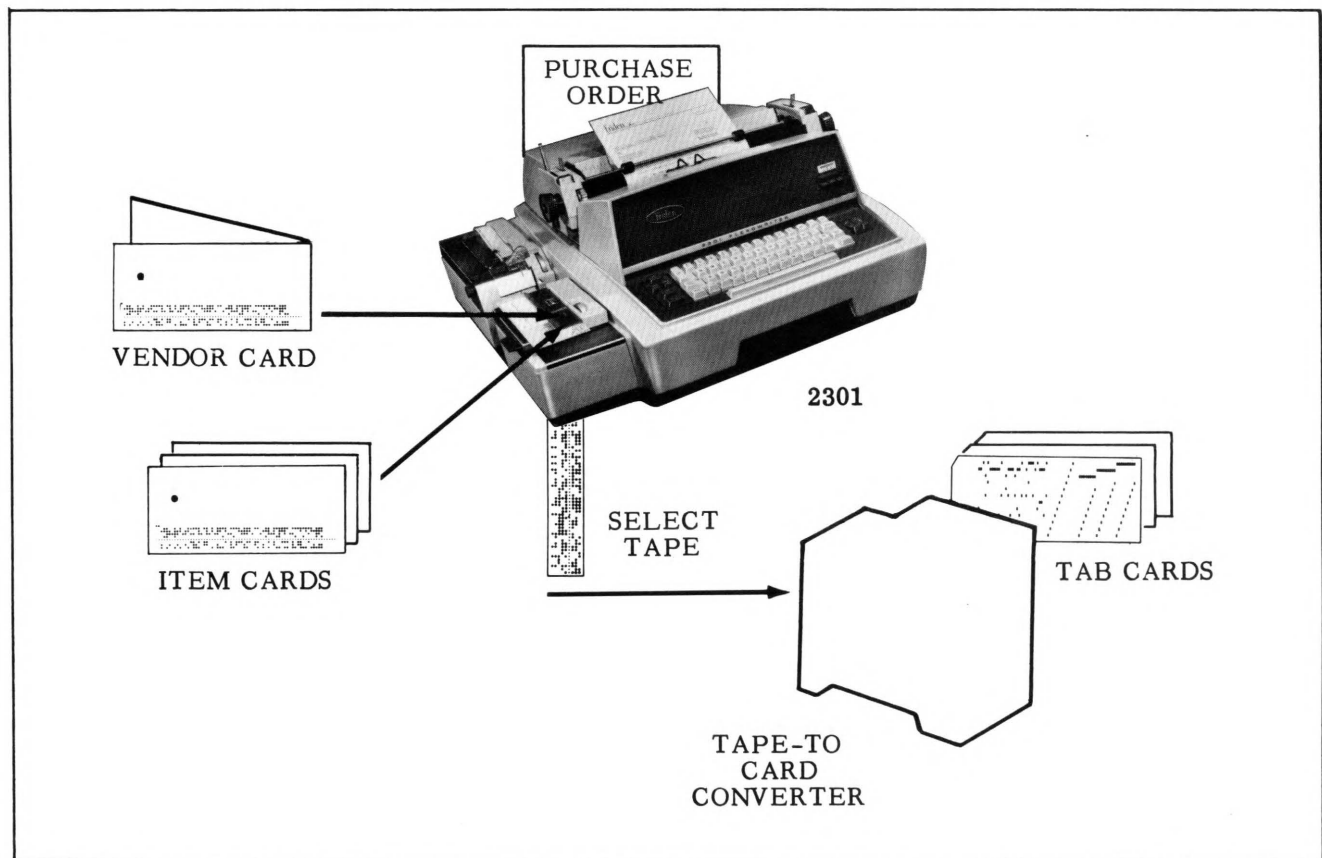


Figure 30. Purchase Order Writing System.

The diagram shows a 'PURCHASE ORDER' form with several fields and a table. To the left of the form are 'VENDOR CARD' and 'ITEM CARDS', each represented by a small card icon with a punch hole. Arrows point from these cards to the corresponding fields on the form: the Vendor Card to the 'TO:' address field, and the Item Cards to the 'MATERIAL DESCRIPTION' column of the table.

PURCHASE ORDER

| | | | | | |
|----------------------|---------------------|-----------------------|---------------------------|------------------------|-----------------|
| VENDOR NO. 672183 | P.O. NO. 9879876 | P.O. DATE 12/10/66 | DELIVERY DATE 12/15/66 | SHIP VIA RR EXPRESS | F.O.B. DEST. |
|----------------------|---------------------|-----------------------|---------------------------|------------------------|-----------------|

TO:
MODERN MOTOR CO.
100 HUMBOLT STREET
ROCHESTER, NEW YORK

PURCHASE ORDER NUMBER MUST APPEAR ON ALL PAPERS AND PACKAGES, PACKING-SLIP MUST ACCOMPANY SHIPMENTS.
ALL INVOICES MUST BE RENDERED IN DUPLICATE

TERMS
2%-10, NET 30 DAYS

| QUANT. | UNIT | MATERIAL DESCRIPTION | CODE | PRICE |
|--------|------|---|------|---------|
| 1 | CASE | 40 SHAFT-MOUNTED SPEED REDUCERS, RATIO 15/1 | 5882 | 72.00 |
| 10 | EA | WORM GEAR SPEED REDUCER, RATIO 10/1 | 6224 | 1500.00 |
| 1 | DOZ | PARALLEL SHAFT SPEED REDUCERS, RATIO 50/1 | 4336 | 425.50 |

Figure 31. Purchase Order Form.

is written automatically from the vendor and item cards.

PRELIMINARY APPROACH

To begin programming this application, the programmer collects samples of the purchase order form and the tab cards. Then a flow chart of the complete application is drawn, as shown in figure 32. There are five steps.

Master Tape Preparation. If there were only one vendor and one item, this step would be unnecessary. However, in this case, assume a large number of vendors, and an even larger number of items. One card will be punched for each. Cards for different vendors will obviously contain different information, but format codes, functional codes, and Stop codes for manual entry will be the same for each vendor card. The same applies to item cards. Vendor and item master tapes are created to provide automatic punching of these codes into the cards, plus entry of the data for different vendors and items. Also, in this illustration, the master tapes will be laid out in such a manner as to type labels for the cards. Tapes are used because they can be glued into a loop to

eliminate reinserting them each time they are read.

Edge-Punched Card Preparation. In this step, the master tapes are read, and along with manual entries, individual vendor and item cards are punched. At the same time, a label is typed for each card. A code in the master tape causes automatic card feeding.

Purchase Order Writing. Vendor and item cards are read in the writing machine reader, along with manual entries, to produce the typed purchase order form, and select tape.

Tape to Card Conversion. After a given number of purchase orders have been written, the select tape is converted automatically to tab cards. Special codes to control this operation, called PI (Program Indication) codes have been punched into the select tape.

Commitment Report Preparation. Data is then automatically perpetuated through a number of steps culminating in the preparation of the commitment report.

WRITING MACHINE SPECIFICATIONS

After considering the entire application a listing of the functional codes to be used is

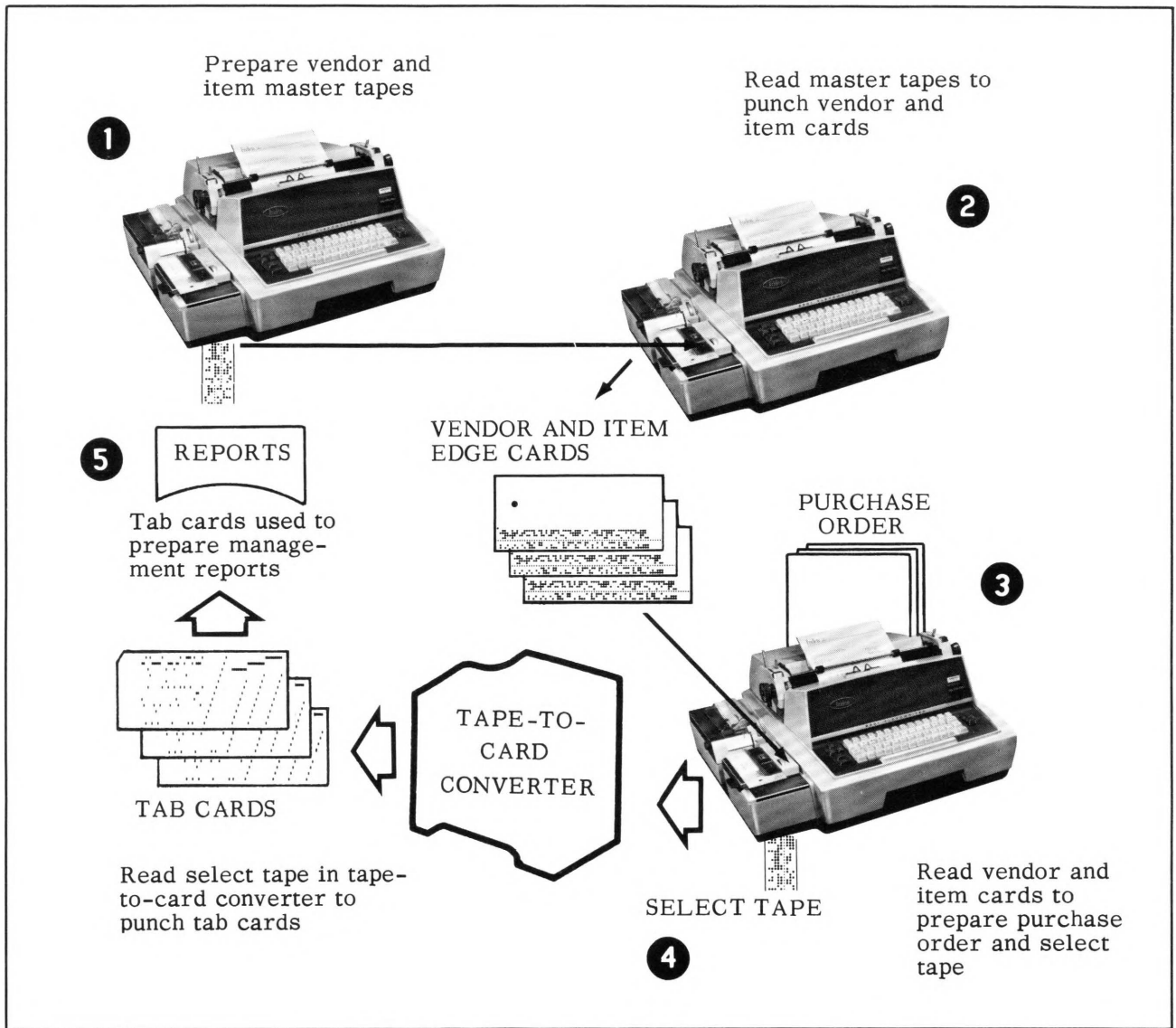


Figure 32. Flow Chart - Purchase Order System.

prepared and placed on a program layout chart, similar to that shown on page 33. These are used later as wiring instructions for the removable terminal connector. In addition, field switch channel assignments for channels 1 and 2 are listed along with those for punch control (3, 4, 5 and 6).

In this particular application some operator discipline will be enforced using channel 1 to modify the START READ function. Actuators placed in this channel will cover the critical manual entry areas on the form. In this way, it is possible to guard against the operator under-filling any field.

The program has been set up to operate at maximum efficiency. After positioning the form, the operator need only insert the vendor and item cards into the writing machine reader, in sequence, and touch the START READ manual control key. All functional and format codes encoded within these cards will cause their appropriate machine function (according to terminal connector wiring). Therefore, the code assigned to the machine function of reader stop will cause the reading action to terminate. This allows the operator to make manual entries.

While forms design places critical numeric data in blocks, just wide enough to allow the

required number of digits to be entered, the operator can still place too few digits within each manual entry field. To preclude this, the 2301 (in this application) is programmed so that the start read function is disabled (non-operative) if the operator fails to enter the required number of digits. This function is assigned to field switch 1.

In this programming example, form design, tab card layout, and the codes required in the select tape are given to the programmer. From these, vendor and item cards are developed. After this has been done, the codes required in the master vendor and item tapes can be developed. Furthermore, this application requires that the punch control switch be in the SELECT position for all stages except the original tape creation. The complete program is shown on the programming layout chart found on page 33.

To better understand this application, the following list of code abbreviations and their functions, used in the programming charts is explained as follows:

| | |
|-------|--------------------|
| CR | Carriage Return |
| TAB | Tabulation |
| SP | Space |
| ON 1 | Integral Punch On |
| ON 2 | Auxiliary Punch On |
| OFF | Punches Off |
| FC ON | Field Control |
| STP | Stop Read |
| NP | Non Print |
| PR | Print Restore |
| TSR | Tape Skip Restore |
| PI | Program Indication |
| CD FD | Card Feed |
| FF | Form Feed |

The first three codes, CR, TAB, and SP, are the only codes which space the carriage (and therefore the form). Using these codes individually or in combinations, permits movement to any desired point on the form.

Control of the punch is done through either

keylever punch control or by carriage position (field control). Using ON 1, ON 2, OFF or FC ON codes, permits only selected information to be punched in the integral punch (or auxiliary output unit or both).

With the punch control switch in the SEL (select) position these punch control codes function only, but do not reproduce their respective codes in the by-product tapes. However, format codes (CR, TAB, SP) will cause their associated machine function and will also reproduce their respective codes (providing the punch is on).

Some of the codes listed above are classified as non-reproducing codes. That is, they will cause their assigned machine functions, but will not reproduce into the by-product tapes. However, the by-product tapes for this application require the presence of STOP, PI, and other codes. By using the automatic non print feature on the 2301, these codes can be reproduced for use in a later operation.

PROGRAM EXPLANATION

To understand the programming charts that follow, first read the codes in the select tape under A, relating them with the tab card layout. Next look at the form and the vendor card to see the relationship between them. Finally, follow the punching of the select tape from the vendor card. The vendor master tape is not shown, as it is especially coded to produce a label, besides preparing vendor edge cards. However, it is shown on the complete programming chart for this application, found on page 33.

A In the select tape, the first code punched is the PI 7 code. This code causes the tape-to-card converter to punch a "1" in the first card column (code position) of the tab card. It also controls the format for punching this card. The vendor number is also punched.

In the vendor card, several codes precede the PI 7 code. These codes control format spacing and the punch. The Off code insures the condition of the punch at the start of the application; Upper Case insures the

| PURCHASE ORDER | | | | | |
|--|---------------------|---|---------------------------|--|-----------------|
| A | B | C | D | E | F |
| VENDOR NO. 672183 | P.O. NO. 9879876 | P.O. DATE 12/10/66 | DELIVERY DATE 12/15/66 | SHIP VIA RR EXPRESS | F.O.B. DEST. |
| TO: MODERN MOTOR CO. 100 HUMBOLT STREET ROCHESTER, NEW YORK | | | | PURCHASE ORDER NUMBER MUST APPEAR ON ALL PAPERS AND PACKAGES, PACKING-SLIP MUST ACCOMPANY SHIPMENTS. ALL INVOICES MUST BE RENDERED IN DUPLICATE | |
| TERMS 2%-10, NET 30 DAYS | | | | | |
| QUANT. | UNIT | MATERIAL DESCRIPTION | | | CODE |
| 1 CASE | | NO. SHEET MOUNTED SPEED REDUCERS RATIO 15/1 | | | 5882 |
| | | | | | 72.00 |

| VENDOR CARD | | | | | | | | | | | |
|-------------|-----------|-----------|---|---|---|--|--|--|--|--|--|
| A | B | C | D | E | F | | | | | | |
| P.O. NO. | P.O. DATE | DEL. DATE | | | | | | | | | |
| 672183 | 12/10/66 | 12/15/66 | | | | | | | | | |
| RR EXPRESS | SA | DEST. | | | | | | | | | |

| SELECT TAPE | | | | | | | | | | | |
|-------------|---------|----------|--|--|--|--|--|--|--|--|--|
| A | B | C | | | | | | | | | |
| 672183 | 9879876 | 12/10/66 | | | | | | | | | |

| TAB CARD | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|-----------|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|
| VENDOR NO. | | | | | | | | | | P.O. NO. | | | | | | | | | | P.O. DATE | | | | | | | | | | VENDOR | | | | | | | | | |
| 1672183 | | | | | | | | | | 9879876 | | | | | | | | | | 121066 | | | | | | | | | | MODERN MOTOR CO | | | | | | | | | |

case shift position. The punch is turned on and the PI 7 code, which is non-reproducing, is non printed into the select tape. This being done, the punch is turned off and two CR codes position the carriage at the first writing line; the punch is turned on, and the vendor number is automatically written (having been punched into the vendor card).

B Purchase order number is the next item of data to be punched into the select tape. On the form, there is one space between vendor number and purchase order number. This space is eliminated from the select tape by the Off-Space-On 1 coding in the vendor card. Purchase Order number is variable information, therefore a Stop

code is present to stop the reading action to allow the operator to make this entry.

At this point, an actuator contacting field switch 1, disables the START READ switch, preventing the operator from under-filling the purchase order number field.

C Programming in this section is identical to that in section B. The purchase order date is entered manually by the operator. Slashes dividing the date to not punch into the tab card, through internal wiring of the converter. Note that to fill this field correctly, the operator must enter zeros prior to the first significant digit in the first nine months, and the first nine days.

PURCHASE ORDER

| A B | | C | D | E | F |
|--|---------------------|-----------------------|---------------------------|--|-----------------|
| VENDOR NO. 672183 | P.O. NO. 9879876 | P.O. DATE 12/10/66 | DELIVERY DATE 12/15/66 | SHIP VIA RR EXPRESS | F.O.B. DEST. |
| TO: MODERN MOTOR CO. 100 HUMBOLT STREET ROCHESTER, NEW YORK | | | | PURCHASE ORDER NUMBER MUST APPEAR ON ALL PAPERS AND PACKAGES, PACKING-SLIP MUST ACCOMPANY SHIPMENTS. ALL INVOICES MUST BE RENDERED IN DUPLICATE | |
| TERMS 2%-10, NET 30 DAYS | | | | | |

G

H

VENDOR CARD

| | | | | | | | | | | | | | |
|----|--------|----|----|----|----|---------|----|--------|----|---------|----|----|--|
| CR | MODERN | NA | DP | OF | CR | 100 | CR | ROCH- | CR | 20%-10, | CR | ST | |
| 41 | MOTOR | PB | BR | FR | | HUMBOLT | R | ESTER, | R | NET | RT | P | |
| | CO. | | | | | STREET | | N.Y. | 4 | 30 DAYS | 3 | | |

G

| | | | | | | | | | | | | | |
|--------|----|--|--|--|--|--|--|--|--|--|--|--|--|
| MODERN | TA | | | | | | | | | | | | |
| MOTOR | AP | | | | | | | | | | | | |
| CO. | BR | | | | | | | | | | | | |

TAB CARD

| VENDOR NO. | | P.O. NO. | | P.O. DATE | | VENDOR | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|---|----------|---|-----------|---|--------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 6 | 7 | 2 | 1 | 8 | 3 | 9 | 8 | 7 | 9 | 8 | 7 | 6 | 1 | 2 | 1 | 0 | 6 | 6 | M | O | D | E | R | N | M | O | T | O | R | C | O |

D Delivery date is not punched into the select tape. The only programming change here is that the punch is not turned on at the start of the field.

E Again a space separates the delivery date field from the ship via field. And ship via data is not punched into the select tape. However, the vendor card is programmed to provide an option in this field. The normal method of delivery will be used in the majority of cases. However, in cases where an alternate method of delivery is desired, the operator has only to operate the program modification switch at any time before this field is reached.

This operation makes the Form Feed code (in this application an alternate Stop code, called as Stop II) active. When the 2301 stops, the operator enters the alternate shipping

method, and touches TAPE SKIP. This causes the reader to cycle through the normal ship via data in the vendor card, and restore to normal reading at the TSR code. Note that because this field is variable in length, START READ is disabled for only the first two characters, insuring that the delivery date field was not overfilled.

F With the punch still off, a Tab code in the vendor card brings the carriage to the FOB field, where this data is written automatically from the vendor card.

G Four CR codes bring the carriage to the vendor name field. Since this data is punched into the select tape, the punch is turned on prior to the automatic writing of this information. There is no field beyond this on the purchase order form, but there

| TERMS 2%-10, NET 30 DAYS | | | | |
|-----------------------------|------|---|------|---------|
| QUANT. | UNIT | MATERIAL DESCRIPTION | CODE | PRICE |
| I | J | K | L | M |
| 1 | CASE | 40 SHAFT-MOUNTED SPEED REDUCERS, RATIO 15/1 | 5882 | 72.00 |
| 10 | EA | WORM GEAR SPEED REDUCER, RATIO 10/1 | 6224 | 1500.00 |
| 1 | DOZ | PARALLEL SHAFT SPEED REDUCERS, RATIO 50/1 | 4336 | 425.50 |

| ITEM CARD | QTY. | J | K | L | M | | | | | | | | |
|------------------|-------------|------------------|--------|-------------|--|-------------|------|--------|-------------|-------|-------------|-------------|-------------|
| O F C R | F C R | N I P 4 | S P | T A B | 40 SHAFT-MOUNTED SPEED REDUCERS, RATIO 15/1 | T A B | 5882 | S P | F P 3 | 72.00 | T S R | O C R | S F P |

| SELECT TAPE | | I | L | | M | |
|-------------|----|---|------|----|-------|----|
| P | SP | 1 | 5882 | SP | 72.00 | CR |
| 4 | 4 | | | 3 | | |

| TAB CARD | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

is in the tab card, punched from the select tape. Therefore, to allow for the necessary skip function in the card, a Tab code is non printed into the select tape. Following this, the punch is turned off, and coding in the vendor card automatically spaces and writes the street address and city/state information.

H With the punch still off, four CR codes bring the carriage to the next writing line, where the terms data is automatically written. Following this, three CR codes bring the carriage out of the heading area on the form. A Stop code stops the reading action in order that the vendor card can be removed, and the first item card inserted.

I In the select tape, the first data punched is the PI 4 code. This code does nothing when read in card column 61, as it is in the first tab card punched. In the second and third tab cards, it will be read in card column 1, where it causes the first 60 card columns to be duplicated from the previous card. In this manner, the heading informa-

tion appears in all three tab cards. Quantity information is also punched into the tab card. An action of the converter causes the preceding spaces in numeric fields to punch as zeros in the tab card.

In the item card, the Off code insures the condition of the punch at the start of the reading; the Upper Case code insures the case shift condition; and the CR code positions the carriage at the first writing line. The FC ON code puts the writing machine in a field punch control condition. An actuator contacting field switch 3 at the margin, turns on the punch. The Stop code stops the reading action to allow the operator to enter the quantity.

J Unit and description data do not punch into the select tape. Therefore, when the operator touches START READ after entering the quantity, an actuator contacting field switch 4 turns off the punch. A Space code moves the carriage to the unit field, and this data is written automatically from

Friden

PROGRAM LAYOUT CHART 2300 SERIES

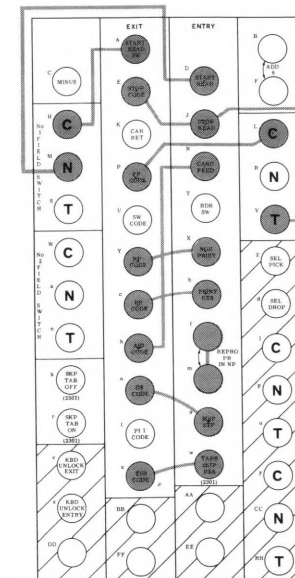
Prepared for _____ CUSTOMER
Friden Office _____
Date Prepared _____

EQUIPMENT: 2301 WITH EDGE-PUNCHED CARD
READER AND PUNCH BY-PRODUCT TAPE
TO TAPE-TO-CARD CONVERTER

| | | | | | | | | |
|--------------------------|---------|---|-----------|------------|-----|-------|--|--|
| VENDOR NO. | PO. NO. | PO. DATE | DEL. DATE | SHIP VIA | FOB | DEST. | VENDOR CARD LABEL | ITEM CARD LABEL |
| 672183 | 9879876 | 12/10/65 | 12/15/65 | RR EXPRESS | | | 672183 RR EXPRESS DEST. MODERN MOTOR CO. 100 HUMBOLT STREET ROCHESTER, NEW YORK 2%-10, NET 30 DAYS | 5882 CASE 40 SHAFT-MOUNTED SPEED REDUCERS, RATIO 15/1 6224 1500.00 4336 425.50 |
| TERMS 2%-10, NET 30 DAYS | | | | | | | | |
| QTY | UNIT | DESCRIPTION | | | | CODE | PRICE | |
| 1 | CASE | 40 SHAFT-MOUNTED SPEED REDUCERS, RATIO 15/1 | | | | 5882 | 72.00 | |
| 10 | EA | WORM GEAR SPEED REDUCER, RATIO 10/1 | | | | 6224 | 1500.00 | |
| 1 | DOZ | PARALLEL SHAFT SPEED REDUCER, RATIO 50/1 | | | | 4336 | 425.50 | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 105 | 110 | 115 | 120 | 125 | 130 | 135 | 140 |
| 1 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 105 | 110 | 115 | 120 | 125 | 130 | 135 | 140 |

TERMINAL CONNECTOR



SPECIAL ASSIGNMENTS

STOP CODE - STOP READ
FF = " - STOP II (PGM MOD)
NP " - NP
PR " - PR (REPRO)
TSR " - TSR
AID " - CARD FEED
DS " - MNP STOP

FIELD SWITCHES

1 DISABLE START READ
2

NOTES

FIELD SWITCH #3 - PUNCH 1 ON } PROVIDED FC ON
" " #4 - PUNCH 1 OFF } CODE IS SENSED

PRGM MOD DEPRESSED - STOP II (FF CODE) EFFECTIVE

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------|--|--|--|--|--|--|--|--|--|---|--|--|--|--|--|--|--|--|--|---------------|--|--|--|--|--|--|--|--|--|------------------------------|--|--|--|--|--|--|--|--|--|---------------------------------------|--|--|--|--|--|--|--|--|--|------------------|--|--|--|--|--|--|--|--|--|-----------------------------|--|--|--|--|--|--|--|--|--|---------------------------------|--|--|--|--|--|--|--|--|--|
| VENDOR MASTER | | | | | | | | | | SHIP VIA | | | | | | | | | | FOB | | | | | | | | | | NAME | | | | | | | | | | STREET CITY | | | | | | | | | | TERMS (CD FD) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VENDOR CARD | | | | | | | | | | P.O. NO. | | | | | | | | | | P.O. DATE | | | | | | | | | | DEL STP II | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| F U N N I P R N P F 2 I R | | | | | | | | | | F S N T F S N T F S T S F P R R R E X P R E S S | | | | | | | | | | T T A D R B R | | | | | | | | | | D E S T . | | | | | | | | | | C O R N P M O D E R N M O T O R C O . | | | | | | | | | | T A P B R | | | | | | | | | | 100 H M B L T S T R N . Y . | | | | | | | | | | O R P 2 % - 10 N E T 30 C S P R | | | | | | | | | |
| SELECT TAPE | | | | | | | | | | P I P | | | | | | | | | | 672183 | | | | | | | | | | 9879876 | | | | | | | | | | 12/10/65 | | | | | | | | | | MODERN MOTOR CO. | | | | | | | | | | T A P B R | | | | | | | | | | | | | | | | | | | |
| ITEM MASTER | | | | | | | | | | FILE REF NO. | | | | | | | | | | UNIT | | | | | | | | | | DESC | | | | | | | | | | DESC 2ND LINE | | | | | | | | | | CODE | | | | | | | | | | PRICE | | | | | | | | | | (CD FD) | | | | | | | | | |
| F U N N I P R N P F 2 I R | | | | | | | | | | F S N T F S N T F S T S F P R R R E X P R E S S | | | | | | | | | | T T A D R B R | | | | | | | | | | D E S T . | | | | | | | | | | C O R N P M O D E R N M O T O R C O . | | | | | | | | | | T A P B R | | | | | | | | | | 100 H M B L T S T R N . Y . | | | | | | | | | | O R P 2 % - 10 N E T 30 C S P R | | | | | | | | | |
| ITEM CARD | | | | | | | | | | QTY | | | | | | | | | | STP II | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| F U C F P I P S P R | | | | | | | | | | C A S E | | | | | | | | | | A B | | | | | | | | | | 40 S H A F T M T D S P E E D | | | | | | | | | | S R E D U C E R S R A T I O 15/1 | | | | | | | | | | A B 5882 S F P R | | | | | | | | | | S P 72.00 | | | | | | | | | | T S C R F S T P R | | | | | | | | | |
| SELECT TAPE | | | | | | | | | | P I P S I | | | | | | | | | | 4 R 4 | | | | | | | | | | 5882 | | | | | | | | | | S P 72.00 | | | | | | | | | | C R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Friden

SAN LEANDRO · CALIFORNIA
SALES AND SERVICE THROUGHOUT THE WORLD
A SUBSIDIARY OF THE SINGER COMPANY

TAB CARD

| | | | | | | |
|------------|----------|-----------|------------------|-------|------|---------|
| VENDOR NO. | P.O. NO. | P.O. DATE | VENDOR NAME | QTY. | CODE | PRICE |
| 672183 | 9879876 | 12/10/65 | MODERN MOTOR CO. | 00001 | 5882 | 0007200 |
| DUPLICATE | | | | 00010 | 6224 | 0150000 |

CODE CHART

| Tape Channels | | | | | | | | | | 2301 | 2301 | 2302 | 2303/2304 |
|---------------|---|---|---|---|---|---|---|---|-----------|----------------|--------------|--------------|------------|
| CARD | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | | CR | CR | CR | CR |
| SPACE | | | | | | | | | | SPACE | SPACE | SPACE | SPACE |
| SKIP | | | 6 | 5 | 4 | 3 | 2 | | | TAB | TAB | TAB | TAB |
| PH-3 | | | 6 | 5 | 4 | 2 | | | | BACK SP | | BACK SP | BACK SP |
| 0 | | | 6 | | | | | | | 10 | 10 | 10 | 0 |
| 1 | | | | | | | | | | 11 | 11 | 11 | 1 |
| 2 | | | | | | 2 | 1 | | | 6 2 | 6 2 | 6 2 | 2 6 |
| 3 | | | | 5 | | 2 | 1 | | | 6 3 | 6 3 | 6 3 | 3 6 |
| 4 | | | | | 3 | | | | | 5 4 | 5 4 | 5 4 | 4 5 |
| 5 | | | | | 3 | 1 | | | | = 5 | = 5 | = 5 | 5 = |
| 6 | | | | 5 | 3 | 2 | | | | 6 6 | 6 6 | 6 6 | 6 6 |
| 7 | | | | | 3 | 2 | 1 | | | 17 | 17 | 17 | 7 1 |
| 8 | | | | | 4 | | | | | * 8 | * 8 | * 8 | 8 * |
| 9 | | | | 5 | 4 | | | | | 19 | 19 | 19 | 9 1 |
| A | 7 | 6 | | | | | | | | a A | a A | a A | a A |
| B | 7 | 6 | | | | | | | | b B | b B | b B | b B |
| C | 7 | 6 | | | | 2 | 1 | | | c C | c C | c C | c C |
| D | 7 | 6 | | | | 3 | | | | d D | d D | d D | d D |
| E | 7 | 6 | | | | 3 | 1 | | | e E | e E | e E | e E |
| F | 7 | 6 | | | | 3 | 2 | | | f F | f F | f F | f F |
| G | 7 | 6 | | | | 3 | 2 | 1 | | g G | g G | g G | g G |
| H | 7 | 6 | | | | 4 | | | | h H | h H | h H | h H |
| I | 7 | 6 | | | | 4 | 1 | | | i I | i I | i I | i I |
| J | 7 | 6 | | | | 5 | 1 | | | j J | j J | j J | j J |
| K | 7 | 6 | | | | 5 | 2 | | | k K | k K | k K | k K |
| L | 7 | 6 | | | | 5 | 1 | | | l L | l L | l L | l L |
| M | 7 | 6 | | | | 5 | 3 | | | m M | m M | m M | m M |
| N | 7 | 6 | | | | 3 | 1 | | | n N | n N | n N | n N |
| O | 7 | 6 | | | | 3 | 2 | | | o O | o O | o O | o O |
| P | 7 | 6 | | | | 3 | 2 | 1 | | p P | p P | p P | p P |
| Q | 7 | 6 | | | | 4 | | | | q Q | q Q | q Q | q Q |
| R | 7 | 6 | | | | 4 | 1 | | | r R | r R | r R | r R |
| S | 7 | 6 | | | | 5 | 2 | | | s S | s S | s S | s S |
| T | 7 | 6 | | | | 5 | 2 | 1 | | t T | t T | t T | t T |
| U | 7 | 6 | | | | 5 | 3 | | | u U | u U | u U | u U |
| V | 7 | 6 | | | | 5 | 3 | 1 | | v V | v V | v V | v V |
| W | 7 | 6 | | | | 3 | 2 | | | w W | w W | w W | w W |
| X | 7 | 6 | | | | 5 | 3 | 2 | 1 | x X | x X | x X | x X |
| Y | 7 | 6 | | | | 5 | 4 | | | y Y | y Y | y Y | y Y |
| Z | 7 | 6 | | | | 5 | 4 | 1 | | z Z | z Z | z Z | z Z |
| # | 7 | 6 | | | | 4 | 2 | 1 | F1 | MANIP STOP | STOP | STOP | STOP |
| (| 7 | 6 | | | | 5 | 4 | 3 | F2 | NP (AUX SP) | NP (AUX SP) | NP (AUX SP) | |
|) | 7 | 6 | | | | 4 | 3 | | F3 PR RES | PR (AUX 0) | PR (AUX 0) | | |
| % | 7 | 6 | | | | 5 | 4 | | F4 | ON 1 | PUNCH ON | | |
| PR | 7 | 6 | | | | 4 | 3 | | F5 | ON 2 | OFF | | |
| E.C.2 | 7 | 6 | | | | 4 | 3 | 2 | F6 | OFF | OFF | | |
| CR | 7 | 6 | | | | 5 | 4 | 3 | 2 | F7 | FC ON | | 3 UNITS |
| EL-1 | 7 | 6 | | | | 4 | 3 | 1 | F8 | TSR (AUX 1) | PI-7 (AUX 1) | | = 1 |
| PI-7 | 7 | 6 | | | | 4 | 3 | 2 | F9 | SW (AUX 2) | SW (AUX 2) | | |
| CR | 7 | 6 | | | | 5 | 4 | 3 | F10 | DS (AUX 3) | DS (AUX 3) | | |
| ERROR | 7 | 6 | | | | 4 | 3 | 2 | F11 | FF (AUX 1) | FF (AUX 1) | | FF (AUX 1) |
| PI-6 | 7 | 6 | | | | 5 | 4 | 3 | F12 | AD (AUX 1) | AD (AUX 1) | | |
| PI-4 | 7 | 6 | | | | 5 | 4 | 3 | F13 | DUP (AUX 1) | | | |
| □ | 7 | 6 | | | | 5 | 4 | 3 | | UPPER CASE | UPPER CASE | UPPER CASE | UPPER CASE |
| SP1 | 7 | 6 | | | | 5 | 4 | 2 | | LOWER CASE | LOWER CASE | LOWER CASE | LOWER CASE |
| 7 | 7 | 6 | | | | 5 | 4 | 2 | 1 | . | . | . | . |
| - | 7 | 6 | | | | 5 | 4 | 2 | 1 | " | " | " | " |
| / | 7 | 6 | | | | 5 | 4 | 2 | 1 | % | % | % | % |
| S | 7 | 6 | | | | 5 | 4 | 2 | 1 | & | & | & | & |
| R | 7 | 6 | | | | 5 | 4 | 2 | 1 | j | j | j | j |
| PI-1 | 7 | 6 | | | | 5 | 4 | 2 | | ± | PI-1 (AUX B) | PI-1 (AUX B) | |
| PI-2 | 7 | 6 | | | | 5 | 4 | 3 | 1 | ¼ | PI-5 (AUX A) | PI-5 (AUX A) | |
| PI-5 | 7 | 6 | | | | 5 | 4 | 2 | 1 | PI-2 (2, 8, 1) | ± | ± | ± |
| REO | 7 | 6 | | | | 5 | 4 | 3 | 1 | TARE, STOP | TARE, STOP | TARE, STOP | TARE, STOP |

INPUT/OUTPUT CONNECTORS

Two connectors are located beneath the machine for connection of auxiliary units. The 2217 Data Selector and any one of three different auxiliary input units can be connected to the input connector (see figure 33):

2312 Auxiliary Reader. Provides an additional tape reading unit for the writing machine. A self-contained unit, the 2312 has its own tape unwinder and tape-up reel. A bin replaces these when a looped tape is being read.

2313 Automatic Card Reader. Provides the writing machine with the ability to read Hollerith-coded tab cards, either singly or in packs.

2314 SELECTADATA Reader. This unit is similar to the 2312 Auxiliary Reader. It also has the ability to search through a tape at the rate of 50 codes per second, and select certain pre-specified data.

2217 Data Selector. This is an input device which contains ten numeric dials. Each of these dials can be manually set to any of the numeric positions (0-9, S, or blank). One of the functional codes is wired to cause this unit to readout the settings, causing document printing and code punching. The 2217 is normally located at the machine desk.

Either of two auxiliary output units can be connected to the output connector of the writing machine:

2215 Auxiliary Tape Punch. Provides an additional tape punching unit for the writing machine. A self-contained unit, the 2215 Auxiliary Tape Punch has its own tape supply spool and tape winder.

2216 Card Punch Control. This is a control unit which serves to connect the writing machine with a Hollerith-coded keypunch, allowing tab cards to be produced as a by-product of FLEXOWRITER automatic writing machine operation.

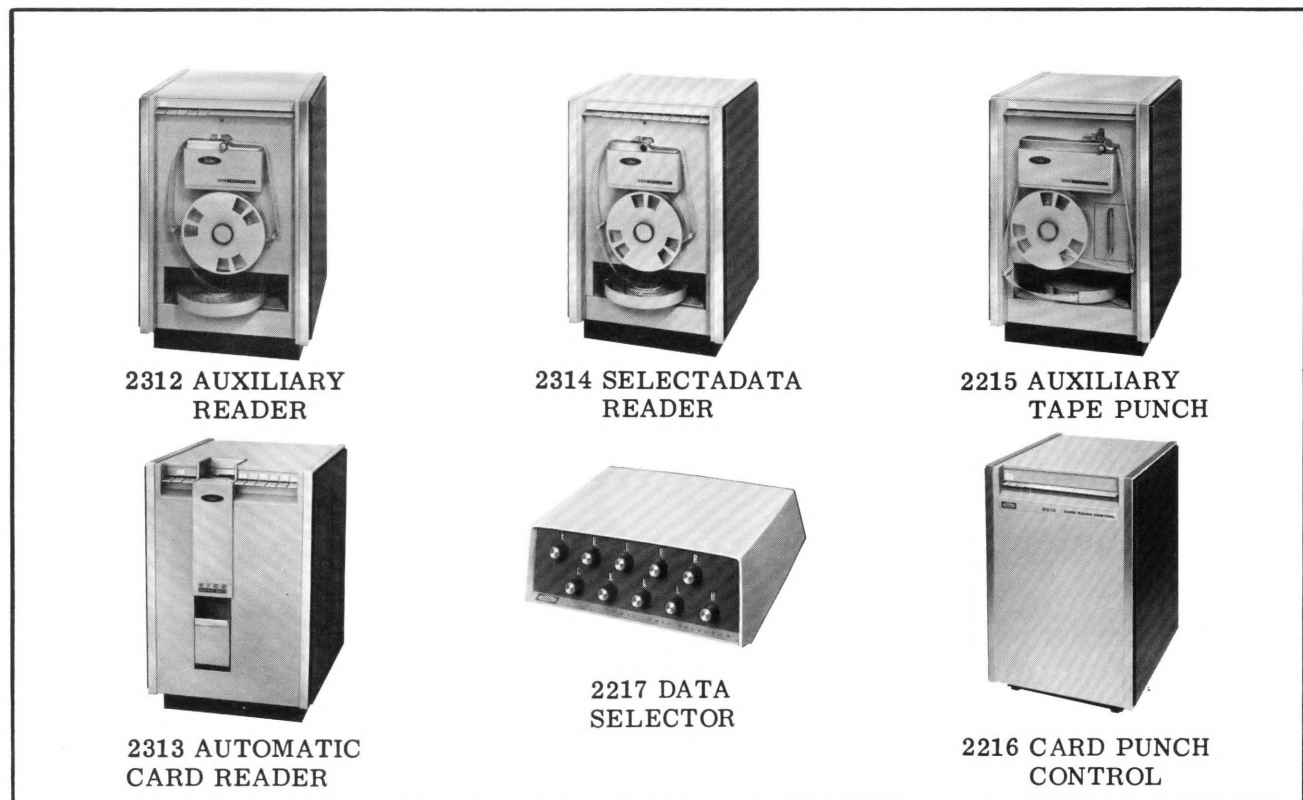


Figure 33. Auxiliary Input/Output Equipment.

SECTION V

2302 WRITING MACHINE

GENERAL

The 2302 FLEXOWRITER automatic writing machine (see figure 34) is a less sophisticated unit than the 2301. However, the 2302 does include many of the features found on the 2301, such as selective punch control, manual non print, field switch function control, and an auxiliary input connector. These features make the 2302 easily adaptable for routine business paperwork requirements, and provide sufficient flexibility for a wide range of applications.

All of the general specifications of the 2300 series, described in Section II, apply to the 2302 FLEXOWRITER writing machine. This section describes the specific operating features of the 2302.

INPUT/OUTPUT VERSATILITY

Either of two readers are available as component parts of the 2302. A tape reader is

standard, while an edge-punched card reader is optional. Manual input is by operation of the writing machine keyboard.

Either of two punches provide punched tape output. An integral tape punch is standard; an edge card punch is optional. Output in the form of a printed document is part of standard 2302 operation.

In addition, the 2302 is capable of cable-connecting one auxiliary input unit to provide further input versatility. A number of different auxiliary input units are available to provide for a wide range of application flexibility.

KEYBOARD

Two basic keyboard variations are available. Figure 35 illustrates the standard double case keyboard arrangement. Forty-three printing keylevers are available for use. Conversion to a single case keyboard is ac-

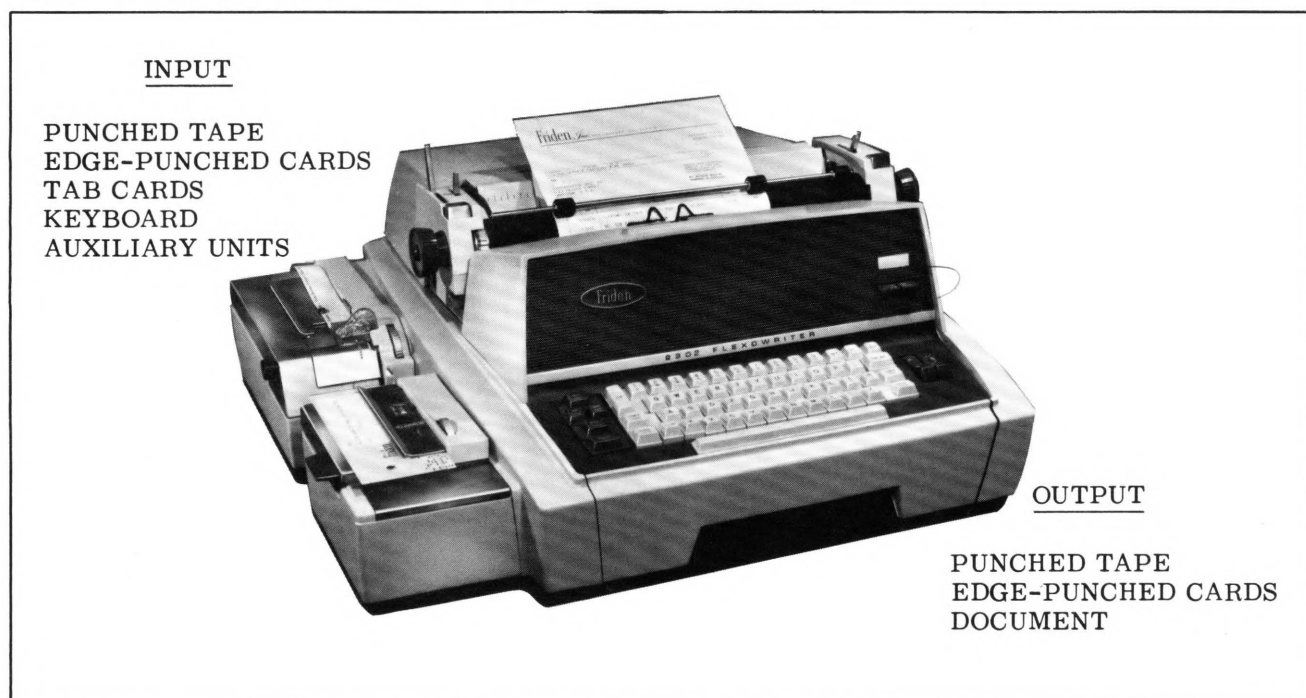


Figure 34. 2302 FLEXOWRITER Writing Machine.

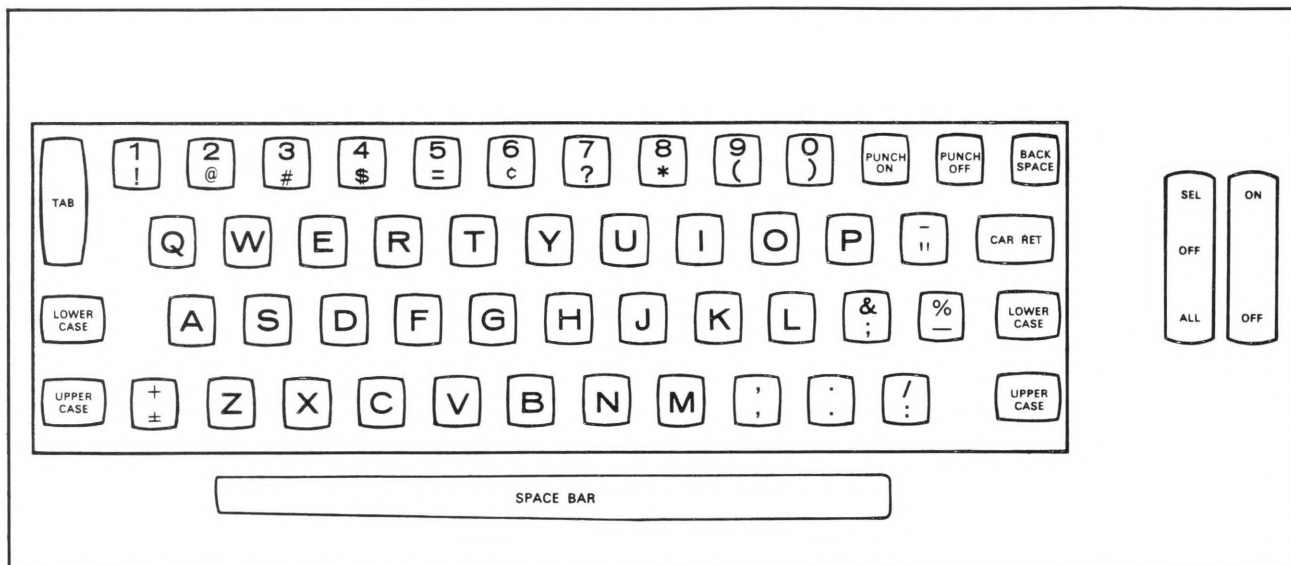


Figure 35. 2302 Keyboard (Double Case).

complished by mechanically locking the type basket in the upper case position. Figure 36 illustrates the single case keyboard with the appropriate keybutton caps.

SWITCHES

Two manually-operated, butterfly switches are located at the extreme right of the keyboard (see figure 35).

Power. This switch has two positions, ON and OFF, which serve to turn on and off the power to the writing machine.

Punch Control. This is a three-position switch that controls the operation of the integral punch. These positions are as follows:

All - When in this position, the integral punch is always in an on condition, and cannot be turned off by any means. In the ALL position, every coded keylever will punch its assigned code. All reproducing codes (key-lever punched) read in the reader, will reproduce in the punch. These are the 43 printing keylevers, the six format control keylevers (CAR RET, TAB, UPPER CASE, LOWER CASE, BACK SPACE, space bar), and the two punch control keylevers, PUNCH ON and PUNCH OFF.

OFF - When in this position (center), the punch is always in an off condition, and cannot be turned on by any means. Consequently, no code punching can occur.

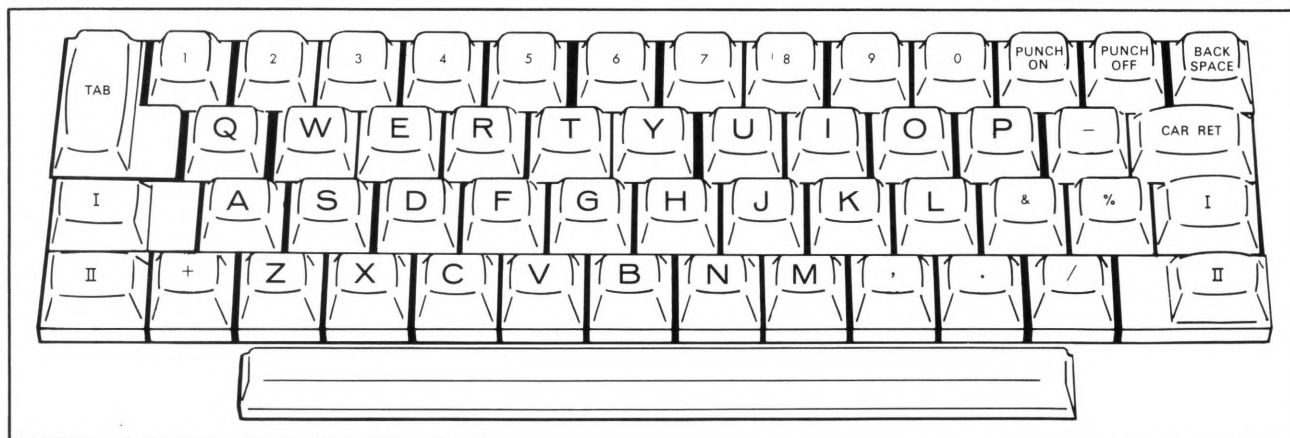


Figure 36. 2302 Keyboard, Single Case (Illustrated).

SEL (select) - In this position, the punch will be normally off, but may be turned on and off by manual or automatic operation of the PUNCH ON and PUNCH OFF keylevers.

TYPE STYLES

Keyboards, as shown in figures 35 and 36, are available in different type styles. All styles listed below have a .300 shift motion, and can be used for single or double case operation.

Systems #310
Pica #310
Pica Gothic #312

All of these type styles provide 10 typewritten characters to the horizontal inch.

PUNCH CONTROL

Two keylevers on the 2302 control operation of the integral punch. These are described as follows:



PUNCH ON - Turns on the integral punch when the punch control switch is in the SEL (select) position.



PUNCH OFF - Turns off the integral punch when the punch control switch is in the SEL (select) position.

These two keylevers operate to punch codes only, when the punch control switch is in the ALL position. They operate to perform their functions only, and do not punch codes when the punch control switch is in the SEL (select) position. And they are inoperative when the punch control switch is in the OFF position.

Figure 37 shows the effect of the punch control switch when in the SEL (select) position. Codes in this illustration are read vertically, from left to right.

CONSOLE PANEL

One indicating light and two panel switches are standard on the 2302 writing machine.

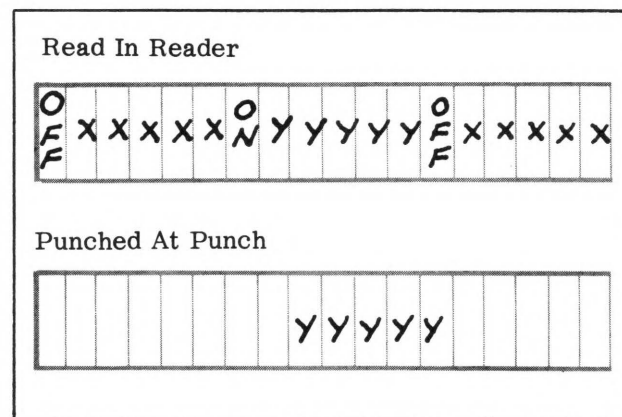
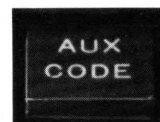


Figure 37. Punch Control Example.

Indicating Light. Glows whenever the integral punch is on, either when the punch control switch is in the ALL position, or in the SEL (select) position after PUNCH ON has been operated. (See figure 38.)

Panel Switches. Two manually-operated panel switches (see figure 38) are located on the console panel.



AUX CODE - Also a momentary, self-restoring switch, it is used to punch certain special function codes. To be operative, this switch must be used in conjunction with a keylever. If the punch is on, holding AUX CODE depressed, and operating a keylever, will cause the 3 and 4 code holes to be added to the code punched by the keylever.

The single exception to this, is operation of AUX CODE and the numeric 8 keylever, which causes code holes 2 and 5 to be added. This exception allows the PI 1 (2-4-5) code to be punched from one operation.

Any code created by a combination of keylever and panel switch operation will not reproduce itself in the punch when read in the reader. Only codes produced by keylever

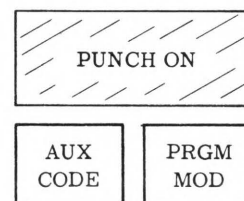


Figure 38. Console Panel.

operation will do so. All other codes, punched by a panel switch, a combination of panel switch/keylever operation, or created by overpunching, will not reproduce, and are referred to as non-reproducing codes.



PRGM MOD (Program Modification) - This is a locking-type switch that must be manually restored to its normal position after operation. It is used to modify certain machine functions through terminal connector wiring.

FIELD SWITCH CONTROL

A field switch rack (see figure 39) is part of the carriage, and moves with the carriage. Its purpose is to initiate, control and/or modify some machine functions in conjunction with terminal connector wiring.

There are 12 channels (horizontal rows), two of which are used, along this rack. Actuators are placed in these channels. As the carriage moves from left to right, these actuators come into contact with stationary field switches. Operation of these field switches activates certain machine functions. On the 2302 writing machine, field switches are

located to be activated by actuators placed in channels 1 and 2 only.

MANUAL CONTROL KEYS

These are a group of five keys located to the left of the keyboard (see figure 40). They are manually operated to control writing machine functions. Through terminal connector wiring, some of these functions can be modified. The following describes the function of each of these keys.

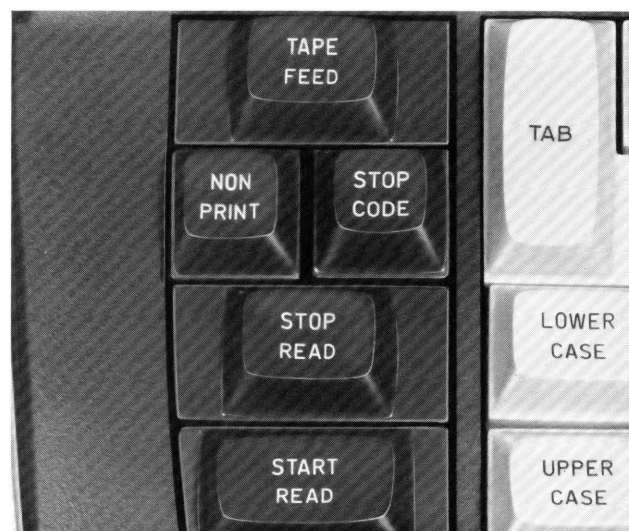


Figure 40. Manual Control Keys.

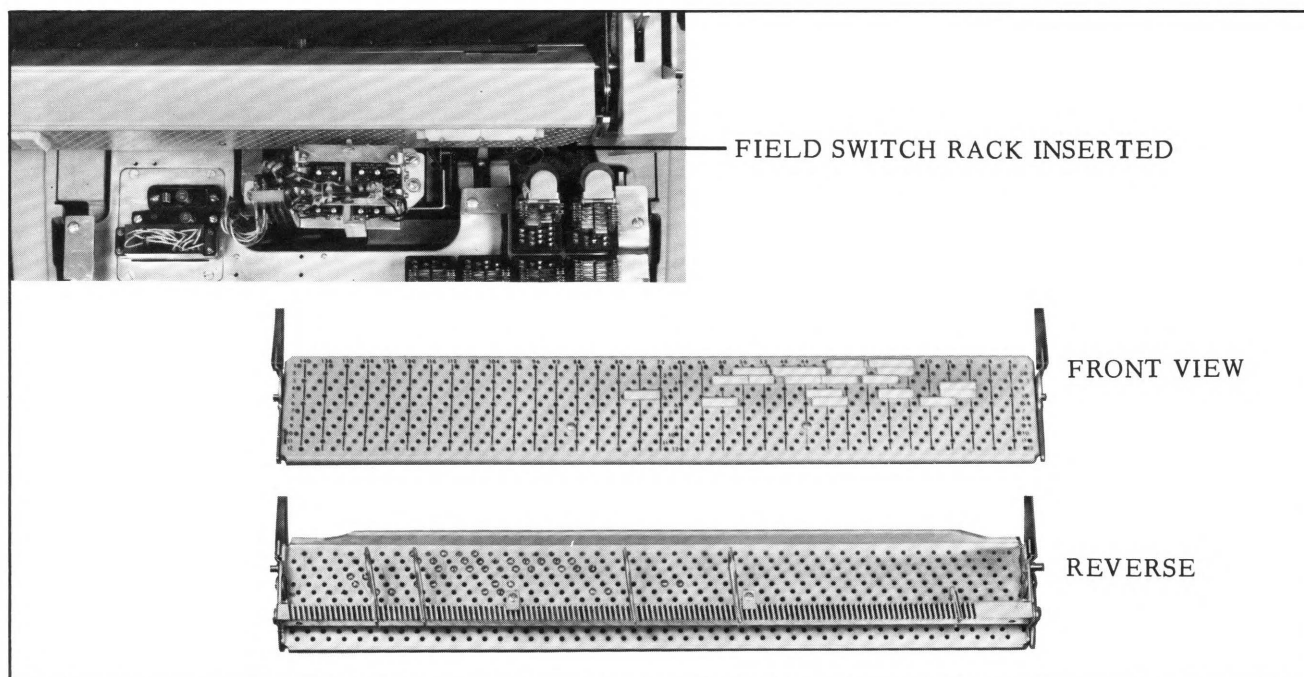


Figure 39. Field Switch Rack.

**START
READ**

START READ. When touched and released, this key starts the reading action of the integral reader. Holding this key depressed, temporarily stops the reading action until it is released, allowing the operator to pulse codes through the reader one at a time. This switch can be rendered inoperative at predetermined carriage positions through use of the field switch/tab rack and terminal connector wiring.

**STOP
READ**

STOP READ. When touched, all action of the reader will stop. This key functions not only when the writing machine is in a normal reading mode of operation, but also when it is reading in either manual non print or tape skip conditions. If this key is used to stop the reading action while in manual non print, those functions can only be reinitiated by touching their respective keys.

**NON
PRINT**

NON PRINT. When touched and released, the writing machine goes into the manual non print condition and begins reading. During this condition, codes read in the reader will be reproduced at the punch (if on). No printing or other machine function will occur. The only function operable in manual non print is the reader stop function.

A hub is available on the terminal connector which permits limited selection of a code to cause the manual non print stop function. The code selected will always reproduce itself first, before terminating the manual non print condition. Manual non print may also be stopped by touching STOP READ. To reinstate the condition, the operator must again touch NON PRINT. Manual non print is used primarily for reproducing and updating punched tapes and edge-punched cards.

**STOP
CODE**

STOP CODE. Operation of this key while the punch is on, causes the Stop code (1-2-4) to be punched into the tape. When this code is read in the 2302 reader, it will cause the reading action to stop. The Stop code will not

reperforate during a normal reading condition, regardless of whether the punch is on or not.

**TAPE
FEED**

TAPE FEED. Touching this key causes tape to feed through the punch for as long as it is held depressed. The punch does not have to be in an on condition for this function to occur. TAPE FEED is used to provide both leader and trailer strips for output punched tapes. It is also used to delete incorrect codes. The Tape Feed or Delete code is 1-2-3-4-5-6-7, and is non-reproducing.

AUXILIARY FUNCTIONS

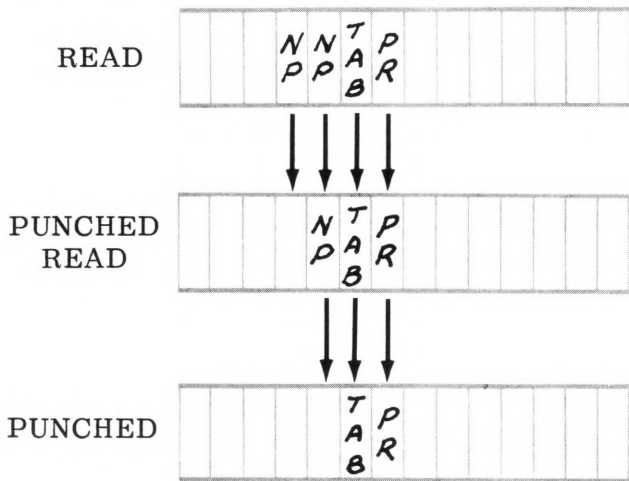
There is a series of codes for the 2302 that, when translated (read), will initiate, terminate, or cause other functions of the writing machine. Through terminal connector wiring, limited selection of codes to cause these auxiliary functions is possible. However, the chart below shows the typical functions assigned to these codes, and how they are punched.

| FUNCTION | AUX CODE PLUS |
|-----------------|---------------|
| Auto. Non Print | Space Bar |
| Print Restore | Zero |
| Switch | 2 |
| Data Select | 3 |
| AID | J |
| Form Feed | L |
| PI 1 | 8 |

Automatic Non Print. Initiates the automatic non print condition when read. During this condition, the reader will continue reading codes, and all codes read will be reproduced in the punch (if on). No printing or other machine function will occur. Automatic non print is generally used to reproduce codes for a later operation. The condition restores to normal reading upon sensing the Print Restore code.

The Non Print code itself is non-reproducing. This means that codes punched in an

To continue this illustration further, assume that the Tab code is not to function until one more level of reproduction. In this case, two Non Print codes are used in the original tape, as:



40

Print Restore. This code restores the automatic non print condition to a normal read condition without stopping the code reading action. It can be wired to be reproducing (in a non print condition), or non-reproducing. The latter is done when no more than one level of code reproduction by the automatic non print method is ever used.

TERMINAL CONNECTOR

Each hub may be classified in one of three different ways:

These hubs emit electrical impulses.

Qualifying - Hubs that control both exit and entry conditions.

Figure 42 illustrates the terminal connector, showing hub location.

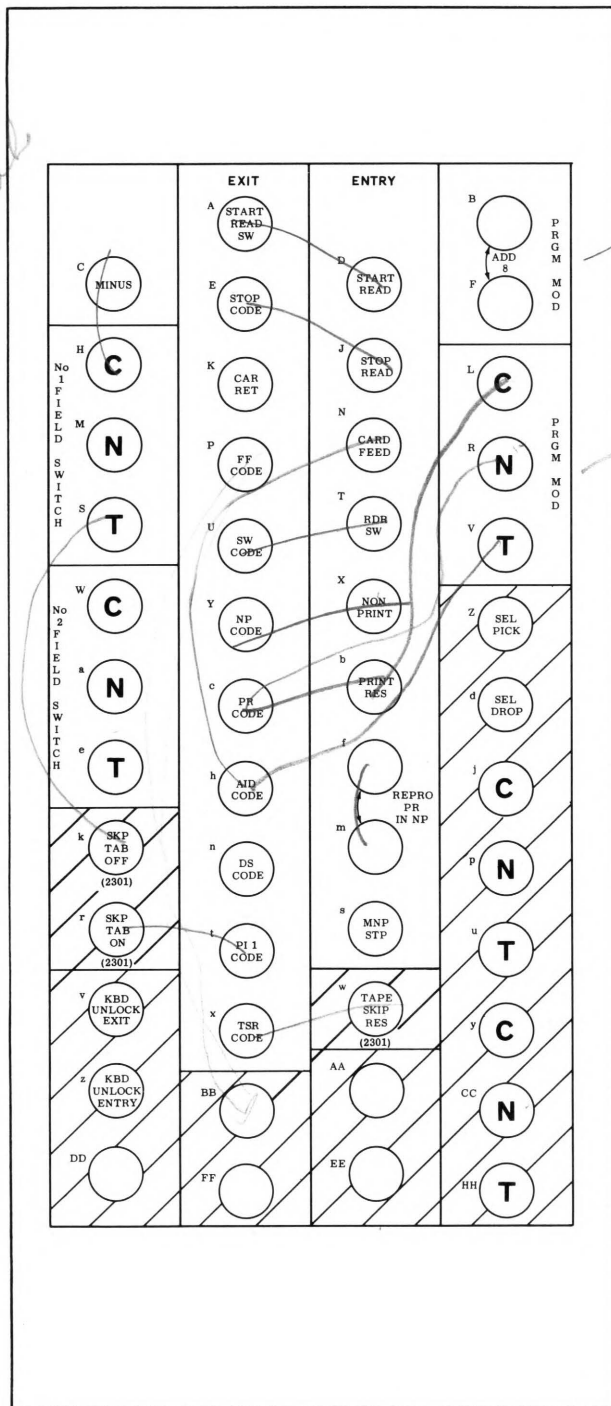


Figure 42. Hub Locations (Illustrated).

Selectors. The extreme right and left rows of the terminal connector contain three vertically adjacent qualifying hubs called selectors. A selector is a switch or relay that routes an electrical impulse along one of two possible paths, a normal path or a transferred path.

Each selector contains one set of common (C), normal (N), and transfer (T) hubs. Internal wiring connects the common hub to the normal hub. Therefore, a wire carrying an electrical impulse into the common hub, will emit from the normal hub. However, when the selector is energized (transferred), the connection between common and normal hubs is broken, and a connection is established between the common and transfer hubs. Therefore, an electrical impulse wired into the common hub of an energized selector, will emit from the transfer hub. This condition continues until the selector is de-energized (dropped). Then the connection between common and normal hubs is re-established. Figure 43 illustrates a selector in both the normal and transferred condition.

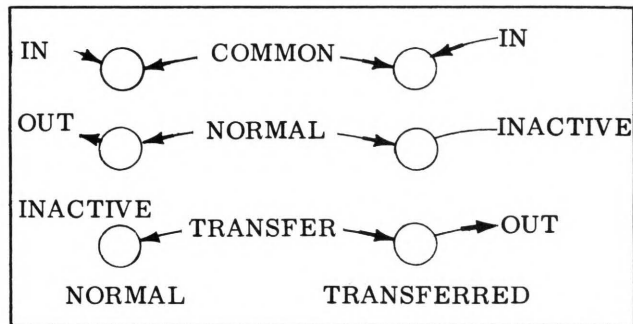


Figure 43. Selector (Illustrated).

Function Code Hubs. The following codes have been made available for functional assignments (see figure 44).

Each of these hubs is an exit hub and will emit an impulse everytime the corresponding code is read in the reader. In order for these codes to cause their associated machine function, each must be wired to the corresponding machine entry hub. However, alternate selections can be made, and one code can be wired to cause more than one function, if desired.

| CODE | CONFIG- URATION | | | | | | | | HUB LOCATION |
|------|--------------------|---|---|---|---|---|---|---|-----------------|
| | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| STOP | | | | | 4 | | 2 | 1 | E |
| CR | 8 | | | | | | | | K |
| FF | | 7 | | | 4 | 3 | 2 | 1 | P |
| SW | | | | | 4 | 3 | 2 | | U |
| NP | | | | 5 | 4 | 3 | | | Y |
| PR | | | 6 | | 4 | 3 | | | c |
| AID | | 7 | | 5 | 4 | 3 | | 1 | h |
| DS | | | | 5 | 4 | 3 | 2 | 1 | n |
| PI-1 | | | | 5 | 4 | | 2 | | t |
| TSR | | | | | 4 | 3 | | 1 | x |

Figure 44. Function Code Hubs.

There are five code exit hubs that have no corresponding functional entry hubs. These are CR (Carriage Return), FF (Form Feed), AID (Address Identification), DS (Data Select), PI 1, and TSR code.

Each hub will emit an electrical impulse when the corresponding code is read. And each will perform its function if the correct accessory is on the 2302, or the applicable auxiliary input unit is connected. Exceptions to this are the carriage return and PI 1 hubs. Carriage return always performs its assigned function, and may be wired to cause any other function. PI 1 may be wired to cause any function, in place of, or in addition to the normal code assignment. Any of these six hubs may be used for any function, if there is no conflict with an accessory device or auxiliary input unit.

Machine Function Hubs. The following are the machine function entry hubs for the 2302 (figure 45).

| FUNCTION | HUB LOCATION |
|----------------|--------------|
| STOP READ | J |
| CARD FEED | N |
| READER SWITCH | T |
| NON PRINT | X |
| PRINT RESTORE | b |
| MANUAL NP STOP | s |

Figure 45. Machine Function Hubs.

STOP READ ENTRY (J) - Causes the reader stop function. When wired from the STOP CODE EXIT (E), every time the Stop code is read, reading will stop. This occurs under

normal read conditions only, and does not apply to the automatic non print condition.

CARD FEED ENTRY (N) - When an edge card punch is substituted for the standard tape punch on the 2302, impulsing this hub causes a card feed function. Any of the function code exit hubs, except CR (Carriage Return) may be wired to the CARD FEED ENTRY hub. Once this function has been initiated, it causes continuous feed hole only punching, until terminated by operation of the card feed micro-switch.

NOTE: On the 2302 it is not necessary to turn on the punch before initiating the card feed function. However, a Tape Feed code (1-2-3-4-5-6-7) must precede the code assigned to the card feed function. This buffer code assures completion of any previous punching operation. The CARD FEED ENTRY hub must never be impulsed when tape is used in the punch. This condition will cause occasional feed hole only punching to occur.

Manual operation of the TAPE FEED switch can always be used to initiate the card feed function in the normal manner.

READER SWITCH ENTRY (T) - Used only when a cable-connected auxiliary input unit is attached to the 2302. When impulsed, normally from the SWITCH CODE EXIT hub (U), a reader switch function will result. That is, the reader, either integral or auxiliary, sensing this code will stop, and the other reader will immediately commence reading codes.

NON PRINT ENTRY (X) - When impulsed, normally from the NON PRINT EXIT hub (Y), the 2302 will go into an automatic non print reading condition.

PRINT RESTORE ENTRY (b) - When the 2302 is in an automatic non print condition, impulsing this hub, usually from the PRINT RESTORE EXIT hub (c), will return the 2302 to normal read condition.

MANUAL NON PRINT STOP ENTRY (s) - This hub, when impulsed, terminates the

manual non print condition. Any of the function code hubs can be used to cause this function. If the STOP CODE EXIT hub (E) is used, operation will be identical to FLEXOWRITER writing machines, Models SPS and SPD, and the 2201 FLEXOWRITER writing machine.

Other hubs. The following describes other hubs, not otherwise classified:

START READ EXIT (A) and ENTRY (D) - When wired together, operation of the START READ switch will cause the 2302 reader to begin reading. This function may be further qualified by wiring through field switch 1 or 2, in order to disable the start read function at given carriage positions.

REPRODUCE PRINT RESTORE IN NON PRINT (f, m) - When these two hubs are wired together, the Print Restore code will reproduce into the output tape, providing the 2302 is in an automatic non print condition. Absence of this connection permits the Print Restore code to terminate the automatic non print condition without reproduction into the output tape.

Note: If any other code is wired to cause the print restore function, this code will always be reproduced in an automatic non print condition.

ADD 8 (B, F) - When these hubs are connected, and the program modification switch is in the operated position (down), the eighth bit will be added to the code punched by any operated keylever or panel switch. This enables address codes to be punched for use with the SELECTADATA selective reader connected to the 2302.

PROGRAM MODIFICATION (L, R, V) - In addition to the address code punching capability, these three hubs provide a selector associated with the program modification switch. Hub L is the common, hub R the normal, and hub V is the transfer. When the program modification switch is in the normal (up) condition, hubs L and R are connected. When in the operated (down) position, hubs L and V are connected.

Normally, either the selector or the address code punching capability is used, seldom together. The selector may be used to cause recognition of a second Stop code, or any similar either/or type function.

MINUS (C) - Provides a constant source of electrical impulses whenever there is power in the writing machine. These are usually employed to provide impulses modified through selectors.

FIELD SWITCHES (H, M, S and W, a, e) - These are two selectors, connected to field switch 1 (H, M, S) and field switch 2 (W, a, e). Hubs H and W are common hubs, M and a are normal, and S and e are transfer. When an actuator comes into contact with one of these field switches, the common and transfer hubs are internally connected.

Field switch hubs are often used for the purpose of blocking the start read function, or for termination of a skip tab condition.

Note: There is no internal wiring that qualifies the operation of these hubs. They will operate not only during normal carriage escapement, but also during the machine functions of carriage return and tabulation.

Customizing Features. Eighteen additional hubs on the terminal connector are for special customizing and optional features (see figure 42). These are described as follows:

OPTIONAL SELECTOR (Z, d, j, p, u, y, CC, and HH) - This selector has two independent sets of common, normal and transfer hubs, j, p, u, and y, CC, HH. The selector becomes transferred when hub Z is impulsed, and remains in that condition until hub d is impulsed, after which, it returns to a normal condition.

KEYBOARD UNLOCK EXIT (v) - (Optional) With this option, strict discipline of operator entry is possible in a limited number of fields on a document. Generally wired through a selector, this hub is used in conjunction with a field switch to block operator entry at certain points. To unlock the key-

board, a circuit must be completed to the KEYBOARD UNLOCK ENTRY hub (Z).

KEYBOARD UNLOCK ENTRY (Z) - (Optional) Used in conjunction with the KEYBOARD UNLOCK EXIT (v), a circuit must be completed between these two for the keyboard to become unlocked. For example, figure 46 below illustrates how a disciplined entry wiring operates. Hubs are shown out of their normal position for clarity.

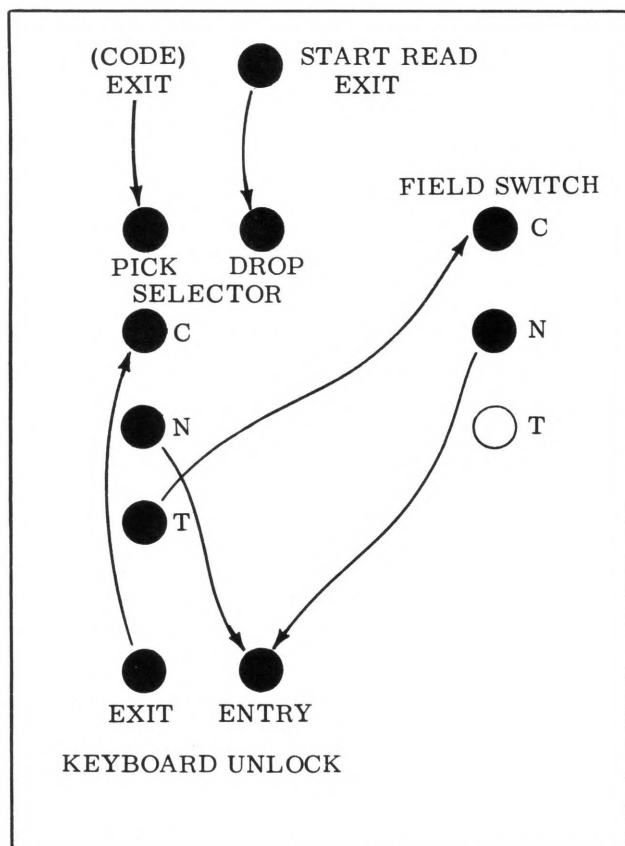


Figure 46. Keyboard Unlock Wiring Example.

In figure 46, under normal conditions, the keyboard remains unlocked. However, before each disciplined field, a code is read that picks the selector. In this transferred condition, the keyboard is still unlocked as long as the selected field switch is unoperated. When an actuator, placed at the end of the disciplined entry field, contacts the field switch, the circuit is broken, and the keyboard becomes locked. At this point, the only way the keyboard can become unlocked, is for the operator to touch START

READ. This action drops the selector (returns it to a normal condition).

Note: There are several ways of causing this same effect. However, whatever the means used to break the connection between the KEYBOARD UNLOCK EXIT and ENTRY hubs, operation of START READ or NON PRINT panel switches will unlock the keyboard, even though not specifically wired to do so, as in the above illustration.

TAPE SKIP RESTORE ENTRY (w) - If the 2302 is equipped with the tape skip feature, impulsing this hub (usually from the TSR EXIT hub) when in the tape skip condition, will restore the 2302 writing machine to a normal reading condition.

CUSTOMIZING HUBS (AA, BB, DD, EE, FF) - These five hubs are available for additional customizing of the 2300 series units, as may be required by specific applications. As such, they are reserved for such functions as reader switching during automatic non print, recognition of Carriage Return codes during tape skip, disabling parity check during any non print condition, and various others.

PROGRAMMING

In general, programming is the planning on paper, of the details of an application. It consists of a step-by-step breakdown of all machine, and operator functions.

The following paragraphs describe a program for the 2302 FLEXOWRITER automatic writing machine. It is not intended to be comprehensive, nor is it meant to suggest any application limitations. However, knowledge of the methods employed here, will enable the user to gain maximum benefit from the 2302 writing machine and any input or output units employed.

To illustrate the basic principles of programming, this section will show a sales order being prepared on the 2302, equipped with edge-punched card reader and punch. Sales order writing involves the use of constant, repetitive data for each customer

and each item purchased, as name, address product code, item description, unit price, and shipping information. Constant data for each customer, and each item is encoded into edge-punched cards. These permit automatic, error free typing of this information, and provide for simple filing card methods.

Figure 47 illustrates the system. Customer and item edge-punched cards contain all constant, unchanging data about the customer and items to be purchased. These cards are read in the writing machine, and with manual entry of current or variable information, produce the typed sales order. At the same time, a by-product tape called the select tape, is punched, containing only a portion of the data typed on the sales order.

This tape is then converted to tab cards,

which, after further automatic processing produce the sales register.

Shown in Figure 48 is the sales order form. Manual entries are shaded. All else is written automatically from the customer and item cards.

PRELIMINARY APPROACH

To begin programming this application, the programmer collects samples of the sales order form and the tab cards. Then a flow chart of the complete application is drawn, as shown in figure 49. There are five steps.

Master Tape Preparation. If there were only one customer and one item, this step would be unnecessary. However, in this case, assume a large number of customers, and an even larger number of items. One card will

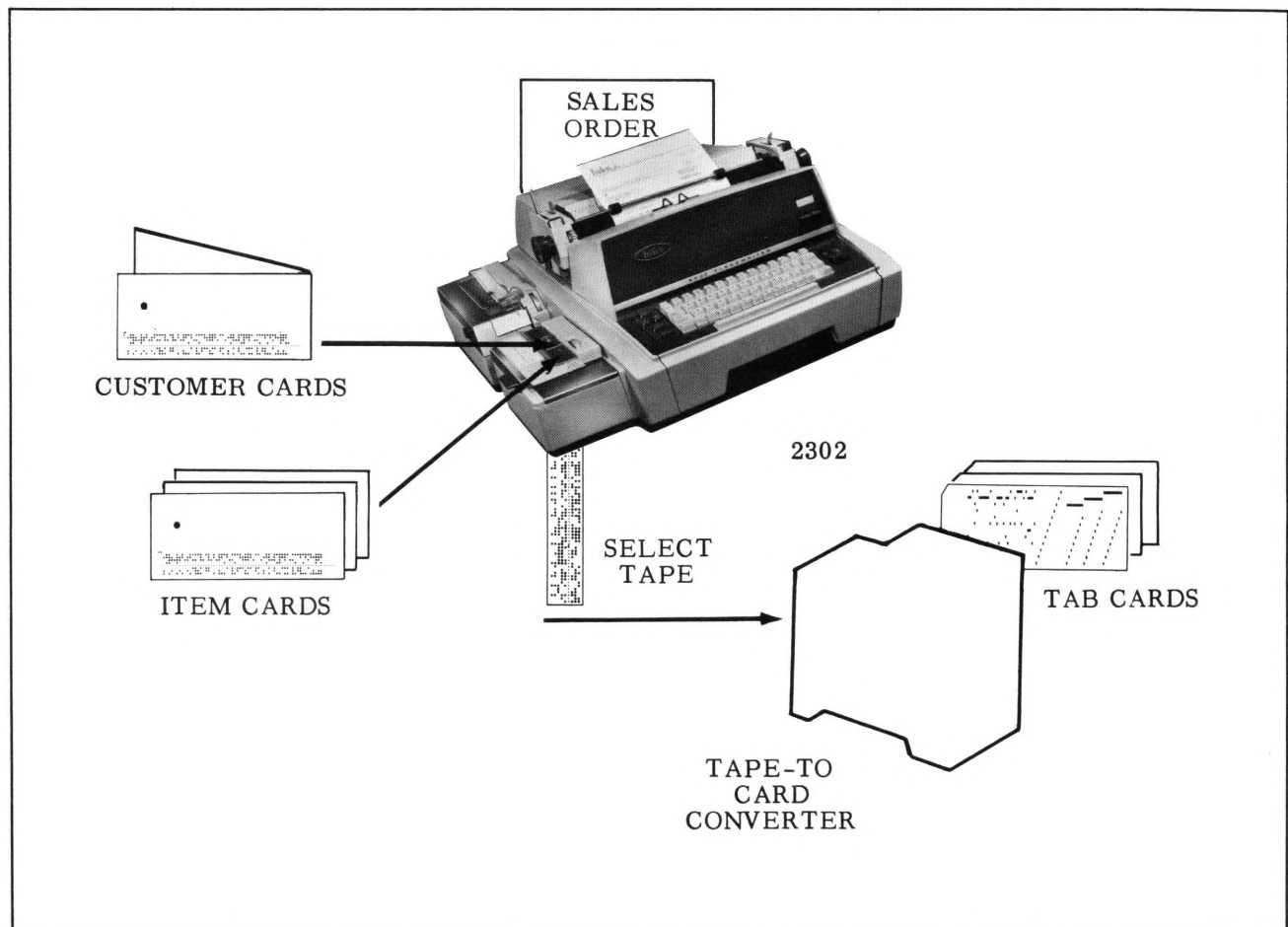


Figure 47. Sales Order Writing System.

CUSTOMER CARD

ITEM CARDS

SALES ORDER

| | | | | |
|-----------|-------|-----------|---------------|-------------|
| CUST. NO. | TERM. | S. W. NO. | SALESMAN NAME | TERMS |
| 123456 | 333 | 4242 | BROWN | NET 10 DAYS |

SHIP TO
 BUSINESS SERVICES INC
 200 STATE STREET
 ALBANY, NEW YORK

SOLD TO
 OFFICE EQUIPMENT SPLY
 100 ELM STREET
 ROCHESTER, NEW YORK

| | | | |
|---------------|------------|-----------------|----------|
| OUR ORDER NO. | ORDER DATE | CUST. ORDER NO. | SHIP VIA |
| 32512 | 12/10/66 | X-10394 | BEST WAY |

| QTY | PRICE | CODE | |
|-----|--------|------|------------------------------------|
| 12 | 12.50U | 5476 | OFFICE SWIVEL CHAIRS - SECRETARIAL |
| 200 | 3.75C | 1015 | GUMMED LABELS BOXED |

DO NOT WRITE IN THIS SPACE

Figure 48. Sales Order Form.

be punched for each. Cards for different customers will obviously contain different information, but format codes, functional codes, and Stop codes for manual entry will be the same for each customer card. The same applies to item cards. Customer and item master tapes are created to provide automatic punching of these codes into the cards, plus entry of the data for different customers and items. Also, in this illustration, the master tapes will be laid out in such a manner as to type labels for the cards. Tapes are used because they can be glued into a loop to eliminate reinserting them each time they are read.

Edge-Punched Card Preparation. In this step, the master tapes are read, and along with manual entries, individual customer and item cards are punched. At the same time, a label is typed for each card. A code in the master tape causes automatic card feeding in the punch.

Sales Order Writing. Customer and item cards are read in the writing machine reader, along with manual entries, to produce the typed sales order form, and select tape.

Tape to Card Conversion. After a given number of sales orders have been written, the select tape is converted automatically

to tab cards. Special codes to control this operation, called PI (Program Indication) codes have been punched into the select tape.

Sales Register Preparation. Data is then automatically perpetuated through a number of steps culminating in the preparation of the sales register.

WRITING MACHINE SPECIFICATIONS

After considering the entire application, a listing of the functional codes to be used is prepared and placed on a program layout chart, similar to that shown on page 51. These are used later as wiring instructions for the removable terminal connector. In addition, field switch channel assignments for channels 1 and 2 are listed.

In this particular application some operator discipline will be enforced using channel 1 to modify the START READ function. Actuators placed in this channel will cover the critical manual entry areas on the form. In this way, it is possible to guard against the operator under-filling any field.

The program has been set up to operate at maximum efficiency. After positioning the form, the operator need only insert the cards into the writing machine reader in sequence, and touch the START READ manual control

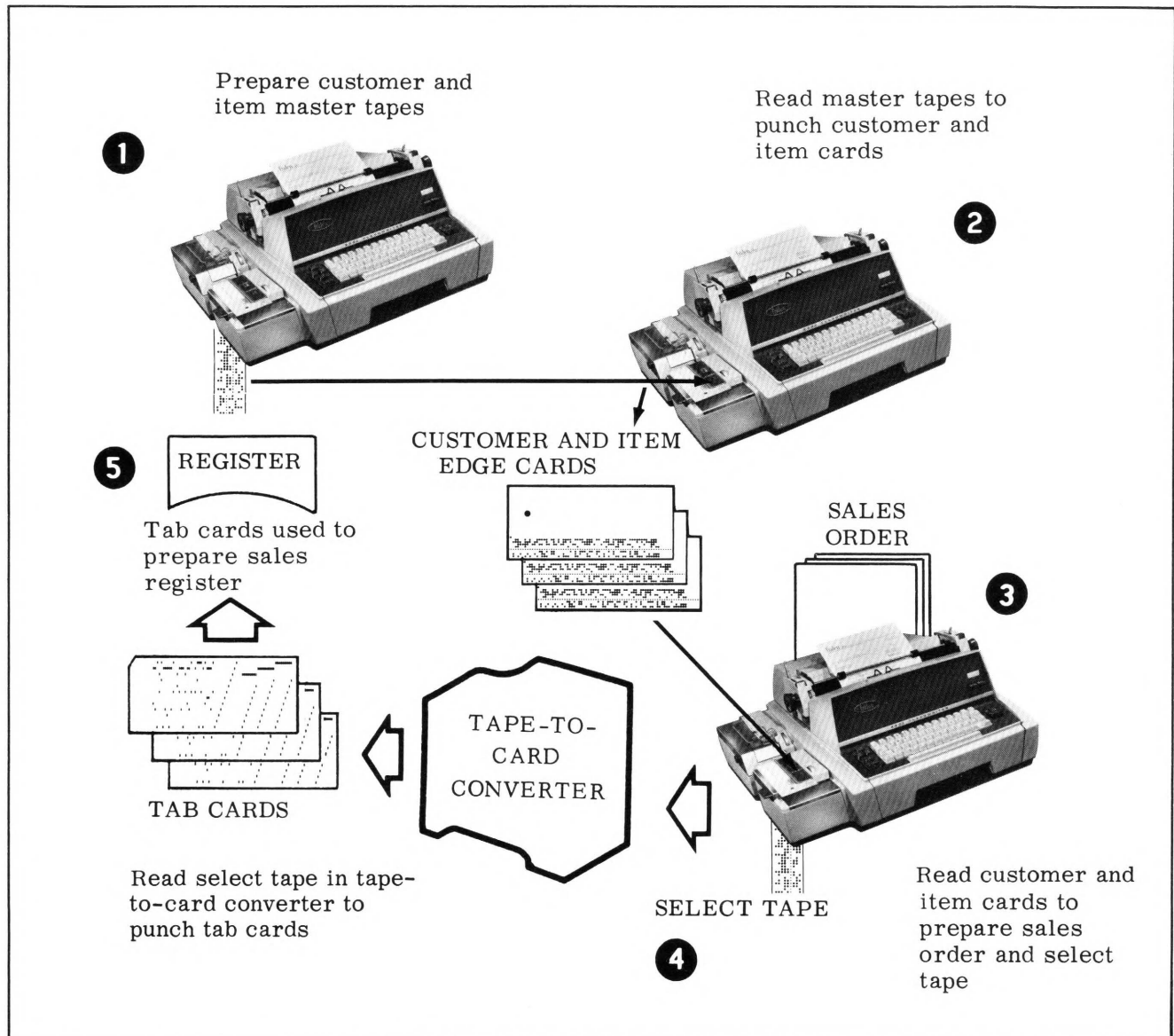


Figure 49. Flow Chart - Sales Order System.

control key. All functional and format codes encoded within these cards will cause their appropriate machine function (according to terminal connector wiring). Therefore, the code assigned to the machine function of reader stop will cause the reading action to terminate. This allows the operator to make manual entries.

While forms design places critical numeric data in blocks, just wide enough to allow the required number of digits to be entered, the operator can still place too few digits within each manual entry field. To preclude this,

the 2302 (in this application) is programmed so that the start read function is disabled (non-operative) if the operator fails to enter the required number of digits.

In this programming example, form design, tab card layout, and the codes required in the select tape are given to the programmer. From these, customer and item cards are developed. After this has been done, the codes required in the master vendor and item tapes can be developed. Furthermore, this application requires that the punch

control switch be in the SELECT position for all stages except the original tape creation. The complete program is shown on the programming layout chart found on page 51.

To better understand this application, the following list of code abbreviations and their functions, used in the programming charts is explained as follows:

| | |
|------|--------------------|
| CR | Carriage Return |
| TAB | Tabulation |
| SP | Space |
| ON | Punch On |
| OFF | Punch Off |
| STP | Stop Read |
| NP | Non Print |
| PR | Print Restore |
| PI | Program Indication |
| CDFD | Card Feed |
| FF | Form Feed |

The first three codes, CR, TAB, and SP, are the only codes which space the carriage (and therefore the form). Using these codes individually or in combinations, permits movement to any desired point on the form.

Control of the punch is done through keylever punch control, using On and Off codes. This permits only selected information to punch. With the punch control switch in the SEL (select) position these punch control codes function only, but do not reproduce their respective codes in the by-product tapes. However, format codes (CR, TAB, SP) will cause their associated machine function and will also reproduce their respective codes (providing the punch is on).

Some of the codes listed above are classified as non-reproducing codes. That is, they will cause their assigned machine functions, but will not reproduce into the by-product tapes. However, the by-product tapes for this application require the presence of STOP, PI, and other codes. By using the automatic non print feature on the 2302, these codes can be reproduced for use in a later operation.

PROGRAM EXPLANATION

To understand the programming charts that

follow, first read the codes in the select tape under A, relating them with the tab card layout. Next look at the form and the customer card to see the relationship between them. Finally, follow the punching of the select tape from the customer card. The master tape is not shown, as it is especially coded to produce a label, besides preparing edge cards. However, it is shown on the complete programming chart for this application, found on page 51.

A In the select tape, the first code punched is the PI 3 code. This code causes the converter to punch a "1" in the first card column (code position) of the tab card. It also controls the format for punching this card. The customer number is also punched.

In the ship to card, several codes precede the PI 3 code. These codes control format spacing and the punch. The OFF code insures the condition of the punch at the start of the application; UC (upper case) insures the case shift position. The punch is turned on, and the PI 3 code, which is non-reproducing, is non printed into the select tape. This being done, the punch is turned off and two CR codes position the carriage at the first writing line; the punch is turned on, and the customer number is written automatically from the ship to card.

B Territory and salesman are the next data punched into the select tape. On the form, there is one space between customer number and territory, and one space between territory and salesman, which do not punch into the select tape. These spaces are eliminated by the OFF-SP-ON coding in the customer card. All of this is repetitive information and is automatically written by the ship to card.

C Since the salesman's name is not punched into the select tape, an OFF code precedes this. A space separates salesman's name field from salesman field. Salesman's name is written automatically. This information is of variable length, so a TAB code is used to bring the carriage to the terms field. This information is also written automatically.

| SALES ORDER | | | | | | | | | | | | | | | | | | | |
|--|--|--|--|--|------------------------|--|---------------|--|------------------------|----------------------------|--|----------------------|--|--|----------------------------|--|--|--|--|
| A | | | | | B | | | | | C | | | | | | | | | |
| CUST. NO. 123456 | | | | | TERR. 333 | | S'MAN 4242 | | SALESMAN NAME BROWN | | | TERMS NET 10 DAYS | | | | | | | |
| SHIP TO D | | | | | | | | | | | | | | | | | | | |
| BUSINESS SERVICES INC 200 STATE STREET ALBANY, NEW YORK | | | | | | | | | | | | | | | | | | | |
| SOLD TO E | | | | | | | | | | | | | | | | | | | |
| OFFICE EQUIPMENT SPLY 100 ELM STREET ROCHESTER, NEW YORK | | | | | | | | | | | | | | | | | | | |
| F | | | | | G | | | | | H | | | | | I | | | | |
| OUR ORDER NO. 32512 | | | | | ORDER DATE 12/10/66 | | | | | CUST. ORDER NO. X-10394 | | | | | SHIP VIA BEST WAY | | | | |
| QTY | | | | | PRICE | | | | | CODE | | | | | DO NOT WRITE IN THIS SPACE | | | | |

| SHIP TO CARD | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|-------------|--------|-------------|-------------|-------------|--------|--------|--------|--------|----------|-------------|--------|-----------|-------------|--------|-------|-------------|-------------------|-------------|-------------------|--------|---------------------|--------|----------------|--------|-------------|
| A | | | | | B | | | | | C | | | | | D | | | | | | | | | | | |
| O F F C | U N C | N P | P I R | P F F | O C R | N 2 | 123456 | F F | S P | N 333 | O F F | S P | N 4242 | O F F | S P | BROWN | T A B | NET 10 DAYS | C R 4 | BUS SER INC | C R | 200 STATE ST. | C R | ALBANY N.Y. | C R | S T P |

| SOLD TO CARD | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|-------------|-------------------------|--------|-------------------|--------------|---------------|--------|-------------|-------------|-------------|--------|-----------|-------------|--------|-----------------|-------------|--------|-----------|-------------|-------------------|-------------|-------------------|--------|---------------------|--------|----------------|--------|-------------|
| E | | | | | F | | | | | G | | | | | H | | | | | I | | | | | | | | |
| | | | | | OUR ORD. NO. | | | | | ORD. DATE | | | | | CUST. ORDER NO. | | | | | STOP II | | | | | | | | |
| O F F C | U N C | OFFICE EQUIP SPLY | C R | 100 ELM ST. | C R | ROCH. N.Y. | C R | O T 5 | S N P | O F F | S P | N 4242 | O F F | S P | N 4242 | O F F | S P | N 4242 | T A B | NET 10 DAYS | C R 4 | BUS SER INC | C R | 200 STATE ST. | C R | ALBANY N.Y. | C R | S T P |

| SELECT TAPE | | | | | | | | | | | | | | | |
|-------------|---|--------|-----|------|-------|----------|--|--|--|--|--|--|--|--|--|
| P I R | 3 | 123456 | 333 | 4242 | 32513 | 12/10/65 | | | | | | | | | |

TAB CARD

| | | CUST. NO. | | | | | | TERR | | S'MAN | | | | OUR ORDER NO. | | | | | ORD. DATE | | | | | QTY. | | | | | PRICE | | | | | COD | | | | | |
|---|---|-----------|---|---|---|---|---|------|----|-------|----|----|----|---------------|----|----|----|----|-----------|----|----|----|----|------|----|----|----|----|-------|----|----|----|----|-----|----|----|----|----|----|
| 1 | 1 | 2 | 3 | 4 | 5 | 6 | 3 | 3 | 3 | 4 | 2 | 4 | 2 | 3 | 2 | 5 | 1 | 2 | 1 | 2 | 1 | 0 | 6 | 6 | 0 | 0 | 1 | 2 | 0 | 0 | 1 | 2 | 5 | 0 | 5 | 4 | 7 | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |

D Four CR codes bring the carriage to the ship to field, and this information, name, address, and city/state, is written automatically from the ship to card. A CR code brings the carriage out of this field, and a Stop code stops the reader in order that the ship to card can be removed, and the sold to card inserted.

E Again note the presence of the OFF-UC "insurance" codes. Two CR codes position the carriage, and the sold to data is

written automatically. None of this punches into the select tape.

F Five CR codes position the carriage at the our order number field, and a Stop code stops the reader to provide for manual entry of this information. The punch is turned on so this information is captured in the select tape.

At this point, after the operator has begun to enter into this field, START READ will not

enter into this field, START READ will not operate, having been disabled by an actuator contacting field switch 1. In all other fields contacting this field switch, the 2302 was already reading automatically, and reading cannot be dropped by actuator position. Therefore, prior to this time, actuators placed to contact field switch 1 are not operative.

G Order date information is punched into the select tape. Again the OFF-SPACE-ON coding prevents the space separating the two fields from being punched. A Stop code provides for manual entry into this field. Again, an actuator contacting field switch 1 prevents the operator from using START READ until the field has been filled. Note that to fill this field correctly, the operator must enter zeros prior to the first significant digit during the first nine months and the first nine days, to keep the field size constant throughout.

H Customer order number is not punched into the select tape, so an OFF code precedes this field. Since this is a manual entry, a Stop code is present in the sold to card to provide for this condition. The information is not punched into the select tape, so disciplined entry is not used. The field is of a variable length so a Tab code is used to bring the carriage to the next field.

I Ship via information is normally an automatic entry. However, a means of entering alternate information is provided. A Form Feed code precedes this field. If the program modification switch is operated (down) the Form Feed code will cause reader stop. In such a case, the operator enters the alternate information, and touches NON PRINT. With the punch off, the manual non print switch causes tape to cycle through the reader without causing punching. Form Feed code also causes manual non print stop, and the operator touches START READ to complete the card.

Three CR codes bring the carriage out of the header portion of the form, and a Stop code

allows the sold to card to be removed, and the first item card to be inserted.

J In the select tape, the first code punched is the PI 4 code. This code does nothing when read in card column 27, as it is in the first tab card punched. In the second tab card it will be read in card column 1, where it causes the first 26 card columns to be duplicated from the previous card. In this manner, the heading information appears in both tab cards for this sales order.

Quantity information is a manual entry and is punched into the select tape. In the tab card, preceding spaces punch as zeros.

In the item card, the OFF code insures the condition of the punch at the start of the reading; the Upper Case code insures the case shift condition; and the CR code positions the carriage at the first writing line. A Stop code allows manual entry of this numeric information.

Note that the quantity field is in the same vertical position as the our order number field. Therefore, the actuator disabling START READ is also effective here.

K Provision is made in the price field for an alternate entry, in the same manner as was done in the ship via field. Therefore, if the alternate entry is made, it is made with START READ disabled, because the price field occupies the same vertical position as the order date field. After the last digit of the price is entered (automatically or manually), the operator touches START READ and the unit designation is printed. (U stands for unit; C per hundred; and M per thousand.) This data does not punch into the select tape, so it is preceded by an OFF code.

L Code data punches into the select tape, The punch is off at this point, and the Space code, between the two fields is read. The punch is turned on, and the code data is written automatically from the item card.

| F | G | H | I |
|---------------------------------|------------------|---------------------------------|---|
| SOLD TO CARD | ORD. DATE | CUST. ORD. | STP II |
| | | NO. | |
| C R O N S | S F P | O F P N S T P | T A B F BEST WAY F C R T P 3 |
| ITEM CARD | J | QTY | K STP II |
| | | | L M |
| O F F C R N P | P I R P | S D P 3 | 12.50 F U F P N 5476 OFFICE SWIVEL CHAIR-SEC. |
| SELECT TAPE | J | K | L M |
| -32513 | 12/10/66 | P I R 4 | S D P 3 12 |
| | | | S D P 3 12.50 |
| | | | 5476 OFFICE SWIVEL CHAIR-SEC. |

TAB CARD

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--|
| 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | |
| 6 OFFICE SWIVEL CHAIRS - SECRETARIAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

M Description data is also punched into the select tape. The space between code and description fields on the form is eliminated by the OFF-SPACE-ON coding. And the description is written automatically from the item card.

The CR code, punched into the select tape causes card release in the converter. Following this, the punch is turned off and the Stop code stops the reading action so the item card can be removed, and a new item card

can be inserted, to continue the application.

All item cards follow this same format, with only the constant data changing from card to card.

This completes the programming description for this application. This page shows the complete programming charts for this application, including the ship to, sold to, and item master tapes, and the terminal block wiring.

Friden

* PROGRAM LAYOUT CHART 2300 SERIES

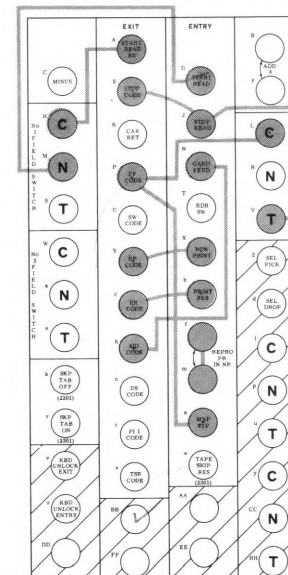
Prepared for _____ CUSTOMER
Friden Office _____
Date Prepared _____

EQUIPMENT: 2302 WITH EDGE-PUNCHED CARD
READER AND PUNCH, BY-PRODUCT
TAPE TO TAPE-TO-CARD CONVERTER

| | | | | | | | | | |
|-------------------------|--------|-----------|----------|----------------|---------|------------------------------------|-------|-------|-------------|
| CUST. NO. | 123456 | TER. | 333 | S'MAN | 4242 | SALESMAN NAME | BROWN | TERMS | NET 10 DAYS |
| SHIP TO | | | | | | | | | |
| BUSINESS SERVICES, INC. | | | | | | | | | |
| 200 STATE STREET | | | | | | | | | |
| ALBANY, NEW YORK | | | | | | | | | |
| SOLD TO | | | | | | | | | |
| OFFICE EQUIPMENT SUPPLY | | | | | | | | | |
| 100 ELM STREET | | | | | | | | | |
| ROCHESTER, NEW YORK | | | | | | | | | |
| ORD. NO. | 32512 | ORD. DATE | 12/10/65 | CUST. ORD. NO. | X-10394 | SHIP VIA | | | |
| | | | | | | BEST WAY | | | |
| QTY | 12 | PRICE | 12.50 | CODE | 5476 | DESCRIPTION | | | |
| | | | | | | OFFICE SWIVEL CHAIRS - SECRETARIAL | | | |
| QTY | 200 | PRICE | 3.75 | CODE | 1015 | DESCRIPTION | | | |
| | | | | | | GUMMED LABELS BOXED | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 105 | 110 | 115 | 120 | 125 | 130 | 135 | 140 |
|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|

TERMINAL CONNECTOR



SPECIAL ASSIGNMENTS

FF CODE - STOP II (PRGM MOD) - ALSO STOPS MNP TO PERMIT TAPE SKIP OPTION FOR SHIP VIA AND PRICE FIELDS)
NP CODE - NP
PR " - PR (REPRO)
STOP " - STOP READ
AID " - CARD FEED

FIELD SWITCHES

- 1 DISABLE START READ
- 2

NOTES

SHIP TO MASTER CUST. NO. TERR S'MAN NO. S'MAN NAME TERMS NAME ST. CITY CD FD

SHIP TO CARD

SELECT TAPE

SOLD TO MASTER FILE REF. NO. NAME ST. CITY SHIP VIA

SOLD TO CARD

SELECT TAPE

ITEM MASTER REF. FILE NO. PRICE SYM CODE DESC. 2ND LINE

ITEM CARD QTY STP II (TOUGH OFF AFTER NEW ENTRY-THEN MNP)

SELECT TAPE

ITEM CARD QTY STP II (TOUGH OFF AFTER NEW ENTRY-THEN MNP)

ITEM CARD QTY STP II (TOUGH OFF AFTER NEW ENTRY-THEN MNP)

ITEM CARD QTY STP II (TOUGH OFF AFTER NEW ENTRY-THEN MNP)

CODE CHART

| Tape Channels | | | | | | | | | | 2301 | 2301 | 2302 | 2303/2304 |
|---------------|---|---|---|---|---|---|---|---------|---------|---------|---------|---------|-----------|
| CARD | 7 | 6 | 5 | 4 | 3 | 2 | 1 | CR | CR | CR | CR | CR | CR |
| SPACE | 6 | 5 | 4 | 3 | 2 | 1 | | SPACE | SPACE | SPACE | SPACE | SPACE | SPACE |
| PL-3 | 6 | 5 | 4 | 3 | 2 | 1 | | TAB | TAB | TAB | TAB | TAB | TAB |
| BACK SP | 6 | 5 | 4 | 3 | 2 | 1 | | BACK SP | BACK SP | BACK SP | BACK SP | BACK SP | BACK SP |
| 0 | 6 | 5 | 4 | 3 | 2 | 1 | | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 6 | 5 | 4 | 3 | 2 | 1 | | 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | 6 | 5 | 4 | 3 | 2 | 1 | | 2 | 2 | 2 | 2 | 2 | 2 |
| 3 | 6 | 5 | 4 | 3 | 2 | 1 | | 3 | 3 | 3 | 3 | 3 | 3 |
| 4 | 6 | 5 | 4 | 3 | 2 | 1 | | 4 | 4 | 4 | 4 | 4 | 4 |
| 5 | 6 | 5 | 4 | 3 | 2 | 1 | | 5 | 5 | 5 | 5 | 5 | 5 |
| 6 | 6 | 5 | 4 | 3 | 2 | 1 | | 6 | 6 | 6 | 6 | 6 | 6 |
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | | 7 | 7 | 7 | 7 | 7 | 7 |
| 8 | 6 | 5 | 4 | 3 | 2 | 1 | | 8 | 8 | 8 | 8 | 8 | 8 |
| 9 | 6 | 5 | 4 | 3 | 2 | 1 | | 9 | 9 | 9 | 9 | 9 | 9 |
| A | 6 | 5 | 4 | 3 | 2 | 1 | | A | A | A | A | A | A |
| B | 6 | 5 | 4 | 3 | 2 | 1 | | B | B | B | B | B | B |
| C | 6 | 5 | 4 | 3 | 2 | 1 | | C | C | C | C | C | C |
| D | 6 | 5 | 4 | 3 | 2 | 1 | | D | D | D | D | D | D |
| E | 6 | 5 | 4 | 3 | 2 | 1 | | E | E | E | E | E | E |
| F | 6 | 5 | 4 | 3 | 2 | 1 | | F | F | F | F | F | F |
| G | 6 | 5 | 4 | 3 | 2 | 1 | | G | G | G | G | G | G |
| H | 6 | 5 | 4 | 3 | 2 | 1 | | H | H | H | H | H | H |
| I | 6 | 5 | 4 | 3 | 2 | 1 | | I | I | I | I | I | I |
| J | 6 | 5 | 4 | 3 | 2 | 1 | | J | J | J | J | J | J |
| K | 6 | 5 | 4 | 3 | 2 | 1 | | K | K | K | K | K | K |
| L | 6 | 5 | 4 | 3 | 2 | 1 | | L | L | L | L | L | L |
| M | 6 | 5 | 4 | 3 | 2 | 1 | | M | M | M | M | M | M |
| N | 6 | 5 | 4 | 3 | 2 | 1 | | N | N | N | N | N | N |
| O | 6 | 5 | 4 | 3 | 2 | 1 | | O | O | O | O | O | O |
| P | 6 | 5 | 4 | 3 | 2 | 1 | | P | P | P | P | P | P |
| Q | 6 | 5 | 4 | 3 | 2 | 1 | | Q | Q | Q | Q | Q | Q |
| R | 6 | 5 | 4 | 3 | 2 | 1 | | R | R | R | R | R | R |
| S | 6 | 5 | 4 | 3 | 2 | 1 | | S | S | S | S | S | S |
| T | 6 | 5 | 4 | 3 | 2 | 1 | | T | T | T | T | T | T |
| U | 6 | 5 | 4 | 3 | 2 | 1 | | U | U | U | U | U | U |
| V | 6 | 5 | 4 | 3 | 2 | 1 | | V | V | V | V | V | V |
| W | 6 | 5 | 4 | 3 | 2 | 1 | | W | W | W | W | W | W |
| X | 6 | 5 | 4 | 3 | 2 | 1 | | X | X | X | X | X | X |
| Y | 6 | 5 | 4 | 3 | 2 | 1 | | Y | Y | Y | Y | Y | Y |
| Z | 6 | 5 | 4 | 3 | 2 | 1 | | Z | Z | Z | Z | Z | Z |
| # | 6 | 5 | 4 | 3 | 2 | 1 | | # | # | # | # | # | # |
| 0 | 6 | 5 | 4 | 3 | 2 | 1 | | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 6 | 5 | 4 | 3 | 2 | 1 | | 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | 6 | 5 | 4 | 3 | 2 | 1 | | 2 | 2 | 2 | 2 | 2 | 2 |
| 3 | 6 | 5 | 4 | 3 | 2 | 1 | | 3 | 3 | 3 | 3 | 3 | 3 |
| 4 | 6 | 5 | 4 | 3 | 2 | 1 | | 4 | 4 | 4 | 4 | 4 | 4 |
| 5 | 6 | 5 | 4 | 3 | 2 | 1 | | 5 | 5 | 5 | 5 | 5 | 5 |
| 6 | 6 | 5 | 4 | 3 | 2 | 1 | | 6 | 6 | 6 | 6 | 6 | 6 |
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | | 7 | 7 | 7 | 7 | 7 | 7 |
| 8 | 6 | 5 | 4 | 3 | 2 | 1 | | 8 | 8 | 8 | 8 | 8 | 8 |
| 9 | 6 | 5 | 4 | 3 | 2 | 1 | | 9 | 9 | 9 | 9 | 9 | 9 |
| A | 6 | 5 | 4 | 3 | 2 | 1 | | A | A | A | A | A | A |
| B | 6 | 5 | 4 | 3 | 2 | 1 | | B | B | B | B | B | B |
| C | 6 | 5 | 4 | 3 | 2 | 1 | | C | C | C | C | C | C |
| D | 6 | 5 | 4 | 3 | 2 | 1 | | D | D | D | D | D | D |
| E | 6 | 5 | 4 | 3 | 2 | 1 | | E | E | E | E | E | E |
| F | 6 | 5 | 4 | 3 | 2 | 1 | | F | F | F | F | F | F |
| G | 6 | 5 | 4 | 3 | 2 | 1 | | G | G | G | G | G | G |
| H | 6 | 5 | 4 | 3 | 2 | 1 | | H | H | H | H | H | H |
| I | 6 | 5 | 4 | 3 | 2 | 1 | | I | I | I | I | I | I |
| J | 6 | 5 | 4 | 3 | 2 | 1 | | J | J | J | J | J | J |
| K | 6 | 5 | 4 | 3 | 2 | 1 | | K | K | K | K | K | K |
| L | 6 | 5 | 4 | 3 | 2 | 1 | | L | L | L | L | L | L |
| M | 6 | 5 | 4 | 3 | 2 | 1 | | M | M | M | M | M | M |
| N | 6 | 5 | 4 | 3 | 2 | 1 | | N | N | N | N | N | N |
| O | 6 | 5 | 4 | 3 | 2 | 1 | | O | O | O | O | O | O |
| P | 6 | 5 | 4 | 3 | 2 | 1 | | P | P | P | P | P | P |
| Q | 6 | 5 | 4 | 3 | 2 | 1 | | Q | Q | Q | Q | Q | Q |
| R | 6 | 5 | 4 | 3 | 2 | 1 | | R | R | R | R | R | R |
| S | 6 | 5 | 4 | 3 | 2 | 1 | | S | S | S | S | S | S |
| T | 6 | 5 | 4 | 3 | 2 | 1 | | T | T | T | T | T | T |
| U | 6 | 5 | 4 | 3 | 2 | 1 | | U | U | U | U | U | U |
| V | 6 | 5 | 4 | 3 | 2 | 1 | | V | V | V | V | V | V |
| W | 6 | 5 | 4 | 3 | 2 | 1 | | W | W | W | W | W | W |
| X | 6 | 5 | 4 | 3 | 2 | 1 | | X | X | X | X | X | X |
| Y | 6 | 5 | 4 | 3 | 2 | 1 | | Y | Y | Y | Y | Y | Y |
| Z | 6 | 5 | 4 | 3 | 2 | 1 | | Z | Z | Z | Z | Z | Z |
| # | 6 | 5 | 4 | 3 | 2 | 1 | | # | # | # | # | # | # |
| 0 | 6 | 5 | 4 | 3 | 2 | 1 | | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 6 | 5 | 4 | 3 | 2 | 1 | | 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | 6 | 5 | 4 | 3 | 2 | 1 | | 2 | 2 | 2 | 2 | 2 | 2 |
| 3 | 6 | 5 | 4 | 3 | 2 | 1 | | 3 | 3 | 3 | 3 | 3 | 3 |
| 4 | 6 | 5 | 4 | 3 | 2 | 1 | | 4 | 4 | 4 | 4 | 4 | 4 |
| 5 | 6 | 5 | 4 | 3 | 2 | 1 | | 5 | 5 | 5 | 5 | 5 | 5 |
| 6 | 6 | 5 | 4 | 3 | 2 | 1 | | 6 | 6 | 6 | 6 | 6 | 6 |
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | | 7 | 7 | 7 | 7 | 7 | 7 |
| 8 | 6 | 5 | 4 | 3 | 2 | 1 | | 8 | 8 | 8 | 8 | 8 | 8 |
| 9 | 6 | 5 | 4 | 3 | 2 | 1 | | 9 | 9 | 9 | 9 | 9 | 9 |
| A | 6 | 5 | 4 | 3 | 2 | 1 | | A | A | A | A | A | A |
| B | 6 | 5 | 4 | 3 | 2 | 1 | | B | B | B | B | B | B |
| C | 6 | 5 | 4 | 3 | 2 | 1 | | C | C | C | C | C | C |
| D | 6 | 5 | 4 | 3 | 2 | 1 | | D | D | D | D | D | D |
| E | 6 | 5 | 4 | 3 | 2 | 1 | | E | E | E | E | E | E |
| F | 6 | 5 | 4 | 3 | 2 | 1 | | F | F | F | F | F | F |
| G | 6 | 5 | 4 | 3 | 2 | 1 | | G | G | G | G | G | G |
| H | 6 | 5 | 4 | 3 | 2 | 1 | | H | H | H | H | H | H |
| I | 6 | 5 | 4 | 3 | 2 | 1 | | I | I | I | I | I | I |
| J | 6 | 5 | 4 | 3 | 2 | 1 | | J | J | J | J | J | J |
| K | 6 | 5 | 4 | 3 | 2 | 1 | | K | K | K | K | K | K |
| L | 6 | 5 | 4 | 3 | 2 | 1 | | L | L | L | L | L | L |
| M | 6 | 5 | 4 | 3 | 2 | 1 | | M | M | M | M | M | M |
| N | 6 | 5 | 4 | 3 | 2 | 1 | | N | N | N | N | N | N |
| O | 6 | 5 | 4 | 3 | 2 | 1 | | O | O | O | O | O | O |
| P | 6 | 5 | 4 | 3 | 2 | 1 | | P | P | P | P | P | P |
| Q | 6 | 5 | 4 | 3 | 2 | 1 | | Q | Q | Q | Q | Q | Q |
| R | 6 | 5 | 4 | 3 | 2 | 1 | | R | R | R | R | R | R |
| S | 6 | 5 | 4 | 3 | 2 | 1 | | S | S | S | S | S | S |
| T | 6 | 5 | 4 | 3 | 2 | 1 | | T | T | T | T | T | T |
| U | 6 | 5 | 4 | 3 | 2 | 1 | | U | U | U | U | U | U |
| V | 6 | 5 | 4 | 3 | 2 | 1 | | V | V | V | V | V | V |
| W | 6 | 5 | 4 | 3 | 2 | 1 | | W | W | W | W | W | W |
| X | 6 | 5 | 4 | 3 | 2 | 1 | | X | X | X | X | X | X |
| Y | 6 | 5 | 4 | 3 | 2 | 1 | | Y | Y | Y | Y | Y | Y |
| Z | 6 | 5 | 4 | 3 | 2 | 1 | | Z | Z | Z | Z | Z | Z |
| # | 6 | 5 | 4 | 3 | 2 | 1 | | # | # | # | # | # | # |
| 0 | 6 | 5 | 4 | 3 | 2 | 1 | | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 6 | 5 | 4 | 3 | 2 | 1 | | 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | 6 | 5 | 4 | 3 | 2 | 1 | | 2 | 2 | 2 | 2 | 2 | 2 |
| 3 | 6 | 5 | 4 | 3 | 2 | 1 | | 3 | 3 | 3 | 3 | 3 | 3 |
| 4 | 6 | 5 | 4 | 3 | 2 | 1 | | 4 | 4 | 4 | 4 | 4 | 4 |

INPUT CONNECTOR

One connector is located beneath the 2302 for connection of auxiliary input units. The 2217 Data Selector and any one of three auxiliary input units can be connected to the input connector (see figure 50):

2312 Auxiliary Reader. Provides an additional tape reading unit for the writing machine. A self-contained unit, the 2312 has its own tape unwinder and tape-up reel. A bin replaces these when a looped tape is being read.

2313 Automatic Card Reader. Provides the writing machine with the ability to read

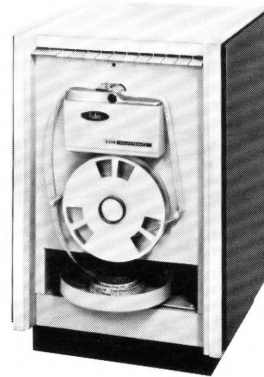
Hollerith-coded tab cards, either singly or in packs.

2314 SELECTADATA Reader. This unit is similar to the 2312 Auxiliary Reader. It also has the ability to search through a tape at the rate of 50 codes per second, and select certain pre-specified data.

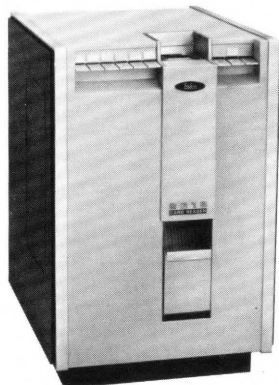
2217 Data Selector. This is an input device which contains ten numeric dials. Each of these dials can be manually set to any of the numeric positions (0-9, S, or blank). One of the functional codes is wired to cause this unit to readout the settings, causing document printing and code punching. The 2217 is normally located on the machine desk.



2312 AUXILIARY TAPE READER



2314 SELECTADATA READER



2313 AUTOMATIC CARD READER



2217 DATA SELECTOR

Figure 50. Auxiliary Input Units for the 2302.

SECTION VI

2303/2304 WRITING MACHINES

GENERAL

The 2303 FLEXOWRITER automatic writing machine (see figure 51) consists of a heavy-duty writing machine with a conventional, electric typewriter keyboard, and a tape punch and reader. It is intended for routine repetitive writing functions common to every business activity. Therefore, programming features and auxiliary input/output unit connectors are not provided.

The 2304 FLEXOWRITER automatic writing machine is identical in specifications to the 2303, except that it uses proportionally-spaced type styles. It is intended for "executive" letterwriting applications and offset master preparation, as well as for all normal repetitive writing functions.

All of the general specifications for the 2300 series, described in Section II apply to the 2303 and 2304 writing machines. This section describes the specific operating features of the 2303 and 2304.

Either of two readers are available to read punched tape (standard), and tape and edge-punched cards (optional). An integral tape punch is standard; a tape and edge card punch is available. Output in the form of a printed document is part of 2303/2304 writing machine operation.

KEYBOARD

The 2303 utilizes a double case writing machine with a .265 shift motion. This model is a monospacing (fixed letter width) unit. Capital letters and some special characters are in the upper case shift position. Numeric, small letters and some special characters are in the lower case shift position.

A fully-expanded keyboard with 45 printing keylevers (see figure 52) is standard. In addition, six format control keylevers (CAR, RET, TAB, BACK SPACE, UPPER CASE, LOWER CASE, space bar) are provided. All are coded for automatic operation.

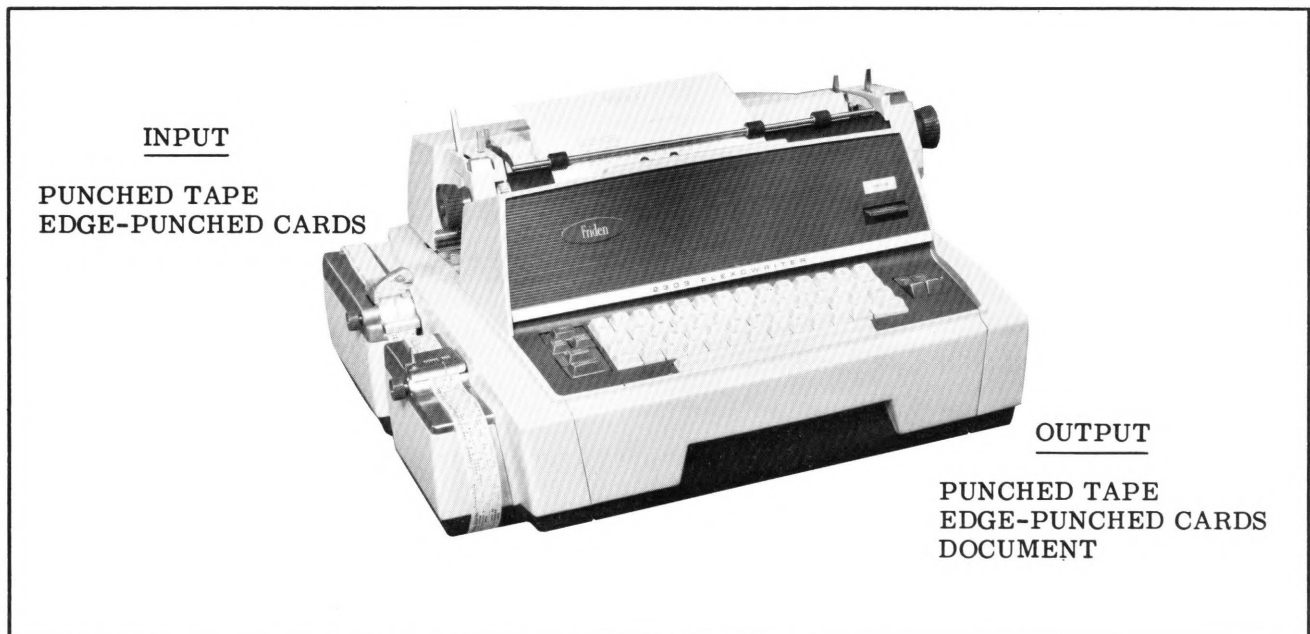


Figure 51. 2303 FLEXOWRITER Writing Machine.



Figure 52. 2303 Keyboard.

While Elite type style is standard on the 2303, various other monospacing type styles are available. Elite type provides 12 characters to the horizontal inch. Tabs may be set at every other letter space position on the writing line.

Figure 53 shows the keyboard of the 2304 automatic writing machine. It has 44 printing keylevers, one less than the 2303. Except for the THREE UNITS keylever, all other keylevers are identical.

Modern type style is standard on the 2304. However, other type styles are available. The list, shown in figure 54, illustrates these other available type styles.

Proportionally-spaced type styles rate each character as having a value of from two to five units of space in proportion to its size. Figure 55 shows the difference between monospacing type styles and proportionally spaced type styles. Point size is that distance from the bottom of a descending character, such as a g, to the top of an ascending character, such as a t, expressed in seventy-seconds of an inch. Pitch is the value of one unit of space expressed in a fraction of an inch, as $1/32$, $1/36$, $1/40$, and $1/48$.

Modern type style, standard on the 2304, is a 10 point type style, with a unit escapement of $1/36$ inches. A 55-tooth ratchet provides five lines to the vertical inch.



Figure 53. 2304 Keyboard.

| TYPE | POINT SIZE | SPACING (Pitch) |
|--------------------|---------------|--------------------|
| Commercial | 14 | 1/32 |
| Bold Face | 12 | 1/32 |
| Bold Italic | 12 | 1/32 |
| Galvin | 12 | 1/32 |
| Rogers | 12 | 1/32 |
| Documentary | 12 | 1/32 |
| Modern* | 10 | 1/36 |
| Booktype | 10 | 1/36 |
| Registry | 10 | 1/36 |
| Galvin 9 Point | 9 | 1/40 |
| Newstext Condensed | 9 | 1/48 |
| Newstext | 8 | 1/48 |
| Galvin 8 Point | 8 | 1/48 |
| Humboldt | 8 | 1/48 |
| Gothic | 8 | 1/48 |
| Legal 7 Point | 7 | 1/48 |
| *2304 standard | | |

Figure 54. Type Styles Available.

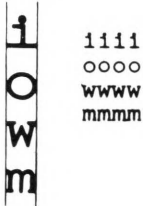

| STANDARD SPACING | PROPORTIONAL SPACING | UNIT WIDTH |
|--|--|--|
|  |  | 2 units 3 units 4 units 5 units |
| <p>Standard Spacing</p> <p>Vertical lines are formed by the white spaces between the rows of characters as shown by the ruled lines.</p> | | |
| <p>Proportional Spacing</p> <p>In the proportionally typed page there are no vertical lines to distract the eye of the reader.</p> | | |

Figure 55. Monospacing and Proportional Spacing.

Spacing is accomplished by using combinations of the space bar, BACK SPACE, and THREE UNITS keylevers. The space bar gives two units of space, and is normally used between words in page copy. BACK SPACE gives one unit of space in reverse, and the THREE UNITS keylever gives three

units of space forward. Combinations of these keylevers and the space bar can provide any special spacing effect. Figure 56 shows the unit width value of all printing characters on the 2304.

| CHARACTER | UNIT WIDTH |
|-----------|------------|
| a A | 3 4 |
| b B | 3 4 |
| c C | 3 4 |
| d D | 3 4 |
| e E | 3 4 |
| f F | 2 4 |
| g G | 3 4 |
| h H | 3 4 |
| i I | 2 2 |
| j J | 2 3 |
| k K | 3 4 |
| l L | 2 4 |
| m M | 5 5 |
| n N | 3 4 |
| o O | 3 4 |
| p P | 3 4 |
| q Q | 3 4 |
| r R | 3 4 |
| s S | 3 3 |
| t T | 2 4 |
| u U | 3 4 |
| v V | 3 4 |
| w W | 4 5 |
| x X | 3 4 |
| y Y | 3 4 |
| z Z | 3 4 |
| 1 , | 3 2 |
| 2 @ | 3 4 |
| 3 # | 3 3 |
| 4 \$ | 3 3 |
| 5 = | 3 3 |
| 6 ¢ | 3 3 |
| 7 ? | 3 3 |
| 8 * | 3 3 |
| 9 (| 3 2 |
| 0) | 3 2 |
| . . | 2 2 |
| , , | 2 2 |
| / ? | 3 3 |
| - " | 3 3 |
| ; : | 2 2 |
| 1/2 1/4 | 3 3 |
| ± + | 3 3 |
|] [| 3 3 |

Figure 56. Character Width Chart.

SWITCHES

Two manually-operated, butterfly switches are located to the extreme right of the keyboard (see figure 57).

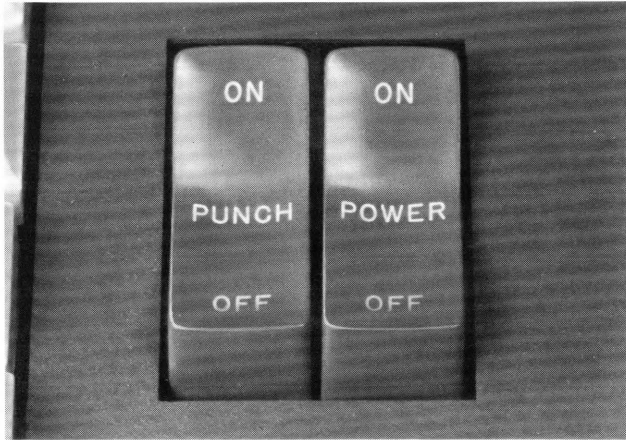


Figure 57. Switches.

Power. This switch has two positions, ON and OFF, which serve to turn on and off the power to the writing machine.

Punch Control. This switch also has two positions, ON and OFF, which serve to control the condition of the writing machine punch. When manually placed in the ON position, all printing and format control keylevers will punch their respective codes, when operated manually or automatically. In the OFF position, no punching will occur.

CONSOLE PANEL

One indicating light and one switch are standard on the 2303. On the 2304 writing machine, there are two indicating lights and one switch (see figure 58).

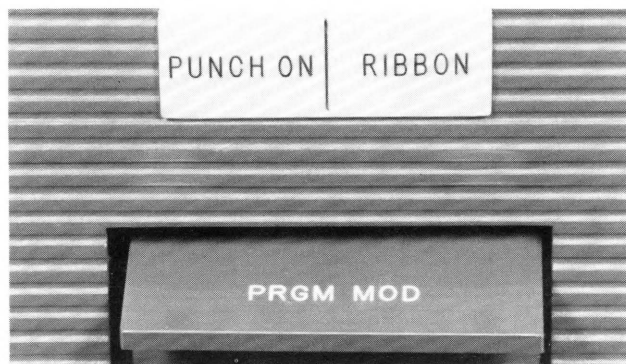


Figure 58. Console Panel (2304).

Indicating Light (2303/2304). Glows whenever the punch is on.

Indicating Light (2304 only). Glows when the carbon ribbon supply is getting low. If the 2304 is in a reading condition at that time, reading will stop. If reading is started again, without replenishing the carbon ribbon supply, no further warnings are given.

PRGM MOD (Program Modification). This is a locking-type switch that must be manually restored to its normal position after operation. It is used to modify certain machine functions through terminal connector wiring methods.

MANUAL CONTROL KEYS

These are a group of five keys located to the left of the keyboard (see figure 59). They are manually operated to control writing machine functions. The following describes the function of each of these keys.

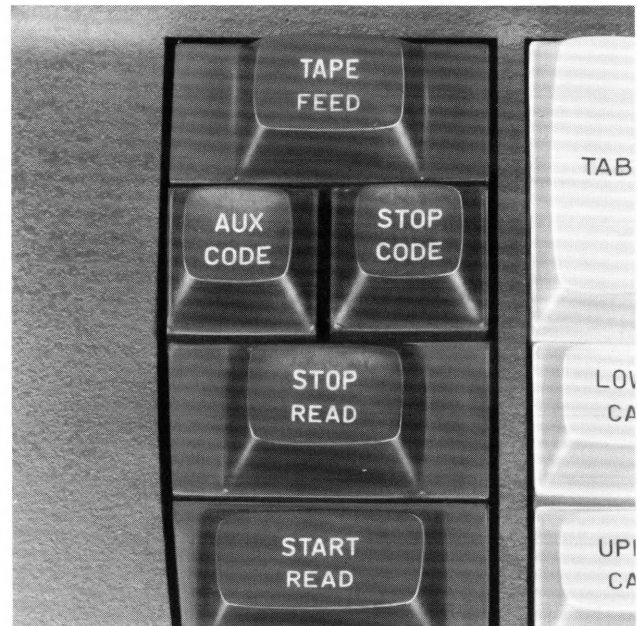


Figure 59. Manual Control Keys.

START READ. When touched and released, this key starts the integral reader. Holding this key depressed, temporarily stops the reading action until it is released, allowing the operator to pulse codes through the reader one at a time.



STOP READ. When touched, all action of the reader will stop.



AUX CODE. This manual control key is used for the purpose of punching certain special functional codes. In order to be operative, this special switch must be used in conjunction with a keylever. If the punch is on, holding AUX CODE depressed, and operating a keylever, will cause the 3 and 4 code holes to be added to the code punched by the keylever.

Any code created by a combination of keylever and panel switch operation will not reproduce itself in the punch when read in the reader. Only codes produced by keylever operation will do so. All other codes, punched by a panel switch, a combination of panel switch/keylever operation, or created by overpunching, will not reproduce, and are referred to as non-reproducing codes.



STOP CODE. Operation of this key while the punch is on, causes the Stop code (1-2-4) to be punched into the tape. When this code is read in the 2303/2304 reader, it will cause the reading action to stop. The Stop code will not reperforate during a normal reading condition, regardless of whether the punch is on or not.



TAPE FEED. Touching this key causes tape to feed through the punch for as long as it is held depressed. The punch does not have to be in an on condition for this function to occur. TAPE FEED is used to provide both leader and trailer strips for output punched tapes. It is also used to delete incorrect codes. The Tape Feed or Delete code is 1-2-3-4-5-6-7, and is non-reproducing.

TERMINAL CONNECTOR

A terminal connector (see figure 60) is used to modify some of the internal functions of the 2303/2304. It is removable, and additional connectors are available to provide

limited program flexibility and simplified application changes.

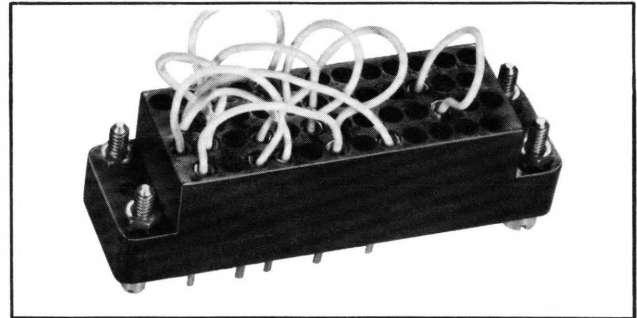


Figure 60. Terminal Connector.

The terminal connector consists of 50 holes, called hubs, arranged in four rows. These hubs either emit or accept electrical impulses carried by wires inserted into them. Any hub may be located by an alphabetic reference, i. e., A, b, EE.

Each hub may be classified in one of three ways:

- Exit - These hubs emit electrical impulses.
- Entry - These hubs accept electrical impulses.
- Qualifying - Hubs that control both exit and entry conditions.

Figure 61 illustrates the terminal connector, showing hub location and function.

Selector. The extreme right row of the terminal connector contains three vertically adjacent qualifying hubs called a selector. A selector is a switch or relay that routes an electrical impulse along one of two possible paths, either a normal path or a transferred path.

A selector contains one set of common (C), normal (N), and transfer (T) hubs. Internal wiring connects the common hub to the normal hub. Therefore, a wire carrying an electrical impulse into the common hub, will emit from the normal hub. However, when the selector is energized (transferred), the connection between common and normal hubs is broken, and a connection is established between the common and transfer hubs. Therefore, an electrical impulse

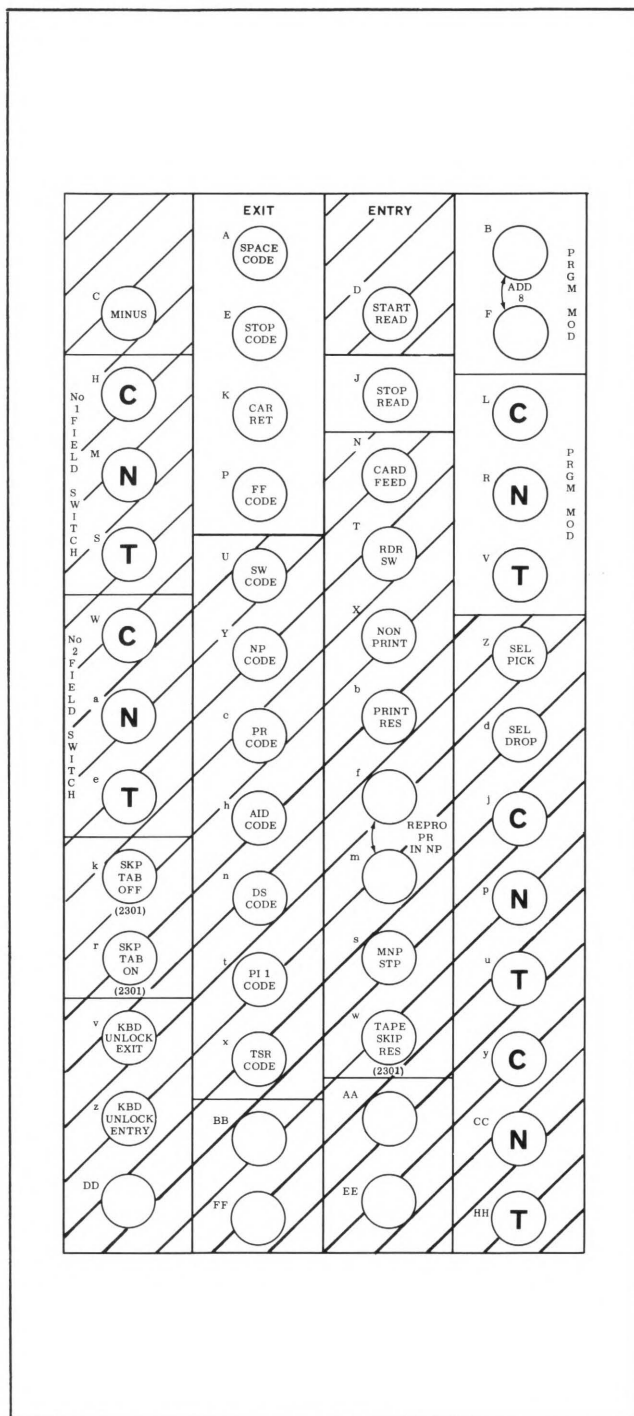


Figure 61. Hub Locations (Illustrated).

wired into the common hub of an energized selector, will emit from the transfer hub. This condition continues until the selector is de-energized (dropped). Then the connection between common and normal hubs is re-established. Figure 62 illustrates the selector in both the normal and transferred condition.

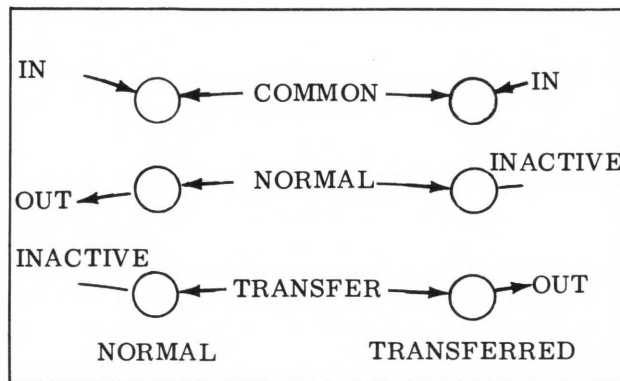


Figure 62. Selector (Illustrated).

Standard Hubs. Of the 50 hubs located on the terminal connector, only 10 are functional on the standard 2303 and 2304 writing machines. Below is a description of the functions of these hubs.

STOP READ ENTRY (J) - Causes the reader stop function. When wired from the STOP CODE EXIT (E), every time the Stop code is read, reading will stop.

STOP CODE EXIT (E) - Emits an electrical impulse each time the Stop code is read.

SPACE EXIT (A) - Emits an electrical impulse each time the Space code is read.

CARRIAGE RETURN EXIT (K) - Emits an electrical impulse each time the Carriage Return code is read.

FORM FEED EXIT (P) - Emits an electrical impulse each time the Form Feed code is read.

ADD 8 (B, F) - When these hubs are connected, and the program modification switch is in the operated position (down), the eighth bit will be added to the code punched by any operated keylever or panel switch. This enables address codes to be punched for use with other 2300 series writing machines having the SELECTADATA selective reader cable-connected. The 2303 and 2304 writing machines are not equipped to connect this auxiliary input unit.

PROGRAM MODIFICATION (L, R, V) - In addition to the address code punching capability, these three hubs provide a selector

associated with the program modification switch. Hub L is the common, hub R the normal, and hub V is the transfer. When the program modification switch is in the normal (up) condition, hubs L and R are connected. When in the operated (down) position, hubs L and V are connected.

Selective Stop. While the 2303/2304 is not extremely flexible, one common method is to wire the machine to provide an alternate Stop code. This is done by using the program modification switch, and one of the functional codes. Assume that the Stop code is normally wired to stop the writing machine, but that when the program modification switch is down, the Form Feed code will also stop the writing machine. Figure 63 shows the wiring. (Hubs are out of their normal arrangement for clarity.)

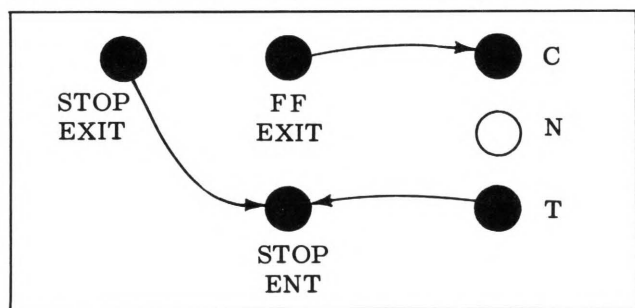


Figure 63. Selective Stop (Example).

An alternate way of doing this is by setting up an either/or condition. When the program modification switch is normal (raised) the Stop code will be effective. When it is operated (down), the Form Feed code will be effective. Figure 64 shows the wiring for this condition. (Hubs are out of their normal arrangement for clarity.)

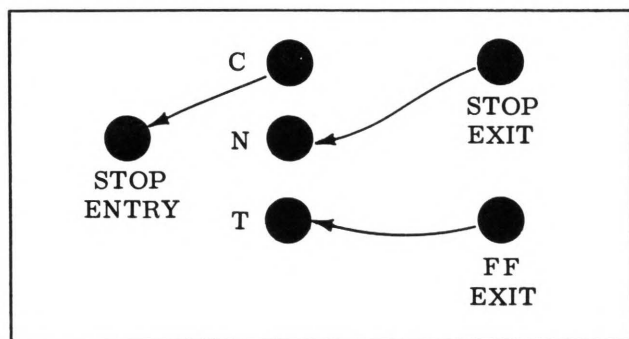


Figure 64. Alternate Example.

Customizing Hubs. All other hubs on the terminal connector are considered to be customizing hubs. Refer to the pages describing the terminal connector on the 2301 or 2302 writing machines, for a complete description of the functions of these hubs.

PROGRAMMING

In general, programming is the planning on paper of the details of an application. It consists of a step-by-step breakdown of all machine and operator functions.

The following paragraphs describe a personalized form letterwriting application for the 2303 FLEXOWRITER writing machine. It is not intended to be comprehensive, nor is it meant to suggest any application limitations. However, knowledge of the methods employed here will enable the user to gain maximum benefit from the 2303 and 2304 writing machines.

Personalized form letterwriting is one of the common uses of the 2303/2304. These letters will all be alike, except that they are individually addressed. Each letter looks and feels as if it was individually typed, which it was. Using the FLEXOWRITER writing machine, this typing is done at the rate of 145 words per minute, and is without error. Personalized form letterwriting is one of the most effective methods of direct mail advertising. Figure 65 shows an example of this type of letter.

PRELIMINARY APPROACH

The letter, shown in figure 65, is a typical form letter produced on the 2303. The body of the letter was written from a letter tape, automatically. This tape contains all of the letter copy, all horizontal and vertical line spacing, and Stop codes for the manual entry of the inside address and salutation. The letter tape will be looped (joined end-to-end) so that it need not be reinserted for each letter to be typed.

A by-product tape will be punched, from each letter written, containing the inside address only. Later, this tape will be used to address

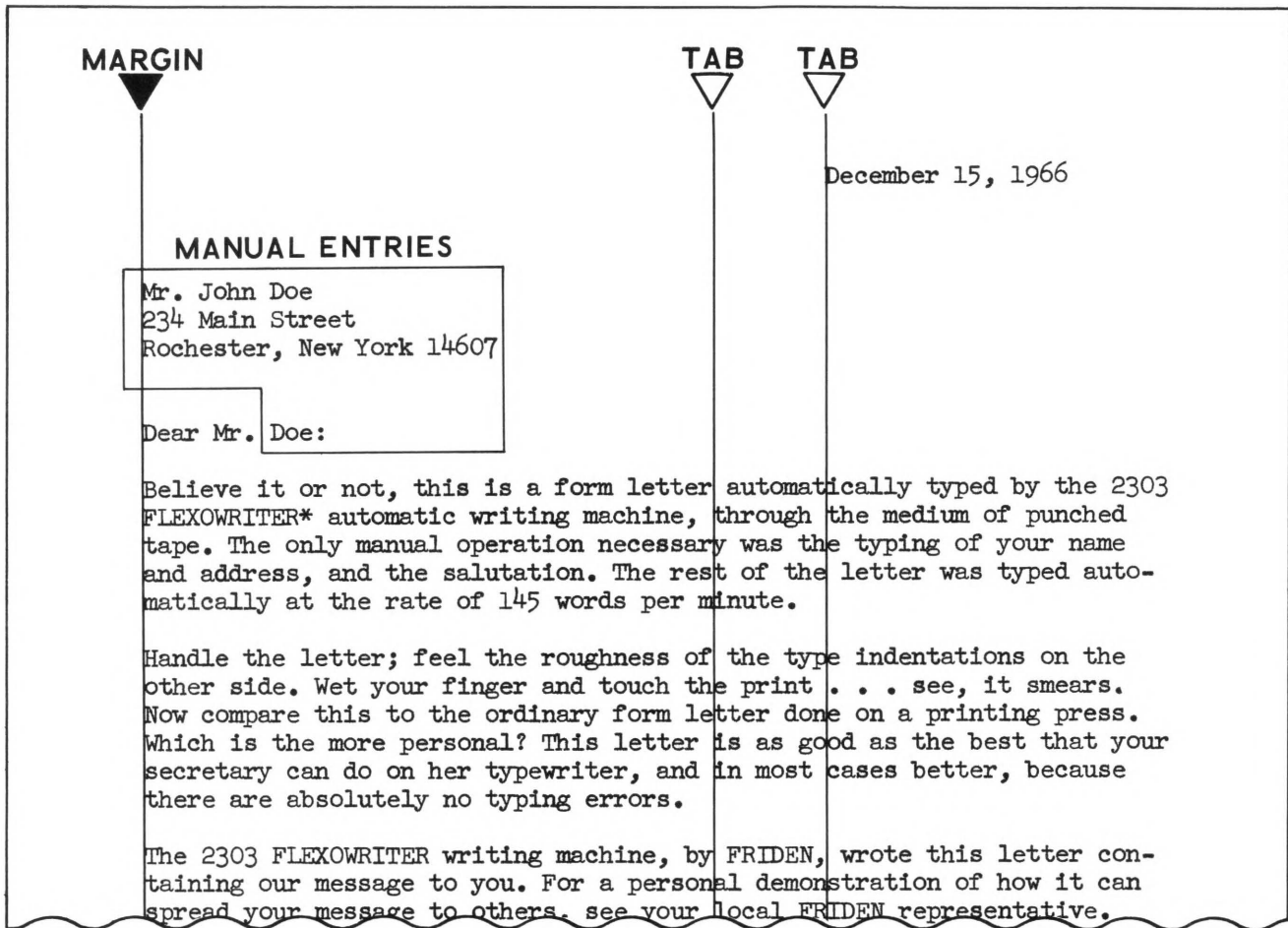


Figure 66. Personalized Form Letter.

the individual envelopes. Figure 66 illustrates the letterwriting application.

The code abbreviations used in the programming charts are listed below. Format and control codes are read on the programming charts vertically.

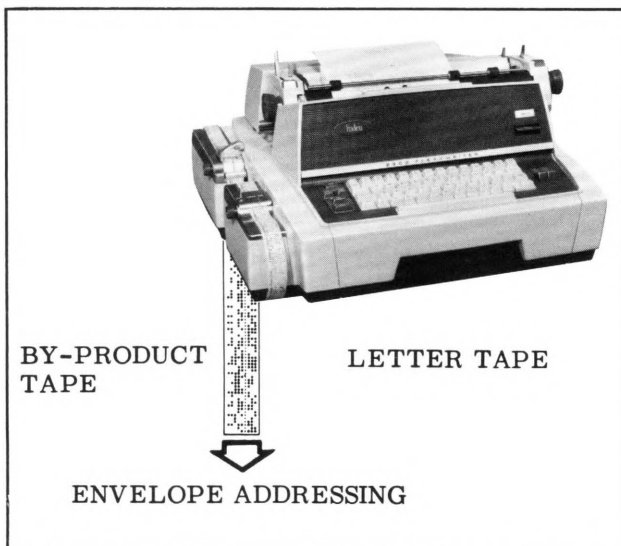


Figure 67. Letterwriting Application.

| | |
|-----|-----------------|
| UC | Upper Case |
| LC | Lower Case |
| CR | Carriage Return |
| TAB | Tabulation |
| SP | Space |
| STP | Stop Read |

PROGRAM EXPLANATION

To begin the application, the operator inserts a blank letterhead into the platen of the 2303, and positions it at an arbitrary starting point. The looped letter tape is inserted into the reader at the starting point. Power is on and the punch is off. The operator touches START READ. The first codes read by the machine are as follows:

CODE CHART

| Tape Channels | | | | | | | | 2201 | 2301 | 2302 | 2303/2304 |
|---------------|---|---|---|---|---|---|---|------|-------------|----------------|--------------|
| CARD | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | | | |
| EL | 8 | | | | | | | | CR | CR | CR |
| SPACE | | | | 5 | | | | | SPACE | SPACE | SPACE |
| SKIP | | | 6 | 5 | 4 | 3 | 2 | | TAB | TAB | TAB |
| PI-3 | | | 6 | | 4 | | 2 | | BACK SP | | BACK SP |
| 0 | | | 6 | | | | | |) 0 |) 0 |) 0 |
| 1 | | | | | | | 1 | | ! 1 | ! 1 | ! 1 |
| 2 | | | | | | | 2 | | @ 2 | @ 2 | @ 2 |
| 3 | | | | 5 | | | 2 | 1 | # 3 | # 3 | # 3 |
| 4 | | | | | | 3 | | | \$ 4 | \$ 4 | \$ 4 |
| 5 | | | | 5 | | | 1 | | = 5 | = 5 | = 5 |
| 6 | | | | 5 | | 3 | 2 | | c 6 | c 6 | c 6 |
| 7 | | | | | | 3 | 2 | 1 | ? 7 | ? 7 | ? 7 |
| 8 | | | | | 4 | | | | * 8 | * 8 | * 8 |
| 9 | | | | 5 | 4 | | | 1 | (9 | (9 | (9 |
| A | | 7 | 6 | | | | | 1 | a A | a A | a A |
| B | | 7 | 6 | | | | 2 | | b B | b B | b B |
| C | | 7 | 6 | 5 | | | 2 | 1 | c C | c C | c C |
| D | | 7 | 6 | | | 3 | | | d D | d D | d D |
| E | | 7 | 6 | 5 | | 3 | | 1 | e E | e E | e E |
| F | | 7 | 6 | 5 | | 3 | 2 | | f F | f F | f F |
| G | | 7 | 6 | | | 3 | 2 | 1 | g G | g G | g G |
| H | | 7 | 6 | | 4 | | | | h H | h H | h H |
| I | | 7 | 6 | 5 | 4 | | | 1 | i I | i I | i I |
| J | | 7 | | 5 | | | | 1 | j J | j J | j J |
| K | | 7 | | 5 | | | 2 | | k K | k K | k K |
| L | | 7 | | | | | 2 | 1 | l L | l L | l L |
| M | | 7 | | 5 | | 3 | | | m M | m M | m M |
| N | | 7 | | | | 3 | | 1 | n N | n N | n N |
| O | | 7 | | | | 3 | 2 | | o O | o O | o O |
| P | | 7 | | 5 | | 3 | 2 | 1 | p P | p P | p P |
| Q | | 7 | | 5 | 4 | | | | q Q | q Q | q Q |
| R | | 7 | | | 4 | | | 1 | r R | r R | r R |
| S | | | 6 | 5 | | | 2 | | s S | s S | s S |
| T | | | 6 | | | | 2 | 1 | t T | t T | t T |
| U | | | 6 | 5 | | 3 | | | u U | u U | u U |
| V | | | 6 | | | 3 | | 1 | v V | v V | v V |
| W | | | 6 | | | 3 | 2 | | w W | w W | w W |
| X | | | 6 | 5 | | 3 | 2 | 1 | x X | x X | x X |
| Y | | | 6 | 5 | 4 | | | | y Y | y Y | y Y |
| Z | | | 6 | | 4 | | | 1 | z Z | z Z | z Z |
| # | | | | | 4 | | 2 | 1 | F1 MNP STOP | STOP | STOP |
| (/ | | | | 5 | 4 | 3 | | | F2 | NP (AUX SP) | NP (AUX SP) |
| % | | | 6 | | 4 | 3 | | | F3 PR RES | PR (AUX 0) | PR (AUX 0) |
| * | | 7 | | | 4 | 3 | | | F4 | ON 1 | PUNCH ON |
| SP2 | | 7 | 6 | | 4 | 3 | 2 | | F5 | ON 2 | |
| E.C.2 | | | 6 | | 4 | 3 | 2 | 1 | F6 | OFF | OFF |
| CR | | 7 | | 5 | 4 | 3 | 2 | | F7 | FC ON | 3 UNITS |
| PI-7 | | | | | 4 | 3 | | 1 | F8 | TSR (AUX 1) | PI-7 (AUX 1) |
| E.C.1 | | | | | 4 | 3 | 2 | | F9 | SW (AUX 2) | SW (AUX 2) |
| COR. | | | | 5 | 4 | 3 | 2 | 1 | F10 | DS (AUX 3) | DS (AUX 3) |
| ERROR | | 7 | | | 4 | 3 | 2 | 1 | F11 | FF (AUX L) | FF (AUX L) |
| PI-6 | | 7 | | 5 | 4 | 3 | | 1 | F12 | AID (AUX J) | AID (AUX J) |
| PI-4 | | | 6 | 5 | 4 | 3 | | 1 | F13 | DUP (AUX /) | |
| □ | | 7 | 6 | 5 | 4 | 3 | | | UPPER CASE | UPPER CASE | UPPER CASE |
| SP1 | | 7 | 6 | 5 | 4 | | 2 | | LOWER CASE | LOWER CASE | LOWER CASE |
| . | | 7 | 6 | | 4 | | 2 | 1 | .. | .. | .. |
| , | | | 6 | 5 | 4 | | 2 | 1 | ,, | ,, | ,, |
| - | | 7 | | | | | | | " " | " " | " " |
| / | | | 6 | 5 | | | | 1 | : / | : / | : / |
| \$ | | 7 | | 5 | 4 | | 2 | 1 | - % | - % | - % |
| & | | 7 | 6 | 5 | | | | | ; & | ; & | ; & |
| PI-1 | | | | 5 | 4 | | 2 | | ± + | PI-1 (AUX 8) | PI-1 (AUX 8) |
| PI-5 | | 7 | 6 | | 4 | 3 | | 1 | ¼ ½ | PI-5 (AUX A) | PI-5 (AUX A) |
| PI-2 | | | | | 4 | | 2 | | ' ° | PI-2 (2, 8, -) | ± + |
| FEED | | 7 | 6 | 5 | 4 | 3 | 2 | 1 | TAPE FEED | TAPE FEED | TAPE FEED |

APPENDIX

FRIDEN EDUCATIONAL CENTER

FRIDEN, INC., continually strives to keep customers and potential customers up-to-date with the latest equipment developments and applications of FRIDEN equipment. This is done through the services of the FRIDEN Educational Center, 31 Prince Street, Rochester, New York. The Center offers a full curriculum of courses and seminars. It publishes many product publications for customer use, such as Case Histories and Technical and Operators Manuals.

COURSES AND SEMINARS

A full, year-round schedule of courses are offered by FRIDEN free of charge. These courses cover integrated data processing procedures, data collection and graphic arts processes.

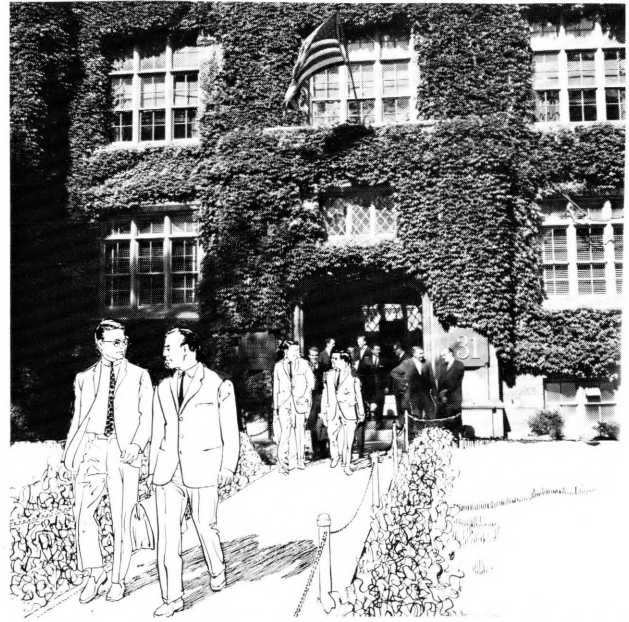
Each course is conducted by an instructor of the Center's Staff. These are planned to give the customer a broad understanding of the versatility of FRIDEN equipment, along with demonstrations of actual applications. The Center has more than \$1 million of FRIDEN and allied equipment for this purpose.

SPECIAL COURSES and SEMINARS also are arranged to satisfy specific procedures or customer applications.

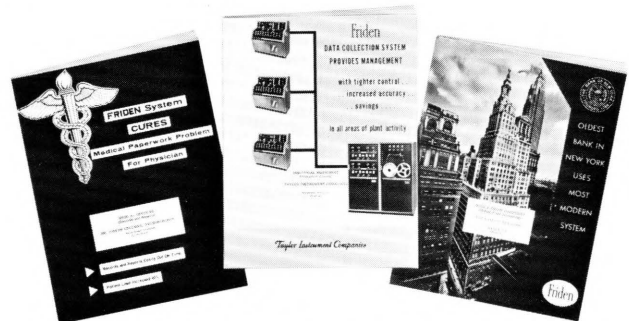
Enrollment and registration for ALL customer programs are done through the FRIDEN representative or office nearest you. They will gladly make arrangements for you and for any member of your organization who wishes to attend any of the courses offered. Ask your FRIDEN representative for the Educational Center brochure describing courses and listing dates.

PUBLICATIONS

Case Histories describe actual customer installations. Each deals with a specific FRIDEN application: Integrated Data Processing, Graphic Arts or Mailroom. And they point out the benefits of FRIDEN equipment in business and industry, highlighting "before-and-after" methods that demonstrate procedures and processes.



The Educational Center serves to fulfill training and guidance needs of customers and potential customers.



Customer Case Histories

FRIDEN Technical and Operators Manuals are written to provide anyone with a complete working knowledge of the equipment. The Manuals are well illustrated and discuss in a clear and logical sequence the entire machine and method of operation.

These product publications may be obtained from FRIDEN Branch Offices located in all major cities.



Technical and Operators Manuals

FRIDEN Products Designed for Practical . . .

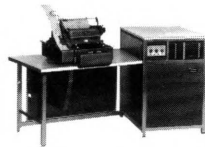


FLEXOWRITER
automatic writing machine

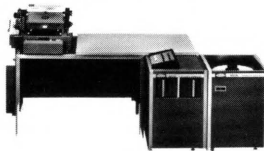
DATA PROCESSING EQUIPMENT

FLEXOWRITER* automatic writing machine produces documents while simultaneously perforating paper tapes or cards. Many models are available for specific data processing applications.

COMPUTYPER
writing/computing machine



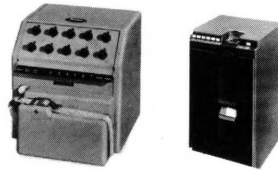
COMPUTYPER* writing/computing machine is a complete billing department at a single desk. It contains all the versatility of the FLEXOWRITER writing machine plus the ability to compute automatically.



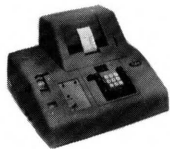
COMPUTER
and
MAGNETIC DISC FILE

FRIDEN 6010 Electronic Computer - A small-scale, business oriented, digital computer. It uses solid-state circuitry in an independent desk-sized machine. High-speed computation is combined with simultaneous output of printed information, plus coded output of punched cards, or any combination of these.

AUXILIARY
EQUIPMENT



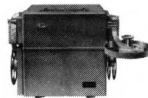
Wide variety of AUXILIARY, input/output units may be cable-connected to the FLEXOWRITER writing machine, the COMPUTYPER writing/computing machine or other FRIDEN equipment. These units facilitate greater application and programming flexibility.



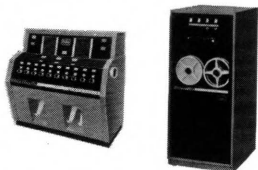
ADD-PUNCH
adding machine/tape punch

ADD-PUNCH* adding machine/tape punch captures numeric data for automatic preparation of reports. This unit creates a printed tape as well as a punched paper tape for many applications.

TELEDATA
data transmitter/receiver



TELEDATA* data transmitter/receiver speeds communications to and from remote points over existing wire services. These units have the ability to simultaneously transmit, receive, and check tapes of 5 through 8-channels for a wide range of applications involving communications.



COLLECTADATA
data collection network

COLLECTADATA* data collection network facilitates fast and accurate reporting from diverse points directly to a data collection center. This transmission and receiving system provides management with up-to-date information on plant operations at all times, thus allowing executive decisions to be based on events as they occur.

CALCULATOR
ADDING MACHINE

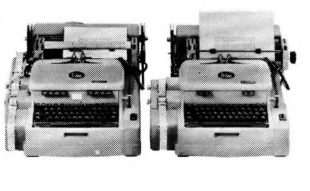

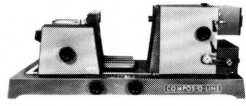
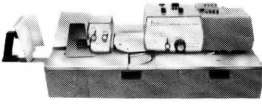
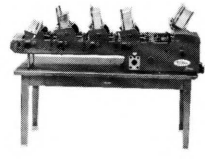
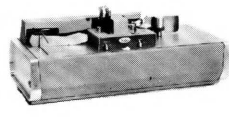




CALCULATORS AND ADDING MACHINES

FRIDEN Calculators, 10-key "natural-way" Adding Machines are leaders in their field. These easy-to-operate units come in a wide variety of rotary and electronic models for all business applications, large and small.

*A Trademark of FRIDEN

Application in Business and Industry

| | |
|---|---|
|  | <p>JUSTOWRITER <i>automatic composing machine</i></p> |
| <p>TYPRO <i>photo type composer</i></p> |  |
|  | <p>COMPOS-O-LINE <i>sequential card camera</i></p> |
| <p>POSTAGE MACHINE</p> |  |
|  | <p>MAIL INSERTER</p> |
| <p>IMPRINTER <i>imprinting machine</i></p> |  |
|  | <p>POSTAL SCALES</p> |
| <p>TICKETOGRAPH <i>ticket imprinter</i></p> |  |

NOTE: Specifications subject to change without notice.

GRAPHIC ARTS EQUIPMENT

JUSTOWRITER* automatic composing machine produces justified (even margin) copy for duplicating or printing. This easy-to-operate machine is available in a variety of models that will provide an economical source of high-quality composition.

TYPRO* photo type composer used to produce flawless, micro-sharp display type and lettering. This easy-to-operate precision machine holds up to 15 type fonts on one reel. Type sizes range from 6 to 144 points and over 1800 selections are available.

COMPOS-O-LINE* sequential card camera converts original source data from file cards into film negatives ready for printing of price lists, directories, catalogs, labels, and other similar applications.

MAILROOM EQUIPMENT

Postage Machine, Models 410 and 420, prints meter stamps on envelopes and seals flaps at the same time, or will perform either operation independently. A tape unit permits printing of meter stamps on wet or dry gummed tape for parcel post or bulky letter mail.

FRIDEN-ERTMA mail inserter automatically gathers and stuffs into envelopes as many as eight different inserts; then seals, stacks and counts the envelopes ready for mailing.

IMPRINTER imprinting machine, signs, endorses, cancels, counts, numbers, dates and imprints checks or other documents at high speed. These operations are performed economically; and safety is insured by the use of locked steel signature dies.

POSTAL SCALES for every mailroom application complement the FRIDEN mailroom and distribution system. Sorting racks, mail bags, and unitized sealers and openers complete the line.

TICKETOGRAPH*

Mather Division of FRIDEN designs and prints coupons or work tickets of all widths, lengths, colors of ink, stock and types of perforations for all kinds of machines, automatic or manual, TICKETOGRAPH ticket imprinter imprints piecework rates and production data utilizing these tickets.

*A Trademark of FRIDEN.

Friden

SAN LEANDRO • CALIFORNIA

SALES AND SERVICE THROUGHOUT THE WORLD

A SUBSIDIARY OF THE SINGER COMPANY