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*Technical Manual for*

# 2201 FLEXOWRITER
# automatic writing machine

PROGRAMATIC Model

Price $2.00

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PROGRAMATIC* Model

# *FOREWORD*

*In the field of source data automation, speed, accuracy, and flexibility are constant goals toward which all systems strive. The 2201 FLEXOWRITER automatic writing machine, PROGRAMATIC model, combines these three in one machine, which can be customized to perform any application.*

*Operating automatically from coded tape or cards at the rate of 11.3 codes per second, the 2201 provides built-in accuracy checking to insure correct coded output. Coded tapes or cards are read to produce a typed document and a punched tape containing all or selected portions of the information typed on the document. In addition, an auxiliary input and output unit can be cable-connected to provide further input sources and output in the form of an additional punched tape, tab cards, documents, or adding machine tape.*

*Control of this machine and all auxiliary connected units is from the coded input source manually and through a removable control panel, and field switch/tab rack. Additional panels and racks are available for further application flexibility.*

*The 2201 FLEXOWRITER automatic writing machine by FRIDEN, provides the ultimate in flexibility and reliability for the demands of today's requirements in the field of source data automation.*

# TABLE OF CONTENTS

2201 FLEXOWRITER automatic writing machine (with optional edge card punch and reader) on Desk, with SELECTADATA* selective reader.

*A Trademark of FRIDEN, INC.

# SECTION I
# INTRODUCTION

## GENERAL

The 2201 FLEXOWRITER automatic writing machine, PROGRAMATIC Model, is capable of many functions. It can sense codes in punched tape, edge-punched cards, or Hollerith coded tab cards to cause automatic typing of a document, and selective punching of an additional coded tape or card at the same time. Furthermore, it can be manually operated to cause typing and code punching either alone, or as a programmed part of automatic operation. Specialized auxiliary units may be cable-connected to provide additional tape and card input versatility to the writing machine.

There is a choice between two keyboards available for the printing of characters (manual or automatic). The single case keyboard provides for typing of capital letters only, numbers, and special characters. The double case keyboard provides, in addition to this, the printing of small letters and a wider selection of special characters.

A selection of readers and punches are available as component parts of the automatic writing machine. Two readers (code sensing devices) operate with punched tape only, or tape and edge-punched cards. A specialized tab card reading unit is also available. Two punches (code punching devices) operate to punch tape only, or tape and edge cards.

## COMPONENTS

Five basic components make up the 2201 (see figure 1): the reader, code translator, writing machine, code selector, and punch. Interaction of these components is as follows:

Reader. Mechanically senses codes punched in tape (edge-punched cards or tab 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 keylever to be operated.

Writing Machine. Contains the power supply, the keylevers, and all necessary equipment

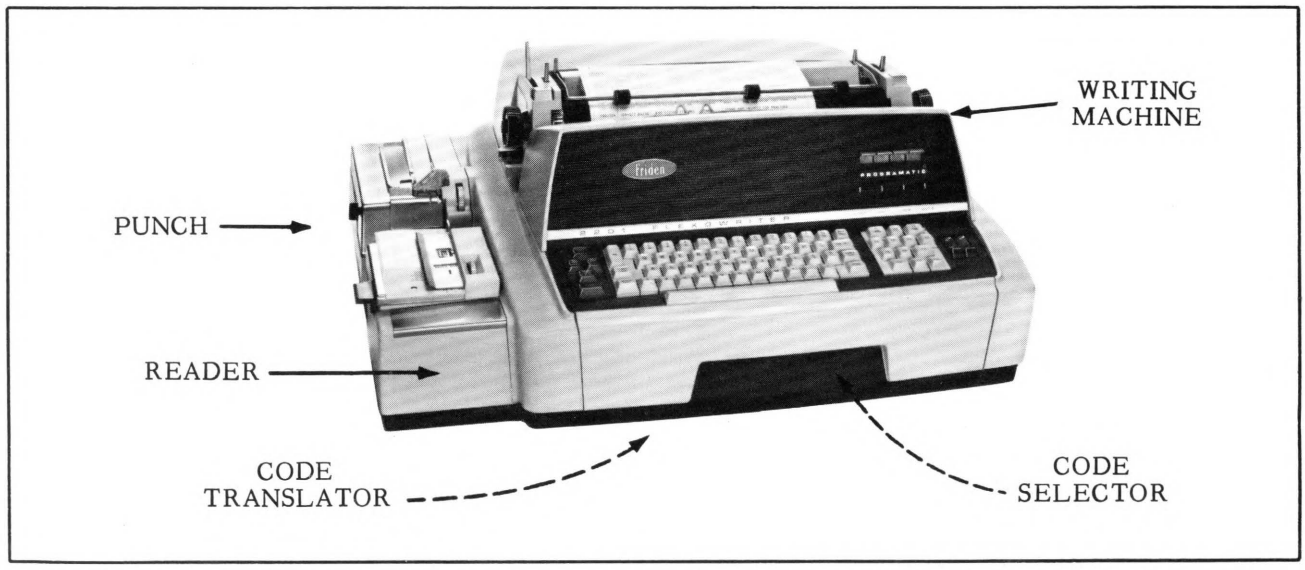



Figure 1. 2201 Machine Components (Optional Edge Card Punch and Reader).

to allow the 2201 to write a document and perform other machine functions.

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

This is the most common sequence of operation for the 2201. However, some functions may alter or bypass parts of this sequence. And all functions and operations of the 2201 are subject to programmed controls.

## OPERATING SPEEDS

Reading (code sensing) speed of the 2201 is 680 codes per minute. This will provide automatic typing at a rate in excess of 135 (5-letter) words per minute.

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

## CONTROL

Specific operation of the 2201 is controlled from three areas: the keyboard, the removable control panel, and field switch rack (see figure 2).

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

Control Panel. The 2201 is programmed for specific applications through codes sensed in the reader. However, the removable control panel is used to specify and modify machine functions and operation. This provides additional flexibility and versatility for all applications. Additional control panels are available, to simplify application changes.

Field Switch Rack. This rack is removable and provides for the initiation or modification of machine functions at specific positions of the carriage. Additional field switch racks are available.

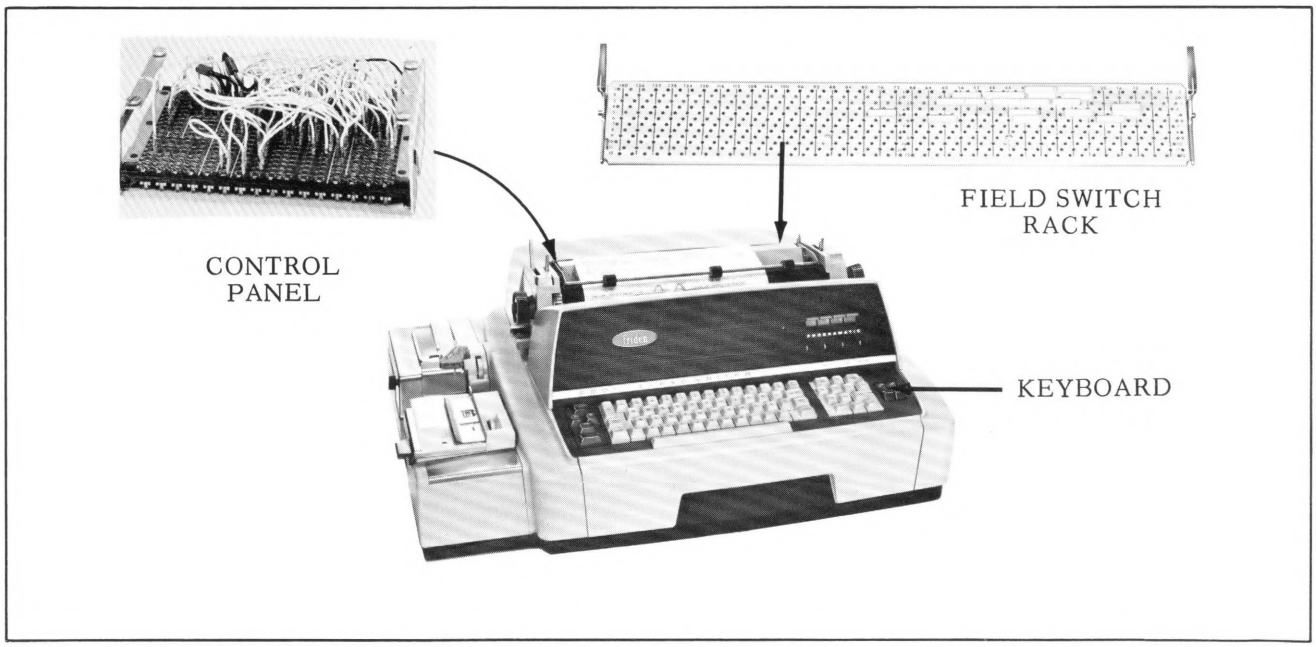



Figure 2. 2201 (with Optional Edge-Punched Card Reader and Punch) Control Features.

# SECTION II
# SPECIFICATIONS

GENERAL

To provide for maximum flexibility and reliability, the 2201 FLEXOWRITER automatic writing machine is designed and engineered as a heavy duty writing machine. These heavy duty characteristics enable the machine to withstand many years of sustained high speed operation. Information contained in this section gives the complete specifications of the unit. Below is a list of general specifications:

Power - 110-115 Volt, 60 Cycle AC
Weight - 115 lbs. (approximately)
Size - 24 1/4" wide, 10 1/4" high, 24 3/8" depth
Color - Friden Tan Armorsol

CARRIAGE

A 16-inch carriage is standard on the 2201 although a 20-inch carriage (see figure 3) 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'' | 15'' | 13-1/2'' |
| 20'' | 19'' | 17-1/2'' |

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 align-

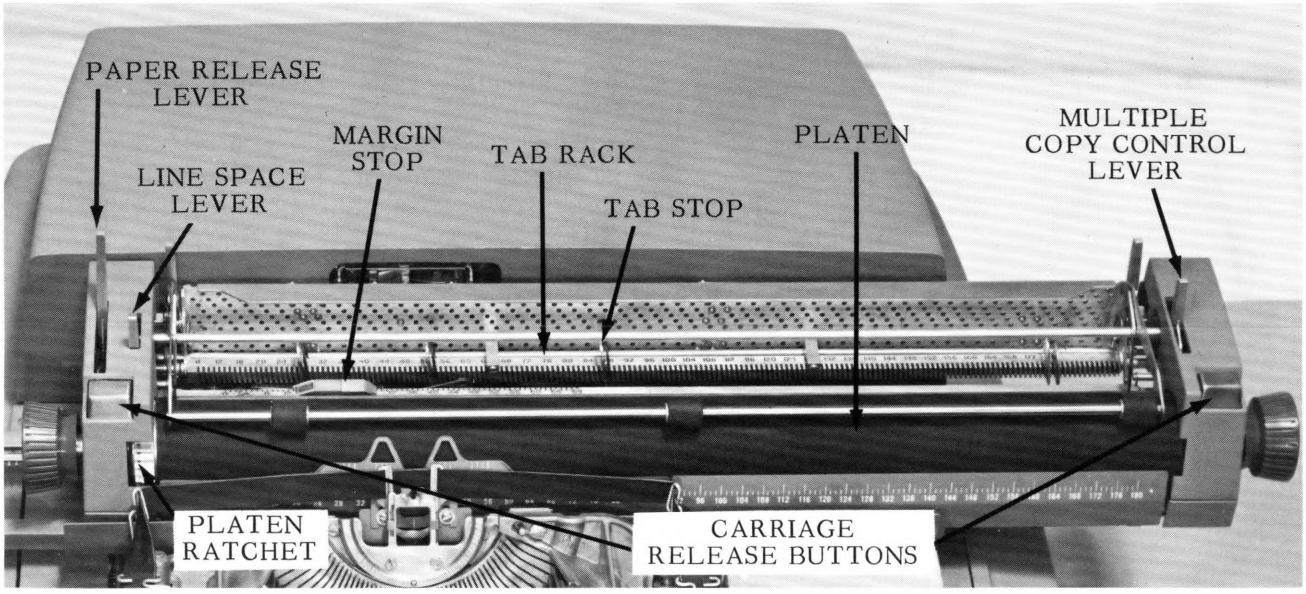



Figure 3. Carriage Showing Standard Features.

ment of forms as they are inserted into the 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 embossing.

Platen. Supplies in various sizes and degrees of hardness for different types of work. Usually, actual documents or forms are sent with the order to facilitate factory type alignment and platen selection.

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 4 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.

| 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 4. Platen Ratchet Chart.

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, double, and triple 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 5), 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 on page 5.

## KEYBOARD

Each FLEXOWRITER writing machine is equipped with a fully electric keyboard for manual operation. There are four rows of keylevers, slightly stepped between each row for maximum speed and ease of operation. Only a 2 1/2 ounce touch, and a total downward movement of 1/4 inch is required to manually operate any keylever.

Either of two keyboard variations are available. Figure 5 shows the standard single case keyboard. It provides for the typing of capital alphabetic characters only, numbers, and special characters. The double case keyboard, shown in figure 6, provides for the typing of both capital and small alphabetic characters, numbers, and a wider selection of special characters. In both variations, the keyboard is divided into three parts: printing and format control keylevers, manual control keys, and function code keys.

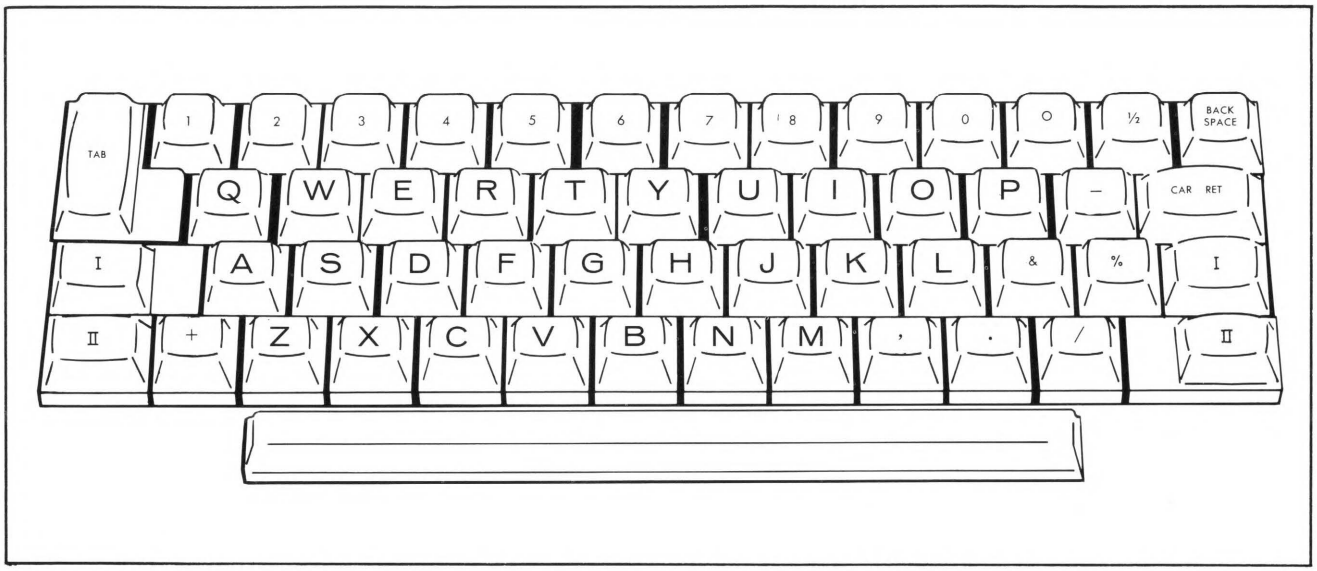



Figure 5. Standard Single Case Keyboard.

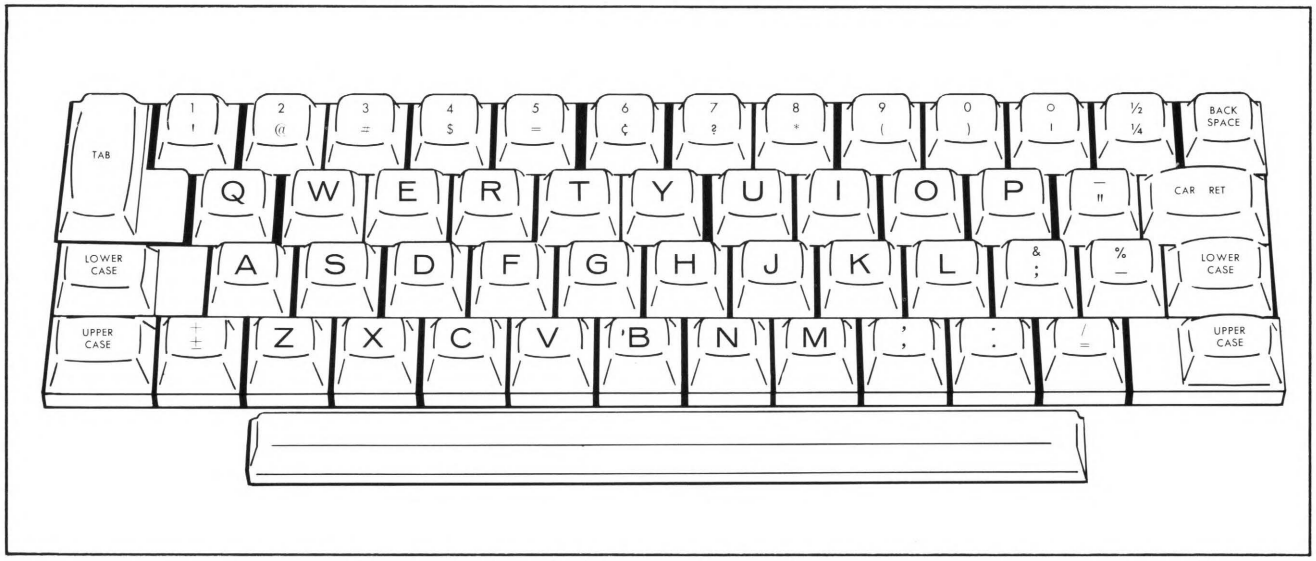
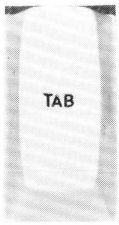



Figure 6. Standard Double Case Keyboard.

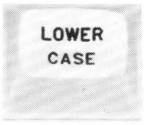
Printing and Format Control Keylevers. Forty-five keylevers cause printing of alpha-numeric and special characters. There are six format control keylevers including the space bar. These are as follows:


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 from one to three line spaces, depending upon the setting of the line space lever (see figure 3).



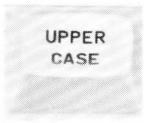

TAB - Manual or automatic operation of the TAB keylever causes right to left carriage movement at high speed. Termination is determined by the placement of tab stops in the tab rack (see figure 3).

Under normal conditions, tabulation will terminate at the first tab stop reached during carriage movement. However, a skip-tab feature allows tabulation to be terminated at any given tab stop setting. Skip-tab is determined by control panel wiring, and is further described in Section V.



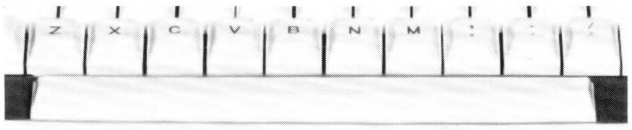

LOWER CASE - On double case keyboards, this keylever shifts the type basket to the lower case position. In this position, small alphabetic characters and special characters are typed when the keylevers are operated. It is possible to control the punching in this position, of those keylevers having a different symbol in the lower case position.

This is done through control panel wiring, and is further described in Section V. Duplicate LOWER CASE keylevers are provided on both sides of the keyboard.




UPPER CASE - On double case keyboards, this keylever shifts the type basket to the upper case position. In this position, capital letters, numbers, and some special characters are typed when the keylevers are operated. Duplicate UPPER CASE keylevers are provided on both sides of the keyboard.


BACK SPACE - Operation of this keylever, either manually or automatically, causes the carriage to move one letter space in reverse (left to right).




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

Manual Control Keys. These five keys are located to the left side of the keyboard, and serve to manually control various machine operations. Specific operation is described in Section III.

Function Code Keys. These 13 keys are located to the right of the keyboard, and serve to initiate or terminate certain machine functions through control panel wiring, and also to punch specific codes. Use of these keys is described in Section III.

## TYPE STYLES

The keyboard, as shown in figures 5 and 6, is available in four different type styles. All four styles can be used for single case or double case operation. These styles are as follows:

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

Of the four styles listed above, 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 characters to the horizontal inch.

## RIBBON

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

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 the ribbon. The center position disengages the ribbon for stencil and other master preparation.

## TAPE USED

A one-inch wide tape (see figure 7) 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.

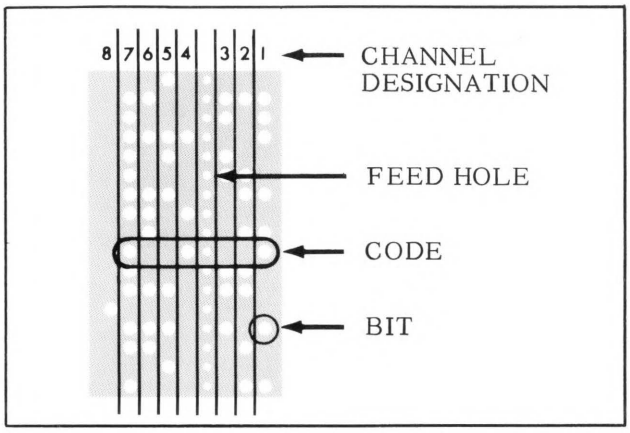



Figure 7. 8-Channel Punched Tape.

## CODE SYSTEM

The FRIDEN 8-channel code is a binary-coded decimal system, and is used by the 2201 FLEXOWRITER writing machine, and other allied equipment. It is often referred to as the common-language code, as it is compatible with a variety of machines manufactured by FRIDEN, INC., and many other data processing machine manufacturers. Eight-channel punched tape, produced on the 2201, may be used: to operate tape-to-card converters; to be transmitted over private and leased wire systems; for computer input and output; for conversion to other code structures; to control machine tools, automatic plate embossing machines, and a variety of other data processing equipment. A code chart, listing all codes used by the 2201 is located on page 16.

## ACCURACY CHECKING

An elaborate system of checks is incorporated to insure accurate code punching. Three of these are integral within the machine; others provide accurate tape feeding and positioning. The three integral checks are as follows:

Parity Check. All codes used by the 2201 (code chart, page 16) are considered valid codes, and contain an odd number of bits (code holes). Electrical circuitry within the machine insures that only valid codes (containing one, three, five, or seven bits) are punched. This circuitry is called odd-count parity check. If the 2201 should attempt to punch an even-bit code, due to a mechanical malfunction, the keyboard will lock, and all operations of the machine will cease. Touching TAPE FEED (a manual control switch) will restore the machine to normal operation.

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.

## 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 8).

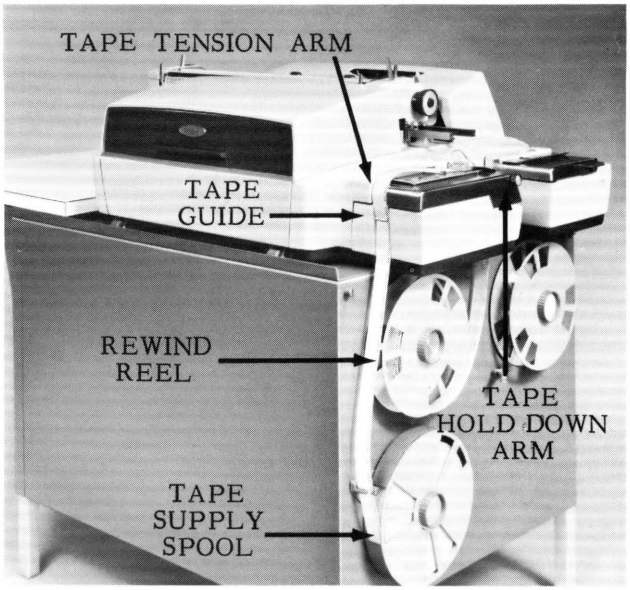



Figure 8. 2201 on Desk-Rear View with Left Desk Top Removed.

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.

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.

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:

2212 Auxiliary Reader. Provides an additional tape reading unit for the writing machine. A self-contained unit, the 2212 has its own tape unwinder and tape-up reel. A bin replaces these when a looped tape is being read.

2213 Automatic Card Reader. Provides the writing machine with the ability to read Hollerith-coded tab cards, either singly or in packs.

2214 SELECTADATA Reader. This unit is similar to the 2212 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). 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 writing machine operation.

MACHINE DESK

A steel desk (see figure 9) with wear-resistant Formica top and satin-finished aluminum trim is optional equipment. This desk was designed especially for the 2201 FLEXOWRITER writing machine, 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 2201 and all connected equipment, and a separate switch for the powered rewind reel. Figure 8 shows a rear view of the machine desk with the left desk top removed.

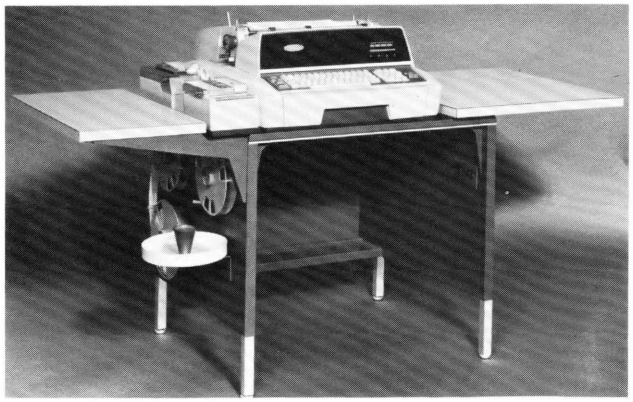


Figure 9. The 2201 on Machine Desk.

# SECTION III
# OPERATING FEATURES

GENERAL

This section describes the operator controls and the basic operating principles of the 2201 FLEXOWRITER automatic writing machine. It is important to understand that all functions are controlled and can be modified through control panel wiring.

SWITCHES

Two manually-operated, butterfly-type switches are located at the extreme right of the keyboard (see figure 10).

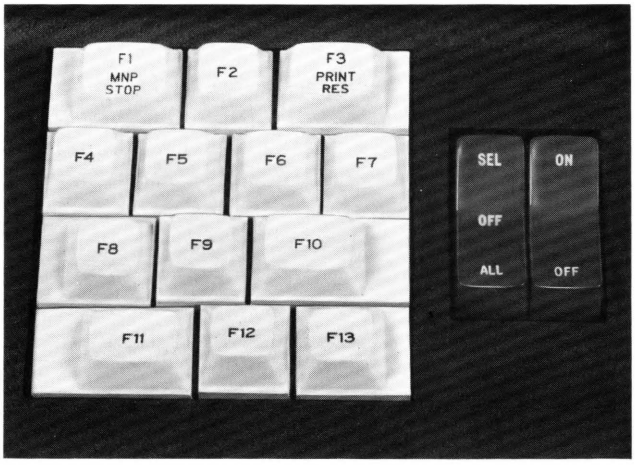



Figure 10. Power and Punch Control Switches.

Power. A two-position switch used to turn power on and off.

Punch Control. A three-position switch. It controls operation of the punch. The three positions are as follows:

ALL - When in this position, the punch is always on. In this condition, some keylevers will punch their respective codes. Others will punch only if the control panel is so wired.

OFF - When in this position, the punch cannot be turned on by any means, and no keylevers will punch codes.

SEL (select) - In this position, the punch may be turned on and off by manual or automatic operation of keylevers, or by field switches. When the punch is on, some keylevers will cause punching. Others will do so only if the control panel is so wired.

CODE PUNCHING

There are 64 keylevers on the keyboard which can cause code punching. These comprise the printing and format control keylevers, and the function code keys. When the punch is in an on condition, the following keylevers will not punch unless specifically wired to do so in the control panel:

All 13 function code keys
Carriage Return (CAR RET)
TAB
Space bar
BACK SPACE
Lower case symbols (where they differ from what is printed in the upper case position)
UPPER CASE
LOWER CASE

All other keylevers will punch codes when the punch is in an on condition, whether the punch control switch is in the ALL or SEL (select) position. This includes the balance of the printing keylevers. On the single case keyboard, a more simplified condition exists: all printing keylevers will punch codes when the punch is on; all other keylevers must be wired to punch through the control panel.

Control panel wiring is used to cause these special keylevers (listed above) to punch and/or function only under certain conditions. Examples of typical conditions which may be specified follow:

1. Certain of the function code keys, punch and function in the ALL posi-

tion, and only function in the SEL (select) position.

2. Space bar, carriage return, and tab keylevers punch in both ALL and SEL positions. The back space keylever does not punch in either position.

3. Upper case symbols punch in the ALL position, but not in SEL.

In addition, field switches and program modification switches may be used, in conjunction with control panel wiring, to further modify punching and/or function of these keylevers.

KEYBOARD

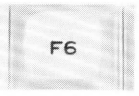
As previously stated in Section II, the keyboard is divided into three parts: printing and format control keylevers, function code keys, and manual control keys (see figure 11). Printing and format control keylevers have been explained in detail (Section II). The following further explains the other two sections of the keyboard.

Function Code Keys. These are a series of 13 keys, located in a group to the right of the keyboard. They are placed here for the purpose of punching codes, which when translated, will cause functions of the 2201 and connected auxiliary input and output equipment. Control panel wiring determines the conditions under which these codes will punch and/or function.

Through control panel wiring, any of these keys can be made to perform any of the functions, or more than one function. However, for the purpose of this manual, assume that the first six keys (F1 - F6) are assigned to the following functions, as shown:


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


ON 2 - Turns on the auxiliary output unit, if connected, and the punch control switch is in SEL.



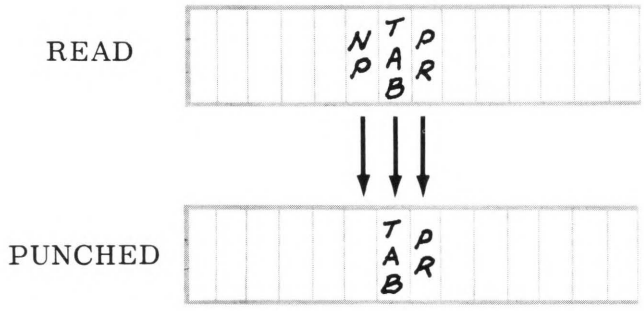

OFF - Turns off both the writing machine punch and the auxiliary output unit (if connected) when the punch control switch is in SEL.


STOP - Causes the reading action to stop automatically when this code is read. This function will occur during normal read, tape skip, and automatic and manual non print conditions, unless otherwise qualified through control panel wiring. A common qualification is to wire the stop function to be ineffective during automatic non print and tape skip conditions.

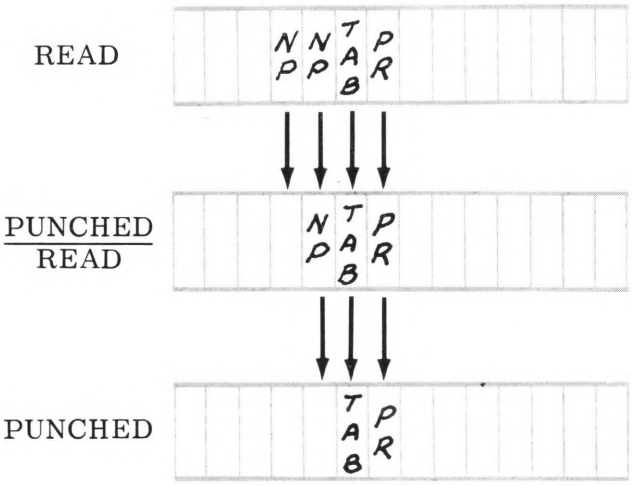

Figure 11. Keyboard Showing Location of Function Code Keys.


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 operation will occur, except for the functions caused by codes punched with the 13 function code keys. If any of these codes are not to cause their assigned functions, they must be so qualified through control panel wiring. For example, a common qualification is to wire the Stop code and the punch control codes (On 1, On 2, OFF) to be ineffective during the automatic non print condition. Automatic non print is generally used to reproduce codes for use in a later operation. The condition restores to normal reading upon sensing the Print Restore code.

Often, the Non Print code is qualified to be non-reproducing (not punching) when the punch control switch is in the SEL position (program modification switches also may be used). This means that the Non Print code which initiates the automatic non print condition will not reproduce. For example, the Tab code does not function in automatic non print, 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 function. This is the normal programming (coding) for this condition to occur by means of automatic non print. Assume also that 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 which 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 predetermined.

Although the parity check feature is still operational during the non print condition, there is one exception during this condition only. That is, Address codes containing an even number of bits will be reproduced without affecting the parity check circuitry. Address codes are used with certain auxiliary input equipment, and are distinguished from standard codes because they all contain the eighth bit (code hole).


PRINT RESTORE - Restores the automatic non print condition to a normal read condition without stopping the code reading action. The Print Restore code can be non-reproducing if desired. This is often done if no more than one level of code reproduction, by the automatic non print method, is ever used.


F7 - F13 - These seven keys are available for the other writing machine functions, auxiliary connected input and output equipment

functions, and for control of certain allied equipment.

There are four additional writing machine functions which can be caused by reading codes punched by these keys: form feed, tape skip restore, skip tab, and card feed. The form feed function is described in Section IV (Electric Line Finder). Tape skip restore is further described in this section, under the heading, Manual Control Keys. The skip tab feature is described in this section under the heading, Field Switch Rack. And the card feed feature is described in Section V.

Figure 12 illustrates the 13 function code keys, the code punched by each, and a typical function assignment.

Manual Control Keys. This group of five keys, located at the extreme left of the keyboard (see figure 13), is used for manual control of writing machine operations. The following describes the function of each key. However, some functions can be modified by control panel wiring.


TAPE FEED - Feeds tape through the punch for as long as this key is held depressed. The punch does not have to be in an on condition for this function to occur. TAPE FEED is also used to delete incorrect codes. The Tape Feed or Delete code is 1-2-3-4-5-6-7.

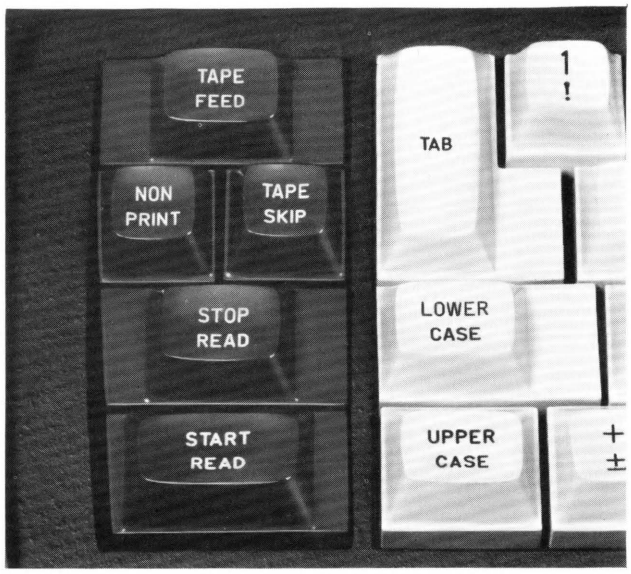



Figure 13. Manual Control Keys.

If the 2201 is equipped with an edge card punch, this switch has a somewhat different function when edge cards are being punched. This is further described in Section IV, Customizing Features.

Although TAPE FEED is technically a code punching key, it is classed separately from the printing and format control keylevers, and the function code keys. One reason for this is that TAPE FEED is primarily used to provide leader and trailer strips for punched tape. Another reason is that it is a non-reproducing code (except in a non print condition). There is no way of causing this code to reproduce under a normal read

| KEY | CODE | TYPICAL FUNCTION ASSIGNMENT |
|---|---|---|
| F1 | 1-2-4 | Stop reading action (Stop Code) |
| F2 | 3-4-5 | Initiate automatic non print (Non Print Code) |
| F3 | 3-4-6 | Print restore (after automatic non print) |
| F4 | 3-4-7 | Punch on (On 1) |
| F5 | 2-3-4-6-7 | Auxiliary output unit on (On 2) |
| F6 | 1-2-3-4-6 | Punch(es) off (OFF) |
| F7 | 2-3-4-5-7 | Skip tab condition on |
| F8 | 1-3-4 | Tape skip restore |
| F9 | 2-3-4 | Switch read (auxiliary input unit function) |
| F10 | 1-2-3-4-5 | Data select (auxiliary input unit function) |
| F11 | 1-2-3-4-7 | Form Feed |
| F12 | 1-3-4-5-7 | AID (auxiliary input unit function) |
| F13 | 1-3-4-5-6 | Duplicate (auxiliary output unit function) |

Figure 12. Function Code Chart.

condition. Any of the other 64 codes can reproduce if desired.


NON PRINT - When touched and released, the writing machine goes into a manual non print condition. This is similar to automatic non print because all codes read from the reader will be reproduced in the punch (if on). And no printing or other function of the machine will occur. The only function operable in manual non print is the F1 (MNP Stop) code, which stops the reading action after reproducing itself. If the manual non print condition is to continue after this code is read, it must be re-instated by touching NON PRINT again. The manual non print condition can also be stopped by touching STOP READ (manual control key), or stopped temporarily by holding NON PRINT depressed. Manual non print is used for reproducing and updating punched tape and cards.


TAPE SKIP - When this key is touched and released, the writing machine will go into a tape skip condition. The reader will begin reading codes, but the only format control function which may be wired to be operable in tape skip is carriage return. No printing or code punching will occur, even if the punch is in an on condition. Tape skip restores to a normal read condition without stopping, upon sensing the Skip Restore code. Skip restore is a function assigned to one of the function code keys through control panel wiring. If desired, the carriage return function can be made inoperative during tape skip. Also, if operable during tape skip, and the punch is on, the Carriage Return code can be made to punch or not punch. These qualifications are determined through control panel wiring. The tape skip function is used when areas of a tape or card are to be used in some cases, and skipped in others.


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. This switch can be rendered inoperative at certain carriage positions if desired. This is done through control panel wiring in conjunction with the field switch rack. Also, other functions can be qualified as occurring or not occurring while code reading is taking place. For example, function code keys assigned to punch control codes (On 1, On 2, Off) can be made to punch codes when manually operated, but when the codes are being read in the reader, they will not reproduce.


STOP READ - When touched, all action of the writing machine reader will stop. This functions for manual non print and tape skip conditions as well as for normal reading. If this key is used to stop the reader during the functions of manual non print and tape skip, those functions can only be reinitiated by touching their respective machine function keys. Touching START READ will initiate a normal read condition at all times.

LIGHTS

Four indicating lights, located just above the function code keys (see figure 14), show the condition of the input and output units at all times. The chart below lists these four lights, and the condition indicated when each is lit.

| LIGHT | CONDITION |
|---|---|
| IN 1 | Writing Machine Reader On |
| OUT 1 | Writing Machine Punch On |
| IN 2 | Auxiliary Input Unit On |
| OUT 2 | Auxiliary Output Unit On |

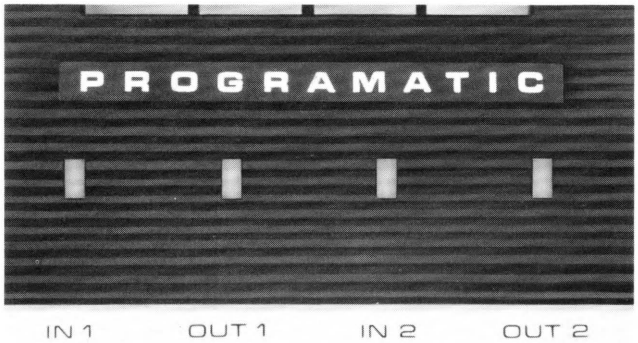



Figure 14. Indicating Lights.

## PROGRAM MODIFICATION SWITCHES

This series of four switches, located just above the indicating lights (see figure 15), allows for minor program modifications through control panel wiring. Switches 1 and 2 lock when depressed, and must be manually restored. Switches 3 and 4 are momentary and self-restoring. Two examples of the use of the locking-type switches follow.

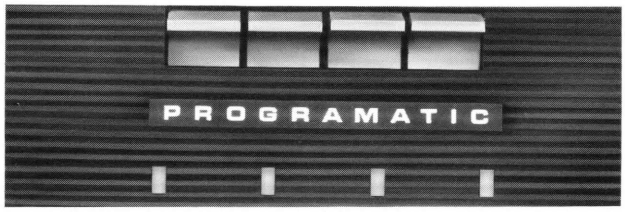



Figure 15. Program Modification Switches.

Reproducing Stop Code. It is possible to have two (or more) different Stop codes. One is punched by one function code key, and is non-reproducing. The other is punched by another function code key, and is always reproducing, but not functioning unless one of the program modification switches is depressed. This feature provides for those updating applications where a card or tape is reproduced an unpredictable number of times, with information added and/or deleted with each reproduction.

Reproduce All Codes. With the punch on, and one of these switches depressed, it is possible to touch START READ and cause all 64 recognized codes to reproduce and print, regardless of any other qualification. Codes bracketed with Non Print and Print Restore codes will not print, but the Non Print code will reproduce even if specified otherwise under normal conditions. This feature differs from manual non print in that codes which normally cause printing will print, and format codes (Carriage Return, Tab, Space, Back Space) will function. However, no manufactured codes, such as Address codes, will reproduce unless bracketed by Non Print and Print Restore codes.

Function codes may or may not cause their assigned functions depending upon further qualification through control panel wiring. This feature can be used for updating applications where a card or tape is reproduced, and a visual proof of any changes made in the coded data is required.

An example of the use of the momentary switches is for the purpose of punching Address codes for use in a connected auxiliary input unit. Holding one of these switches depressed, and touching a keylever, converts the code punched by that keylever into an Address code by adding the 8th bit. Parity check is automatically disabled during this operation.

Standard on the 2201 are two locking-type switches and two momentary switches. However, any combination of locking-type and momentary switches may be obtained.

## FIELD SWITCH RACK

This unit (see figure 16) is attached to the carriage and moves with the carriage. Its purpose is to initiate, control, and modify machine functions by the position of the carriage. It is removable, and contains the tab rack, as previously described on page 5.

There are 12 channels (horizontal rows) on the rack (6 are standard, 6 are optional). Along these channels, actuators are placed. As the carriage moves from left to right, these actuators come into contact with the stationary field switches. Operation or non-operation of field switches is used to activate machine functions. All functions of the field switch rack are controlled through control panel wiring. The following are typical uses of the field switch rack.

Punch Control. The writing machine punch and the auxiliary output unit may be turned on and off by field switch actuators. One channel is assigned to each on and off function. Any of the spare function codes can be used to initiate the condition. And the condition may be terminated by a function code, or a function such as carriage return or tab. It is also possible for the machine to be under both keylever (coded) punch control, and field switch punch control at the same time. For example, a code can turn the writing machine punch on, and a field switch actuator can turn it off.

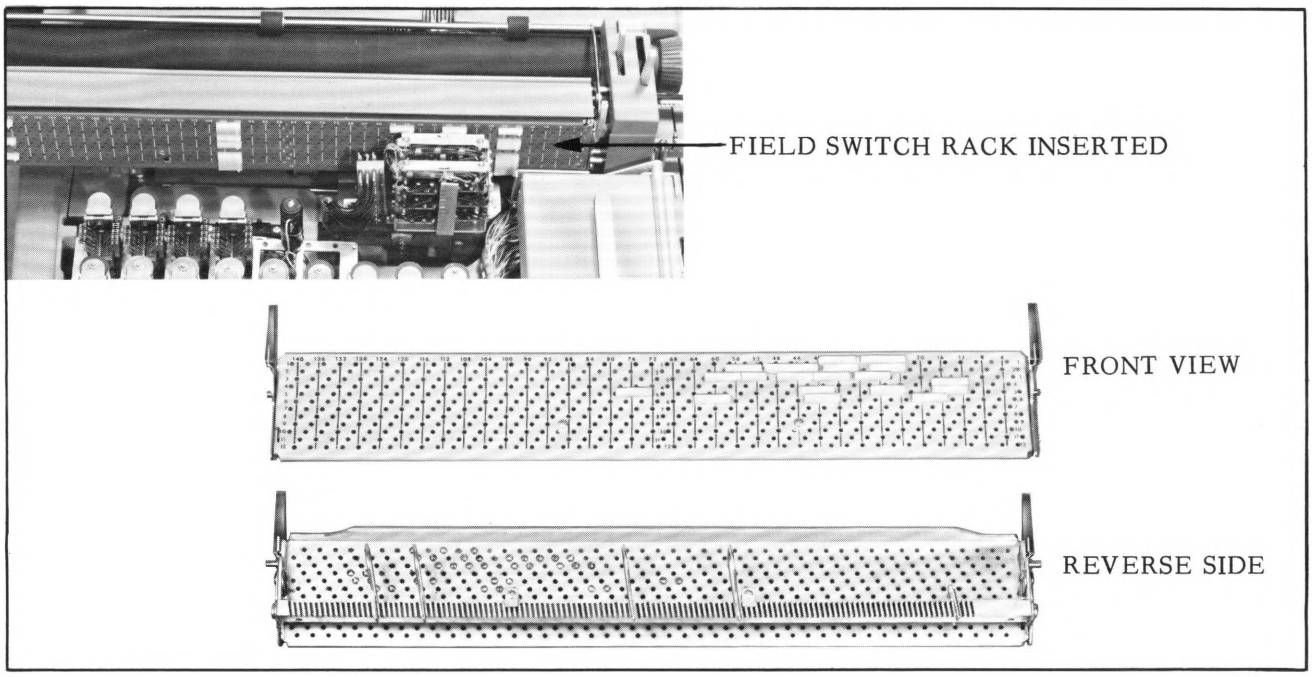



Figure 16. Field Switch Rack.

Through control panel wiring, several patterns of field switch punch control may be used. Each pattern would be initiated by a different code or machine function.

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 control panel wiring and the field switch rack, it is possible to cause tabulation to bypass tab stops, and terminate at a predetermined tab stop. This function is called skip tab. Generally, two codes and one channel on the field switch rack are used. One function code initiates the skip tab condition when read. The next Tab code, read after this code, will cause tabulation to the pre-selected tab stop position.

Placement of an actuator along one of the channels determines which tab stop will terminate tabulation. The actuator must be at least three character positions long, and must be placed so that the first character position is at least six character positions from the selected tab stop position (see figure 17).

Suppress Functions. Field switch actuators

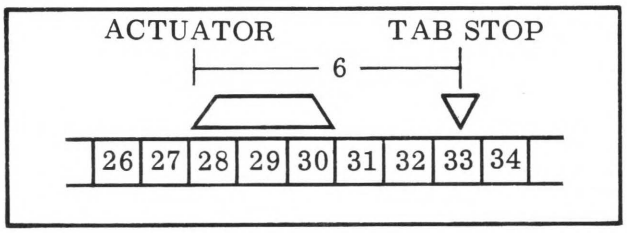



Figure 17. Diagram of Actuator Placement for Skip Tab Function.

can be used to disable control switches START READ and TAPE SKIP at particular carriage positions. This is helpful in preventing a wrong operator decision when a critical form is being typed.

Stop Read. Actuator placement can stop the reading action. However, before stopping, the reader will read one code after the field switch operates. Under no conditions can the reader be started automatically.

Care must be taken when inserting and removing the field switch rack. First, position the carriage so that actuators are well away from contact with the field switches. It is necessary to use both hands when disengaging the field switch rack from the carriage, and it should be removed and inserted in as nearly a horizontal position as possible.

# AUTOMATIC WRITING MACHINE
# CODE CHART

| STANDARD TAB CARD PUNCHING POSITIONS | | | | | | | | | | | | CARD PUNCH | STANDARD TAPE CHANNEL NUMBERS | | | | | | | | 2201 | MODEL SPS/SPD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 11 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | | 8 | 7 | 6 | 5 | 4 | FEED | 3 | 2 | 1 | |
| | | ▮ | | | | | | | | | | 0 | | | ● | | | • | | | | ) — 0 (ZERO) | (ZERO) 0 — ) |
| | | | ▮ | | | | | | | | | 1 | | | | | | • | | | ● | ! — 1 | 1 — ! |
| | | | | ▮ | | | | | | | | 2 | | | | | | • | | ● | | (( — 2 | 2 — (( |
| | | | | | ▮ | | | | | | | 3 | | | | ● | | • | | ● | ● | # — 3 | 3 — # |
| | | | | | | ▮ | | | | | | 4 | | | | | | • | ● | | | $ — 4 | 4 — $ |
| | | | | | | | ▮ | | | | | 5 | | | | ● | | • | ● | | ● | = — 5 | 5 — = |
| | | | | | | | | ▮ | | | | 6 | | | | ● | | • | ● | ● | | ¢ — 6 | 6 — ¢ |
| | | | | | | | | | ▮ | | | 7 | | | | | | • | ● | ● | ● | ? — 7 | 7 — ? |
| | | | | | | | | | | ▮ | | 8 | | | | | ● | • | | | | * — 8 | 8 — * |
| | | | | | | | | | | | ▮ | 9 | | | | ● | ● | • | | | ● | ( — 9 | 9 — ( |
| ▮ | | | ▮ | | | | | | | | | A | | ● | ● | | | • | | | ● | a — A | a — A |
| ▮ | | | | ▮ | | | | | | | | B | | ● | ● | | | • | | ● | | b — B | b — B |
| ▮ | | | | | ▮ | | | | | | | C | | ● | ● | ● | | • | | ● | ● | c — C | c — C |
| ▮ | | | | | | ▮ | | | | | | D | | ● | ● | | | • | ● | | | d — D | d — D |
| ▮ | | | | | | | ▮ | | | | | E | | ● | ● | ● | | • | ● | | ● | e — E | e — E |
| ▮ | | | | | | | | ▮ | | | | F | | ● | ● | ● | | • | ● | ● | | f — F | f — F |
| ▮ | | | | | | | | | ▮ | | | G | | ● | ● | | | • | ● | ● | ● | g — G | g — G |
| ▮ | | | | | | | | | | ▮ | | H | | ● | ● | | ● | • | | | | h — H | h — H |
| ▮ | | | | | | | | | | | ▮ | I | | ● | ● | ● | ● | • | | | ● | i — I | i — I |
| | ▮ | | ▮ | | | | | | | | | J | | ● | | ● | | • | | | ● | j — J | j — J |
| | ▮ | | | ▮ | | | | | | | | K | | ● | | ● | | • | | ● | | k — K | k — K |
| | ▮ | | | | ▮ | | | | | | | L | | ● | | | | • | | ● | ● | l — L | l — L |
| | ▮ | | | | | ▮ | | | | | | M | | ● | | ● | | • | ● | | | m — M | m — M |
| | ▮ | | | | | | ▮ | | | | | N | | ● | | | | • | ● | | ● | n — N | n — N |
| | ▮ | | | | | | | ▮ | | | | O | | ● | | | | • | ● | ● | | o — O | o — O |
| | ▮ | | | | | | | | ▮ | | | P | | ● | | ● | | • | ● | ● | ● | p — P | p — P |
| | ▮ | | | | | | | | | ▮ | | Q | | ● | | ● | ● | • | | | | q — Q | q — Q |
| | ▮ | | | | | | | | | | ▮ | R | | ● | | | ● | • | | | ● | r — R | r — R |
| | | ▮ | | ▮ | | | | | | | | S | | | ● | ● | | • | | ● | | s — S | s — S |
| | | ▮ | | | ▮ | | | | | | | T | | | ● | | | • | | ● | ● | t — T | t — T |
| | | ▮ | | | | ▮ | | | | | | U | | | ● | ● | | • | ● | | | u — U | u — U |
| | | ▮ | | | | | ▮ | | | | | V | | | ● | | | • | ● | | ● | v — V | v — V |
| | | ▮ | | | | | | ▮ | | | | W | | | ● | | | • | ● | ● | | w — W | w — W |
| | | ▮ | | | | | | | ▮ | | | X | | | ● | ● | | • | ● | ● | ● | x — X | x — X |
| | | ▮ | | | | | | | | ▮ | | Y | | | ● | ● | ● | • | | | | y — Y | y — Y |
| | | ▮ | | | | | | | | | ▮ | Z | | | ● | | ● | • | | | ● | z — Z | z — Z |
| | | | | | | | | | | | | SPACE | | | | ● | | • | | | | SPACE | SPACE |
| | ▮ | | | | | | | | | | | - | | ● | | | | • | | | | " — - | - — " |
| | | ▮ | ▮ | | | | | | | | | / | | | ● | ● | | • | | | ● | : — / | / — : |
| | | | | | ▮ | | | | | | ▮ | # | | | | | ● | • | | ● | ● | F1 (MNP STOP) | STOP |
| | ▮ | | | | ▮ | | | | | | ▮ | $ | | ● | | ● | ● | • | | ● | ● | % — — | % — — |
| | | ▮ | | | ▮ | | | | | | ▮ | , | | | ● | ● | ● | • | | ● | ● | , — , | , — , |
| ▮ | | | | | ▮ | | | | | | ▮ | . | | ● | ● | | ● | • | | ● | ● | . — . | . — . |
| | | | | | | ▮ | | | | | ▮ | (( | | | | ● | ● | • | ● | | | F2 | NON-PRINT (AUX. SPACE) |
| | | ▮ | | | | ▮ | | | | | ▮ | % | | | ● | | ● | • | ● | | | F3 | PRINT-RESTR. (AUX. ZERO) |
| | ▮ | | | | | ▮ | | | | | ▮ | ‡ | | ● | | | ● | • | ● | | | F4 | ON 1—ON 2 (U.C.) |
| ▮ | | | | | | ▮ | | | | | ▮ | □ | | ● | ● | ● | ● | • | ● | | | UPPER CASE | UPPER CASE |
| ▮ | | | | | | | | | | | | & | | ● | ● | ● | | • | | | | ; — & | & — ; |
| | | ▮ | | | | | | ▮ | | | ▮ | SKIP | | | ● | ● | ● | • | ● | ● | | TAB | TAB |
| | | | | | | | | ▮ | | | ▮ | END CARD 1 | | | | | ● | • | ● | ● | | F9 | CONTROL (AUX. 2) |
| | | ▮ | | | | | | | | ▮ | ▮ | END CARD 2 | | | ● | | ● | • | ● | ● | ● | F6 | PUNCH OFF |
| | | | | | | | | | | ▮ | ▮ | COR. TAB | | | | ● | ● | • | ● | ● | ● | F10 | DATA SELECTOR (AUX. 3) |
| | ▮ | | | | | | | | | ▮ | ▮ | ERROR | | ● | | | ● | • | ● | ● | ● | F11 | FORM FEED (AUX. L) |
| | | | | ▮ | | | | | | | ▮ | PI 1 | | | | ● | ● | • | | | ● | ± — + | PI 1 (2, 8, SP) |
| | ▮ | | | ▮ | | | | | | | ▮ | PI 2 | | ● | | | ● | • | | | ● | ' — ° | PI 2 (2, 8, -) |
| | | ▮ | | ▮ | | | | | | | ▮ | PI 3 | | | ● | | ● | • | | | ● | BACK SPACE | PI 3 OR BS (2-8-0) |
| | | ▮ | | | | | ▮ | | | | ▮ | PI 4 | | | ● | ● | ● | • | ● | | ● | F13 | PI 4 (AUX. /) |
| ▮ | | | | | | | ▮ | | | | ▮ | PI 5 | | ● | ● | | ● | • | ● | | ● | ¼ — ½ | PI 5 (AUX. A) |
| | ▮ | | | | | | ▮ | | | | ▮ | PI 6 | | ● | | ● | ● | • | ● | | ● | F12 | ADDRESS IDEN. (AUX. J) |
| | | | | | | | ▮ | | | | ▮ | PI 7 | | | | | ● | • | ● | | ● | F8 | SKIP RESTORE (AUX. 1) |
| ▮ | | | | ▮ | | | | | | | ▮ | SP-1 | | ● | ● | ● | ● | • | | ● | | LOWER CASE | LOWER CASE |
| ▮ | | | | | | | | ▮ | | | ▮ | SP-2 | | ● | ● | | ● | • | ● | ● | | F5 | ON 2 |
| | ▮ | | | | | | | ▮ | | | ▮ | CR | | ● | | ● | ● | • | ● | ● | | F7 | FC ON |
| ▮ | | | | | | | | | ▮ | | ▮ | TAPE FEED | | ● | ● | ● | ● | • | ● | ● | ● | TAPE FEED | TAPE FEED |
| | | | | | | | | | ▮ | | ▮ | END LINE | ● | | | | | • | | | | CAR. RET. | CAR. RET. |
| 12 | 11 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | | EL | X | O | CH | 8 | FEED | 4 | 2 | 1 | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | CHANNEL NUMBERS | | | | | | | | | | |

# SECTION IV
# CUSTOMIZING FEATURES

## GENERAL

Customizing the 2201 FLEXOWRITER automatic writing machine, for specific application requirements is mostly a matter of control panel wiring. However, there are several optional features which may be incorporated into the machine for use with particular applications. This section describes these optional features.

## ADDITIONAL CONTROL FEATURES

Standard on the control panel of the 2201 are six field switch control channels and one selector. In addition to this, up to six more field switch control channels, and three selectors may be added.

## EDGE-PUNCHED CARD READER/PUNCH

An edge-punched card reader and/or punch can be installed on the writing machine in place of the standard tape only reader and punch. Figure 18 illustrates the appearance of these units. Both the reader and the punch can use either tape or edge-punched cards.

Figure 18. The 2201 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 removal, as well as simplified filing methods, make edge-punched unit record cards particularly well adapted to systems applications.

With edge cards in the punch (see figure 19), the TAPE FEED manual control 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.

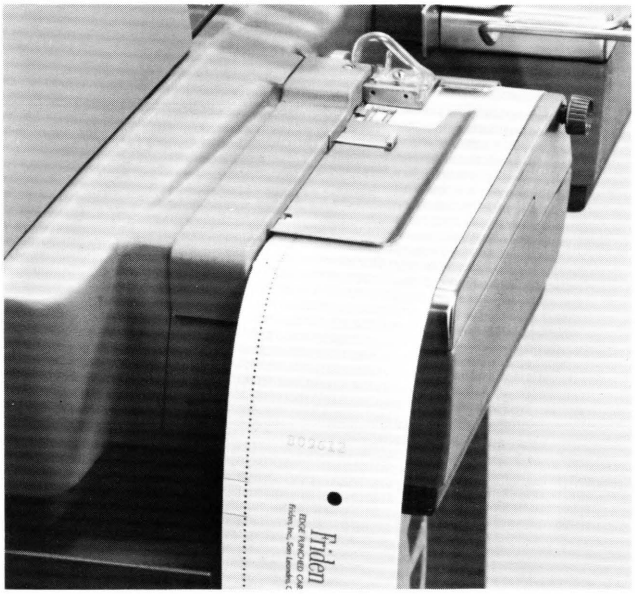


Figure 19. Cards in Edge Card Punch.

This means that when edge cards are being punched, TAPE FEED cannot be used to delete codes erroneously punched by the operator. Instead, wrong codes are overpunched first with the "C" keylever, and then with any of the function code keys, F2 through F13. This will insure the deletion of any code.

With tape in the punch (see figure 20), the TAPE FEED manual control switch operates normally. It punches the Tape Feed (Delete) code as long as it is held depressed.

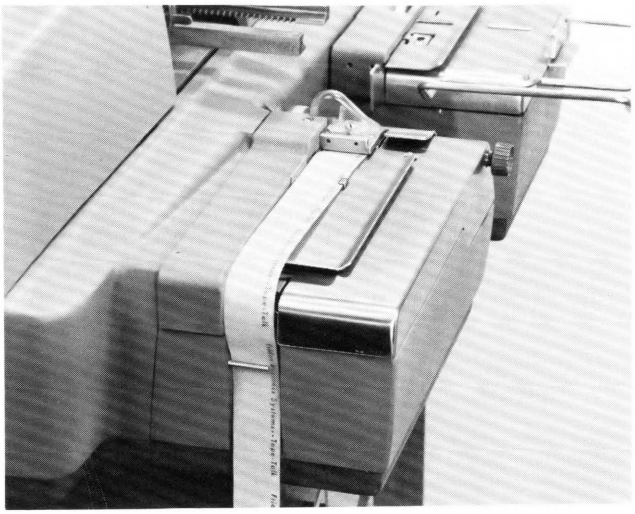


Figure 20. Tape in Edge Card Punch.

## AUTOMATIC CARD READER

The 2213 Automatic Card Reader (see figure 21), 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.

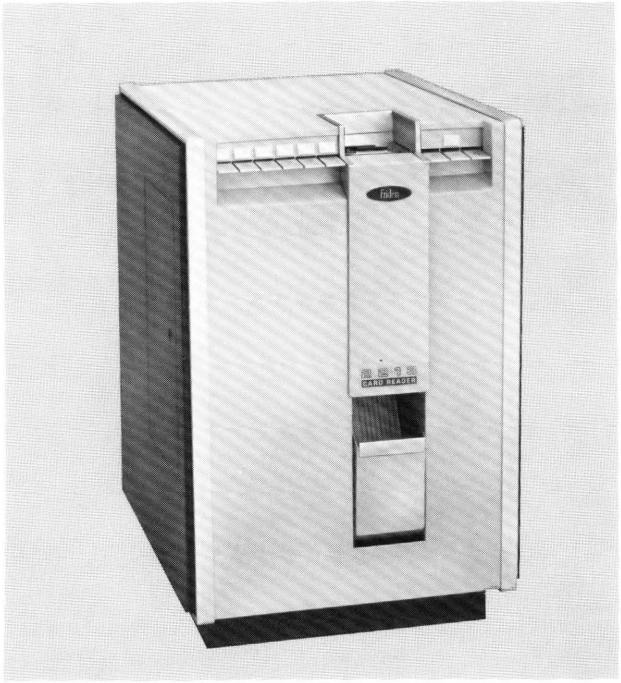



Figure 21. 2213 Automatic Card Reader.

Basically, the automatic system consists of feeding cards from a 200 card capacity hopper (see figure 22) 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.


Figure 22. Card Hopper and Manual Controls.

Further flexibility is provided because the 2213 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 replaces the standard tape reader. In this manner, it operates as an integral reading unit. Or, it can be connected to the auxiliary input unit connector, 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, as shown in Figure 23 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 2213 Automatic Card Reader can accept four different card formats, intermixed in random fashion, and process each format according to a different program.


Figure 23. Program Control Cylinder and Terminal Block within Unit.

## 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.

When ordering pin feed platens, the overall form width to be used must be specified. Pin-to-pin dimensions will be one-half inch smaller than this figure. The chart (see figure 24) shows the platens available, and the maximum form widths for each carriage length.

| TYPE | MAX. FORM WIDTH | |
|---|---|---|
| | 16" Car. | 20" Car. |
| Regular Pin Type _ Variable | 14" 14 11/16" | 18" 18 11/16" |

Figure 24. Pin Feed Platen Dimensions.

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. The chart (see figure 4) gives the line spacing values for these alternate ratchets.

## ELECTRIC LINE FINDER

An electric line finder may be installed on the 2201. 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.

If installed, one of the function code keys is assigned to the form feed function. Control panel wiring determines the conditions under which this code will be reproducing.

## 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.

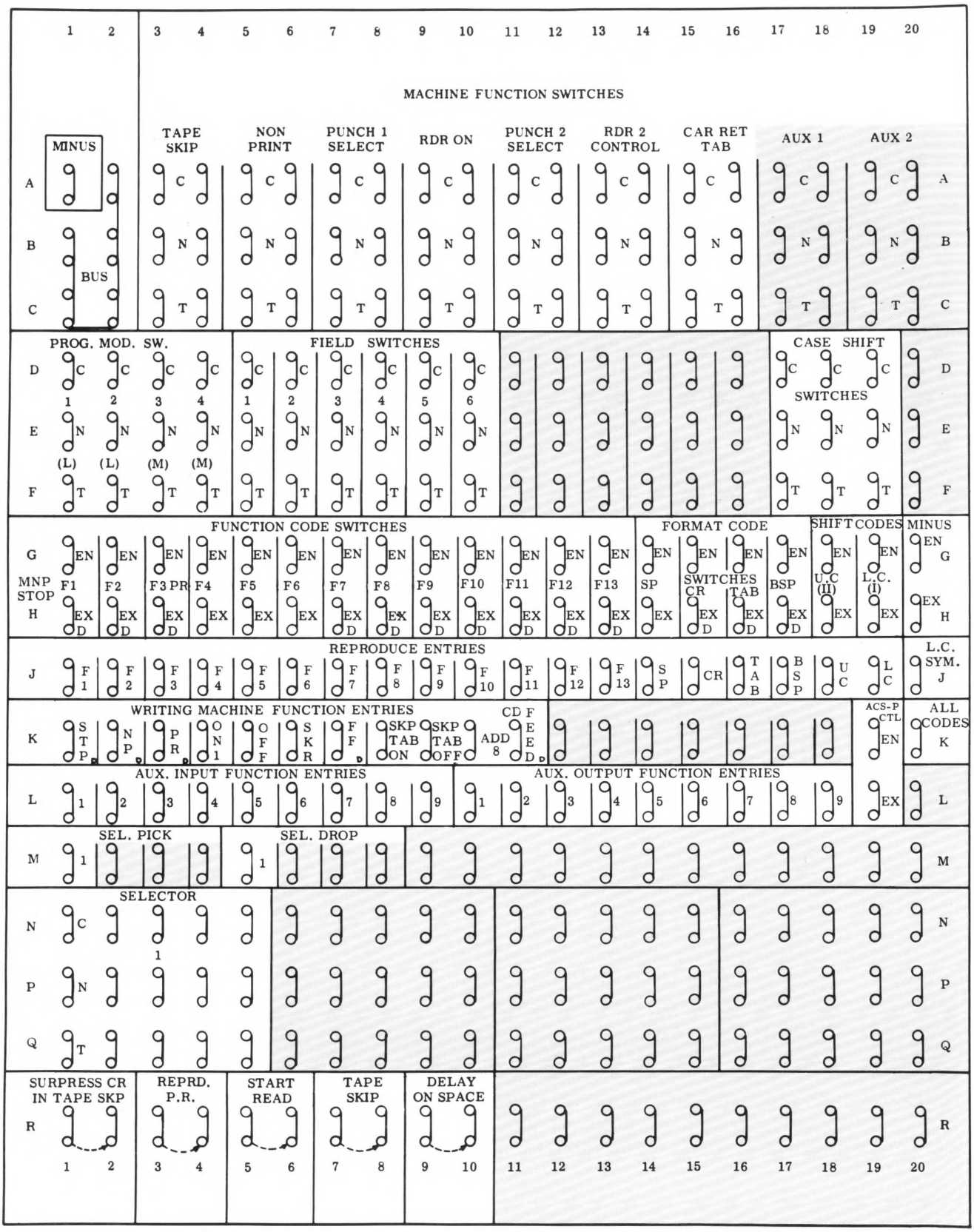



Figure 28. Control Panel (Illustration).

# SECTION V
# CONTROL PANEL WIRING

## GENERAL

On the 2201 FLEXOWRITER automatic writing machine, the control panel is used to customize the internal functions of the machine for specific applications. It is removable, and additional panels are available to provide program flexibility and simplified application changes. Figure 25 shows the location of the control panel in the machine. This section describes common methods of control panel wiring.

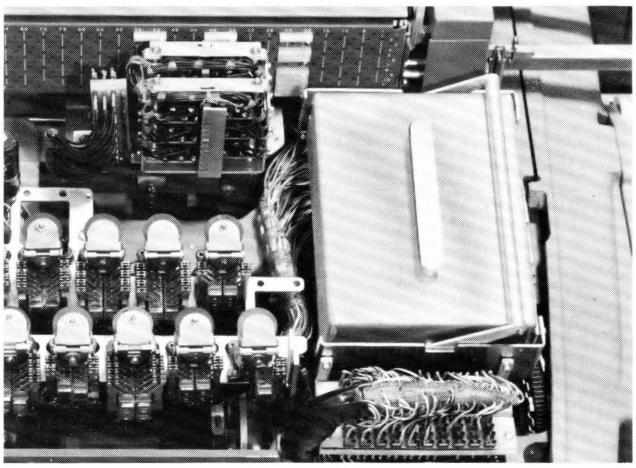


Figure 25. Control Panel in the 2201.

## CONTROL PANEL DESCRIPTION

Figure 26 illustrates the appearance of the control panel. It consists of 320 set of double hubs (holes), arranged in rows. Any hub can be located by an alphabetic reference vertically, and a numeric reference horizontally. Some hubs can only accept electrical impulses and are called entry hubs. Others emit impulses and are called exit hubs.

Wires are plugged into these hubs, from exits to entries, to establish control circuits for machine operation. Standard wires come in several colors and lengths, and contain a plug at both ends. A pair of long-nosed pliers is usually to insert or remove the wires.

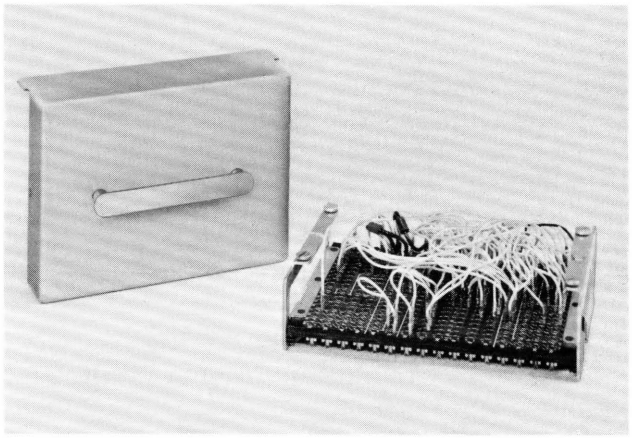


Figure 26. Control Panel.

Diode wires are used under special circumstances. They allow electrical impulses to pass through in one direction only, and are used to prevent back circuits. Diodes are encapsulated in the middle of each wire, and are imprinted with the electrical symbol. Diode wires should be plugged from exit hubs to entry hubs according to the position of this symbol, as shown in figure 27 below.

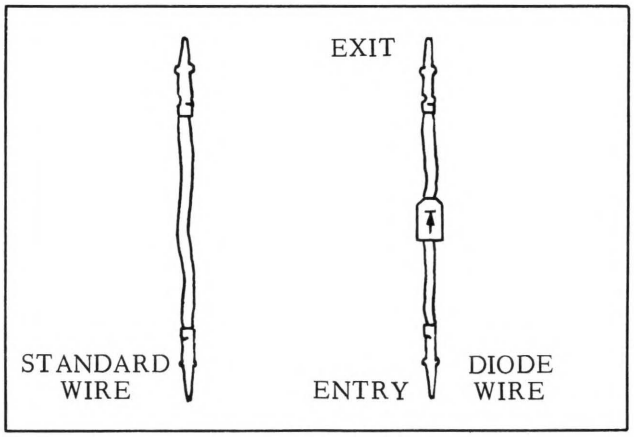



Figure 27. Control Panel Wires.

## CONTROL PANEL SUMMARY

Figure 28 (opposite page) illustrates a chart of the control panel showing the location of the hubs. Following is a description of the function of each of these hubs.

MINUS (A1). This hub provides a 90-volt DC electrical potential whenever there is power in the writing machine. Wiring the control panel consists chiefly of establishing circuits from MINUS to the entry hubs, through various logic switches.

BUS (A2; B; and C 1 & 2). These hubs are all common (interconnected). By themselves, they have no function. But if a connection is made from MINUS to one of these hubs, each BUS hub will supply power in the same manner as the MINUS hub. This is usually done to provide the necessary additional power sources for most applications.

MACHINE FUNCTION SWITCHES (A, B, C 3-20). There are nine sets of these switches, and they are used to qualify circuits during machine functions. Each set has two separate series of hubs, labeled C (common), N (normal) and T (transfer). When one of these machine functions is in effect, there is an internal connection between each of the common hubs of that switch and the transfer hubs located in the same vertical column. When that machine function is not in effect, there is an internal connection between each of the common hubs of that switch, and the normal hubs located in the same vertical column. Figure 29 illustrates the normal and transferred condition of one of these switches.

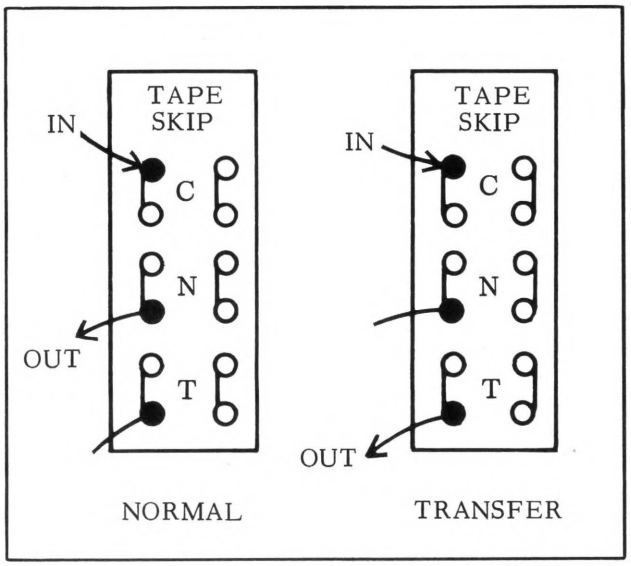



Figure 29. Machine Function Switches - Normal and Transfer Condition.

Each series of common, normal, and transfer hubs for any of these switches is independent of the other series. The following describes each of the nine sets of switches:

TAPE SKIP - Transfers during a tape skip condition.

NON PRINT - Transfers during an automatic non print condition. One use of this switch is to prevent Stop codes from functioning during the automatic non print condition.

PUNCH 1 SELECT - Transfers when the punch control switch is in the SEL (select) position. When the punch control switch is in the ALL position, connection is made between the common and normal hubs. One use of this switch is to qualify code punching in SEL (select) and ALL.

READER ON - Transfers during operation of the writing machine reader or auxiliary input unit, if connected.

PUNCH 2 SELECT - Transfers when the auxiliary connected output unit is in an on (functioning) condition.

READER 2 CTL (Control) - Transfers during operation of the auxiliary connected input unit.

CAR RET TAB - Transfers during the machine functions of carriage return and tabulation.

AUX 1 & AUX 2 - These switches are auxiliaries, and can be associated with functions of various auxiliary connected input and output units.

PROGRAM MODIFICATION SWITCHES (D, E, F, 1-4). There is one series of common, normal, and transfer hubs for each of these switches. When a switch is operated, there is an internal connection between the common and transfer hubs. When not-operated, the connection is between the common and normal hubs. Switches 1 and 2 are momentary; switches 3 and 4 are latching.

FIELD SWITCHES (D, E, F5 - 10). There is one series of common, normal, and transfer hubs for each of the 6 field switches. When an actuator on the field switch rack comes into contact with one of the field switches, there is an internal connection between the common and transfer hubs of that switch on the control panel. When an actuator is not in contact, the connection is between the common and normal hubs. The design of these switches is such that they will operate not only during normal carriage escapement, but also during the functions of tabulation and carriage return. Therefore, it is desirable to qualify circuits that are not to operate during these conditions, through the common and normal hubs of the CAR RET TAB machine function switch. Functions such as skip tab restore should not be qualified through this switch.

CASE SHIFT SWITCHES (D, E, F17 - 19). There are three series of common, normal, and transfer switches, which apply to the double case keyboard only. When in the lower case shift condition, an internal connection is made between the common and normal hubs. When in the upper case shift condition, connection is between the common and transfer hubs. Each of the three series of common, normal, and transfer hubs, is independent of the other two.

FUNCTION CODE SWITCHES (G, H1 - 13). These 13 switches are associated with the 13 function code keys. Every switch consists of two hubs, an entry hub and an exit hub. Operation of any of the function code keys, either manually or automatically, causes the corresponding entry and exit hubs to be internally connected. In order for any function code key to cause a function or punch a code, power must first be wired into the entry hub, and from the exit hub to whatever machine operation is desired. Some of these switches provide a momentary delay (82 milliseconds), and are used with machine functions which require a delay. Those switches which provide a delay are marked with a D on the control panel.

FORMAT CODE SWITCHES (G, H14 - 17). Each of these four switches is associated with a format control keylever: space bar, CAR RET (carriage return), TAB, and BACK SPACE. In order for any of these keylevers to punch codes, or perform additional functions, power must be wired into the corresponding entry hub, and from the exit hub to the operation desired. Note that the carriage return, tab, and back space switches provide a delay. They may be used to initiate functions which require a delay.

SHIFT CODES (G, H 18 & 19). These switches are associated with the case shift keys. They provide the ability to cause additional functions from the case shift operation. In single case operation, they provide two additional codes for functional use.

MINUS (G, H 20). This switch is associated with the dash (or minus) keylever. It is used in association with a cable-connected input adding machine (Model ACEO-P) to cause a subtract function of that unit.

REPRODUCE ENTRIES (J 1 - 19). In order for function codes and format codes to reproduce themselves, power must be applied to these hubs individually. There is one hub for each of the function, format, and shift codes.

L. C. SYM (Lower Case Symbols) (J 20). Used only with the double case keyboard. There are 17 keylevers which print different symbols in the lower case position, than they do in the upper case position. Unless power is applied to this hub, these 17 keylevers will not punch codes in the lower case position.

WRITING MACHINE FUNCTION ENTRIES (K 1 - 10). In order for any of these 11 functions to occur, power must be applied to the individual hubs. In order for any of them to function automatically from codes, power must first be wired through the function code switches. It is at this point where function code keys are assigned their specific functions. Note that when making function code key assignments, those functions which require a delay must be wired through function code switches which provide a delay. On the control panel, those functions which require

a delay are marked with a D. A listing follows:

Non Print
Print Restore
Stop Read
Form Feed
Card Feed

An additional function, not mentioned previously, is the CARD FEED hub (K11). If the 2201 is equipped with the edge card punch and reader, impulsing the hub from a function code will cause an automatic feed to the next edge card in the punch.

ACS-P CTL (Control) (G, H19). When an output adding machine (Model ACS-P) is connected to the 2201, there is an electrical requirement. The power (MINUS) must be wired through this hub before being plugged into the functional entries for this unit.

ALL CODES (K20). If power is applied to this hub, 64 of the 65 codes used with the 2201 will reproduce. The Tape Feed (Delete) code is the only exception, and will not reproduce except under a non print condition. This hub is often wired from a program modification switch, to cause simultaneous code reproduction and printing.

AUXILIARY INPUT FUNCTION ENTRIES (L1 - 9). These nine hubs are assigned functions for particular cable-connected auxiliary input units.

AUXILIARY OUTPUT FUNCTION ENTRIES (L10 - 18). These nine switches are assigned functions for particular cable-connected auxiliary output units.

SELECTOR (N, P, Q1 - 5). This is a group of five independent rows of hubs. Each vertical row has a common (C), normal (N), and a transfer (T) hub. Under normal conditions, power wired into any common hub will exit from its associated normal hub. However, if the SELECTOR PICK hub (M1) is impulsed, power wired into any of the common hubs will exit from their associated transfer hubs. This transfer condition will remain until the SELECTOR DROP hub (M5) is impulsed, or until power to the writing machine is turned off. When either of these conditions occur, all vertical groups of hubs return to a normal condition. Figure 30 illustrates the normal and transfer condition of the selector.

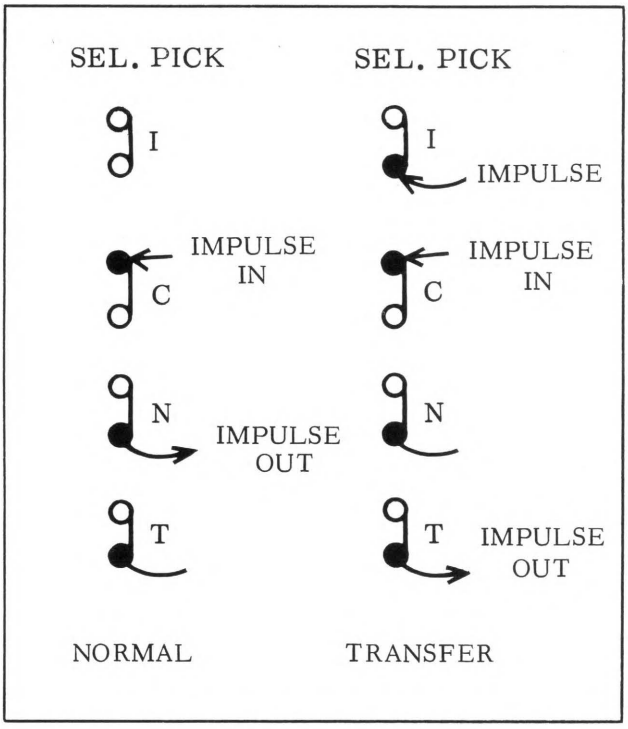



Figure 30. Selectors, Normal and Transfer Condition.

The selector can be picked and dropped from machine function switches, field switches, case shift switches, function code switches, format code switches and shift codes. They are generally used to select between two or more conditions, such as patterns of field switch punch control or code reproduction.

SELECTOR PICK (M1). This hub, when impulsed, causes the selector to change from a normal condition (common to normal) to a transfer condition (common to transfer).

SELECTOR DROP (M5). When this hub is impulsed, the selector will change from a transfer condition to a normal condition. If the selector is already in a normal condition, impulsing the SELECTOR DROP hub does nothing.

SUPPRESS CAR. RET. IN TAPE SKIP (R 1 and 2). If hub R 1 is wired to hub R 2, the Carriage Return code will not function when the writing machine is in a tape skip condition. If left unwired, this code will be recognized and cause its function.

REPRODUCE PRINT RESTORE (R 3 and R4). In order to cause the Print Restore code to reproduce when it is used to terminate the automatic non print condition, hub R 3 must be wired to hub R 4. However, if the code is read or the F 3 (Print Res) function code key is operated under normal conditions, the code will or will not reproduce depending upon whether a circuit has been established to the Print Restore Reproduce Entry hub.

START READ (R 5 and R 6). Unless hub R 5 is wired to hub R 6 the START READ manual control switch is inoperative. By wiring through field switches or other logic switches, it is possible to disable START READ at specific parts of a program. This connection does not affect TAPE SKIP and NON PRINT manual control switches.

TAPE SKIP (R 7 and R 8). Unless hub R 7 is wired to hub R 9, the TAPE SKIP manual control switch is inoperative. By wiring through field switches or other logic switches, it is possible to disable TAPE SKIP at specific parts of the program.

DELAY ON SPACE (R 9 and R 10). Of the four format code switches (G, H 14 - 17), the space switch is the only one without an integral delay. If an additional function is to be caused by the Space code when read, and it is to be a function which requires a delay, hub R 9 must be wired to hub R 10.

## WIRING EXAMPLES

In order to illustrate the setting up of logical circuits in the control panel, wiring for some common functions is explained. These examples will be concerned with writing machine functions only. However, wiring logic for auxiliary connected input and output units will follow the same pattern. The following are the selected examples.

Preliminary Wiring. In all applications, a wiring logic or pattern is established. Later in this section, an illustration of one such pattern is explained. However, for the purposes of developing realistic wiring examples, some such pattern must be used as a basis.

This particular pattern (see figure 31) is a common one, since it separates the three reading conditions: normal read, tape skip, and automatic non print. Unless otherwise specified, all wired functions occur in all reading modes. Therefore, this logic pattern is set up to separate functions which are to occur under any of the following three conditions.

1. In a tape skip condition only.
2. In an automatic non print condition only.
3. In neither tape skip nor automatic non print conditions (in other words, in a normal read condition).

Figure 31 illustrates the wiring. The following is the explanation:

(1) MINUS to BUS. This is standard wiring used to provide the additional power sources needed in most applications.

(2) MINUS (BUS) to TAPE SKIP COMMON (Machine Function Switch).

(3) NORMAL to NON PRINT COMMON (Machine Function Switch). If the machine is not in a tape skip condition, this wire will carry the electrical impulse.

(4) NORMAL (Non Print). This is the wire that will carry the impulse if the machine is in a normal read condition (neither series of hubs transferred).

(5) TRANSFER (Non Print). Carries the impulse only when the machine is in a non print condition.

(6) TRANSFER (Tape Skip) to NON PRINT COMMON (Machine Function Switch).

(7) NORMAL (Non Print). Will carry the impulse only if the machine is in a tape skip condition.

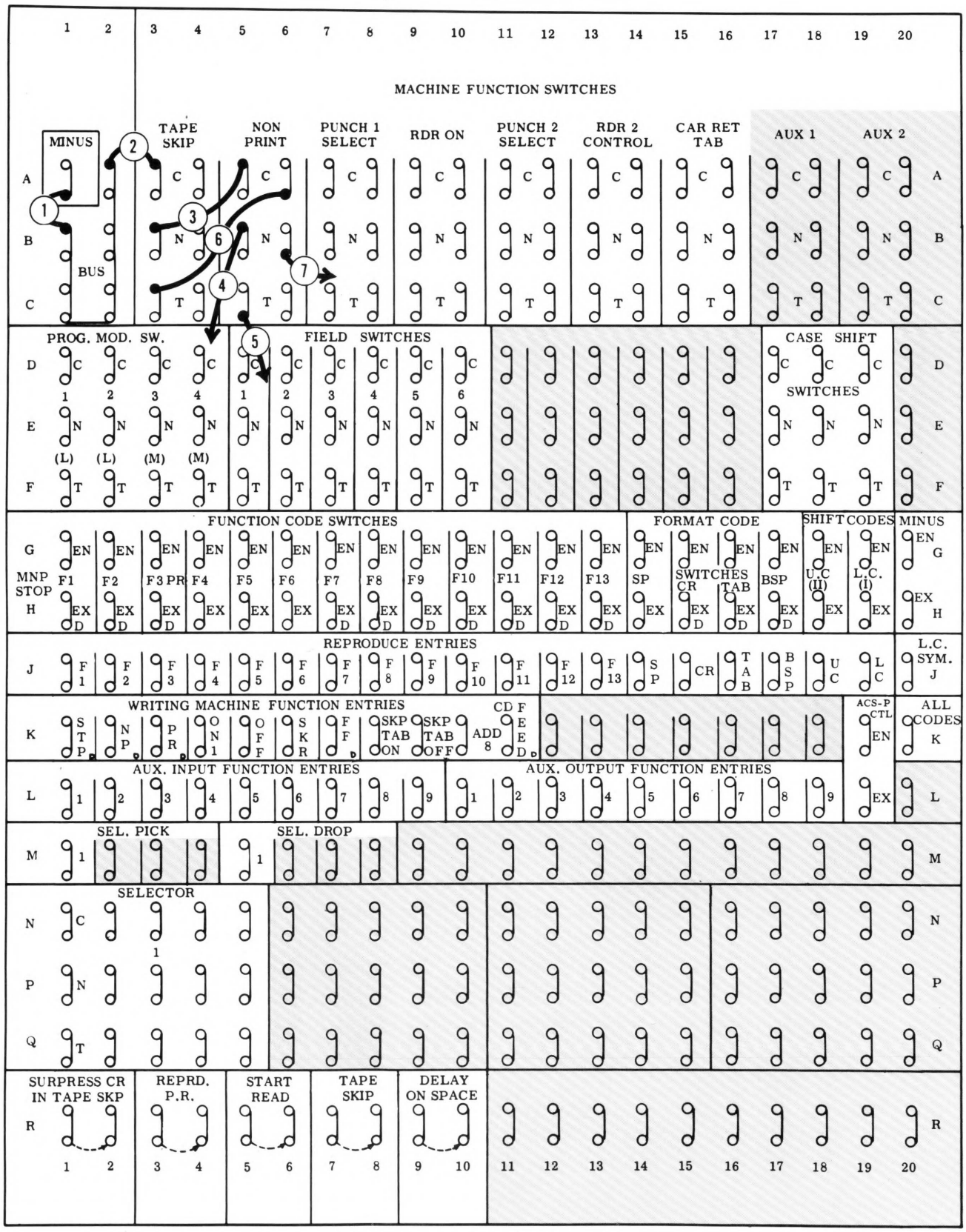



Figure 31. Preliminary Wiring.

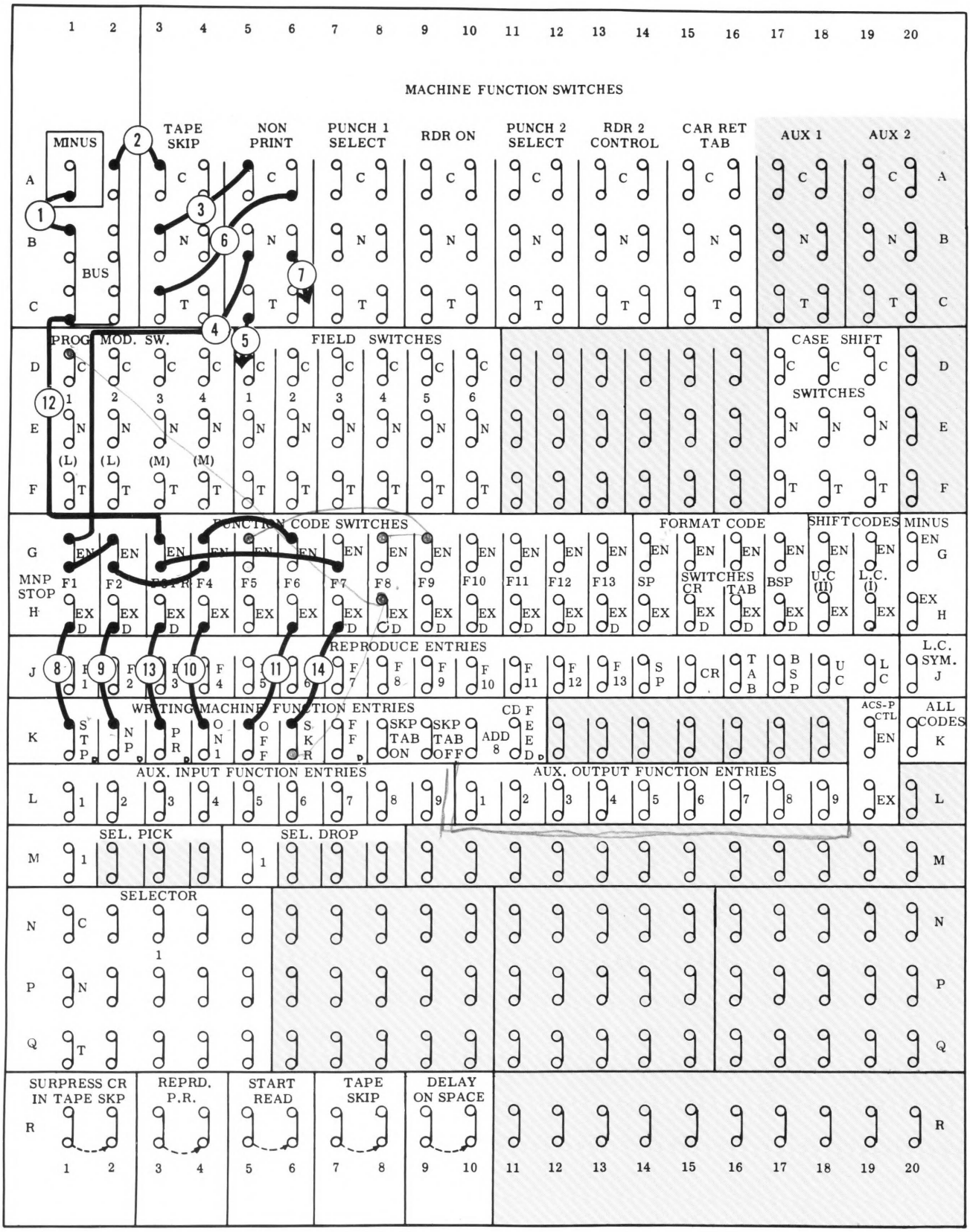



Figure 32. Standard Function Wiring.

Standard Functions. With this preliminary wiring pattern done, wiring of standard writing machine functions is simple. Assume the following writing machine functions are to be used, and assigned to these function code keys:

| | |
|---|---|
| F1 Stop | F4 Punch On |
| F2 Non Print | F6 Punch Off |
| F3 Print Restore | F7 Tape Skip Restore |

Also assume that the functions of stop read, non print, punch on, and punch off, are to occur only in a normal read condition. Figure 32 illustrates the wiring. Following is the explanation:

(4) NORMAL (Non Print) to F 1 ENTRY (Function Code Switch). This wire brings power under a normal read condition to the F 1 Function Code Switch. And since power must also be brought to the F 2, F 4, and F 6 entries, it is done by "leapfrog" wiring as shown.

(8) F 1 EXIT to STOP ENTRY (Writing Machine Function Entry). When the F 1 code is read in a normal read condition, it will now cause the stop read function. Other functions are wired similarly.

(9) F 2 EXIT to NON PRINT ENTRY (Writing Machine Function Entry).

(10) F 4 EXIT to ON 1 ENTRY (Writing Machine Function Entry).

(11) F 6 EXIT to OFF ENTRY (Writing Machine Function Entry).

It is possible to qualify the print restore and tape skip restore functions through the pattern. However, these functions have no meaning unless the writing machine is in an automatic non print or tape skip condition. Therefore, these functions are usually wired directly from MINUS, as:

(12) MINUS (BUS) to F 3 ENTRY (Function Code Switch). From here the power is leapfrog-wired to the F 7 entry.

(13) F 3 EXIT to PRINT RESTORE ENTRY (Writing Machine Function Entry).

(14) F 7 EXIT to SKIP RESTORE ENTRY (Writing Machine Function Entry).

Punch Control. After functions have been established, code punching can be considered. All alpha-numeric and special character codes (except certain lower case symbols) will punch anytime the punch is on, and will reproduce during normal read and automatic non print functions. Function code keys, format control keylevers, and certain lower case symbols must be wired to punch under any conditions. Conditions for code punching and/or reproduction can be established. Some of the common conditions are:

1. No code reproduction during tape skip.
2. Punch only when the punch control switch is in the ALL (or SELECT) position.
3. Punch only when keylevers or switches are manually operated.

There are other conditions, but these are some of the common ones. Figure 33 illustrates the wiring for some of these conditions. The explanation follows.

Assume that the codes that cause the functions of tape skip restore (F7), space, carriage return, and tabulation will always punch and always reproduce any time the punch is on, except during a tape skip condition. The wiring is as follows:

(1) MINUS (BUS) to TAPE SKIP COMMON (Machine Function Switch)

(2) NORMAL to F 7 ENTRY (Reproduce Entry). This brings power to the F 7 code entry hub, at any time the machine is not in a tape skip condition. There is no need to wire through tab and space entry hubs, as these are normally blocked during tape skip.

Carriage Return is blocked by the jumper wire from R 1 to R 2.

In the same example, assume that the codes which cause the functions of non print (F2), print restore (F3), punch on (F4) and off (F6), will punch and reproduce in the ALL position of the punch control switch, but not in the SELECT condition. And they will never reproduce in a tape skip condition. This is the wiring:

(3) NORMAL (Tape Skip) to PUNCH 1 SELECT COMMON (Machine Function Switch). This switch transfers when the punch control switch is in the SELECT position. When in ALL, there is an internal connection between the common and normal hubs.

(4) NORMAL to F 2 ENTRY (Reproduce Entry). From this, the inpulse is leapfrog wired to the other entries associated with this condition.

Continuing the example, the code causing the stop read function (F1), is to punch only when manually operated, and never when read under any reading condition. Following is the wiring for this condition:

(5) TAPE SKIP COMMON to READER ON COMMON (Machine Function Switch). This wiring continues the power source to another hub. It could have been wired directly from Minus. However, this method if often used to conserve Minus hubs for other functions.

(6) NORMAL to F 1 ENTRY (Reproduce Entry). With this wiring, power will only be brought to the F 1 Entry when the reader is not operating (and the punch is on).

This illustration has explained several methods of qualifying code punching. Other special methods are described later within this section.

One Code - Two Functions. It is possible for one code to cause more than one function. However, if one of these functions is to be caused by another code, some care must be taken to prevent back circuits. For example, assume that anytime the F 2 code is read, the writing machine will go into the automatic non print condition and the punch will go on. Also, the F 3 code will terminate the non print condition and the punch will go off. Also assume that the punch will be turned on and off by other codes. Figure 34 illustrates the wiring. The explanation is as follows:

(1) NORMAL (Non Print) to F 2 ENTRY (Function Code Entry).

(2) F 2 EXITS to NON PRINT and diode wire to ON 1 ENTRY (Writing Machine Function Entries).

(3) MINUS (BUS) to F 3 ENTRY (Function Code Switch).

(4) F 3 EXITS to PRINT RESTORE and diode wire to OFF ENTRY (Writing Machine Function Entries).

If diode wires were not used, any other code which caused the punch on condition, for

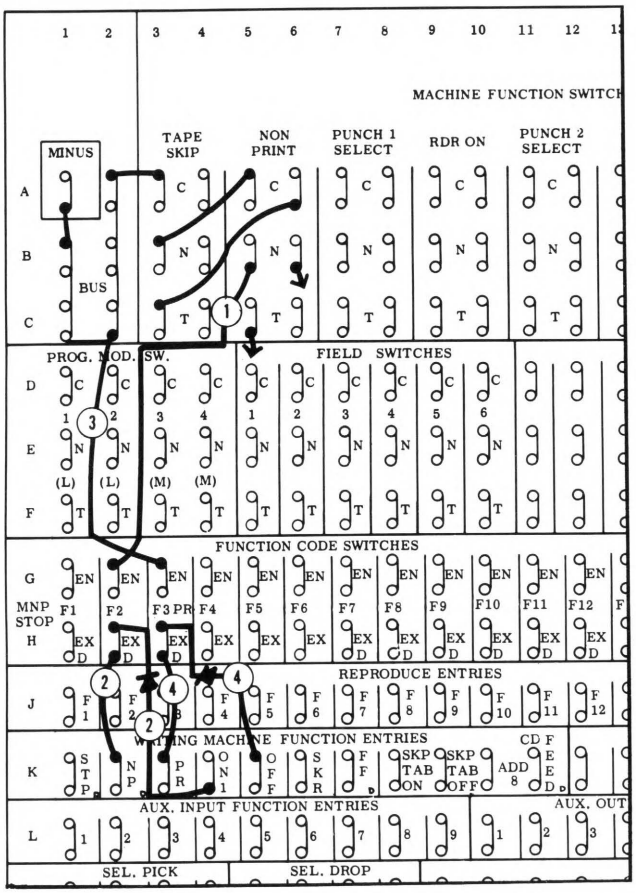



Figure 34. One Code - Two Function Wiring.

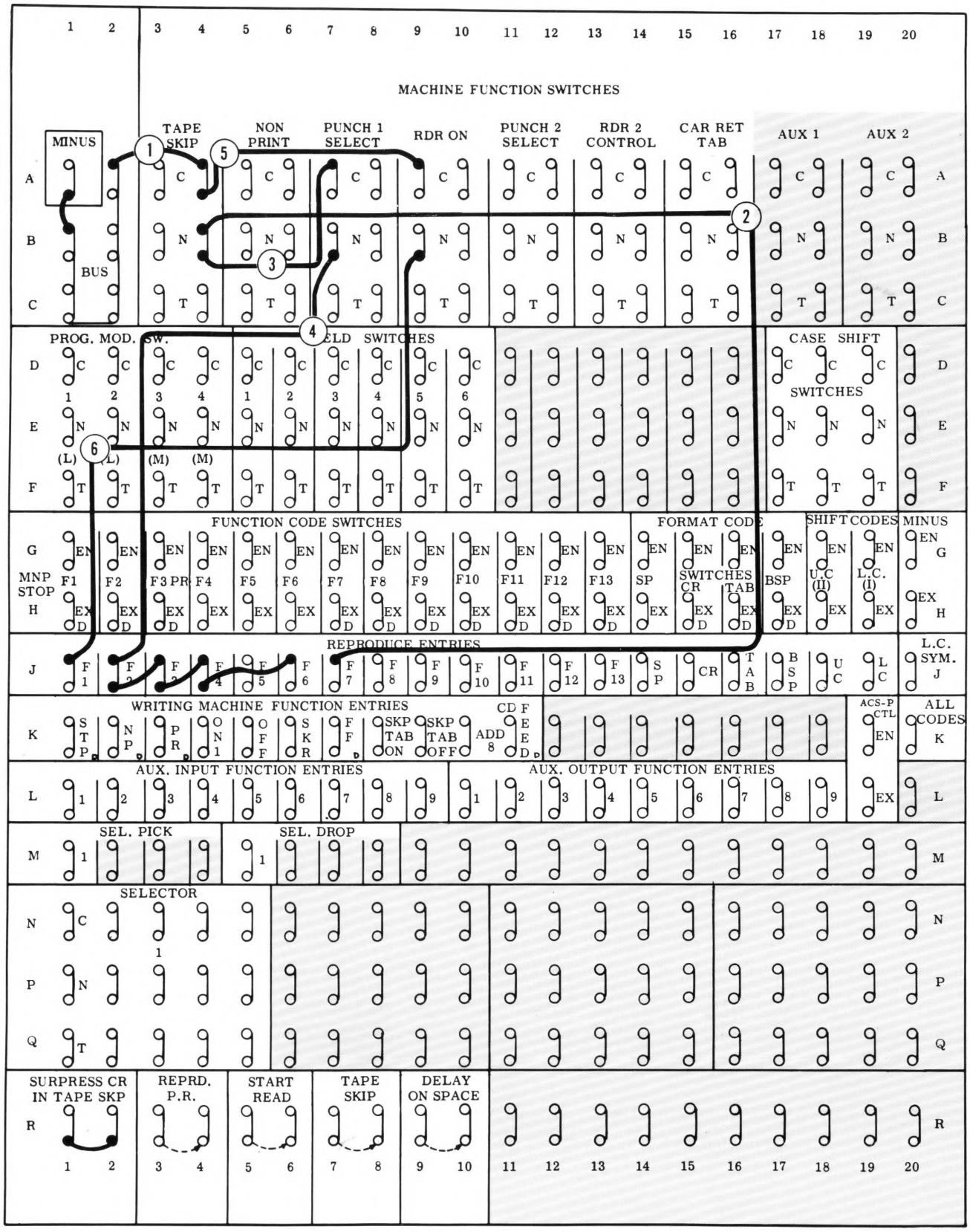



Figure 33. Punch Control Wiring.

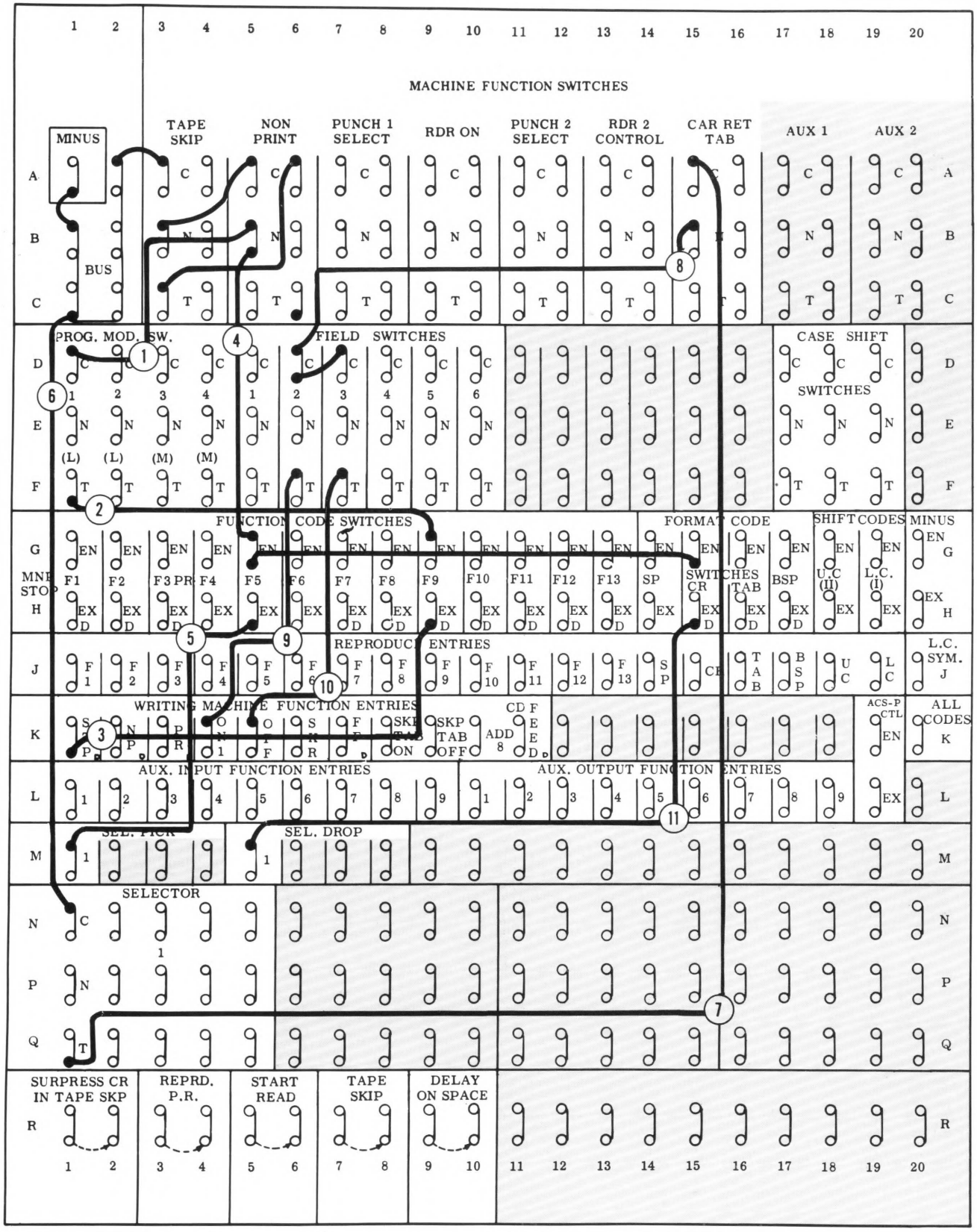



Figure 35. Reproducing Stop Code and Field Switch Punch Control Wiring.

instance, would also cause the automatic non print condition. By using these diode wires, no back circuits of this nature can occur.

Reproducing Stop Code. It is possible to have more than one code to cause the stop read function. In applications which involve the updating of tapes, a second stop code (often referred to as Stop II code) is sometimes desirable. This example illustrates the wiring of a second stop code, which will not interfere with the operation of a non-reproducing stop code. These are the qualifications of the Stop II code used here:

1. Initiated from the F 9 function code switch.
2. Functions only when program modification switch no. 1 is operated.
3. Functions only in a normal read condition.
4. Always reproduces whenever the punch is on, except in a tape skip condition.

Figure 35 shows the wiring. Following is the explanation:

(1) NORMAL (Non Print) to PROGRAM MODIFICATION SWITCH 1 COMMON. This wiring goes through the circuit which qualifies the impulse to occur during a normal read condition only.

(2) TRANSFER to F 9 ENTRY (Function Code Switch).

(3) EXIT to STOP READ ENTRY (Writing Machine Function Entry).

Qualification of this function is almost complete. All that is left to do is to wire the punching and reproduction qualifications of the F 9 code. This is done in the manner previously described on page 26.

Field Switch Punch Control. The writing machine punch (and connected auxiliary output units) can be controlled from field switch actuators. This field switch punch control can operate separately or in conjunction with keylever (code) control. For example it is possible to turn on the punch by a code, and turn if off with an actuator. However, this example concerns only with the wiring of field switch punch control. It will require the use of the selector (if other means of punch control are also used), a code to initiate the condition, a code or other means to terminate the condition, and two field switch channels to provide for the on and off functions. Following are the specifications:

1. F 5 code initiates the field switch punch control condition.
2. Carriage return function terminates the condition.
3. Actuators placed in channel 2 will turn on the punch.
4. Actuators placed in channel 3 will turn off the punch.
5. The condition will occur in normal read circumstances only.

Figure 35 shows the wiring. Following is the explanation:

(4) NORMAL (Non Print) to F 5 ENTRY (Function Code Switch) and CARRIAGE RETURN ENTRY (Format Code Switch). This wiring qualifies the function as occuring during a normal read condition only.

(5) F 5 EXIT to SELECTOR PICK.

(6) MINUS (BUS) to SELECTOR COMMON.

(7) TRANSFER to CAR RET/TAB COMMON (Machine Function Switch).

Although probably not necessary in this example, it is generally desirable to wire most functions caused by field switch actuators through the Carriage Return/Tab Machine Function Switch. This prevents operation of actuators during the functions of carriage return and tabulation.

(8) NORMAL to FIELD SWITCHES 2 and 3 COMMON.

(9) TRANSFER (Field Switch 2) to ON 1 (Writing Machine Function Entry).

(10) TRANSFER (Field Switch 3) to OFF (Writing Machine Function Entry).

(11) EXIT (Carriage Return) to SELECTOR DROP.

Skip Tab. Wiring for the skip tab function requires a code to initiate the function, and a field switch actuator to terminate the function. After the initiating code has been read, the next Tab code will cause the skip tab function. Placement of the terminating actuator is described on page 15. In this example, the F 8 code initiates the function (in normal read only), and an actuator placed in channel 1 of the field switch rack terminates the function. Figure 36 illustrates the wiring. Following is the explanation:

(1) NORMAL (Non Print) to F 8 ENTRY (Function Code Switch).

(2) EXIT to SKIP TAB ON ENTRY (Writing Machine Function Entry).

(3) MINUS (BUS) to FIELD SWITCH 1 COMMON.

(4) TRANSFER to SKIP TAB OFF ENTRY (Writing Machine Function Entry).

As desired, the F 8 code can be made reproducing or non-reproducing under various conditions. Also, various patterns of skip tab can be made to occur by using other codes and other channels. Depending upon the conditions, this may require the use of the selector.

Address Code Punching. When Address codes are to be punched for use in the 2214 (SELECTADATA selective reader), the ADD 8 Writing Machine Function Entry hub is used. Power is wired to this hub through one of the momentary-type program modification switches. When the switch is manually depressed, and a keylever or function code switch is operated, the 8th bit will be added to the code normally punched by the keylever. Parity checking is disabled during this function. Figure 36 illustrates the wiring. Following is the explanation:

(5) MINUS (BUS) to PROGRAM MODIFICATION SWITCH 3 COMMON.

(6) TRANSFER to ADD 8 ENTRY (Writing Machine Function Entry.

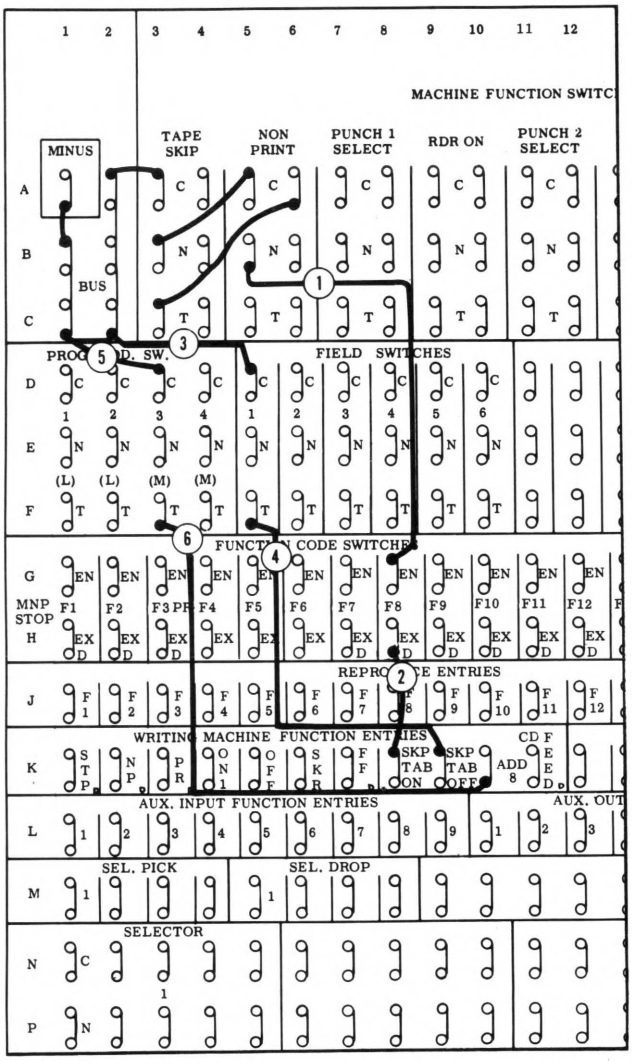


Figure 36. Skip Tab and Address Code Wiring.

Reproduce All Codes. In some applications it is desirable to have the ability to alter data in a tape or edge-punched card, and also provide a visible record that this has been done. To do this, power is wired to the ALL CODES hub through one of the latching-type program modification switches. With this switch operated, the operator need only touch START READ with the punch on, and all codes will reproduce, while a visible document is being typed. This will occur

regardless of any qualification on the reproduction of any code.

## APPLICATION PLANNING

When planning the control panel wiring for a particular application, charts such as those shown in figures 37 and 38 can be developed and will prove helpful. The balance of this section will illustrate the control panel wiring for the application described in Section VI.

Wiring the control panel is done only after the application has been developed and programmed. After this has been done, the first step is to develop a chart similar to the one shown in figure 37. This chart lists all of the functional and format codes used in the application, their assignment, the conditions under which they will function, and how they can be punched or reproduced.

When this has been completed, another chart can be developed, if needed, to assign field switch channels to machine functions. Figure 38 illustrates such a chart.

In a real situation, the programming is done first, and then these charts are developed. This is done because it is not necessary to wire the panel for every conceivable situation, but only for those situations which the operator will encounter when performing the application. These charts should always accompany the program layout. If they are complete, they are the only tools necessary to wire a control panel for any particular application.

Working from the charts shown in figures 37 and 38, the following explains the control panel wiring for this application. For simplicity, the single case version of the 2201 FLEXOWRITER writing machine is used. Figures 39 and 40 illustrate the wiring. The explanation follows:

| KEYS | ASSIGNMENT | FUNCTIONS IN | REPRODUCES IN |
|---|---|---|---|
| F1 | STOP READ | Normal Read Only | ALL Position Only |
| F2 | AUTO. NON PRINT | Normal Read Only | ALL Position Only |
| F3 | PRINT RESTORE | Non Print Only | ALL Position Only |
| F4 | ON 1 | Normal Read Only | ALL Position Only |
| F5 | OFF | Normal Read Only | ALL Position Only |
| F8 | SKIP RESTORE | Tape Skip Only | Always |
| F9 | CARD FEED | Normal Read Only | ALL Position Only |
| F10 | SELECTOR PICK | Normal Read Only | ALL Position Only |
| F12 | (Punch PI 6 Code) | | Always |
| F13 | (Punch PI 4 Code) | | Always |
| SPACE | | | Always |
| CAR RET | SELECTOR DROP | | Always |
| TAB | | | Always |

Figure 37. Function and Format Code Assignments.

| FIELD SWITCH CHANNEL ASSIGNMENTS | |
|---|---|
| CHANNEL | ASSIGNMENT |
| 1 | Writing Machine Punch On |
| 2 | Writing Machine Punch Off |
| 3 | Disable START READ |

Figure 38. Field Switch Channel Assignments.

The first step in wiring is to assign the function codes. Examining the chart shown in figure 37, it can be seen that there are three qualifications: normal read only, tape skip condition only, and automatic non print condition only. Therefore, a pattern like that described on page 25 is set up first, and the codes are assigned from this logic.

(1) NORMAL (Non Print) to F 1 ENTRY (Function Code Switch). Leapfrog wiring carries this impulse to the F2, F4, F5, F9, F10 and Carriage Return entries. These are all qualified as occuring under normal read conditions only.

(2) TRANSFER (Non Print) to F 3 ENTRY (Function Code Switch). The impulse will reach this hub only under an automatic non print condition.

(3) NORMAL (Non Print) to F8 ENTRY (Function Code Switch). The impulse will reach this hub only under a tape skip condition.

After this preliminary wiring, function code switches are assigned to their writing machine functions, as follows:

(4) F1 EXIT to STOP READ ENTRY (Writing Machine Function Entry).

(5) F2 EXIT to NON PRINT ENTRY (Writing Machine Function Entry).

(6) F3 EXIT to PRINT RESTORE ENTRY (Writing Machine Function Entry).

(7) F4 EXIT to ON 1 ENTRY (Writing Machine Function Entry).

(8) F5 EXIT to OFF ENTRY (Writing Machine Function Entry).

(9) F8 EXIT to SKIP RESTORE ENTRY (Writing Machine Function Entry).

(10) F9 EXIT to CARD FEED ENTRY (Writing Machine Function Entry).

(11) F10 EXIT to SELECTOR PICK ENTRY.

(12) CARRIAGE RETURN EXIT to SELECTOR DROP ENTRY.

Field switch punch control can be wired next. Since this application also involves controlling the writing machine punch by codes, a selector is used. The F10 code is already wired to pick the selector, and the Carriage Return code to drop it. Following is the wiring for the assignment of the field switches to the punch on and punch off writing machine functions:

(13) MINUS (BUS) to SELECTOR COMMON ENTRY.

(14) TRANSFER to CAR RET/TAB COMMON ENTRY.

(15) TRANSFER to FIELD SWITCHES 1 AND 2 COMMON ENTRIES.

(16) TRANSFER (Field Switch 1) to ON 1 ENTRY (Writing Machine Function Entry).

(17) TRANSFER (Field Switch 2) to OFF ENTRY (Writing Machine Function Entry).

Even though there are two methods of causing the punch on and punch off functions, there is no need to use diode wires. This is because back circuits can do no harm in this instance.

Qualifications on code punching and reproduction can be wired next. There are two qualifications: when the punch control switch is in the ALL position, and under all conditions. Although there may be other conditions under which it would be desirable to have codes punch or not punch, if these conditions will never arise during the application, they can be safely ignored. For example, assume that it is undesirable to have certain codes reproduce during a tape skip function. However, if the punch is never on during those times when the operator has the option of using this feature, it is not necessary to qualify those codes under this condition. Therefore, the wiring is kept as simple as possible consistant with the requirements of the application.

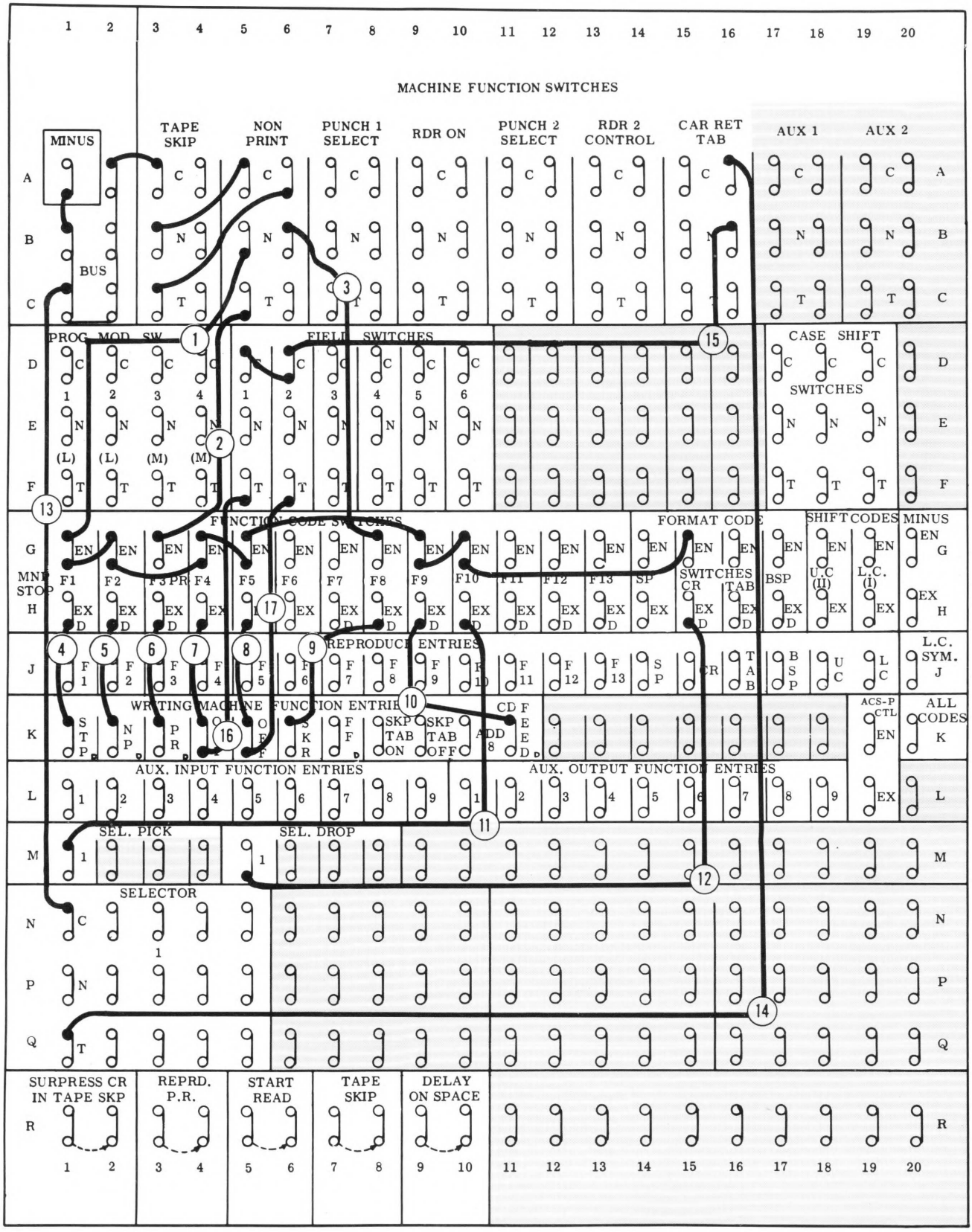



Figure 39. Application Wiring.

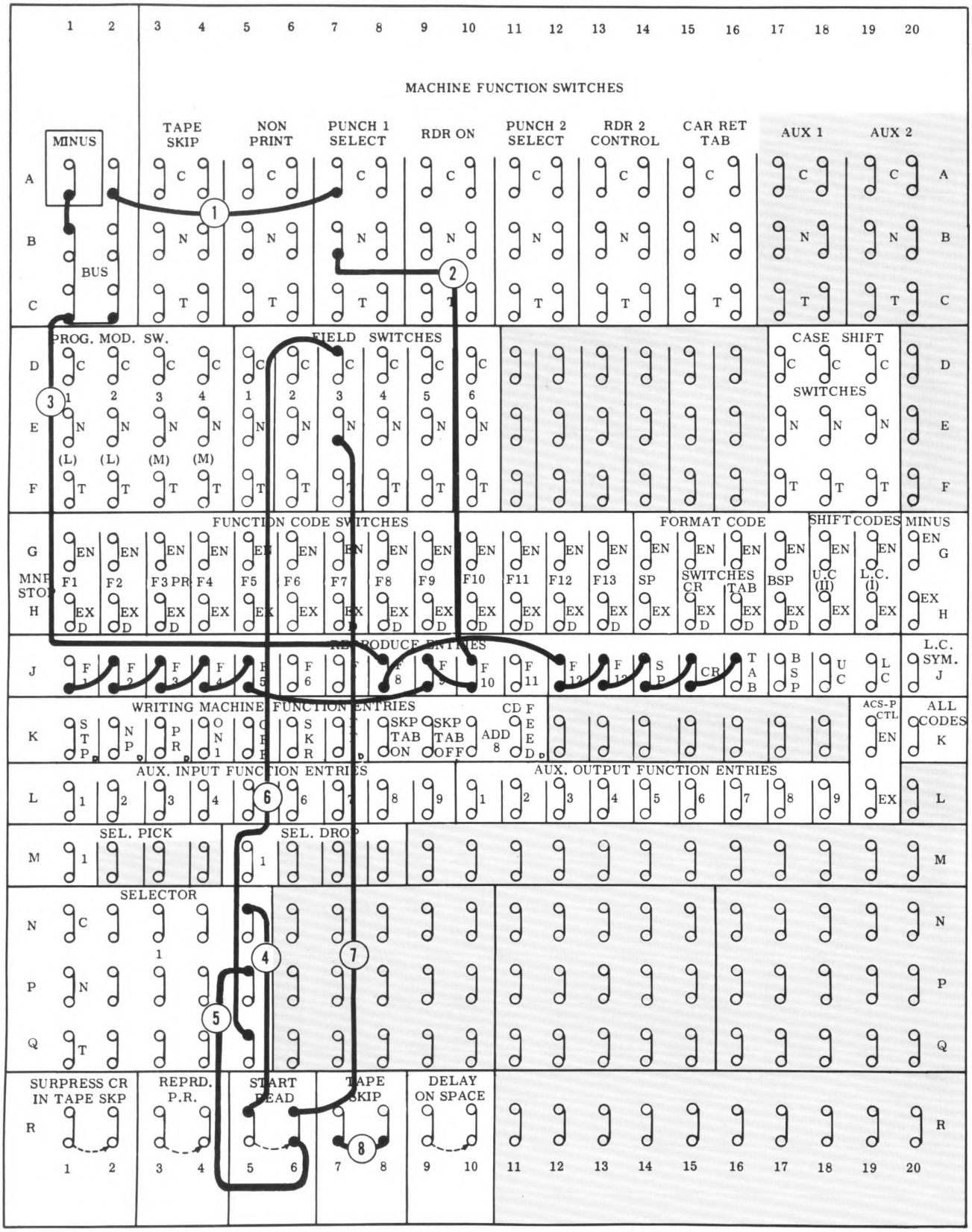



Figure 40. Application Wiring.

Following is the wiring for code reproduction. This explanation is illustrated in figure 40.

(1) MINUS (BUS) to PUNCH 1 SELECT COMMON (Machine Function Switch).

(2) NORMAL to F10 ENTRY (Reproduce Entry). From here, the wiring is leapfrogged to F9, F5, F4, F3, F2, and F1 entries. This qualifies those codes which can be punched in the ALL position of the punch control switch.

(3) MINUS (BUS) to F8 ENTRY (Reproduce Entry). From here, leapfrog wiring carries power to F12, F13, Space, Carriage Return, and Tab entries. These codes will always punch and reproduce any time the punch is on.

All that remains to be done is to qualify Start Read so that it is disabled during the operation of the number 3 field switch, and to jumper the Tape Skip hubs together so this function can occur. Since the disabling of Start Read is to occur only while under field switch punch control, it is wired through the selector. The following describes this wiring:

(4) START READ EXIT to SELECTOR COMMON ENTRY.

(5) NORMAL to START READ ENTRY. This negates action of the field switch when the selector is not picked.

(6) TRANSFER to FIELD SWITCH 3 COMMON ENTRY.

(7) NORMAL to START READ ENTRY.

(8) TAPE SKIP EXIT to TAPE SKIP ENTRY.

This completes the wiring for this application as specified. The application and the programming for this wiring is described in Section VI.

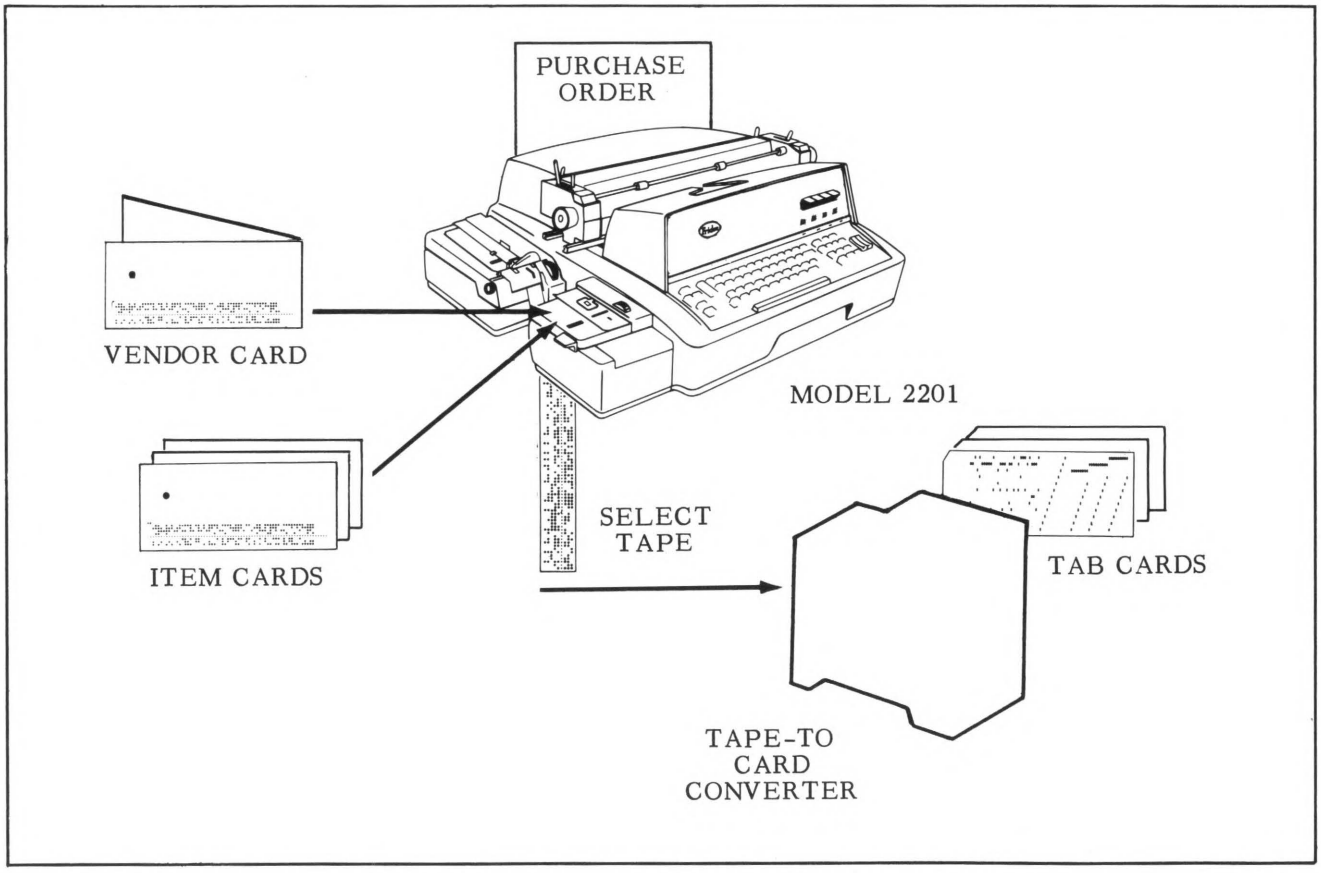



Figure 41. Purchase Order Writing System.

# SECTION VI
# PROGRAMMING

## GENERAL

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

This section describes the program for a purchase order writing application of the 2201 FLEXOWRITER writing machine equipped with a single case keyboard. Control panel wiring for this application has been described, beginning on page 30.

In this illustration, management desires to produce a large volume of purchase orders daily. And they must be as accurate as possible. In addition, they desire to capture part of the data on each purchase order, in a form that will provide an automatic commitment report.

Figure 41 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 produces the commitment report.

Shown in Figure 42 is the purchase order form. Manual entries are shaded. All else 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 43. There are five steps.

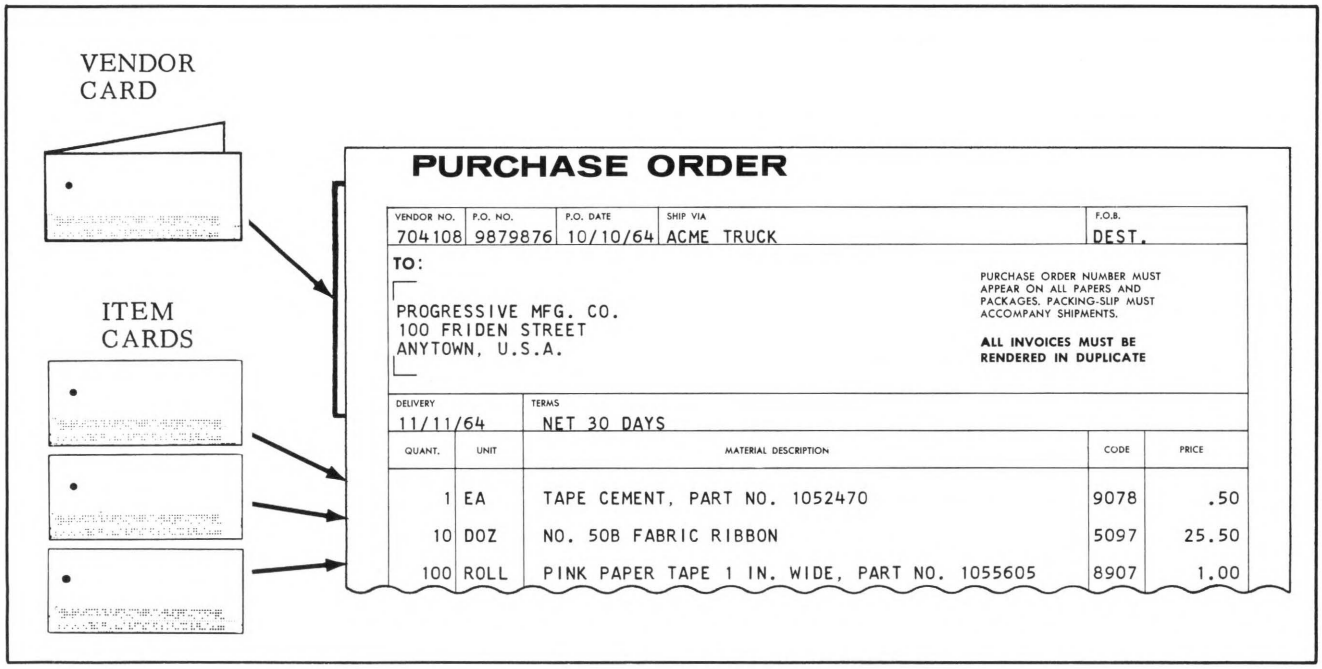



Figure 42. Purchase Order Form.

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.

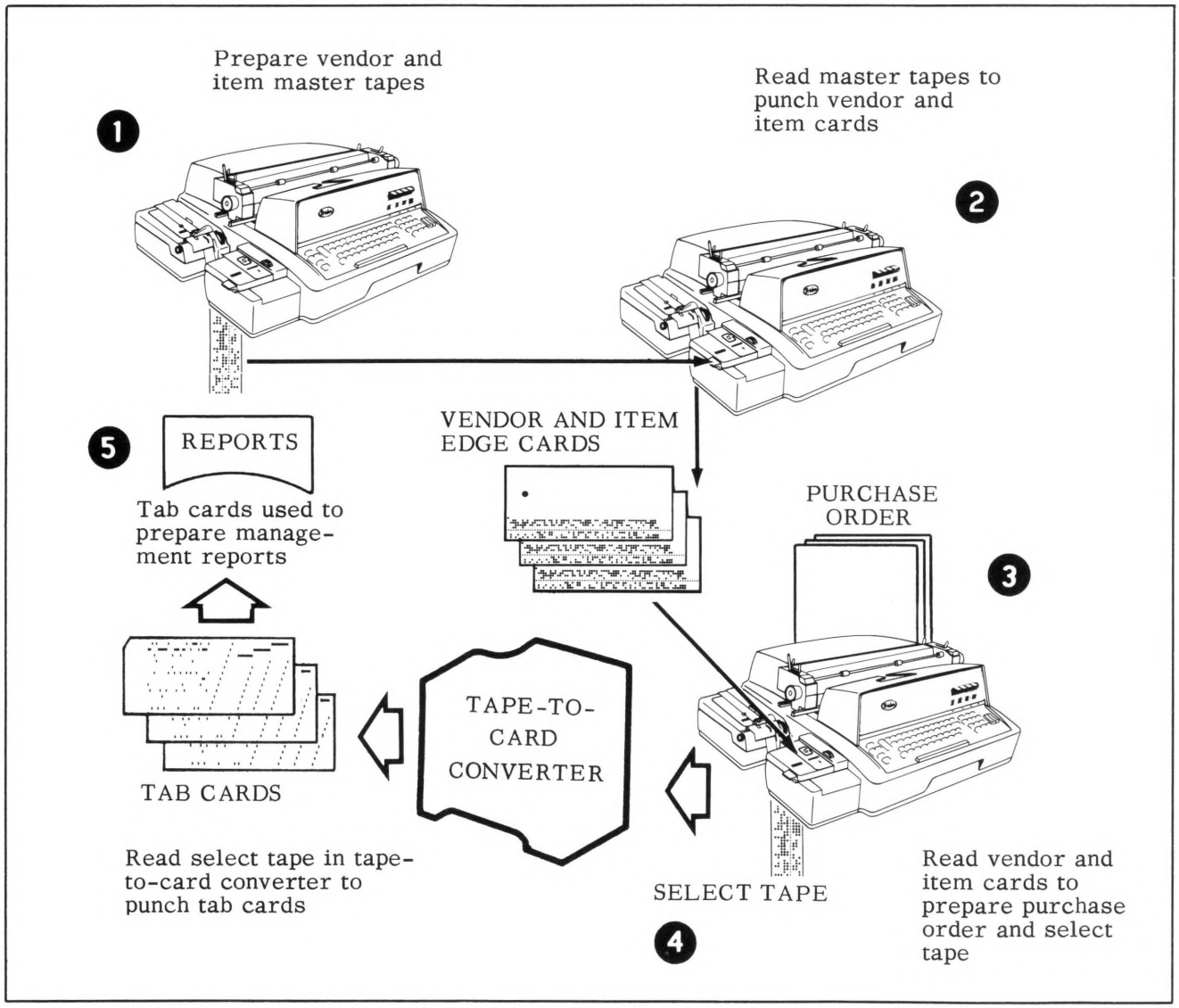



Figure 43. Flow Chart - Purchase Order System.

# Friden * PROGRAM LAYOUT CHART

Prepared for _____ CUSTOMER

Friden Office _____

Date Prepared _____

EQUIPMENT: 2201 WITH EDGE CARD PUNCH AND READER. SELECT TAPE TO TAPE-TO-CARD PUNCH.

| VENDOR NO. | P.O. NO. | P.O. DATE | SHIP VIA | F.O.B. |
|---|---|---|---|---|
| 704108 | 8978976 | 10/10/64 | ACME TRUCK | DEST. |

PROGRESSIVE MFG. CO.
100 FRIDEN STREET
ANYTOWN, U.S.A.

DEL. DATE 11/11/64 — TERMS NET 30 DAYS

| QTY. | UNIT | DESCRIPTION | CODE | PRICE |
|---|---|---|---|---|
| 10 | EA. | TAPE CEMENT | 9078 | .50 |
| 1 | DOZ. | NO. 50 B FABRIC RIBBON | 5097 | 25.50 |
| 100 | ROLL | PINK PAPER TAPE 1 IN. WIDE | 8907 | 1.00 |

VENDOR CARD LABEL

704108
ACME TRUCK — DEST.
PROGRESSIVE MFG. CO.
100 FRIDEN STREET
ANYTOWN, U.S.A.
NET 30 DAYS

ITEM CARD LABEL

EA.
TAPE CEMENT
9078
.50

ON
OFF
DISABLE SR

TO PREPARE MASTER TAPES, REFER TO FUNCTION CODE KEY ASSIGNMENT CHART

VENDOR MASTER TAPE — VENDOR NO. | SHIP VIA | F.O.B. | VENDOR NAME | STREET | CITY/STATE | TERMS

VENDOR CARD — P.O. NO. | P.O. DATE | DEL. DATE

704108 | ACME TRUCK | DEST. | PROGRESSIVE MFG. CO. | 100 FRIDEN STREET | ANYTOWN U.S.A. | NET 30 DAYS

SELECT TAPE

704108 | 8978976 | 10/10/65 | PROGRESSIVE MFG. CO. | TAB

TO PREPARE MASTER TAPES, REFER TO FUNCTION CODE KEY ASSIGNMENT CHART

ITEM MASTER TAPE — UNIT | DESC. | CODE | PRICE

ITEM CARD — QTY.

SP | EA. | TAB | TAPE CEMENT | TAB | 9078 | SP | SP/5 .50 CR | STP

SELECT TAPE (CONT.)

PI 6 | SP/4 | 9078 | SP/5 .50 CR

WHEN PREPARING MASTER TAPES, REFER TO FUNCTION CODE KEY ASSIGNMENT CHART FOR FUNCTION EQUIVALENTS.

| VENDOR NO. | P.O. NO. | P.O. DATE | VENDOR NAME | QTY | CODE | PRICE |
|---|---|---|---|---|---|---|
| 704108 | 8978976 | 10/10/64 | PROGRESSIVE MFG. CO. | 00010 | 9078 | 0000050 |
| DUPLICATED FROM FIRST CARD UNDER PI 2 | | | | QTY | CODE | PRICE |
| 704108 | 8978976 | 10/10/64 | PROGRESSIVE MFG. CO. | 00001 | 5097 | 0002550 |

Friden, Inc. TAB CARD
SAN LEANDRO · CALIFORNIA
SALES AND SERVICE THROUGHOUT THE WORLD
A SUBSIDIARY OF THE SINGER COMPANY
*A Trademark of FRIDEN, INC.

## FUNCTION CODE KEYS (NON PRINTING)

| KEYS | ASSIGNMENT | FUNCTIONS IN | REPRODUCES IN |
|---|---|---|---|
| F1 MNP STOP | STOP READ | NORMAL READ ONLY | ALL POSITION ONLY |
| F2 | AUTO. NON PRINT | NORMAL READ ONLY | ALL POSITION ONLY |
| F3 PR-RES | PRINT RESTORE | NON PRINT ONLY | ALL POSITION ONLY |
| F4 | PUNCH ON | NORMAL READ ONLY | ALL POSITION ONLY |
| F5 | PUNCH OFF | NORMAL READ ONLY | ALL POSITION ONLY |
| F6 | | | |
| F7 | | | |
| F8 | SKIP RESTORE | TAPE SKIP ONLY | ALWAYS |
| F9 | CARD FEED | NORMAL READ ONLY | ALL POSITION ONLY |
| F10 | FIELD PUNCH CONTROL ON | NORMAL READ ONLY | ALL POSITION ONLY |
| F11 | | | |
| F12 | (PUNCH PI-6 CODE) | | ALWAYS |
| F13 | (PUNCH PI-4 CODE) | | ALWAYS |
| SWITCHES | | | |
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |

NOTES

SPACE - ALWAYS REPRODUCES
CAR RET SELECTOR DROP - ALWAYS REPRODUCES
TAB - ALWAYS REPRODUCES

NOTE: FUNCTION CODE KEY ASSIGNMENTS ARE FOR THIS PARTICULAR APPLICATION. OTHER APPLICATIONS MAY UTILIZE DIFFERENT ASSIGNMENTS.

## CODE CHART

| CARD | 8 | 7 | 6 | 5 | 4 | • | 3 | 2 | 1 | 2201 | SFD, SP5, SPD |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EL | 8 | | | | | • | | | | CR | CR |
| SPACE | | | | 5 | | • | | | | SPACE | SPACE |
| SKIP | | | 6 | 5 | 4 | • | 3 | 2 | | TAB | TAB |
| PI-3 | | | 6 | | 4 | • | | 2 | | BACK SP | BACK SP |
| 0 | | | 6 | | | • | | | | 0 ) | 0 ) |
| 1 | | | | | | • | | | 1 | 1 ' | 1 ' |
| 2 | | | | | | • | | 2 | | 2 @ | 2 @ |
| 3 | | | | 5 | | • | | 2 | 1 | 3 # | 3 # |
| 4 | | | | | | • | 3 | | | 4 $ | 4 $ |
| 5 | | | | 5 | | • | 3 | | 1 | 5 = | 5 = |
| 6 | | | | 5 | | • | 3 | 2 | | 6 ¢ | 6 ¢ |
| 7 | | | | | | • | 3 | 2 | 1 | 7 ? | 7 ? |
| 8 | | | | | 4 | • | | | | 8 * | 8 * |
| 9 | | | | 5 | 4 | • | | | 1 | 9 ( | 9 ( |
| A | | 7 | 6 | | | • | | | 1 | A a | a A |
| B | | 7 | 6 | | | • | | 2 | | B b | b B |
| C | | 7 | 6 | 5 | | • | | 2 | 1 | C c | c C |
| D | | 7 | 6 | . | | • | 3 | | | D d | d D |
| E | | 7 | 6 | 5 | | • | 3 | | 1 | E e | e E |
| F | | 7 | 6 | 5 | | • | 3 | 2 | | F f | f F |
| G | | 7 | 6 | | | • | 3 | 2 | 1 | G g | g G |
| H | | 7 | 6 | | 4 | • | | | | H h | h H |
| I | | 7 | 6 | 5 | 4 | • | | | 1 | I i | i I |
| J | | 7 | | 5 | | • | | | 1 | J j | i J |
| K | | 7 | | 5 | | • | | 2 | | K k | k K |
| L | | 7 | | | | • | | 2 | 1 | L l | l L |
| M | | 7 | | 5 | | • | 3 | | | M m | m M |
| N | | 7 | | | | • | 3 | | 1 | N n | n N |
| O | | 7 | | | | • | 3 | 2 | | O o | o O |
| P | | 7 | | 5 | | • | 3 | 2 | 1 | P p | p P |
| Q | | 7 | | 5 | 4 | • | | | | Q q | q Q |
| R | | 7 | | | 4 | • | | | 1 | R r | r R |
| S | | | 6 | 5 | | • | | 2 | | S s | s S |
| T | | | 6 | | | • | | 2 | 1 | T t | t T |
| U | | | 6 | 5 | | • | 3 | | | U u | u U |
| V | | | 6 | | | • | 3 | | 1 | V v | v V |
| W | | | 6 | | | • | 3 | 2 | | W w | w W |
| X | | | 6 | 5 | | • | 3 | 2 | 1 | X x | x X |
| Y | | | 6 | 5 | 4 | • | | | | Y y | y Y |
| Z | | | 6 | | 4 | • | | | 1 | Z z | z Z |
| # | | | | | 4 | • | | 2 | 1 | F1 MNP STOP | STOP |
| @ | | | | 5 | 4 | • | 3 | | | F2 | N.P. (AUX SP) |
| % | | | 6 | | 4 | • | 3 | | | F3 PR RES | P.R. (AUX 0) |
| * | | 7 | | | 4 | • | 3 | | | F4 | ON 1, ON 2 |
| SP2 | | 7 | 6 | | 4 | • | 3 | 2 | | F5 | ON 2 |
| E.C.2 | | | 6 | | 4 | • | 3 | 2 | 1 | F6 | OFF |
| CR | | 7 | | 5 | 4 | • | 3 | 2 | | F7 | FC ON |
| PI-7 | | | | | 4 | • | 3 | | 1 | F8 | TSR (AUX 1) |
| E.C.1 | | | | | 4 | • | 3 | 2 | | F9 | SW (AUX 2) |
| COR. | | | | 5 | 4 | • | 3 | 2 | 1 | F10 | DS (AUX 3) |
| ERROR | | 7 | | | 4 | • | 3 | 2 | 1 | F11 | F.F. (AUX L) |
| PI-6 | | 7 | | 5 | 4 | • | 3 | | 1 | F12 | AID (AUX J) |
| PI-4 | | | 6 | 5 | 4 | • | 3 | | 1 | F13 | DUP (AUX /) |
| □ | | 7 | 6 | 5 | 4 | • | 3 | | | UPPER CASE | UPPER CASE |
| SP1 | | 7 | 6 | 5 | 4 | • | | 2 | | 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 | | + ± | P.I. 1 (2, 8, SP) |
| PI-5 | | 7 | 6 | | 4 | • | 3 | | 1 | ½ ¼ | F.S. (AUX A) |
| PI-2 | | 7 | | | 4 | • | | 2 | | ° ' | P.I. 2 (2, 8, -) |
| FEED | | 7 | 6 | 5 | 4 | • | 3 | 2 | 1 | TAPE FEED | TAPE FEED |
| | CR | — | O | SP | R | • | 4 | 2 | 1 | | |

3902

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 whole application, the programmer should draw up a chart, similar to the one shown in figure 44. This chart lists the functional and format codes to be used, their assignment, function qualifications, and how they may be punched or reproduced. Later, this chart can be used for control panel wiring instructions.

An additional chart, showing field switch channel assignments will also prove helpful. In this application, field switch punch control is used in the item portion of the purchase order. Since the data in this portion falls in vertical columns, field switch punch control methods are easily adaptable. Figure 45 illustrates the chart for this application.

Channel 3 is assigned to disable the start read function. Actuators in this channel are placed to cover all critical entry fields. This guards against the operator under-filling a field.

| FIELD SWITCH CHANNEL ASSIGNMENTS | |
|---|---|
| **CHANNEL** | **ASSIGNMENT** |
| 1 | Writing Machine Punch On |
| 2 | Writing Machine Punch Off |
| 3 | Disable START READ |

Figure 45. Field Switch Channel Assignment Chart.

Form design places critical numeric data in blocks which are just wide enough to allow the required number of digits to be entered. Over-filling of any field will be immediately obvious as numbers will be typed on the dividing line between fields.

The program will be set up to operate at maximum efficiency. After positioning the form, the operator will only insert the vendor and item cards into the writing machine reader in sequence and touch START READ. Reading will stop to allow the operator to make manual entries, and also at the end of each card. This sequence of START READ-ENTER-START READ is also used when reading master tapes to prepare the edge-punched cards.

| KEYS | ASSIGNMENT | FUNCTIONS IN | REPRODUCES IN |
|---|---|---|---|
| F1 | STOP READ | Normal Read Only | ALL Position Only |
| F2 | AUTO. NON PRINT | Normal Read Only | ALL Position Only |
| F3 | PRINT RESTORE | Non Print Only | ALL Position Only |
| F4 | ON 1 | Normal Read Only | ALL Position Only |
| F5 | OFF | Normal Read Only | ALL Position Only |
| F8 | SKIP RESTORE | Tape Skip Only | Always |
| F9 | CARD FEED | Normal Read Only | ALL Position Only |
| F10 | SELECTOR PICK | Normal Read Only | ALL Position Only |
| F12 | (Punch PI 6 Code) | N/A | Always |
| F13 | (Punch PI 4 Code) | N/A | Always |
| SPACE | | N/A | Always |
| CAR RET | SELECTOR DROP | N/A | Always |
| TAB | | N/A | Always |

Figure 44. Function Code Assignment Chart.

PROGRAMMING

In this programming example, the form design, tab card layout, and the codes which must appear in the select tape are given to the programmer. From these, the vendor and item cards must be developed, and also the vendor and item master tapes. Furthermore, the punch control switch is in the SELECT position during all stages, except for the original punching of the master tapes. Following is a listing of code abbreviations used in the programming charts:

| | |
|---|---|
| CR | Carriage Return |
| TAB | Tabulate |
| SP | Space |
| ON 1 | Punch On |
| OFF | Punch Off |
| NP | Non Print |
| PR | Print Restore |
| TSR | Tape Skip Restore |
| PI | Program Indication |
| CD FD | Card Feed |
| STP | Stop Read |

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 39.

**A** In the select tape, the first code punched is the PI4 (F13) code. This code causes the tape-to-card converter to punch a "1" in the first card column (code position) of the tab card format for the first card. The vendor number is also punched.

In the vendor card, several codes precede the F 13 code. These codes control format spacing and the punch. The Off code insures the condition of the punch at the start of the application. Two CR (Carriage Return) codes position the form at the first writing line. The ON 1 code turns on the punch, allowing the F 13 code and the vendor number to be punched into the select tape. Since vendor number is constant information, it is read automatically from the vendor card.

**B** The purchase order number is the next item of data to be punched into the select tape. On the purchase order 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. Since this information is variable, a Stop code in the vendor card stops the reading action and allows the operator to manually enter this information.

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

**D** Since the ship via information is not to punch into the select tape, an Off code precedes it. At this point, the operator has the ability of making a choice between shipping methods. The Stop code marks this point of decision. If the goods are shipped by Acme Truck, the operator touches START READ. If they are to be shipped by another method, the operator enters this information and touches TAPE SKIP. This causes the reader to cycle over the Acme Truck data

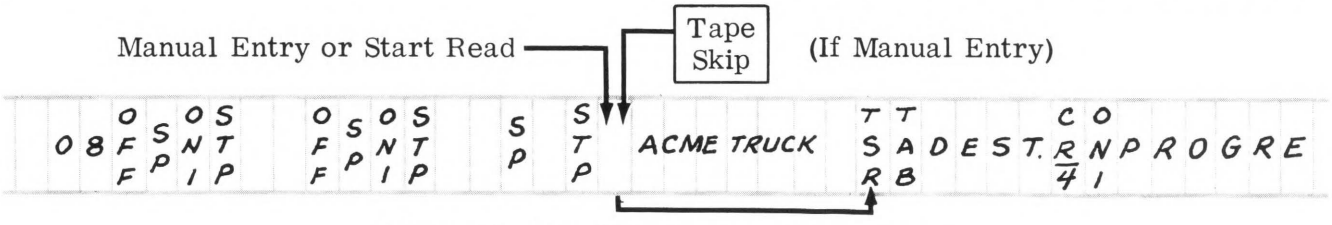
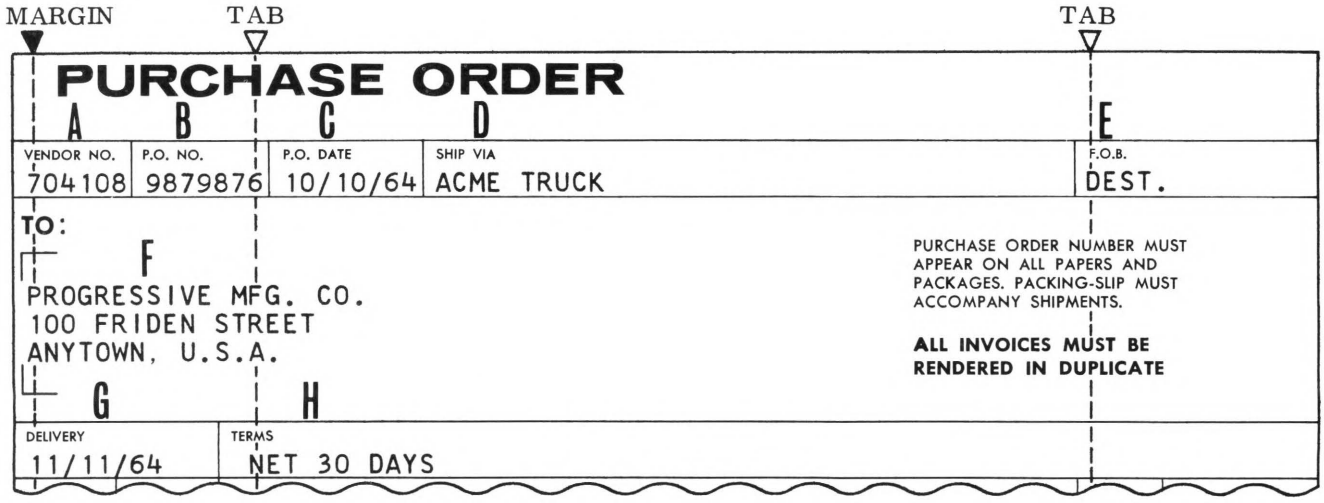
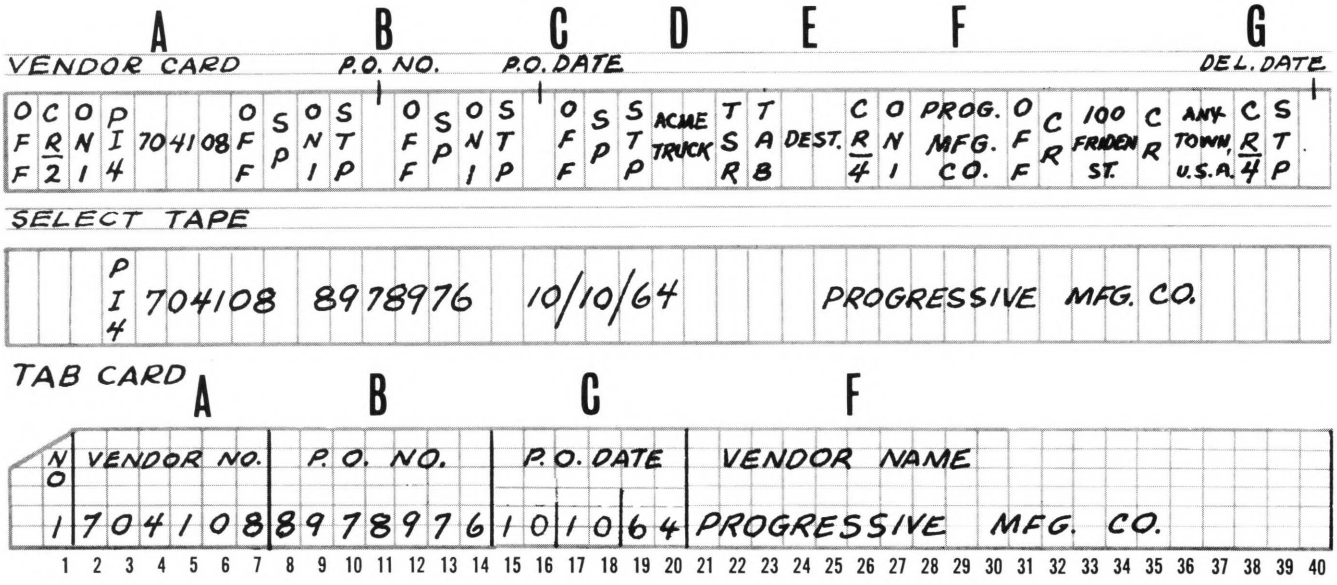



Figure 46. Tape Skip Option - Illustration.




and restore to normal reading upon sensing the Tape Skip Restore code. Figure 46 shows this programming in the vendor card, isolated for clarity.

**E** Information typed into the ship via field is of uncertain length, a Tab code is used to position the form at the next field. F.O.B. data is written automatically from the vendor card. Four Carriage Return codes position the form at the next writing line.

**F** Vendor name is punched into the select tape, and is therefore preceded by an On 1 code. An Off code follows this information. Street address and city/state information are also written automatically from the vendor card.

**G** Four Carriage Return codes bring the form to the next writing line. A Stop code allows manual entry of the delivery date.

**H** Delivery date is of an uncertain length. Therefore a Tab code positions the carriage at the next writing field on the purchase order form. However, since the Tab code must be punched into the select tape (to

cause a card skip function of the converter), the Tab code is bracketed with an On 1 and an Off code. Terms data is written automatically from the vendor card. Three Carriage Return codes bring the carriage out of the heading area of the form. A Stop code stops the reader in order that the vendor card can be removed and the first item card inserted.

I In the select tape, the first data to be punched is the F 12 (PI 6) code. This code does nothing when read in card column 61, as it is in the first tab card. In the second and third tab cards, however, it will be read in card column 1, where it causes the first 60 columns to be duplicated from the previous card. In this manner, the heading information appears in all three tab cards. Quantity information is also punched into the tab card. An action of the converter, causes the preceding spaces to punch zeros in the tab card.

In the item card, the Off code insures the condition of the punch at the start of the reading. A CR code positions the carriage at the first writing line. The On code turns on the punch and the PI 6 code is punched into the select tape. At this point the F 10 code turns on the pattern of field switch punch control and the Stop code is read allowing the quantity to be manually entered. An actuator in channel 3 prevents START READ from being operative again until the quantity field is completely filled. For the balance of the line, field switch actuators in channels 1 and 2 will control the punching.

J Unit and description data do not punch into the select tape. An off actuator turns off the punch before this data is written. Since it is constant for this item, it is written automatically from the item card. Additional codes in the item card provide for format spacing.

K Item code data is punched into the select tape. Punching is controlled by actuators. This data is constant and is written from the item card.

L Price data is punched into the select tape, followed by a CR code which concludes the punching of the first tab card. There is an automatic skip function which occurs between card columns 70 and 73, which is caused automatically by the converter. After the first tab card is completed, the next code read in the select tape will be another PI 6 code from the second item card. This code will be read in card column 1 of the second tab card, and will cause duplication of all header information from the preceding card. Following this, information from the second item card will be punched.

In the item card, there is one space between code and price which is eliminated from the select tape by the field switch actuators. The price is written from the item card. The CR code completes the line and drops the pattern of field switch panel control. A Stop code allows the first item card to be removed and the second item card to be inserted.

This completes the programming for this application. Page 39 shows the complete programming charts, including the vendor master and item master tapes.

MARGIN TAB TAB

# PURCHASE ORDER

A B C D E

| VENDOR NO. | P.O. NO. | P.O. DATE | SHIP VIA | F.O.B. |
|---|---|---|---|---|
| 704108 | 9879876 | 10/10/64 | ACME TRUCK | DEST. |

TO: F

PROGRESSIVE MFG. CO.
100 FRIDEN STREET
ANYTOWN, U.S.A.

G H

PURCHASE ORDER NUMBER MUST APPEAR ON ALL PAPERS AND PACKAGES. PACKING-SLIP MUST ACCOMPANY SHIPMENTS.

**ALL INVOICES MUST BE RENDERED IN DUPLICATE**

| DELIVERY | TERMS |
|---|---|
| 11/11/64 | NET 30 DAYS |

| QUANT. | UNIT | MATERIAL DESCRIPTION | CODE | PRICE |
|---|---|---|---|---|
| 1 | EA | TAPE CEMENT, PART NO. 1052470 | 9078 | .50 |
| 10 | DOZ | NO. 50B FABRIC RIBBON | 5097 | 25.50 |
| 100 | ROLL | PINK PAPER TAPE 1 IN. WIDE, PART NO. 1055605 | 8907 | 1.00 |

H I J K L

VENDOR CARD ITEM CARD QTY.

ONI / TAB / TOF / NET 30 DAYS / CR/3 / STP // OFF / CR / ONI / PI6 / FCON / STP / SP / EA / TAB / TAPE CEMENT / TAB / 9078 / SP / SP/5 / .50 / CR / STP

SELECT TAPE

TAB / PI6 / SP/4 1 / 9078 / SP/5 / .50 / CR

TAB CARD

I K L

QTY. CODE PRICE

00010 9078 00000 50

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

# 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.

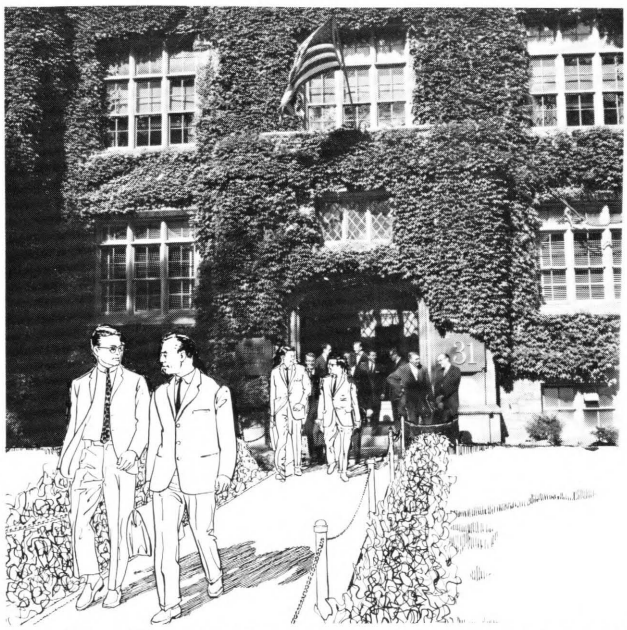
Each course is conducted by an instructor of the Center's Staff. These are planned to give the customer a broad understanding of the versatility of FRIDEN equipment, along with demonstrations of actual applications. The Center has more than $1 million of FRIDEN and allied equipment for this purpose.

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.

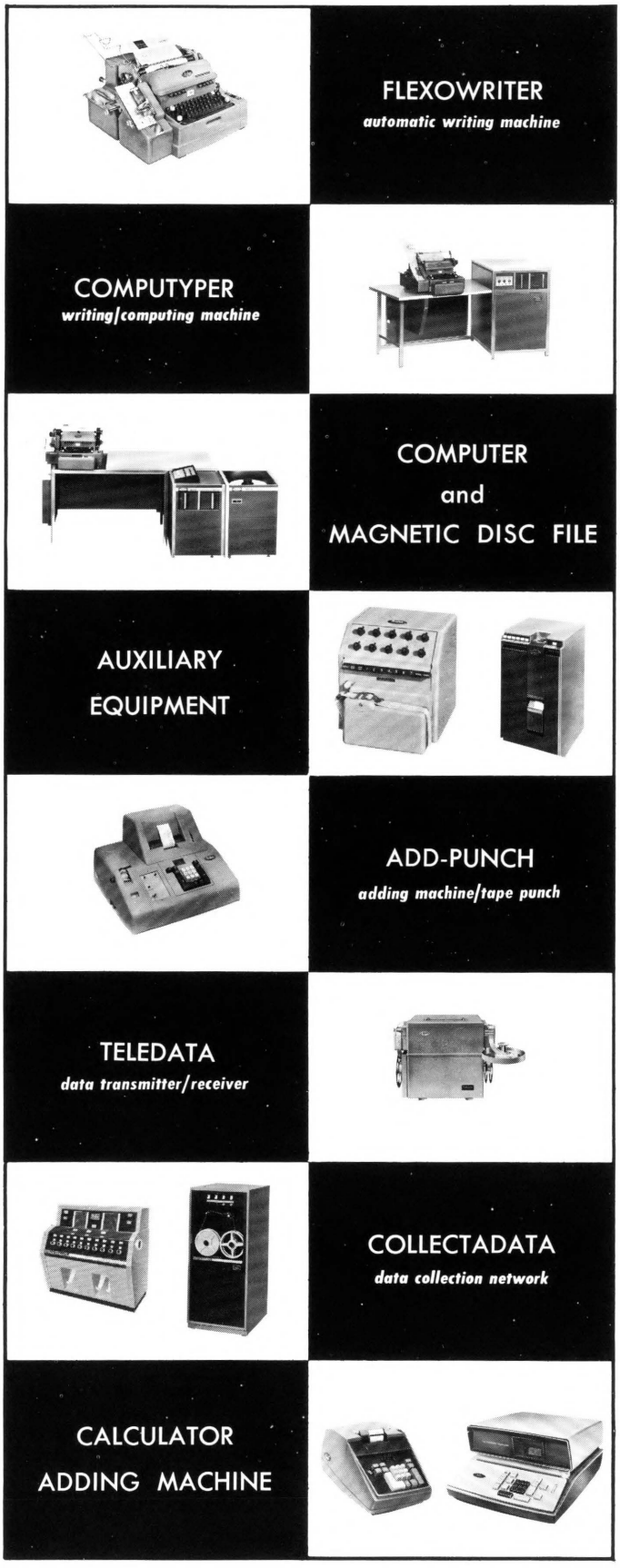

Customer Case Histories

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 . . .




## 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 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.

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.

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 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 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 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.

## 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.

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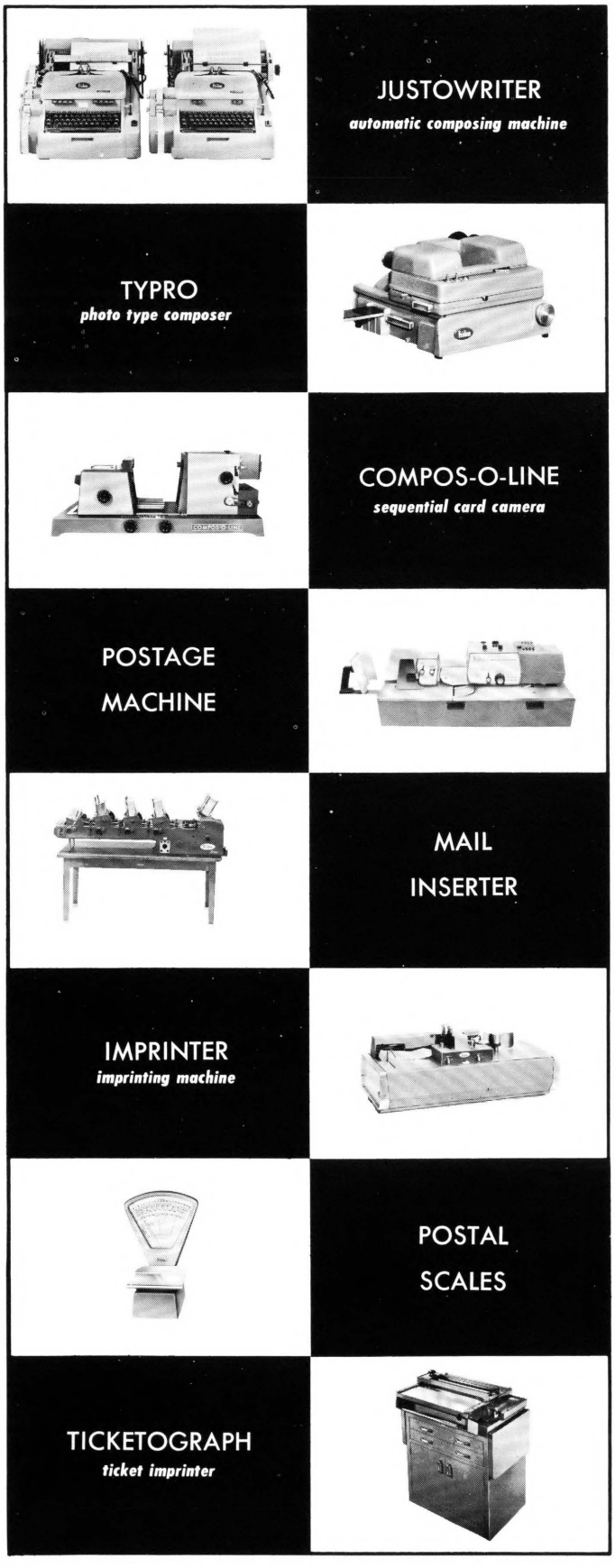
# Application in Business and Industry




## 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 signiture 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, INC., 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.

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