IBM 63

Card-Controlled Tape Punch

CONTENTS

IBM 63 CARD-CONTROLLED TAPE PUNCH

INFORMATION contained in IBM cards at one location is frequently required at another. For example, orders received at the home office are sent to the factory or warehouse for shipment. Summary information pertaining to stock records at the branch must be conveyed to the home office for consolidation into inventory reports. In general accounting, summarized data at the branch offices are required at the home office to expedite monthly closings and to prepare consolidated balance sheets, and profit and loss statements.

This interchange of information between two locations can be accomplished quickly and efficiently through the use of two IBM machines:

Type 63 Card-Controlled Tape Punch (Frontispiece), which operates automatically from IBM cards to produce a perforated tape, 11/16ths of an inch wide, identical to that produced by printing telegraph equipment.

Type 46 or 47, Model 1, Tape-to-Card Punch or Type 43 Tape-Controlled Card Punch, which punch IBM cards automatically from the perforated tape.

This manual describes the operating features and principles of the Type 63 Card-Controlled Tape Punch, and the control panel wiring for various types of operations. It also includes the principles of tape preparation for automatic document writing on printing telegraph machines.

The examples in this manual are arranged in order of complexity, and each is explained in terms of knowledge of features already covered in preceding examples. To learn the operation of the machine, therefore, most effective results will be obtained in reading the examples in order.

Preparation of Tape

A tape can be perforated by:
1. The Type 63 Card-Controlled Tape Punch operated automatically from IBM cards.
2. Direct telegraphic transmission of information during the preparation of original source documents on printing telegraphic equipment.
3. Direct telegraphic transmission of information already recorded in another tape.

Tape information can thus be conveyed from one location to another either by mail or by direct wire transmission. At the receiving location, the perforated tape can then be used automatically to transcribe the information into IBM cards.

Figure 1 illustrates the methods of tape preparation and transmission.

The keyboard on a printing telegraph machine is illustrated in Figure 2. Each character key has a dual use controlled by either the letters-shift key (lower case) or the figures-shift key (upper case).

Depression of the letters-shift key will cause each succeeding key depression to print a letter on a document. Depression of the figures-shift key will cause each succeeding key depression to print either a digit or a special character. Special char-
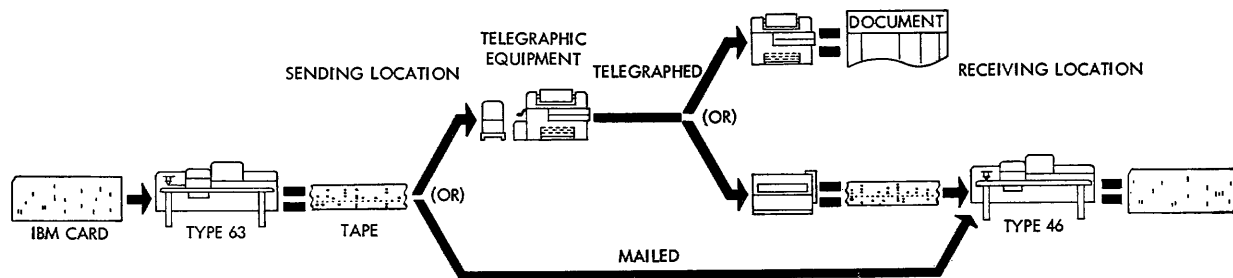

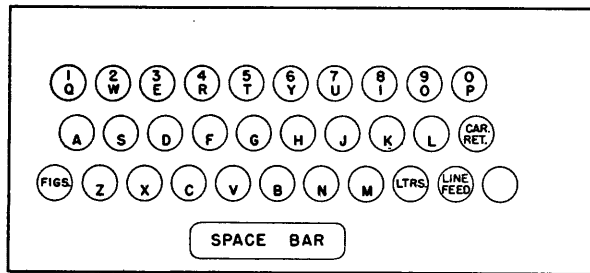FIGURE 1. METHODS OF TAPE TRANSMISSION

FIGURE 2. KEYBOARD OF THE PRINTING TELEGRAPH
MACHINE

acters, located in the middle and lower rows, are
not standard and, therefore, are not shown in Fig-
ure 2. The space bar is self-explanatory. Depres-
sion of the carriage return key returns the carriage
but does not advance the paper. Depression of
the line feed key will advance the paper for each
line. When the printing telegraph machine is
automatically operated by perforated tape, the
same operations are controlled by the code punch-
ing in the tape.

The tape, illustrated in Figure 3, is commonly
known as "chad" tape. The Type 63 Card-Con-
trolled Tape Punch produces chad tape.

Tape Codes

As illustrated in Figure 3 (Tape A), holes are
perforated across the width of the tape. The
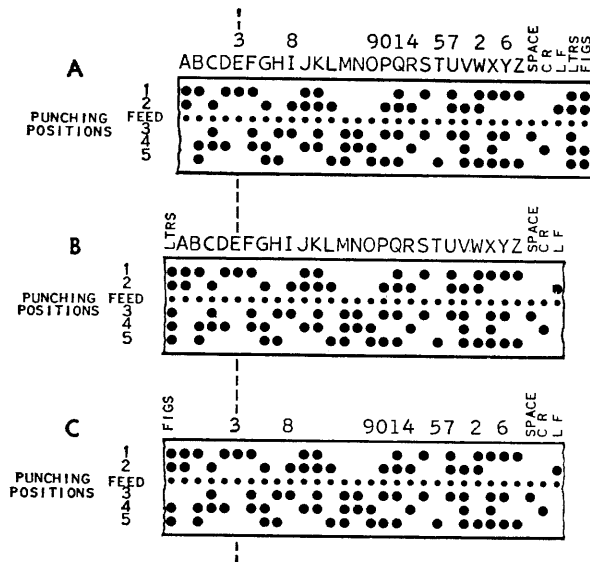
FIGURE 3. CHAD TAPES

smaller holes are used for feeding the tape, and
the five larger holes, perforated from top to
bottom, are used either singly or in combination
to represent characters and functions. In the
illustration, each code is identified across the top
of the tape.

There are 26 character codes and 5 functional
codes. The character codes represent letters, digits
and special characters, such as punctuation marks,
fractions, and symbols. The functional codes rep-
resent functional operations on printing tele-
graphic equipment, such as space, carriage return,
line feed, letters-shift (lower case), and figures-
shift (upper case).

Character codes represent letters if they are
preceded by a LTRS code (Tape B). They repre-
sent digits or special characters if they are preceded
by a FIGS code (Tape C). For example, a hole in
the first vertical punching position of the tape is
the code for the letter E if it follows LTRS, or the
digit 3 if it follows FIGS.

Ten codes can be punched in one inch of tape.
Punching in a tape must be continuous; there can
be no blank positions between codes, not even
for spaces between words.

A roll of tape eight inches in diameter will
contain all of the information that can be punched
in approximately 1500 80-column IBM cards. The
same size roll of tape will contain information for
approximately 3000 cards if only 40 columns of
information are to be punched.

IBM Card Punching

Figure 4 shows the registration of punching in
an IBM card. Codes 11 and 12 can be punched
over numerical information (0-9) for control
purposes.

Flexibility of Transcribing

Since the columns in the cards are read one at
a time from left to right, the information must
be punched into the tape in the same sequence.

Through the use of a control panel, tape punch-
ing can be suspended while fields on the cards are
skipped. This eliminates from the tape informa-
tion which is not wanted, or repetitive information
which can be automatically duplicated or gang
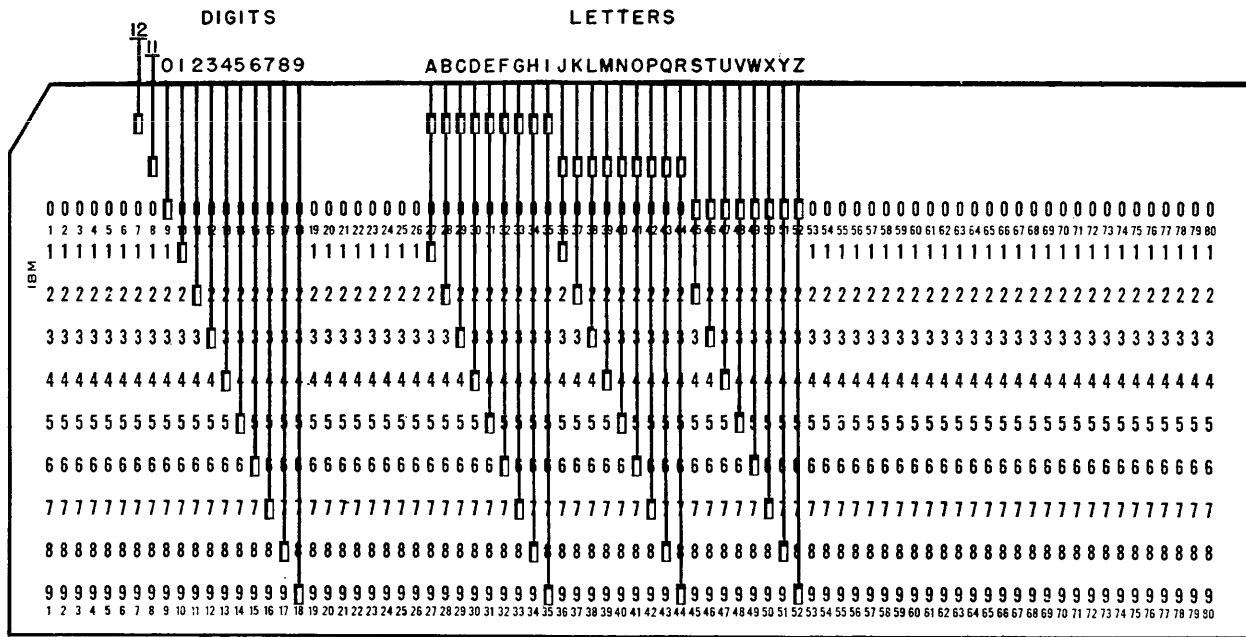
FIGURE 4. IBM CARD PUNCHING

punched at the time the tape reproduces cards in the Type 43, 46, or 47 tape-to-card punches. Thus, not only is the tape reduced in length with a consequent saving in mailing cost, but a considerable reduction in transmittal time can also be effected when transmitting information by commercial wire.

When information is transmitted by telegraph, documents can be simultaneously printed by the sending telegraph machine or by the receiving telegraph machine, or by both machines. In fact, several machines in different locations can receive the information as it is sent out and each can write documents, if it is so desired. The section *Document Writing by Tape-Controlled Telegraph* describes typical operations, along with information about card and document design and control panel wiring.

The application of the tape principle thus provides an economical, efficient and automatic means of preparing the following:

1. Documents at either the sending location or one or more receiving locations, or both, printed by telegraphic equipment.

2. IBM cards at one location when the source information is at another.

FEATURES

THE CARD reading unit of the Type 63 Card-Controlled Tape Punch (Figure 5) is similar in principle to the card reading unit of the Type 55 Alphabetical Verifier.

Feeding and Ejecting Cards

The card hopper holds approximately 250 cards. Cards should be well fanned, flexed, and joggled against the joggle plate before they are placed in the hopper.

Cards are fed from the bottom of the hopper deck into the machine. As it is desirable to start tape punching with the first card in the deck, cards are placed in the hopper *face down with column 1 to the left*. Thus, the first card in the deck is the first card to be read into the tape. This method eliminates the necessity of reversing the deck of cards before tape punching can begin.

Automatic feeding will be facilitated if the ends of the cards curve slightly downward as they are placed in the hopper. The card weight must be placed on the cards to insure sufficient pressure during feeding.

The first card is fed from the hopper into reading position by operating the release switch
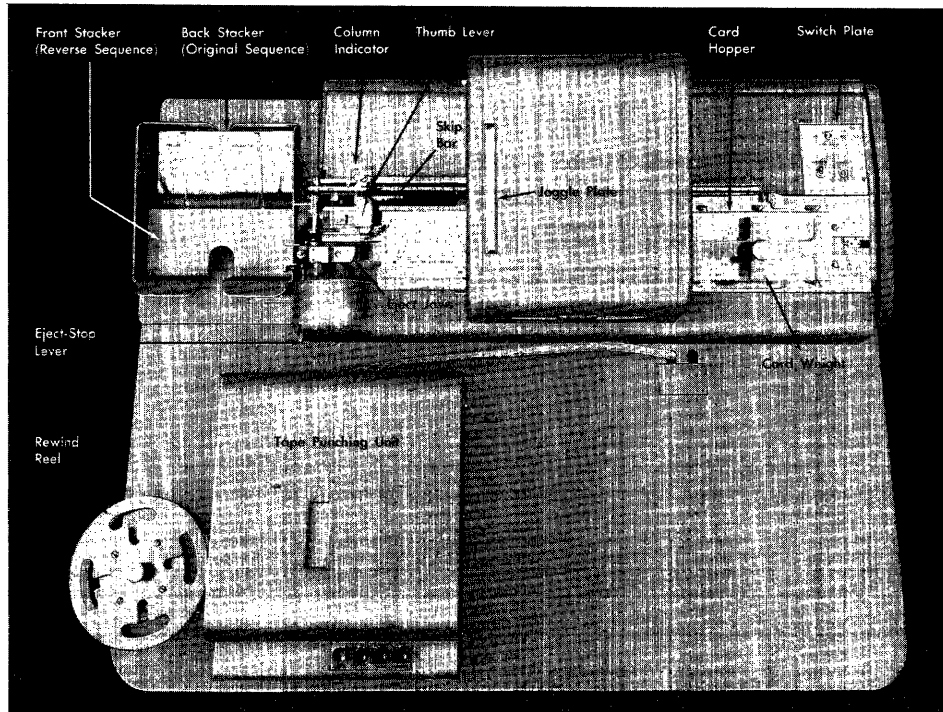
FIGURE 5. MACHINE FEATURES

on the switch plate. As each card is ejected, the bottom card in the hopper is automatically fed under the reading mechanism. An automatic eject and feed cycle requires 0.65 of a second.

Ejection is controlled by the eject-stop lever located immediately to the left of the card bed. When the eject-stop lever is down (Figure 6), it is inoperative and the card grippers flip the card into the stacker, face up. As the card grippers return to their normal position, the card rack also returns to the first column position. Simultaneously, a new card is fed. When the eject-stop lever is up, the card grippers are stopped and the card rack remains slightly beyond column 80 in the eject-stop position.

Card Reversing Device

The machine is equipped with a card reversing device and two card stackers (Figure 6). The position of the reversing guide plate determines whether cards are stacked in original sequence (back stacker) or reverse sequence (front stacker). When the guide plate is placed in the bottom of the back stacker, the reversing fingers are allowed

to operate. As each card is ejected into the front stacker face up, the reversing fingers flip the card over into the back stacker, face down, and the original sequence is maintained. When the guide plate is turned around and placed so that it forms a partition between the two stackers, the reversing fingers are held down. Thereafter, the cards are stacked face up in reverse sequence.
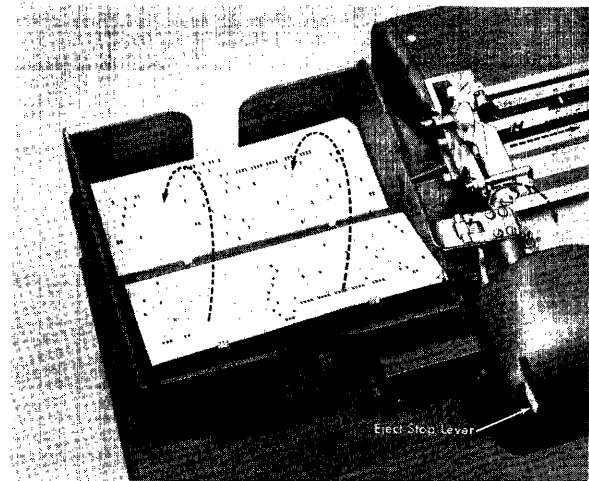
FIGURE 6. CARD REVERSING DEVICE
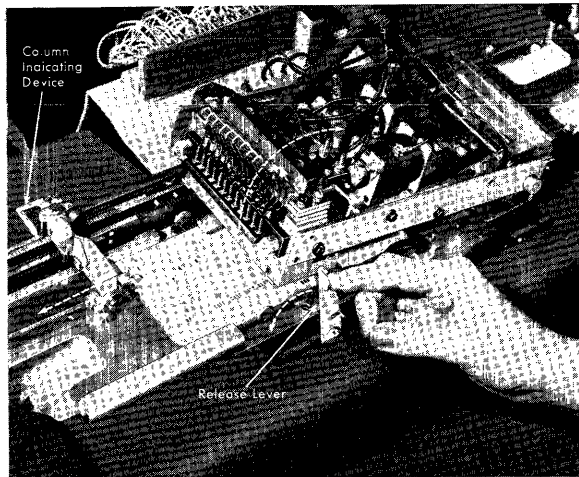
FIGURE 7. RELEASING THE CARD READING UNIT

Card Reading Unit

As a card is fed through the machine, it passes beneath the reading mechanism where it is read column for column, left to right, except when skipping or releasing takes place.

The card reading unit is so constructed that a damaged card can be removed easily. First, the cover which is over the reading mechanism is raised. The lifting of this cover interrupts the power to the machine. Next, the release lever (Figure 7) is moved counterclockwise to unlatch the unit. As the reading unit is released, the left end rises, which (a) completely exposes the card bed and (b) releases the card rack to slightly beyond column 80. After the damaged card is removed, the left end of the reading unit is lowered and latched into place again with slight pressure. After the cover is replaced, the release switch must be operated to feed the next card.

Column Indicating Device

The column indicating device (Figure 7) indicates the next column of the card to be read.

Thumb Lever

When the thumb lever (Figure 8) is operated, the machine is immediately stopped, selector hold (normal) impulses are terminated, and all devices are turned off. The thumb lever does not terminate the GP exit (left hub) impulse which may be used to control a selector. When the card rack is in the eject-stop position (eject-stop lever up), operation
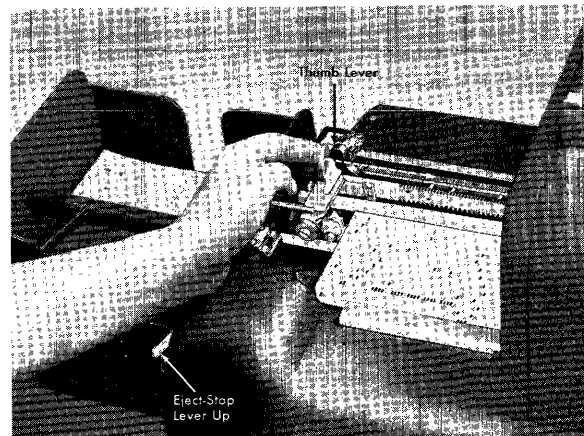
FIGURE 8. OPERATING THE THUMB LEVER

of the thumb lever cancels release and moves the card rack back to the first column position. Cards are manually fed in this manner. Card reading is resumed after use of the thumb lever by depressing the start button.

Switch Plate

The switch plate (Figure 9) is located behind the card hopper. Mounted on the switch plate are the following:

Line Switch (and Light):

ON – Current to the machine is supplied by turning the toggle switch on. When the switch is in this position, the power light goes on.

OFF – This switch should be off whenever the machine is not in use.
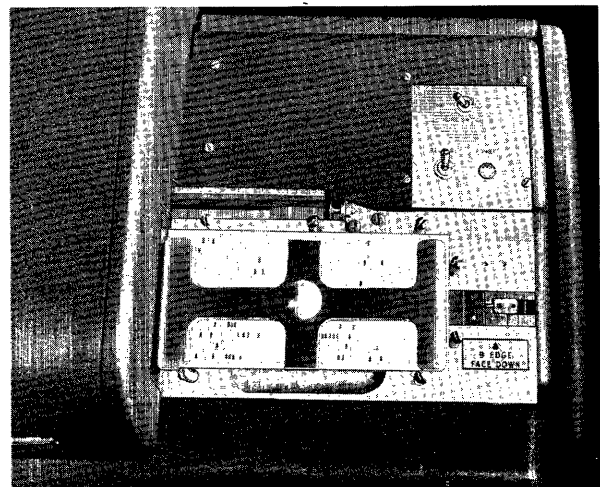
FIGURE 9. SWITCH PLATE

Release Switch. Operation of this switch will release the card rack to the eject position. Ejection will follow automatically if the eject-stop lever is down. This switch should not be operated while a card is being read.

Fuses

If the machine does not operate when the line switch is turned on, the first check is to be sure that the machine is connected to the proper power outlet. If the machine still does not operate, the fuses should be checked.

The fuses are located beneath the back cover near the switch plate. Pressing against the spring catches in the cover will release them so that the cover can be lowered far enough to reach the fuses. The power to the machine is interrupted when the cover is lowered. Each fuse is removed by turning its holder counterclockwise to unlock the holder from its frame.

A blown fuse will generally have a darkened tube. This is not always true, however, as a fuse may be defective because of a loose connection between the fuse wire and one of the metal caps. This type of defect is not, as a rule, apparent to the eye. When there is doubt, the fuses should be replaced by others known to be in good condition.

As indicated below each fuse location, a 3- or 5-ampere fuse should be used. The capacity of a glass cartridge fuse is marked on one of its metal caps.

Adjustable Skip Bar

The skipping of any number of columns is started by control panel wiring, and stopped by skip-stop inserts in the adjustable skip bar (Figure 10). The skip bar can be readily inserted and removed from the card rack when the rack is in the eject-stop position. This is accomplished by raising the eject-stop lever and operating the release switch. The skip bar is inserted, right end first, and locked into place. A slight pressure to the right and upward on the protruding end of the bar will release this lock when the bar is to be removed for inserting skip stops.

Skip-stop inserts can be placed anywhere except in adjacent columns. The inserts are placed in the first column to be read after each skip,

with the small notch under the triangular head of the insert facing toward the back of the bar.

Control Panel Rack

The control panel rack is located in the left end of the machine behind a small door. The door is opened by a slight, quick pressure along its right center edge.

The locking bar, when raised, permits insertion or removal of the control panel. Before the control panel is inserted into the rack, the prongs on the back of the panel should be inspected, as paper clips, rubber bands, or any foreign matter may cause damage to the machine.

Tape Punching Unit

The tape punching unit is connected to the card reading unit by a cable. The connector at the end of the cable is lowered through the opening in the table, directly in front of the card hopper, and fitted into a socket beneath the table. The grommet on the cable should be fitted about the table edge to avoid cable wear.

The four posts on the bottom of the tape punching unit fit into four rubber grommets on the table. Thus, the unit is positioned over the chad box opening in the table. The chad box catches the chads, as they fall from the tape, and it should be emptied periodically. The box is held against
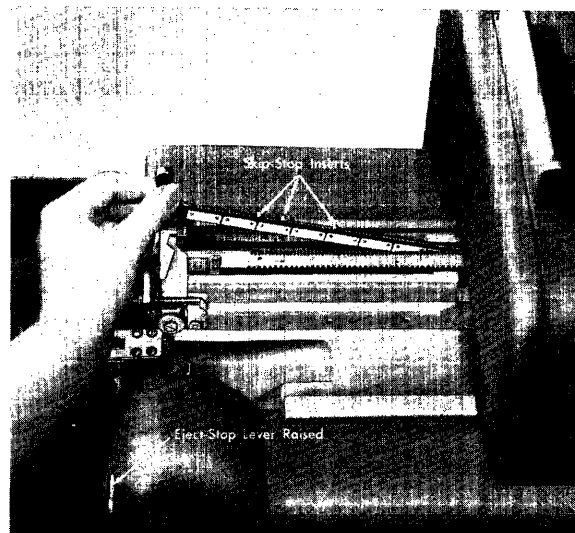
FIGURE 10. INSERTING THE ADJUSTABLE SKIP BAR

FIGURE 11. TAPE PUNCHING UNIT WITH COVER RAISED FOR TAPE THREADING

the table undersurface on two slides; it is removed by sliding it to the right.

The tape punching unit and all machine operations are governed by the wiring of the control panel. The machine will punch at a speed of approximately *10 columns per second.*

Tape Threading

Beneath the top cover of the tape punching unit is a turntable for a roll of unpunched tape. When the top cover is raised (Figure 11), the turntable and the punching mechanism are accessible for tape threading. The roll of unpunched tape is placed on the turntable so that the turntable will move clockwise as the tape is unwound. Sufficient tape must be unwound to permit easy threading of the tape through the punching mechanism.

Before threading can begin, the tape retainer (F) must be rotated to the left by pushing back on its extended left edge. As this is done, the tape lever (C) moves forward to facilitate threading. The unwound tape is then passed:

1. In back of guide (A).

2. In front of the tape tension guide (B).
3. In back of tape lever (C).
4. On tape guide (D).
5. Between the punching mechanism and the punch guide block (E), which can be seen in front of the tape.
6. Between the guides on the tape retainer (F). With the end of the tape held to the left, the tape retainer (F) is returned to its normal position, which causes the pins on the feed roll to prick through the blank tape. The tape lever simultaneously returns to its normal position with its top guide above the tape.

Starting Tape Punching

Before tape punching can be started the punching unit must be made ready for operation as follows:

1. Insert the control panel.
2. Turn the line switch on.
3. Insert the adjustable skip bar, if it is needed.
4. Place the cards to be read in the card hopper.
5. Feed the first card to be read under the reading mechanism by operating the release switch.

It is necessary to punch a series of LTRS (letters-shift) codes for a length of three to six inches at the beginning (and end) of each section of tape. These codes insure proper feeding of the tape in the punching unit and are an aid to threading tape into the tape reading unit of the tape-to-card punch.

The LTRS codes are punched by depressing the auto feed button (J) for a sufficient length of time to punch the required length of tape. Depression of this button places the machine in letters-shift as it punches LTRS codes. It may be necessary to apply continuous pressure to the tape retainer (F) while the auto feed button is being depressed until the pins on the feed roll carry the tape evenly by themselves.

After the LTRS codes have been punched, tape punching is started by depressing the start button (I). Also, when punching has been interrupted, the start button must be depressed after the card rack has been pushed back by the thumb lever and the card is repositioned at column 1.

The run light on the tape punching unit is on during card reading.

Rewinding

A reel is provided for rewinding the tape as it is punched. The top section of this reel is held to the lower section by a thumb screw at the center of the reel. After the top section has been removed by turning the thumb screw counterclockwise, the beginning end of the tape can be inserted in the post slot and the top section can be replaced. The top section of the rewind reel has cut-outs used to gauge the length of the tape, as indicated in Figure 12.

After LTRS codes have been punched for a length of three to six inches at the end of each section of tape, by depressing the auto feed button (J), the tape can be torn off on the left edge of the tape retainer (F).

Stopping Tape Punching

If tape punching is to be stopped at the end of any card cycle, the eject-stop lever is raised.
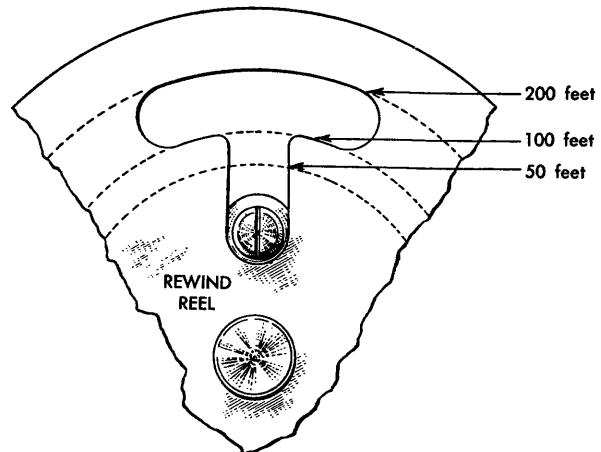
FIGURE 12. GAUGING THE TAPE LENGTH

When the eject-stop lever is lowered, operation will be resumed automatically.

The stop button (H) may be depressed or the thumb lever may be operated to stop tape punching immediately. Also, tape punching will stop automatically for any of the following reasons:

1. When the machine runs out of cards or tape.
2. If a card fails to feed properly under the reading mechanism.
3. If the tape becomes taut at any point to the right of the punching station; this causes the tape tension guide (B) to move to the left to stop the machine.
4. If a code is not punched during a punching cycle. When this happens, the non-punch light on the tape punching unit will turn on. Usually, blank tape is the result of incorrect control panel wiring, and the error becomes evident during testing.

Operation of the stop button or the tape tension guide (B) terminates selector hold circuits and turns off all devices that are operative.

When the machine is stopped during a card cycle for any reason, the information already punched into the tape for that card should be cancelled before tape punching is resumed.

Tape Cancellation

To position the tape for cancellation, pin feed knob (G) is rotated in a counterclockwise direction until the code for the first column is at the

punching station. In this position the last functional code for the preceding card can be seen immediately to the left of the punch guide block (E). The auto feed button is then depressed until all former punches are cancelled. As LTRS is a combination of all five punching positions, it cancels any other combination previously punched.

After cancellation is completed, (a) the card rack is pushed back by the thumb lever so that the first column of the card which is still in the rack is positioned for rereading, or (b) the card is ejected by operating the release switch and the next card is fed into reading position. Tape punching is then resumed by depressing the start button. When the non-punch light is on, the non-punch reset button (K) must be depressed before depression of the start button is effective.

Tape Supply

The supply of unpunched tape is visible through a window placed in the cover above the turntable. The inner end of each roll of tape is usually marked with red for a length of approximately twenty feet. This warning gives the operator a chance to stop tape punching at the end of a card cycle before the tape supply is exhausted. Should the operator fail to do so, the machine will stop automatically at the end of the roll when the tape becomes taut, or when the end of the tape passes the tape lever (C).

Control Panel

Fully automatic operation of the Type 63 Card-Controlled Tape Punch is controlled by the wiring of the control panel (Figure 13). The wiring of the control panel is similar in principle to the operation of a telephone switchboard—electrical impulses, brought to the control panel, are wired to perform specific functions.

The control panel hubs are grouped by function, and labeled above or to the left to facilitate wiring. Each hub on the control panel can be classified generally as an exit or an entry hub. An exit hub emits an impulse; an entry hub accepts an impulse. An exit must be wired to an entry to perform a specific function. Some hubs can be

exits or entries, depending upon specific conditions.

Two or more hubs on the control panel connected with a line vertically or horizontally are known as "common" hubs and are exactly alike. Common hubs are provided to eliminate the need for split wires (wires which have three or more ends). The common hubs marked BUS are extension hubs which, when connected to an exit hub, make available more exit hubs with the same impulse. When they are connected to an entry hub, the bus hubs make available more entry hubs of the same type.

Shaded hubs on the diagram in Figure 13 represent hubs for additional special characters and distributors which may be installed as optional features.
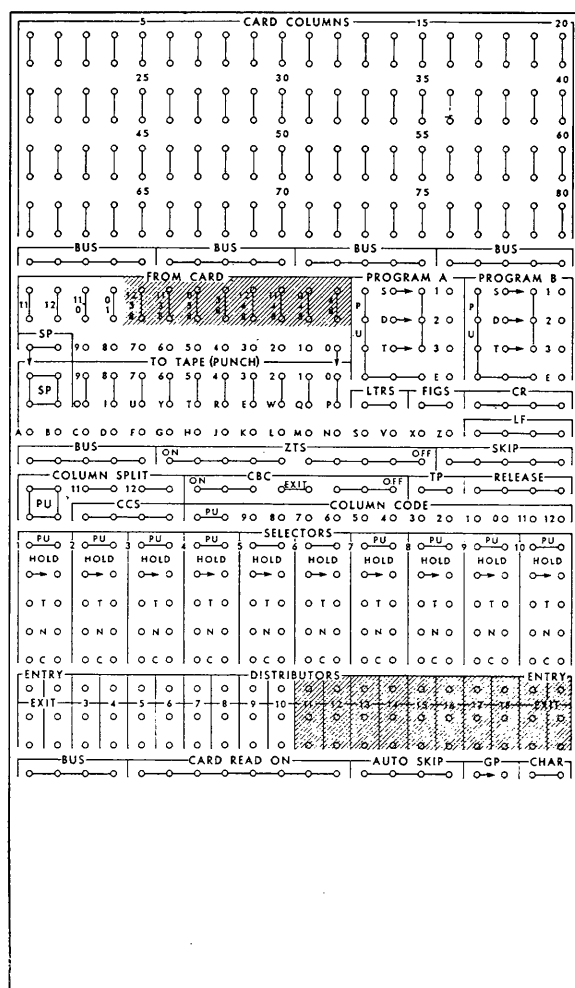

FIGURE 13. CONTROL PANEL

A full explanation of each group of hubs will be given as they are first used in examples. A summary explanation of the control panel is given on page 115.

Tape Punching

Each column of a card is read unless it is skipped by wiring. Through internal wiring, all alphabetic characters automatically punch their five-hole counterpart into the tape. The control panel must be wired, however, to punch digits, blank columns, and special code combinations in the tape. This allows recoding and keeps the machine operation extremely flexible.

If the punching in the first card column read is alphabetic, the LTRS (letters-shift) code is punched automatically into the tape preceding the character code (Tape A of Figure 14); if it is numerical, the FIGS (figures-shift) code is punched into the tape preceding the digit or character code (B). If the first column read is blank, the FIGS code is punched into the tape preceding the space code (C).
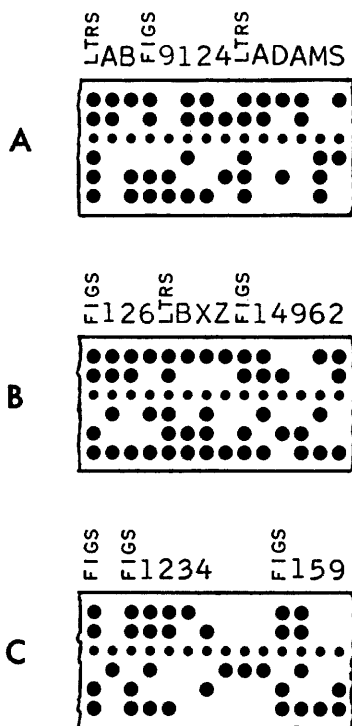
FIGURE 14.

The LTRS and FIGS codes which are punched for the first column of each card are also punched for all changes from letters to digits, and *vice versa,* during the reading of the card. These codes put the printing telegraph machine into the proper shift.

The space code is independent of shift. It will be punched after figures-shift characters or after letters-shift characters without being preceded by a shift code. The space code causes printing telegraph equipment to space.

The space function of printing telegraph machines is normally independent of shift. Some machines, however, are arranged to shift automatically from figures to letters whenever a space follows a figures-shift character. Accordingly, whenever numerical information is read from the card following an unpunched card column, the FIGS code is automatically punched into the tape between the last space code and the numerical character code, regardless of whether the information preceding the unpunched column is alphabetic or numerical (C).

It is necessary to punch codes to operate the carriage return and line feed mechanisms on telegraphic equipment. These operations are independent and each requires a code to govern it. Therefore, after the information for each line is punched into the tape, the CR and LF codes are punched to return the carriage and to advance the paper. Usually, one CR and one LF code are all that are necessary. Additional LF codes may be required, however, to cause additional line spacing on a document. CR and LF are independent of shift. When a tape is mailed instead of telegraphed, a single code is all that is necessary to represent the end of card data and to control card reproduction in a tape-to-card punch. This code may be CR, LF, or any special character code. In the mailing examples in this manual, CR has been used.

Alphabetic fields in the cards are seldom punched completely. Consequently, it is necessary to space over or skip the unused columns when the cards are being read. Skipping is faster than spacing on the machine, and it conserves tape. Control panel wiring is used to start skipping on the card

and to punch the tape with a skip code which will cause skipping on the report written by the tape-controlled telegraph machine. On telegraph machines the skip code is generally fig-G, which causes tabulation without printing. On machines with no tabulation feature, the fig-G prints an ampersand (&) in most instances. When the tape is mailed, the skip code causes the unused columns to be skipped on the cards reproduced by the tape.

Card feeding or the punching of fig-G or CR, drops the punch out of shift. When it is out of shift, the machine will punch the proper shift code before the information read in the next column is punched. As previously stated, the machine also punches the proper shift code before a numerical code which follows a space, or before any figures-shift code which is read after a space has been program punched when the machine is in figures-shift.

Examples

The card forms illustrated with each example in the *Basic Operations* section of this manual are designed to demonstrate functional wiring of the control panel. All examples in the section *Document Writing by Tape-Controlled Telegraph* are typical applications.

The examples in the *Basic Operations* section are designed for mail or printing telegraph transmittal. The principles of wiring explained for each example are applicable to either method of transmission. The one difference in wiring for these two methods of transmission is the code punched at the end of the data for each card; CR and LF are punched when the tape is to control a printing telegraph machine, while only CR is punched when the tape is to be mailed.

PUNCHING FROM 80 COLUMNS OF THE CARD;
PROGRAM PUNCHING (FIGURE 15)

Card Columns. As a card advances column by column under the reading mechanism in the machine, each card column hub in turn is an exit for a constant impulse which can:

Start card reading.

Cause releasing or skipping (SKIP) after the punching cycle, or cause immediate skipping (AUTO SKIP) when card reading is not active.

Control a program unit.

Control a selector.

Control the column code, column split, column code suppression, consecutive blank column, and zero to space devices.

Gang punch when the GP hubs are connected.

Note: At no other time are the column impulses to be wired to the punch hubs.

If a column is passed by skipping or releasing, no impulse is available. Also, no impulse is available at a card column hub while program punching takes place.

Card Read On. The first card column to be read on a card, or the first card column to be read after skipping or after program punching, is wired to CARD READ ON to start card reading. Card reading is automatically stopped after column 80. Card reading is also automatically stopped when skipping (SKIP), releasing, or program punching is activated.

From Card. When card reading is on, alphabetic information read in the card is internally connected to the tape punching mechanism, while impulses for special codes (11, 12, etc.), blank columns, and numerical information are brought to the FROM CARD section of the control panel for wiring flexibility. Special codes 11, 12, 11-0, and 0-1 are on the standard machine. The remaining special codes (shown in the shaded area of Figure 13) are optional.
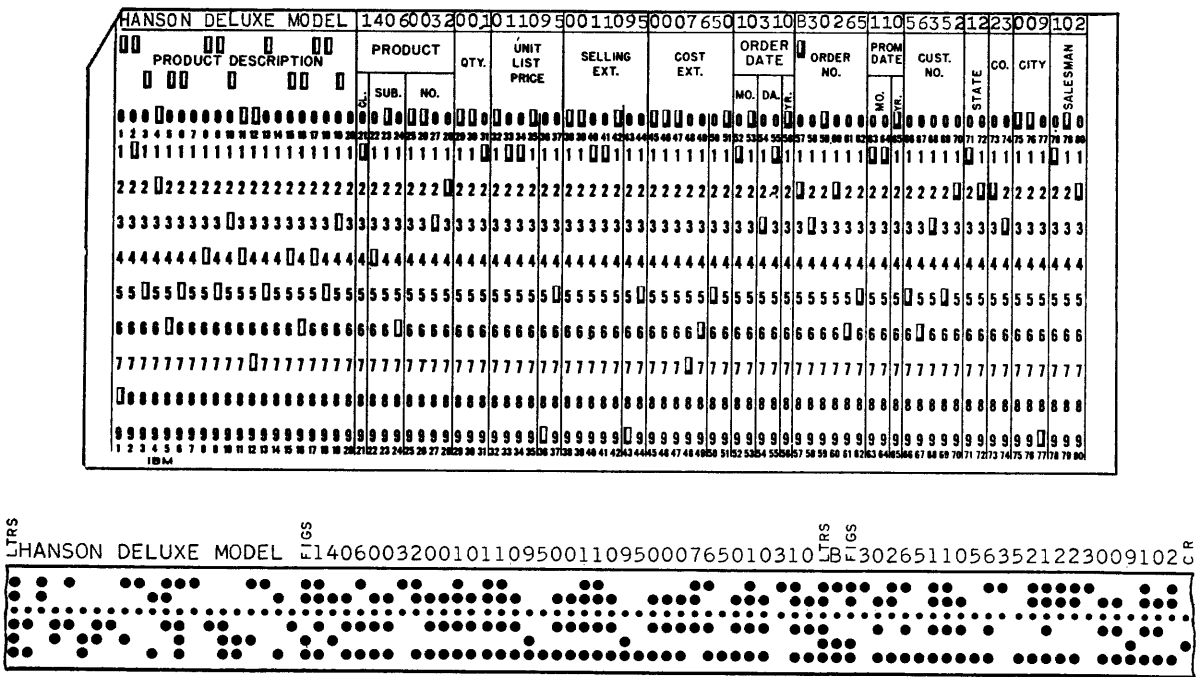

FIGURE 15.

An impulse is available at the common SP hubs as a blank column is read on the card. An impulse is available at each digit hub as the corresponding digit is read from the card. A space hub and the digit hubs are normally connected to the TO TAPE (PUNCH) hubs directly beneath them. The FROM CARD hubs do not emit impulses when gang punching is operative, or when CCS (column code suppression) is activated by a card column. An impulse from one of these hubs can:

Punch itself, or be recoded to punch any digit, figures-shift character, or functional code (except FIGS and LTRS) into the tape.
Control a selector.
Control column code suppression (CCS), or cause skipping (SKIP) or releasing after the punching cycle.
Control a program unit.

If an impulse which is available at the FROM CARD hubs is not wired to a TO TAPE (PUNCH) hub and if CCS is not activated, only a feed hole is punched into the tape and the machine is automatically stopped.

To Tape (Punch). These hubs are entries for impulses to punch digits, figures-shift characters and the functional codes (LTRS, FIGS, SP, CR and LF) in the tape. Figures-shift characters (fractions, punctuation marks, etc.) and their locations vary on different types of printing telegraphic equipment. Therefore, only the standard alphabetic letter and digit identifications are given. Under certain conditions these hubs are also entries for program impulses or card column impulses to punch codes for alphabetic letters.

These hubs, with the exception of LTRS and FIGS, can be impulsed by any card code impulse in the FROM CARD group of hubs, or by a program punching impulse, exits 1, 2, or 3. Program exits can also punch LTRS and FIGS. All of these hubs can be impulsed by card column impulses when gang punching is operative. When LTRS or FIGS is activated, the machine is automatically placed in the corresponding shift.

These hubs, with the exception of the G hub which is only an entry hub, are connected di-

rectly to the tape punching mechanism internally and are, therefore, exits when alphabetic information is being read from the card. For example, if an A were being read, the A hub would emit an impulse; and if an E were being read, the E (3) hubs would emit an impulse. Therefore, no two of these hubs should be connected together or to any other hub; such impulses should pass through distributors.

Tape Punching for This Example

Blank columns on the card are usually wired to punch space codes in the tape; the codes, in turn, cause spacing on printing telegraph machines and on cards reproduced by the tape. Therefore, in this example, one of the two SP (space) exit hubs is connected to one of the four entry hubs below.

As no recoding of digits is desired in this example, the digit and punch hubs are connected digit for digit.

Program A and B. It is often necessary to punch into the tape extra codes which cannot be read from the card. For instance, at the end of information which is to constitute a line of data printed by telegraphic equipment, CR (carriage return) and LF (line feed) codes must be punched to operate the telegraph machine.

The program device provides the punching impulses that are needed for extra tape codes. It has two punching units: program A and program B. Each unit has pickup (PU) hubs which can be impulsed by one of the following impulses:

Card Column.
Card code wired directly from the FROM CARD hubs (from the PUNCH hubs when alphabetic information is being read), or through the column split or column code device.
CHAR (character).
TP (tape punch) during card reading.
CBC exit.

Card reading has to be on before programming can be activated. As soon as the tape punch cycle is completed and the card advances to the next column, program punching starts and card reading automatically stops. No card

column impulse is available while program punching takes place. In other words, when a program unit is picked up by card column 10, the code for column 10 is read from the card and punched into the tape before program punching starts. The card moves to column 11 and remains there until program punching is completed. The impulse for card column 11 is not available to control various functions until program punching is completed.

Each program unit can be controlled to emit one punch impulse, two punch impulses, or three punch impulses. The impulses which control these punching cycles are identified as S (single), D (double), and T (triple); one of these impulses must always be wired into one of the common hubs to control the program unit. When S is wired, one punching impulse is available at the exit 1 hub. When D is wired, two punching impulses are available, one from the exit 1 hub and one from the exit 2 hub. When T is wired, three punching impulses are available, from the exit 1 hub, the exit 2 hub, and the exit 3 hub. Each punching impulse which is emitted from the exit hubs must be wired to punch a code or only a feed hole will be punched into the tape, which automatically stops the machine. Therefore, each program unit must be controlled to emit the proper number of punching impulses needed.

A program exit impulse can punch any tape code. An exit impulse can also control selectors, and cause skipping or releasing.

At the end of the program cycles, regardless of how many there are, an impulse is available at the E (end) hub. The E impulse is not a punching impulse. It can be used, however, to control selectors, CBC (consecutive blank column) and ZTS (zero to space) devices; it can also be used to resume card reading *if no skipping or releasing takes place.* The E impulse can be wired to AUTO SKIP or release; it cannot be wired to the SKIP hubs.

Whenever skipping or releasing as well as program punching is desired, the two are wired to function simultaneously to reduce operating time. Either the program pickup impulse or the program punching impulses can be wired to

SKIP or release. If the E impulse is to be used, this impulse should be wired to AUTO SKIP, which causes an immediate skip when card reading is stopped.

When there is skipping or releasing during program punching, card reading is restarted by the impulse of the next column to be read after program punching is completed. When the card has remained stationary during program punching, card reading can be resumed by using either the E impulse or the impulse of the column where the card has been waiting for program punching to be completed.

Program Punching CR

When the tape is to be mailed, no thought need be given to program punching extra codes for functions on printing telegraph machines. Rather, one code must be program punched at the end of the information for each card, for checking purposes when the cards are reproduced by the tape.

In this example, CR is program punched by program B which is picked up by column 80. The S impulse controls the program unit, as only one punching cycle is desired for this condition. The exit 1 hub is wired to CR, which is punched during card eject and feed cycles.

Release. These hubs are common entries to release the card and can be impulsed by one of the following impulses:

Card column.

Card code wired directly from the FROM CARD hubs (from the PUNCH hubs when alphabetic information is being read), or through the column split or column code device.

CHAR (character).

TP (tape punch).

Program exit 1, 2, or 3.

Program end.

CBC exit.

When card reading is taking place, the release of the card is automatically delayed to allow the column being read to punch a code into the tape. Where a release is started, card reading is automatically stopped. When card reading is
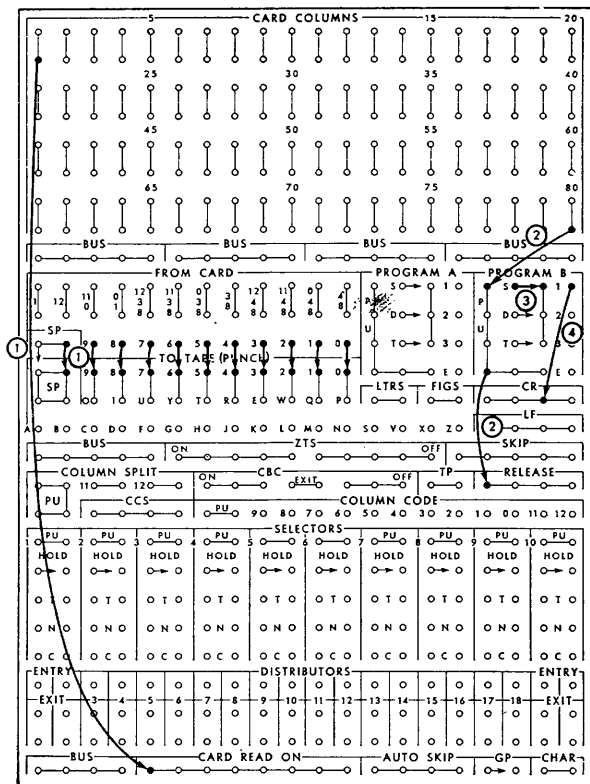
FIGURE 16.

not taking place, the card is released immediately. A new card will feed automatically if the eject-stop lever is down.

Wiring (Figure 16)

1. Column 1 is wired to start card reading, which will continue for the entire card cycle in this example. Blank columns are wired to punch space codes; digit-for-digit punching is wired.

2. Column 80 is wired to pick up program B, and to release the card.

3. The S impulse controls program B, as only one punching impulse is needed.

4. Exit 1 of program B is wired to CR.

OMITTING INFORMATION; AUTO SKIPPING; PUNCHING A TAPE SPACE CODE (FIGURE 17)

Omitting Repetitive Information

Repetitive card information can be omitted if it is not needed on a document prepared by the tape. Omitting this type of information speeds tape preparation and conserves tape length. The

repetitive information can be duplicated from a master card when the Type 43 Tape-Controlled Card Punch reproduces cards from the tape, or it can be gang punched at high speed in a subsequent operation.

In this example, plant name is omitted merely by skipping it.

Skip and Auto Skip. There are two types of skip entry hubs on the control panel: SKIP, which causes delayed skipping when card reading is on, and AUTO SKIP, which causes immediate skipping when card reading is off. Delayed skipping allows the code being read to punch the tape before card reading is automatically stopped and skipping is started. Immediate skipping can be used only when card reading is not taking place.

The SKIP hubs can be impulsed by one of the following impulses:

Card column.

Card code wired directly from the FROM CARD hubs, or through the column split or column code device. If an alphabetic character is to control skipping, the impulse is available at the PUNCH hubs.

CHAR (character).

TP (tape punch).

Program exit 1, 2, or 3.

CBC exit.

FIGURE 17.

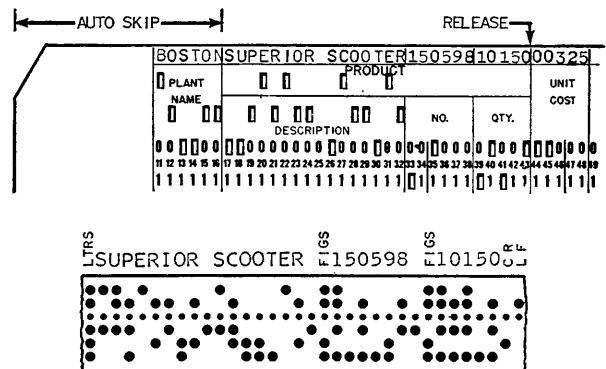The AUTO SKIP hubs can be wired from card columns. They are used mostly for skipping from column 1 when card reading is not started in this column, as in this example, and for successive skipping when card reading has been stopped by programming or by delayed skipping (SKIP). Also, the end impulse of a program unit can be wired to these hubs.

Card reading must be started again after all skipping is over. The first column to be read is wired to CARD READ ON.

Punching a Tape Space Code

Where printed forms are not used, it is often desirable for visual clarity when transmitting data by telegraph to have the fields of information separated by one or more spaces. This can be done by program punching a space code between the fields of information as they are punched into the tape.

In this example, a space code is punched between the data read in columns 32 and 33, 38 and 39.

Omitting Information not Needed for Tape Punching

Information which is not needed when cards are reproduced, or when a document is printed by telegraph, can also be omitted.

In this example, unit cost is not read for tape punching. The card is released at column 43 and program punching of CR and LF occur, instead.

Program Punching CR and LF

It will be noted that exit 1 of program A punches CR and exit 2 punches LF.

The carriage return operation on most printing telegraph machines requires two codes after the CR; LF and LTRS or FIGS. For this reason, CR and LF must always be program punched in this sequence. As CR automatically drops the machine out of shift, the next code read from the card will be preceded by a shift code.

Wiring (Figure 18)

1. Column 1 is wired to cause immediate skipping. A skip-stop insert in the adjustable skip bar is set at column 17.

2. Column 17 is wired to start card reading. Blank columns are wired to punch space codes; digit-for-digit punching is wired.

3. Column 32 is wired to pick up program B. The S impulse controls the program unit as only one punching impulse is needed.

4. Exit 1 of program B punches a space code.

5. After the space code is punched, an impulse from the E hub of program B restarts card reading.

6. Column 38 is wired to pick up program B via column 32. Another space code is program punched.

7. Column 43 is wired to pick up program A, and to release the card. The D impulse controls the program unit as two punching cycles are needed.

8. Exit 1 of program A is wired to CR.

9. Exit 2 of program A is wired to LF.
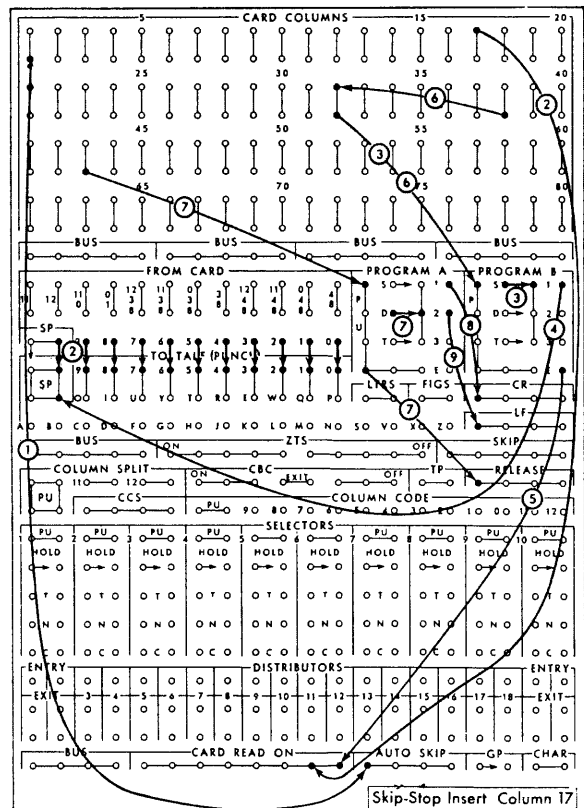
FIGURE 18.

RECODING AND SELECTIVE SKIPPING BASED ON A CARD CODE (FIGURE 19)

IN THIS example two types of cards are read: Card 1 is a production applying record and card 2 is a salesman's commission record. For each sale, the two cards must be read, each with certain skipped fields.

The skipped fields on card 1 contain repetitive information which can be duplicated when the cards are reproduced. The skipped fields on card 2 are unused columns and repetitive information which can be skipped and duplicated, respectively, when the cards are reproduced.

Card 1 has a 9 to 0 digit of customer number punched in column 1 which is tape punched normally; card 2 has a 12 punched in column 1. The

12 is recoded to a fig-A in the tape; it also controls selector 3 for the entire card 2 cycle and causes skipping.

Distributors. Distributors are much like buses in purpose, i. e., they provide facilities for expansion of exits. They go further, however, in that an impulse can pass through a distributor in only one direction, thus eliminating "back circuits." Each distributor has an entry hub and two exit hubs. When an impulse is wired to the entry hub of a distributor, the same impulse is available at both exit hubs. The two exit hubs are not common and, therefore, can be used to control functions independently without interference from other controls wired directly to the same functions.
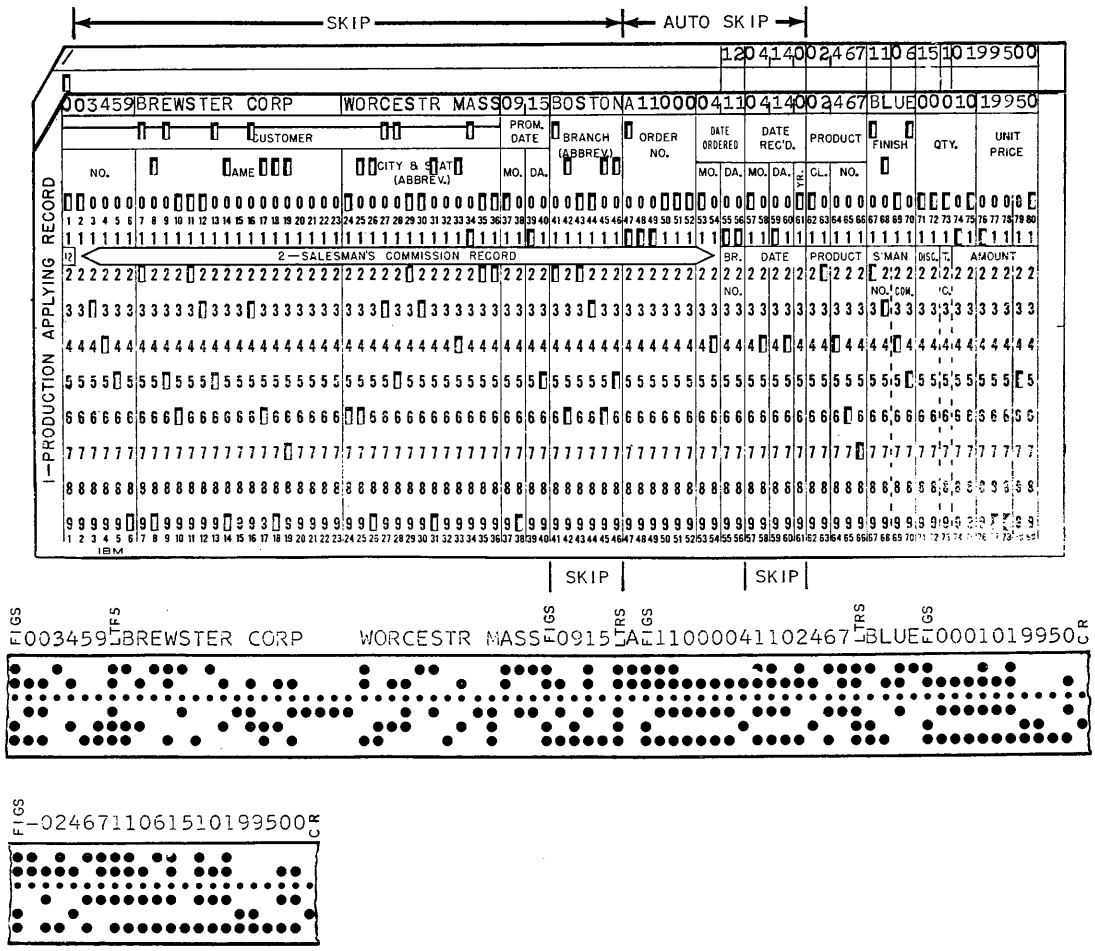
FIGURE 19.

FIGURE 20. DISTRIBUTORS

FIGURE 21. SCHEMATIC DIAGRAM OF SELECTOR OPERATION

When an impulse is needed for three (or more) functions, the original impulse must be wired to the entries of two (or more) distributors, as shown in Figure 20. Ten distributors are provided on the standard machine; more distributors can be installed, if needed, as optional.

Selectors. There are ten 2-position selectors on a standard machine. More selectors can be installed, if needed, as optional. Each selector has PU (pickup) hubs, hold hubs, and C (common), N (normal), and T (transferred) hubs. A selector may be picked up by one of the following impulses:
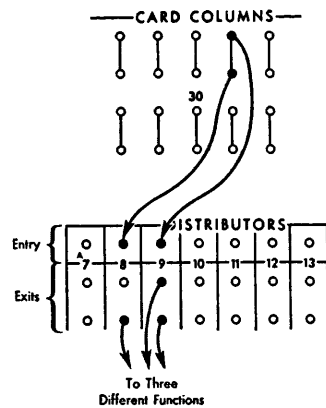
> Card column.
> Card code wired directly from the FROM CARD hubs (from the PUNCH hubs when alphabetic information is being read), or through the column split or column code device.
> CBC exit.
> Program exit 1, 2, or 3, or end.
> CHAR (character).
> TP (tape punch).

Normally, an internal path is maintained between C and N. When a selector is picked up or *transferred*, however, the internal path is immediately established between C and T (Figure 21). The transferred condition lasts for the duration of the impulse wired to the pickup hubs. For example, when column 51 is wired to pick up a selector, the selector is transferred for column 51 only. It is normal for all other columns.

A selector may be transferred for a specific number of card columns or for the remainder of the card cycle by use of the hold hubs. The exit (left) hub emits a constant impulse; the entry (right) hub can accept an impulse when the selector is transferred. Therefore, the constant hold impulse, when wired to the entry hub, will hold a transferred selector transferred for the remainder of the card cycle. The hold impulse is terminated and the selector is returned to normal (a) when a new card is automatically fed into reading position, (b) when the thumb lever or the stop button is operated, or (c) when the tape becomes taut and moves the tape tension guide to the left. If the hold impulse is wired to the entry hub through the C and N hubs of another selector, the first selector will remain transferred until the second selector is transferred.

Recode

Any code read from the card which is available at the control panel can be recoded. In other words, any digit, space, or special code, such as 11, 12, 11-0, or 0-1, can punch any digit, figures-shift character, or functional code except LTRS and FIGS into the tape.

Selective Skipping

Selective skipping is skipping selected for the type of card or field being read. In this example, skipping is selected for card 2 at column 47 by recognizing the 12 in column 1 on this card.

Wiring (Figure 22)

1. Column 1 is wired to start card reading. Blank columns are wired to punch space codes; digit-for-digit punching is wired.

CARD 1

2. Column 40 is wired to cause delayed skipping. A skip-stop insert in the adjustable skip bar is set in column 47.

3. Column 47 is wired through the normal hubs of selector 3 to start card reading.

4. Column 56 is wired via column 40 to SKIP. A skip-stop insert is set in column 62.

5. Column 62 is wired to restart card reading.

6. Column 80 is wired to pick up program B, and to release the card. The S impulse controls the progra a unit.

7. Exit 1 of program B is wired to CR, which is the only code needed as the tape will be transmitted by mail.

CARD 2

8. A FIGS code is punched by the machine when

Skip-Stop Inserts: Columns 47, 62

FIGURE 22

it reads the 12 in column 1 on card 2. This 12 impulse is available at the 12 FROM CARD hub and is wired to accomplish the following:

a. To pick up selector 3. The hold hubs of the selector are connected to keep it transferred for the entire card cycle.

b. To punch A through distributor 2. A distributor must be used, as alphabetic A's are available at the A hub when they are read from the card. The distributor prevents the alphabetic A's from picking up selector 3.

c. To cause delayed skipping through distributor 2. The skip-stop insert in column 47 stops the skipping. The use of the distributor is again necessary in order to prevent selector 3 from being picked up by the column impulses wired to SKIP.

9. Column 47 is wired through the transferred hubs of selector 3 to the AUTO SKIP hubs to start a second skip. A skip-stop insert is set in column 62.

10, 11, 12. Same as steps 5, 6, and 7.

PROGRAM PUNCHING SKIP CODE FIG-G

THE fig-G skip code must be program punched into the tape when fields are skipped on some of the cards if skipping is also to take place on the cards reproduced from the tape, or if tabulation is to take place when the telegraph machine prints the report. The fig-G will cause tabulation without printing on telegraph machines equipped with the tabulation feature; on others, it will cause an ampersand (&) to print in most cases. The skipped fields may be punched or unpunched in the original cards.

As both the Type 43 punch and the printing telegraph machine are governed by shift codes, it is necessary to visualize the conditions preceding a skip code in order to know what must be program punched into the tape for proper automatic machine operation. The conditions to be recognized follow:

(a.) When the last code read before programming is alphabetic, the machine is in letters-shift.
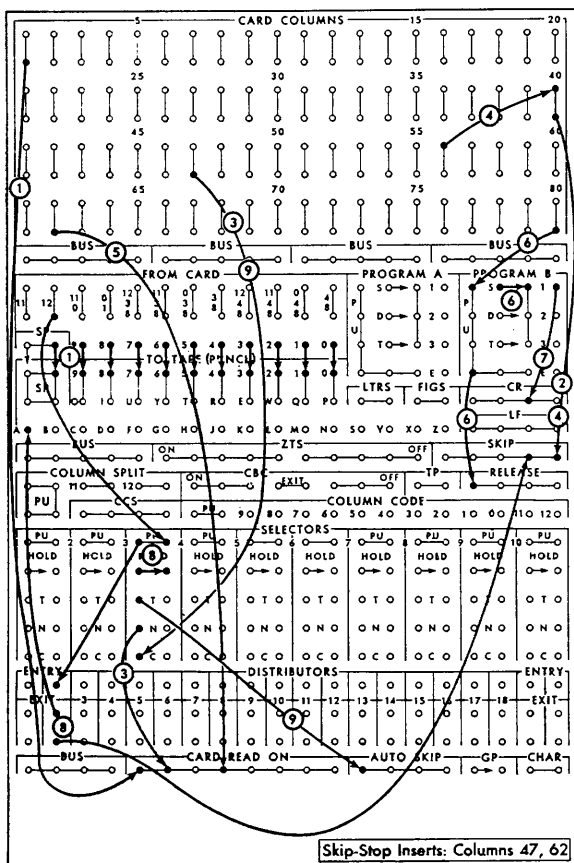
Therefore, FIGS must be punched before the G code is punched. If it is not, the G will be a letter instead of the desired fig-G when the tape is read. See the wiring explanations for Figure 23.

(b.) The space function of printing telegraph machines is normally independent of shift. Some machines, however, are arranged to shift automatically from figures to letters whenever a space follows a figures-shift character. Therefore, when the last code read before programming is a space, it is advisable to punch FIGS into the tape before G or any other figures-shift character is punched. See the wiring explanations for Figure 23.

(c.) When the last code read before programming is numerical, the machine is in figures-shift. Therefore, a G can be program punched and it will be read as fig-G. See the wiring explanations for Figure 24.

(d.) When a tape, transmitted by telegraph, writes a document on the sending or receiving end, or both, it is often necessary to cause tabulation on the document when no skipping occurs on the cards. In this case the G (preceded by FIGS, when necessary, as described above) is punched between card fields. See the wiring explanations for Figure 25.

Wiring

In the following examples only the pertinent wiring is shown:

FIGURE 23

1. Column 29 is wired to the pickup hub of program A, and to SKIP. The same impulse used to pick up the program unit can also be used to cause skipping. This impulse can be wired directly to SKIP *if* skipping is not activated by any other impulse which must not, in turn, cause program punching. If it is, the program pickup impulse will have to be wired through a distributor to SKIP. A skip-stop insert in the adjustable skip bar is set at column 40. The D impulse controls the program unit.

2. Exit 1 of program A is wired to FIGS.

3. Exit 2 of program A is wired to the G hub. The FIGS and G codes are punched while the card is skipping.

4. Column 40 is wired to start card reading again.

FIGURE 23. PROGRAM PUNCHING A FIG-G
AFTER A LETTER OR SPACE

FIGURE 24

1. Column 29 is wired to the pickup hub of program A, and to SKIP. A skip-stop insert in the adjustable skip bar is set at column 40. The S impulse controls the program unit.

2. Exit 1 of program A is wired to the G hub. The G code is punched while the card is skipping.

3. Column 40 is wired to restart card reading.

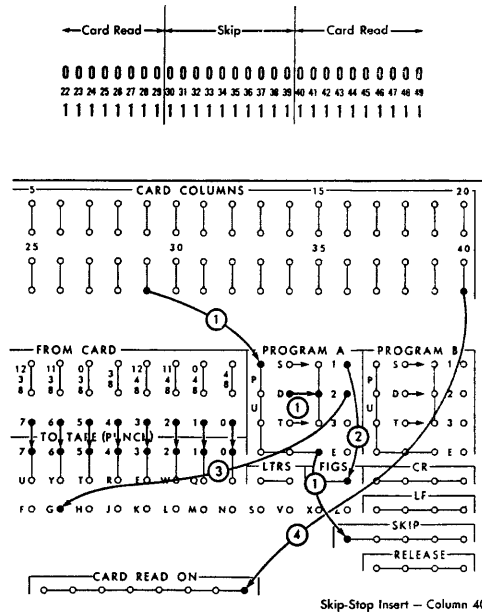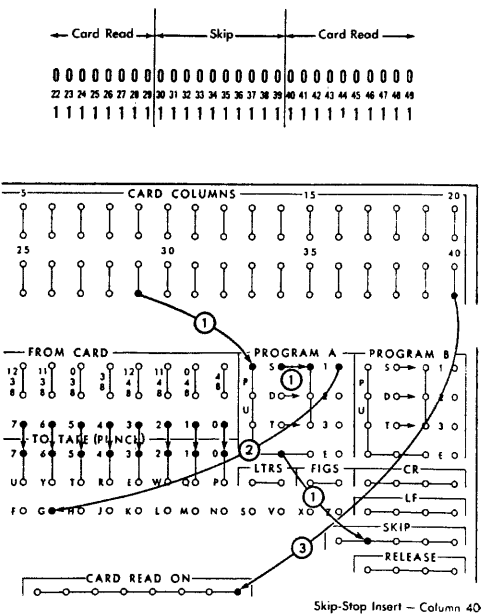FIGURE 24. PROGRAM PUNCHING A FIG-G
AFTER A NUMERAL

FIGURE 25

1. Column 14 is wired to the pickup hub of program B. The D impulse controls the program unit.

2. Exit 1 of program B is wired to FIGS.

3. Exit 2 of program B is wired to the G hub. While the FIGS and G codes are being punched, the card remains at column 15.

4. When there has been no skipping (or releasing) during program punching, the E impulse of the program unit restarts card reading, as shown, or the next column to be read (column 15 in this instance) can be wired to CARD READ ON.
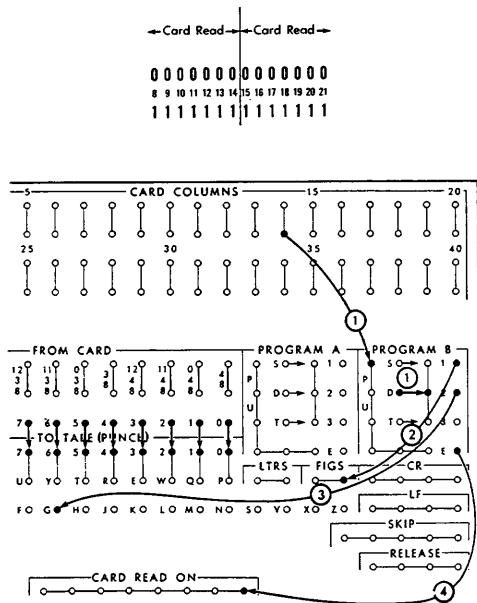

FIGURE 25. PROGRAM PUNCHING A FIG-G BETWEEN CODES PUNCHED IN ADJACENT CARD COLUMNS

Shift Drop-Out

Whenever a fig-G is punched, either by recoding or by programming, the machine drops out of shift and a shift code is automatically punched ahead of the next code read from the card. This shift code is required after a fig-G when tabulating on a printing telegraph machine.

A shift code must be gang punched after a gang punched fig-G which is to be followed by another gang punched code. A fig-G which is the last code gang punched is automatically followed by a shift code punched to precede the code which is read from the card.

TWO OR MORE LINES FROM ONE CARD; IDENTIFYING INFORMATION TO BE OMITTED WHEN CARDS ARE REPRODUCED (Figure 26)

Two or More Lines from One Card

Information from one card can be punched into a tape so that two or more lines can be printed on a document prepared by a telegraph machine which is automatically operated by the tape. This example (Figure 26) shows information recorded in the tape so that two lines will be printed; the information for each of the lines is followed by CR and LF, which are program punched codes.

Identifying Information to be Omitted When Cards are Reproduced

At times it is necessary to have information punched into the tape for document writing by telegraph when the information is not desired on the cards reproduced from the tape. When this condition exists, the information to be omitted must be identified. This requires a special character code. As only one code is required when the information to be omitted is at the beginning or the end of the card data, it is advantageous to so position the data whenever possible. The information to be omitted in this example is in the middle of the card data, and *two* special character codes are needed—one preceding the information and one following it. These codes are program punched.

In this example, the information to be omitted is the street address. The following special character codes are chosen arbitrarily:

Fig-A, which is usually the hyphen key on a standard telegraph machine, will precede the street address.

Fig-M, which is usually the period key on a standard telegraph machine, will follow the street address.

When the tape reproduces cards in the Type 43 Tape-Controlled Card Punch, fig-A (-) can stop card punching while the street address is being read in the tape, and fig-M (.) can restart card

|←SKIP→|

| 1304212 | DOWNING FOOD CORPORATION | FRONT STREET AT MAINE | SOUTH LAWRENCE | CONN |
| 1067312 | CENTER MANUFACTURING CO | 1493 MIDDLETON COURT | SOUTHAMPTONVILLE | CONN |

CUSTOMER NO.	STATE	CUSTOMER NAME	STREET ADDRESS	CITY	STATE

F10673 C F L TRS CENTER MANUFACTURING CO FIGS -1493 LTRS MIDDLETON COURT FIGS . LTRS SOUTHAMPTONVILLE CONN C R F L

F13042 C F L TRS DOWNING FOOD CORPORATION FIGS - LTRS FRONT STREET AT MAINE FIGS . LTRS SOUTH LAWRENCE CONN C R F L

```
10673
CENTER MANUFACTURING CO -1493 MIDDLETON COURT .SOUTHAMPTONVILLE   CONN
13042
DOWNING FOOD CORPORATION-FRONT STREET AT MAINE.SOUTH LAWRENCE     CONN
```

FIGURE 26.

punching so that the city and state address will be punched into the card.

Program A provides the punching impulse for both the hyphen and the period. Exit 1 of program A is wired to FIGS; exit 2 of program A is controlled by selector 6 to punch A after column 36 and to punch M after column 57. Selector 6 is controlled by column 37. The card moves to column 37 as soon as program punching is begun and waits there during program punching. No impulse is available at column 37 until program punching is completed. Selector 6 is transferred at that time for the remainder of the card cycle; it is normal when programming is started by column 36 and it is transferred when programming is started by column 57.

Wiring (Figure 27)

1. Column 1 is wired to start card reading. Blank columns are wired to punch space codes; digit-for-digit punching is wired.

2. Column 5 is wired to cause delayed skipping, and through distributor 9 to pick up program B. The D impulse controls the program unit. A skip-stop insert in the adjustable skip bar is set at column 13.

3. Exit 1 of program B is wired to CR.

4. Exit 2 of program B is wired to LF.

5. Column 13 is wired to restart card reading directly, or as shown.

6. Column 36 is wired to pick up program A. The D impulse controls the program unit.

FIGURE 27.

7. Exit 1 of program A is wired to FIGS.

8. Exit 2 of program A is wired through the normal hubs of selector 6 to the A hub.

9. The E impulse of program A is wired to restart card reading.

10. Column 37 is wired to pick up selector 6 which remains transferred for the remainder of the card cycle, as the hold hubs are connected.

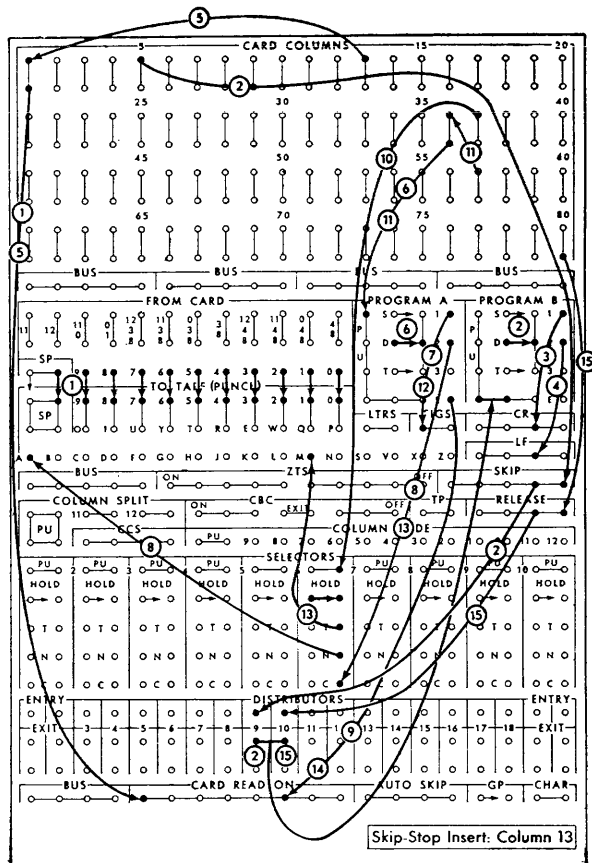11. Column 57 is wired to pick up program A directly, or as shown.

12. Exit 1 of program A is wired to FIGS.

13. Exit 2 of program A is wired through the transferred hubs of selector 6 to the M hub.

14. The E impulse of program A restarts card reading again.

15. Column 80 is wired to release the card, and through distributor 10 to pick up program B. The D impulse controls the program unit. CR and LF are program punched as described in steps 3 and 4.

COLUMN CODE DEVICE CONTROLS SELECTIVE SKIPPING AND RELEASING; COLUMN CODE SUPPRESSION AND ZERO TO SPACE DEVICES (FIGURE 28)

Column Code. When picked up by a card column, the column code device makes the impulses read in that column available at the special row of exit hubs. For example, if an N is being read in that specific column, impulses are available at both the 5 and 11 exit hubs of the column code device; if a 6 is being read, the impulse is available at the 6 exit hub. A column code impulse is normally wired as follows:

To control a selector.

To control program punching.

To control CCS (column code suppression device).

To cause skipping (SKIP) or releasing after normal or gang punching is completed.

Column code impulses are early impulses which are available as soon as card reading is started and they last through punching time.

When two or more column code impulses are used to control the same function or device, each impulse should be wired to that function or device through a distributor. (The exception to this rule is presented on page 33.) This is necessary because otherwise multiple punching will occur. For example, if the 4 hub and the 5 hub are wired directly to pick up the same selector, each time the 4 impulse picked up the selector it would follow back into the 5 hub of the column code device and cause a 5 to punch along with the 4, and *vice versa*.

When the column split device is active at the same time as the column code device, no 11 or 12 column code impulse is available.

If wired, the column code device is active during gang punching.

In the following example, the column code device is used to read the type of sale code punched in column 20. When a 1 is read, the unit list price and the regular selling extension are punched into the tape before the card is released. When a 2 is read, columns 21-31 are skipped and the special sale is punched into the tape before the card is released. When skip-

CUSTOMER	TERRITORY	SALESMAN	PRODUCT NO.	QUAN-TITY	TYPE SALE	UNIT LIST PRICE	REGULAR SELLING EXTENSION [1]	SPECIAL SALE [2]
8920 4	10 2	3	59 0 65 4	0001 2	1	2500	01250 0	009895
34902	43	2	0037 6	0001 1		05995	005995	

FIGS 34902   FIGS 43   FIGS 2   FIGS 376   FIGS 1   FIGS*   FIGS 5995   FIGS 5995 CR LF

FIGS 892041023590654   FIGS 1   FIGS*   FIGS 9895 CR LF

*CCS

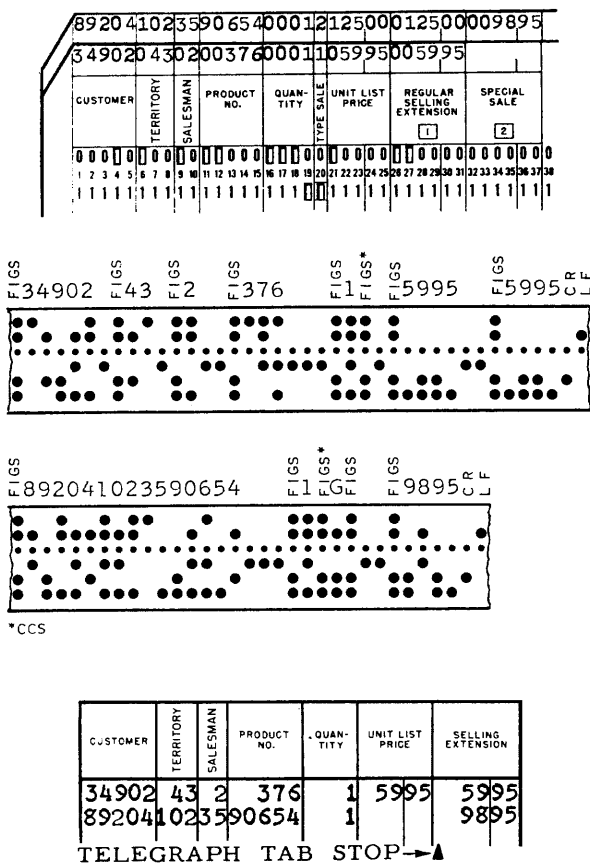| CUSTOMER	TERRITORY	SALESMAN	PRODUCT NO.	.QUAN-TITY	UNIT LIST PRICE	SELLING EXTENSION
34902	43	2	376	1	5995	5995
89204	1023590654			1		9895

TELEGRAPH TAB STOP→▲

FIGURE 28.

ping occurs, a fig-G is program punched. The fig-G code will operate the telegraph machine so that the amount for a special sale will print beneath the amount for a regular sale. Also, the fig-G will be used to cause the desired skipping during card reproduction.

Column Code Suppression (ccs). It is often necessary to read a code punched in the card to control machine functions, as described above, but to suppress punching of the card code in the tape. The column code suppression device (ccs) can be impulsed by a card column when all codes in that column are to be suppressed, or it can be impulsed by specific card codes. The card codes can be wired directly from the FROM CARD hubs (or from the PUNCH hubs when alphabetic information is being read), or through the column split or column code device. A character impulse can also activate this device.

When this device is activated, the proper shift code is substituted for the code normally punched. For example, LTRS is punched for letters and FIGS is punched for numerals, etc. When ccs is activated by a card column impulse, the FROM CARD hubs do not emit impulses. A code in the card can be read for control purposes, however, through the column code or column split device. When ccs must be activated by a code of multiple punching, such as 11-0 or 0-1, the FROM CARD impulse is used to pick up ccs.

When the code being read also causes a change in shift, immediate ccs action will cause only one shift code to be punched into the tape. The only impulse listed above which does not give immediate action is the FROM CARD impulse. When this impulse is used to control ccs, the normal shift code is punched and followed by a second shift code which is substituted for the code read. The ccs device is inactive during gang punching.

CCS and SKIP (or RELEASE) cannot be activated by the same FROM CARD impulse; rather, the column code or column split device is picked up and the exit impulse corresponding to the FROM CARD impulse is wired to ccs and SKIP (or RELEASE).

In the following example, column 20 is wired to ccs; the type of sale code is read but FIGS is substituted in tape punching.

Zero to Space (zts). As it is customary to punch zeros to the left of significant digits in cards, and as it is usually desirable to omit the printing of such zeros on a report, a zero to space device (zts) is provided on this machine to automatically recode zeros in the cards to spaces in the tape. This device is normally controlled by a card column impulse.

When one of the common ON hubs of zts is impulsed from a card column, all zeros read in that and subsequent card columns which are wired to the 0 punch hub will punch space codes until the OFF hubs are impulsed from the first column *not* to have a zero converted to a space, or by one of the following automatic means:

When a significant digit (1-9), any special character except 12 or 11 alone, or an alphabetic character is read from the card.

When the GP (gang punch) hubs are connected.

When a new card is fed.

When the thumb lever or the stop button is operated, or the tape becomes taut and moves the tape tension guide to the left.

When ZTS is active, the automatic analyzing functions of the machine are the same as though a space were read from the card instead of a zero. However, when CBC (consecutive blank column device) and ZTS are on at the same time, CBC will not function until ZTS is turned off.

In the following example, ZTS is turned on for each of the fields on the card; at columns 1, 6, 9, 11, 16, 21, 26, and 32. If desired, it can be turned off in the cents column of amount fields so that an amount under ten cents will have a zero ahead of it. In this example, it is not necessary to wire ZTS off, as it is predetermined that no amount will be less than ten cents. ZTS is turned off, however, in many of the other examples in this manual.
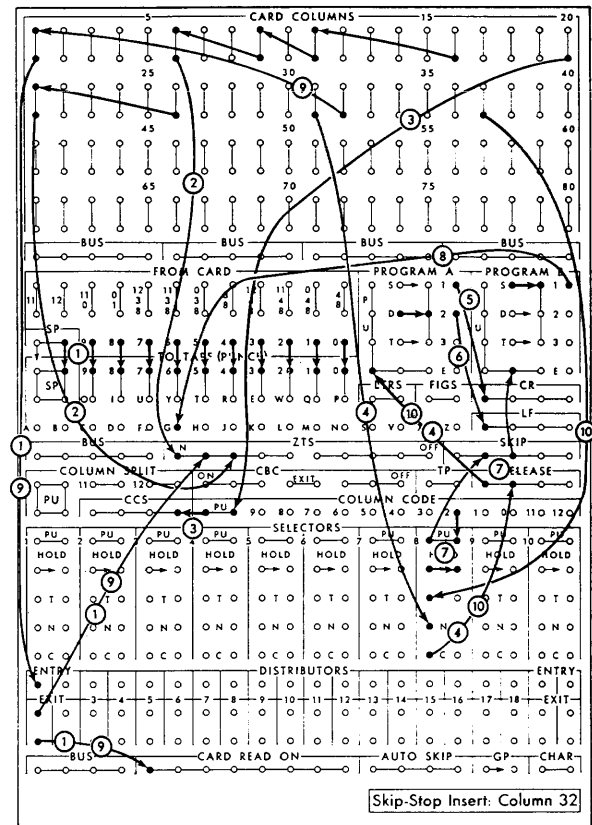

FIGURE 29.

Wiring (Figure 29)

1. Column 1 is wired through distributor 1 to start card reading, and to ZTS ON. Blank columns are wired to punch space codes; digit-for-digit punching is wired.

2. Columns 6, 9, 11, 16, 21, and 26 are wired to ZTS ON.

3. Column 20 is wired to pick up the column code device, and to control CCS. CCS causes FIGS to be punched instead of the 1 or 2 read in this column. Code 2 controls selector 8.

TYPE 1 SALE

4. As selector 8 is not transferred for a type 1 sale, column 31 is wired through its normal hubs to release the card, and to pick up program A. The D impulse controls the program unit.

5. Exit 1 of program A is wired to CR.

6. Exit 2 of program A is wired to LF.

TYPE 2 SALE

7. The 2 read in column 20 is wired from the 2 hub of the column code device as follows:

a. To pick up selector 8. As the hold hubs are connected, the selector remains transferred until a new card cycle is started.

b. To SKIP to start skipping as soon as the normal punch cycle is completed. A skip-stop insert is set at column 32.

c. To pick up program B. The S impulse controls the program unit.

8. Exit 1 of program B is wired to the G hub. The FIGS code, which was punched in place of the type of sale code, precedes the G code in the tape.

9. Column 32 is wired via column 1 through distributor 1 to restart card reading, and to ZTS ON.

10. Column 37 is wired through the transferred hubs of selector 8 to release the card, and to pick up program A. CR and LF are program punched as described in steps 5 and 6.

COLUMN SPLIT DEVICE; DEBITS AND CREDITS
(FIGURE 30)

Column Split. When an 11 or a 12 is punched for control purposes over a digit in a card column, these holes must not be read as a letter. When the column split device is picked up by the card column impulse, the digit is read as though there were no overpunching. The impulse for the overpunching is available at the corresponding 11 or 12 hub in the column split device and can be used or not as desired. Either of these impulses is normally wired as follows:

To control a selector.

To control program punching.

To cause skipping (SKIP) or releasing.

These impulses are early impulses which are terminated before punching time and, therefore, cannot punch codes into the tape.

When the column split device is picked up for a column immediately following one which has controlled program punching, card reading must be started by the card column impulse rather than by the program end impulse. Otherwise, the machine will analyze the information read as alphabetic before the column split device can be activated.

When the column split device is active, no 11 or 12 FROM CARD impulse is available. When the column code device is active at the same time as the column split device, no 11 or 12 column code impulse is available.

If wired, the column split device is active during gang punching.

Debits and Credits

In this example, the debit cards have no code punched in column 15 while all credit cards have an 11 punched over a credit code in this column. Both debit and credit amounts are punched in the same columns, 16-22.

As shown in Figure 30, the tape is prepared so that the debit amounts will list in the debit column and the credit amounts will list in the credit column on the report printed by a telegraph machine equipped with the tabulation feature. This is done by wiring column 15 to the column split device, which makes the 11 on the credit
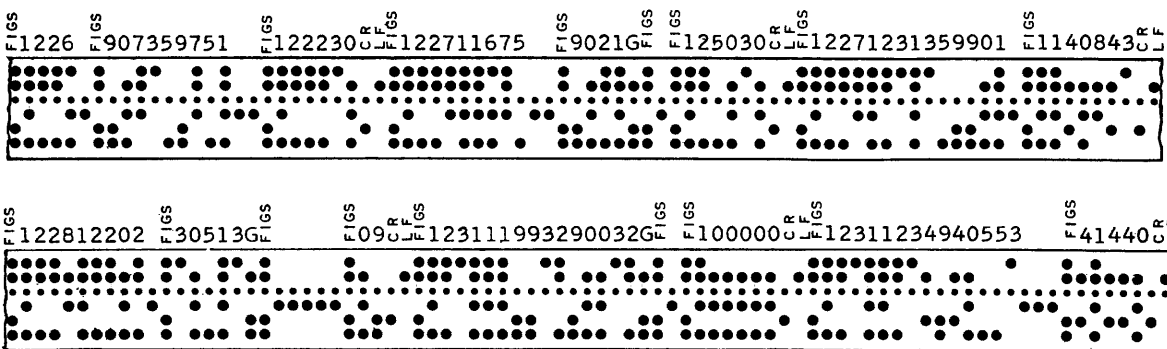

FIGURE 30.

cards available at the 11 hub of the column split device. The 11 is wired to pick up program A which, in turn, punches a fig-G into the tape. When the tape controls the printing telegraph machine, the fig-G code will cause the machine to tabulate over the debit column on the report to the credit column so that the credit amount will be printed there.

ZTS Control

In this example, ZTS is turned on at columns 5, 10, and 16. It is turned off at column 21 so that any amount under 10¢ will be preceded by a zero.

Wiring (Figure 31)

1. Column 1 is wired to start card reading. Blank columns are wired to punch space codes; digit-for-digit punching is wired.

2. Columns 5 and 10 are wired to ZTS ON.

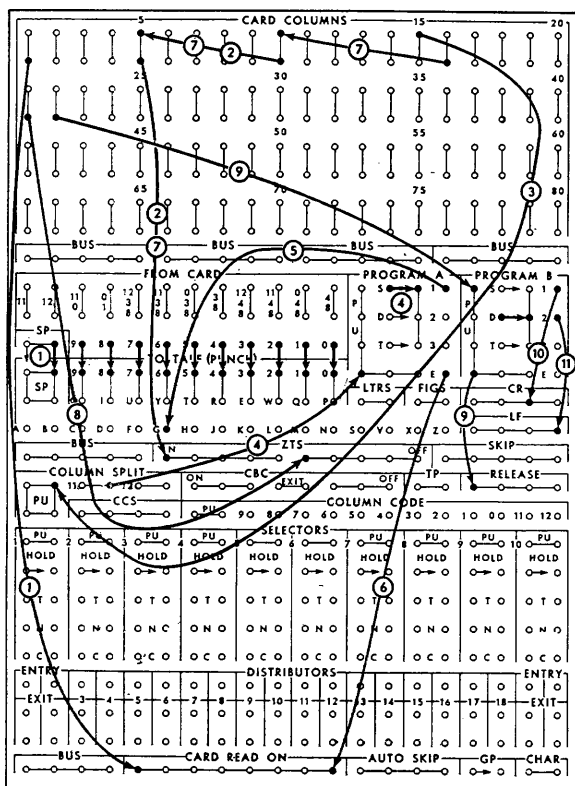3. Column 15 is wired to pick up the column split device.

FIGURE 31.

DEBITS

As column 15 is unpunched, a space code will be punched into the tape for debit cards.

CREDITS

A 1, 2, or 3 is read in column 15 and is punched into the tape for these cards when the 11 over-punching is separated from the reading by the column split device.

4. The 11 code is wired from the 11 hub of the column split device to pick up program A. The S impulse controls the program unit.

5. Exit 1 of program A is wired to the G hub.

6. The E impulse of program A is wired to restart card reading after program punching.

ALL CARDS

7. Column 16 is wired to ZTS ON directly, or as shown.

8. Column 21 is wired to ZTS OFF.

9. Column 22 is wired to pick up program B, and to release the card. The D impulse controls the program unit.

10. Exit 1 of program B is wired to CR.

11. Exit 2 of program B is wired to LF.

IDENTIFYING CREDITS WITH "CR" (FIGURE 32)

RATHER than print the amounts in debit and credit columns, as shown in the preceding example (Figure 30), it is possible to print both the debit and credit amounts in one column and to identify the credit amounts with "CR." Again, the 11 (credit X) in column 15 is used to recognize credit cards.

For debits: Columns 1 to 22 inclusive are read on debit cards. Column 15 is wired to CCS so that no space code will be punched into the tape. Column 22 picks up program B via the normal hubs of selector 2, (transferred for credit cards only), and CR and LF are program punched as the card is released.

For credits: Columns 1 to 22 inclusive are read on credit cards. When column 15 is read, the credit code is suppressed while the 11 via the column split device picks up selector 2 which is held in a transferred position for the remainder of the card cycle. When column 22 is read, it is
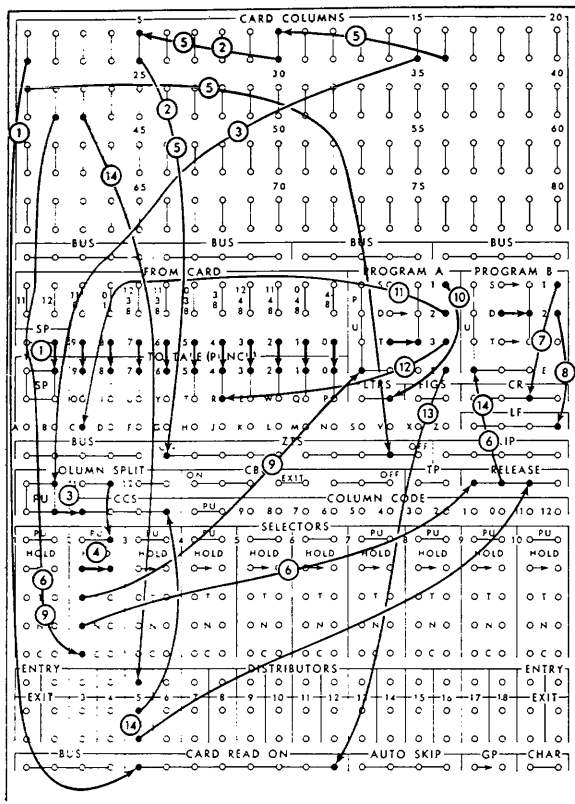
| DATE | REFERENCE | CUSTOMER | AMOUNT |
MO. DA.	NO.	NO.	
1226	9073	59751	122230
1227	11675	902	125030CR
1227	12313	59901	1140843
1228	12202	3051	09CR
1231	11993	29003	100000CR
1231	12349	40553	41440

FIGURE 32.

wired through transferred selector 2 to pick up program A; LTRS, C, and R are program punched. The E impulse of program A restarts card reading. Column 23 is read and suppressed; this column is read so that program B may be picked up. Program B punches CR and LF while the card is being released. As column 23 is blank, it may be suppressed, as shown, or the ccs wiring may be omitted, in which case a space code will be punched into the tape.

The ZTS control is the same for this example as for the preceding example.

Wiring (Figure 33)

1. Column 1 starts card reading. Blank columns are wired to punch space codes; digit-for-digit punching is wired.

2. Columns 5 and 10 are wired to ZTS ON.

3. Column 15 is wired to pick up the column split device, and to activate ccs.

4. The 11 is wired from the column split device to pick up selector 2. The hold hubs are connected in the selector.

5. Column 16 is wired to ZTS ON directly, or as shown; column 21 is wired to ZTS OFF.

DEBITS

6. Column 22 is wired through the normal hubs of selector 2 to release the card, and to pick up program B. The D impulse controls the program unit.

7. Exit 1 of program B is wired to CR.

8. Exit 2 of program B is wired to LF.

CREDITS

9. Column 22 is wired through the transferred hubs of selector 2 to pick up program A. The T impulse controls the program unit.

10. Exit 1 of program A is wired to LTRS.

11. Exit 2 of program A is wired to the C hub.

12. Exit 3 of program A is wired to the R hub.

13. The E impulse of program A is wired to restart card reading.

14. Column 23 is wired through distributor 5 to ccs, to release the card, and to pick up program B. CR and LF are program punched as described in steps 7 and 8.

FIGURE 33.

PLUS AND MINUS SIGNS (FIGURE 34)

IT IS possible to identify debit and credit amounts with plus (+) and minus (−) signs rather than to identify them as shown in the two preceding examples.

In this example, the code in column 33 identifies each item: 1, 2, 5, 7, and 8 are debit items, while 3, 4, 6, and 9 are credit items. There is no 11 overpunching for credits. The credit codes control selector 8 which, in turn, controls the program punching of the signs. Fig-z is arbitrarily chosen for the plus sign; fig-a is arbitrarily chosen for the minus sign. The codes are not punched into the tape, as ccs is activated by column 33.

In this example, an exception is presented to the previously stated rule (page 27) that when two or more column code impulses control the same function or device, each impulse should be wired to that function or device through a distributor.

Distributors for combined column code controls can sometimes be dispensed with when ccs is active at the same time as the column code device so that none of the codes in the combination is punched into the tape. When column code im-
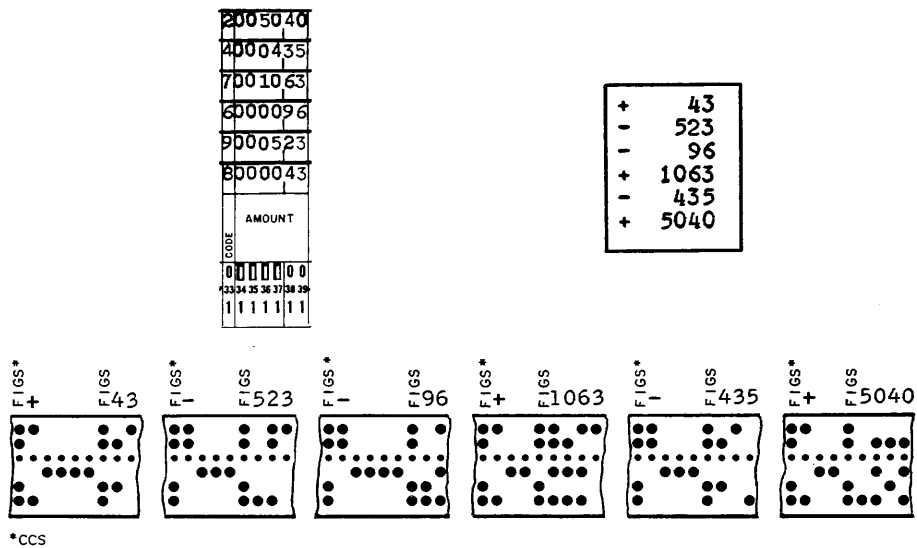

FIGURE 34.

pulses are wired together, however, as shown in this example, care must be taken to recognize what the machine will read. Any zone code (12, 11 or 0) combined with a numerical code (1 to 9) will make the machine seem to read a letter, and LTRS will be the ccs code in the tape. This may be desirable for certain operations, but in this example, where the ccs code must be FIGS to precede the program punched Z or A, care must be taken that the ccs code is FIGS, not LTRS. As 3, 4, 6, and 9 make no alphabetic combination and as none of these codes punches its corresponding code into the tape, distributors have not been used and the impulses are wired via bus or directly to selector 8.

Wiring (Figure 35)

It is assumed that card reading is on when column 33 is reached.

1. Column 33 is wired (a) to pick up the column code device, (b) to ccs, and (c) to pick up program A. The S impulse controls the program unit.

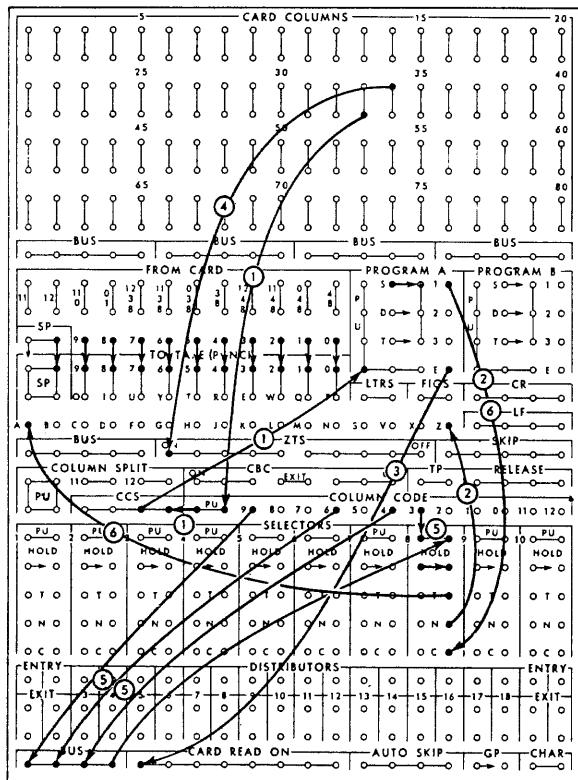#### DEBITS

When code 1, 2, 5, 7, or 8 is read, selector 8 is normal.

2. Exit 1 of program A passes through the normal hubs of selector 8 to fig-z (+).

3. The end impulse of program A is wired to restart card reading.

4. Column 34 is wired to ZTS ON. The remainder of the wiring is not shown.

CREDITS

5. When code 3, 4, 6, or 9 is read, the impulse is wired via bus or directly to pick up selector 8. The hold hubs of selector 8 are connected.

6. Exit 1 of program A passes through the transferred hubs of selector 8 to fig-A (−).

7. Same as steps 3 and 4.

RECODING 11 AND 12 TO LETTERS A AND B (FIGURE 36)

IN THIS example, both ccs and program A are activated by a code in the card. The single digit code is read in column 6. All of the digits (0 to 9) punch normally, but an 11 or 12, recognized by the column split device, impulses ccs and causes program punching of LTRS and A, or B when the 12 controls selector 5.

The column code device can be used instead of the column split device, as shown. As the 11 or 12 is punched alone in column 6, it can also be wired to the pickup hubs of the program unit directly from the FROM CARD hubs if there is no 11 or 12 punched in any other column on the card.
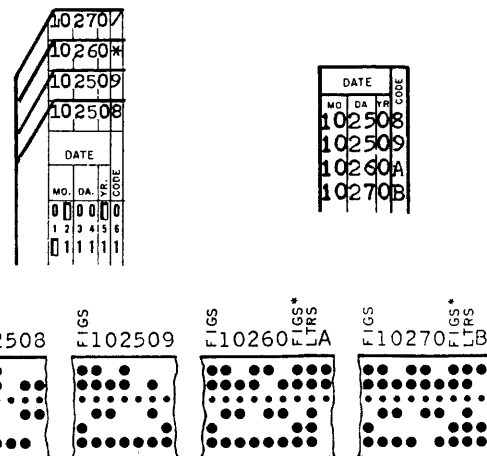

FIGURE 35.

FIGURE 36.

Wiring (Figure 37)

1. Column 1 is wired to start card reading. Blank columns are wired to punch space codes; digit-for-digit punching is wired.

2. Column 6 is wired to pick up the column split device.

11 IN COLUMN 6

3. The 11 impulse of the column split device is wired to CCS, and to pick up program A. CCS will substitute FIGS for the space code which would normally be punched. The D impulse controls the program unit.

4. Exit 1 of program A is wired to LTRS.

5. Exit 2 of program A is wired through the normal hubs of selector 5 to the A hub. (Selector 5 is transferred by a 12 in column 6.)

6. The E impulse of program A is wired to restart card reading. The remainder of the wiring is not shown.

12 IN COLUMN 6

7. The 12 impulse of the column split device is wired through distributor 7 to CCS and to pick

up program A, and to pick up selector 5. The hold hubs of selector 5 are connected.

8. Exit 1 of program A is wired to LTRS.

9. Exit 2 of program A is wired through the transferred hubs of selector 5 to the B hub.

10. Same as step 6.

CHARACTER IMPULSE; INSERTING COMMAS ON TELEGRAPH REPORT (FIGURE 38)

Character. The character impulse is available each time a code is read from the card. No impulse is available when a zero is converted to a space, or when a blank column is read. Gang punching has no effect on a character impulse.

This impulse comes after a column code exit impulse, so that it can be selected by a column code impulse. It comes before and lasts through punching time, however, so that it, in turn, can control a selector through which a punch impulse is wired.
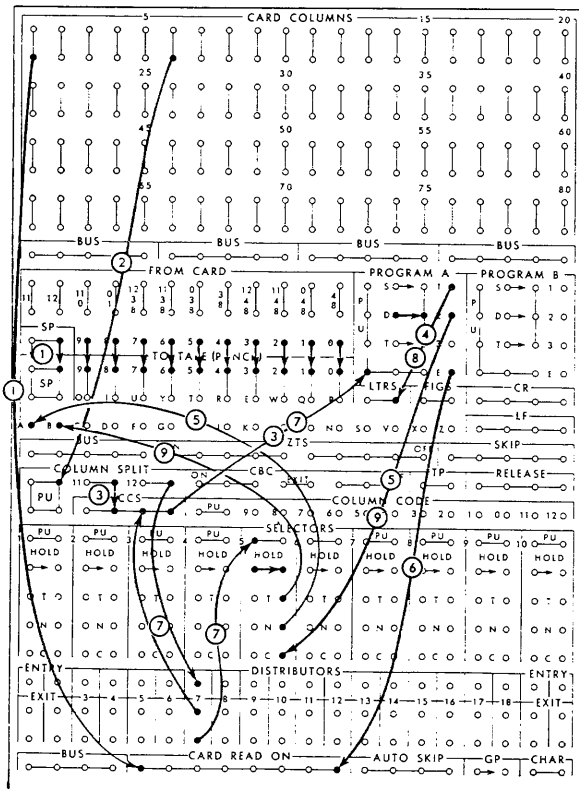
Inserting Commas on Telegraph Report

It is often desirable when transmitting data by telegraph to insert commas in columns of figures, i. e., to have the telegraph machine print 50,000,000 rather than 50000000. Inserting a comma can be done by program punching a figures-shift character into the tape wherever a comma is needed. Numbers such as 50,000,000 need two commas, 2,000 needs but one, and 975 needs none. To position these figures properly in a column, program punching must take place for all of them, as follows:

CARD COLUMNS 41-48	REPORT		
50000000	50,000,000)		50,000,000)	With
00002000	00,002,000)	or	2,000)	ZTS ON
00000975	00,000,975)		975)	

Program punching provides two commas for 50,000,000, a space and a comma for 2,000, and two spaces for 975 with ZTS ON

FIGURE 37.

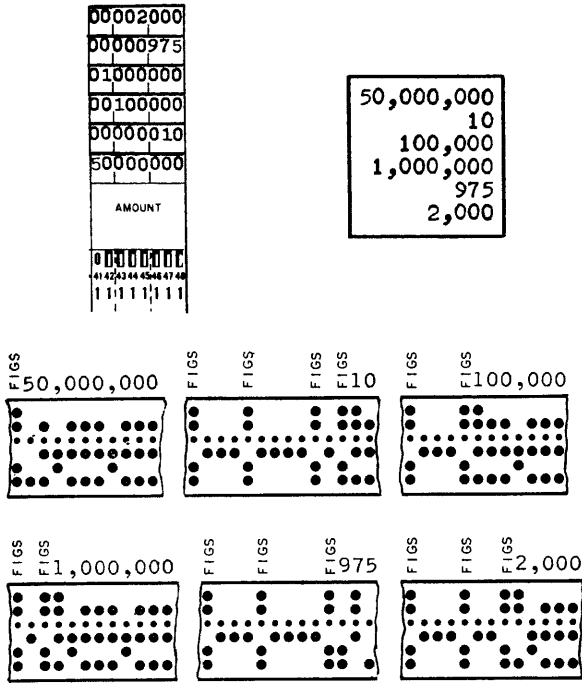| 50,000,000 |
| 10 |
| 100,000 |
| 1,000,000 |
| 975 |
| 2,000 |

FIGURE 38.

Program punching is controlled by columns 42 and 45. The selection of the program punching is controlled by the character impulse emitted by the first significant digit in the field.

In this example (Figure 39), selector 4 is transferred by column 41, the first column of the field. The first character impulse in the field is wired through the transferred hubs of selector 4 to pick up selector 5. If selector 5 is transferred when program punching starts, the exit 1 impulse reaches fig-N, which is arbitrarily chosen as the comma key. If selector 5 is not transferred when program punching starts, the exit 1 impulse punches a space code. Both of these selectors are returned to normal by selector 6, which is controlled by column 46 after program punching is completed for the field.

When a space code is program punched and the machine is in figures-shift, the machine is dropped out of shift so that the first succeeding code read from the card will be automatically preceded by a shift code. This accounts for the second and third figures-shift codes between the spaces for the second amount listed, 10. The space to the left of each of these FIGS codes is program punched; the space to the right is the first code punched

from the card after program punching is completed.

Wiring (Figure 39)

It is assumed that card reading is on when column 41 is reached.

1. Column 41 is wired to ZTS ON, and to pick up selector 4. The hold hubs of selector 4 are connected through the normal hubs of selector 6.

2. The character impulse is wired through the transferred hubs of selector 4 to pick up selector 5. The hold hubs of selector 5 are also connected through the normal hubs of selector 6.

3. Columns 42 and 45 are wired to pick up program A. The S impulse controls the program unit.

4. When there has been a significant digit preceding program punching: Exit 1 of program A is wired through the transferred hubs of selector 5 to the N hub.
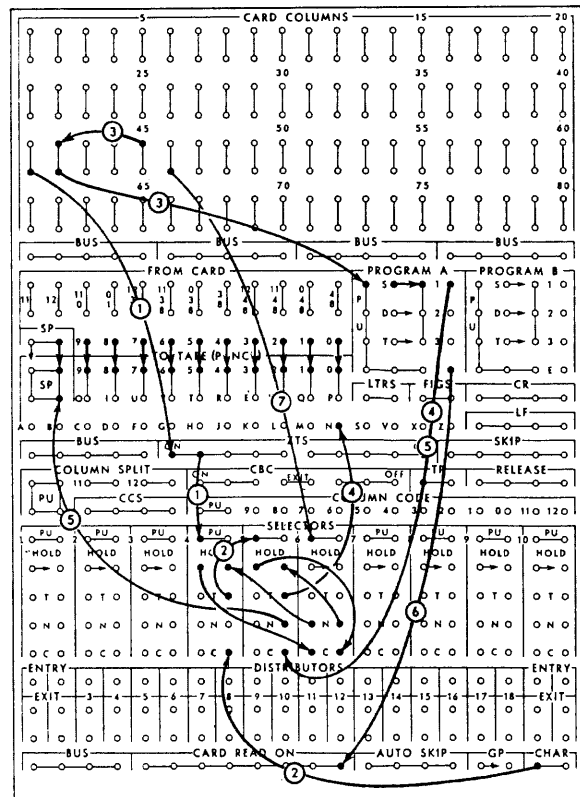

FIGURE 39.

5. When there has been no significant digit preceding program punching: Exit 1 of program A is wired through the normal hubs of selector 5 to the space hub.

6. The E impulse of program A restarts card reading.

7. Column 46 is wired to pick up selector 6 which breaks the hold connections of selectors 4 and 5, if these selectors have been picked up.

The remainder of the wiring is not shown. If commas are needed in additional fields, the wiring to these selectors and program A can be augmented by following the same pattern of wiring; no additional selectors are needed.

11-SKIPPING (FIGURE 40)

IN THIS example, columns 69-73 were key punched when a discount was allowed the customer. When no discount was allowed, an 11 (X) was punched in column 69 to skip the field.

When the card is read by the Type 63 punch, an 11 in column 69 makes the card skip and punches a skip code, fig-G, into the tape. The fig-G will cause skipping of unused discount allowed columns when the tape reproduces cards. Also, it will cause tabulation without printing on telegraph machines which have the tabulating feature; on others, it will usually cause an ampersand to print.
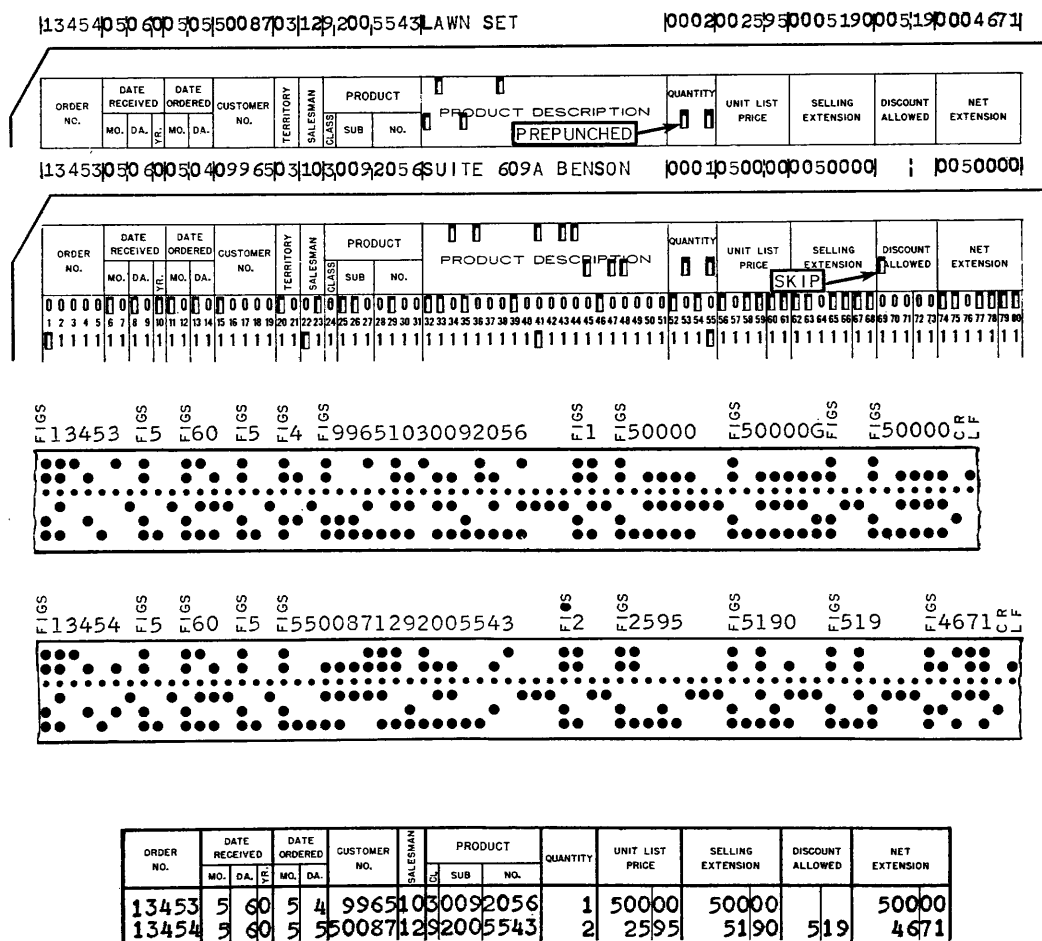

FIGURE 40.

The column split device is used for columns 53 and 55 which have identifying 11's punched over digits. The 11 exit hubs of the device are left unwired, as the 11's are not needed for control purposes in this operation. When the column split device is active, no punching impulse is available at the FROM CARD 11 hub.

ZTS control is wired for columns 6, 8, 11, 13, 15, 52, 56, 62, 69, and 74. It is assumed that no amount will be less than 10¢; therefore, ZTS OFF is not wired.

Wiring (Figure 41)

1. Column 1 is wired to start card reading. Blank columns are wired to punch space codes; digit-for-digit punching is wired.

2. Columns 6, 8, 11, 13, and 15 are wired to ZTS ON.

3. Column 19 causes skipping. A skip-stop insert in the adjustable skip bar is set at column 22.

4. Column 22 is wired to restart card reading directly, or as shown.

5. Column 31 is wired to SKIP directly, or as shown. A skip-stop insert is set at column 52.

6. Column 52 is wired through distributor 5 to restart card reading, and to ZTS ON.

7. Columns 53 and 55 are wired to pick up the column split device.

8. Columns 56, 62, and 69 are wired to ZTS ON.

9. When an 11 is read in column 69, it passes through distributor 2 to the G hub, and to SKIP. A skip-stop insert is set at column 74. When an 11 is not read in column 69, card reading and tape punching continue normally.

10. Column 74 is wired via column 52 through distributor 5 to start card reading, and to ZTS ON.

11. Column 80 is wired to pick up program B, and to release the card. The D impulse controls the program unit.

12. Exit 1 of program B is wired to CR.
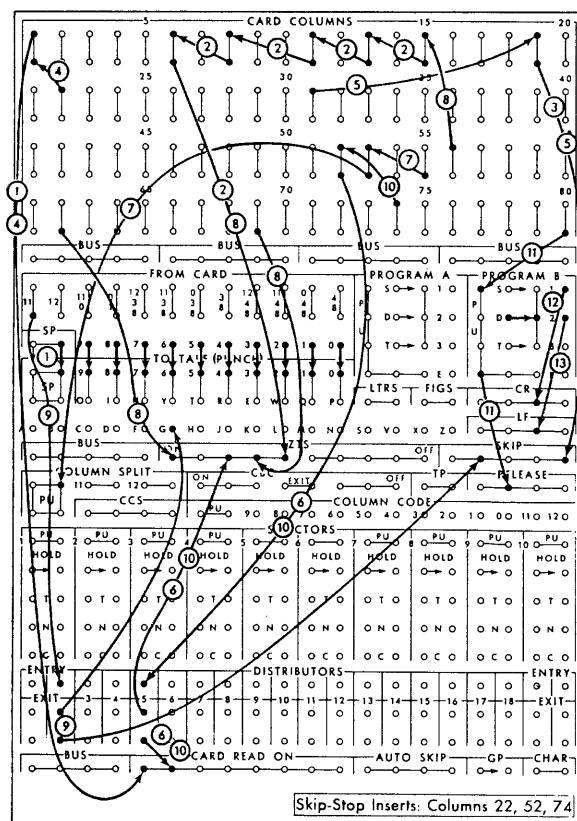
13. Exit 2 of program B is wired to LF.

FIGURE 41.

READING THE FIRST CARD OF EACH GROUP COMPLETELY; READING SUBSEQUENT CARDS PARTIALLY
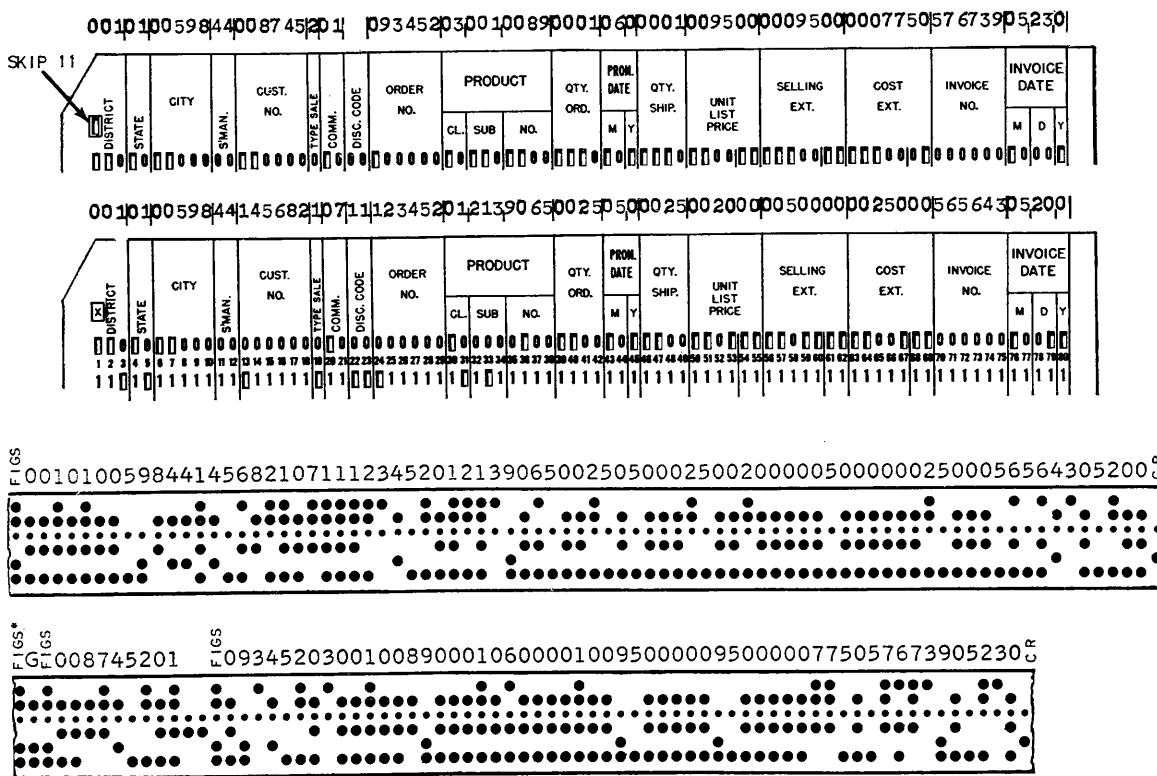### (FIGURE 42)

WHEN cards for this example were key punched, the first card of each group was punched completely, including the repetitive information in columns 1-12. Columns 1-12 of all subsequent cards in the same group were skipped by depressing the skip (X) key at column 1, which punched an 11 into column 1 at the same time. This 11 punch was then used to control a gang punch operation. The information in columns 1-12 on the first card was gang punched into all other cards for the same group. At the end of the gang punching operation, the cards had been punched as follows:

COLUMNS:	1	2	3
First card of group (NX1)		0	0	1
All other cards (X1)	11-0	0	1

When the cards are read for tape punching, the repetitive information in columns 1-12 can be read from the first card of each group and this information can be skipped on all subsequent cards for the same group to increase the speed of tape preparation. To do this, column 1 is analyzed by the column split device to distinguish between the first card and all subsequent cards in a group. The analysis controls the reading of the cards and the punching of the tape in the following manner:

First card of a group: An 11 is not read in column 1 and the card is, therefore, read completely.

All other cards for the same group: An 11 is read in column 1; it activates ccs, picks up program A, and starts a delayed skip. The machine automatically punches a figures-shift code at column 1 after analyzing the digit in that column, which is also suppressed. Therefore, only G needs to be program punched. Exit 1 of program A is wired to punch the G, while columns 2-12 are skipped.

FIGURE 42.

Wiring (Figure 43)

ALL CARDS

1. Column 1 is wired through distributor 1 to start card reading, and to pick up the column split device. Blank columns are wired to punch space codes; digit-for-digit punching is wired.

FIRST CARD OF EACH GROUP

The entire card is read for tape punching.

SUBSEQUENT CARDS FOR THE SAME GROUP

2. The 11 in column 1 is wired from the column split device to CCS, to pick up program A, and to SKIP. The S impulse controls the program unit. A skip-stop insert is set at column 13.

3. Exit 1 of program A is wired to the G hub.

4. Column 13 is wired to restart card reading after skipping.

ALL CARDS

5. Column 80 is wired to pick up program B, and to release the card. The S impulse controls the program unit.

6. Exit 1 of program B is wired to CR.

MASTER NAME CARD FILED AHEAD OF PRODUCT CARDS FOR EACH CUSTOMER (FIGURE 44)

GROUP information need not be punched into the first card of a group, as shown in the preceding example, but it can be stored in a master card which is placed ahead of the group of product cards. The master card is a prepunched card which is pulled from a file whenever it is needed; it is returned to the file after it has been used.

In this example, the information from the master name card and that from the first product card is punched into the tape for the first product card to be reproduced by the tape; no master cards will be reproduced by the tape. Thereafter, the information from each product card is punched into the tape for each remaining product card in the group.

Control Punching

The two kinds of cards (master and product) are distinguished at column 1, which is blank on
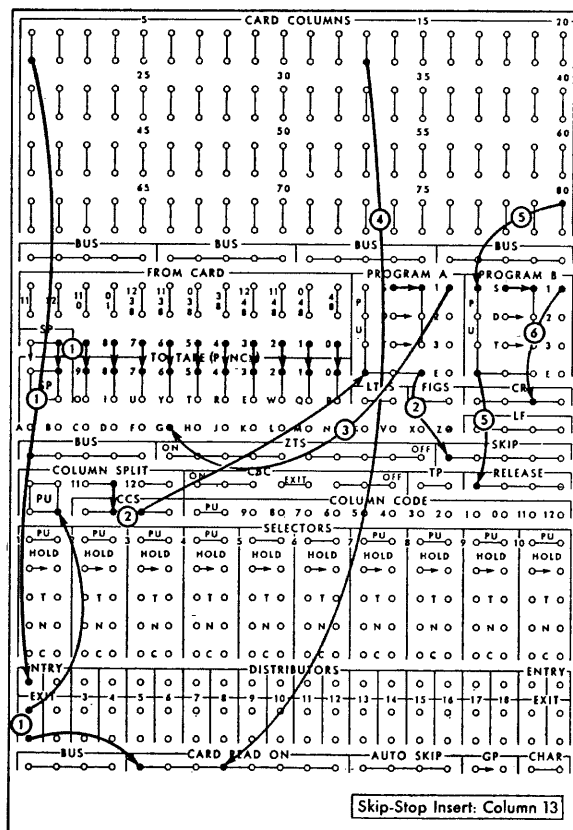

FIGURE 43.

the master card and punched 11 in the product card.

After column 38 is read on the master card, program B is picked up and exit 1 punches a fig-M which will be used for checking purposes when the tape reproduces cards.

The 11 in column 1 on the product cards is recoded to an A in the tape. This fig-A will be used to punch an 11 into the product cards which are reproduced by the tape. The 11, in turn, will be the "detail X" for the subsequent gang punching of group information into product cards.

Use of Distributors

When program punching is started, releasing can also take place. Program B is picked up for the master card, while program A is picked up for the product cards in each group; distributors 9 and 10 are used to allow releasing regardless of which program unit is active.

The 11 impulse is wired through distributor 3 to both SKIP and the A hub. This is done so that an A impulse, which is emitted each time a letter A is read, will not cause unwanted skipping.
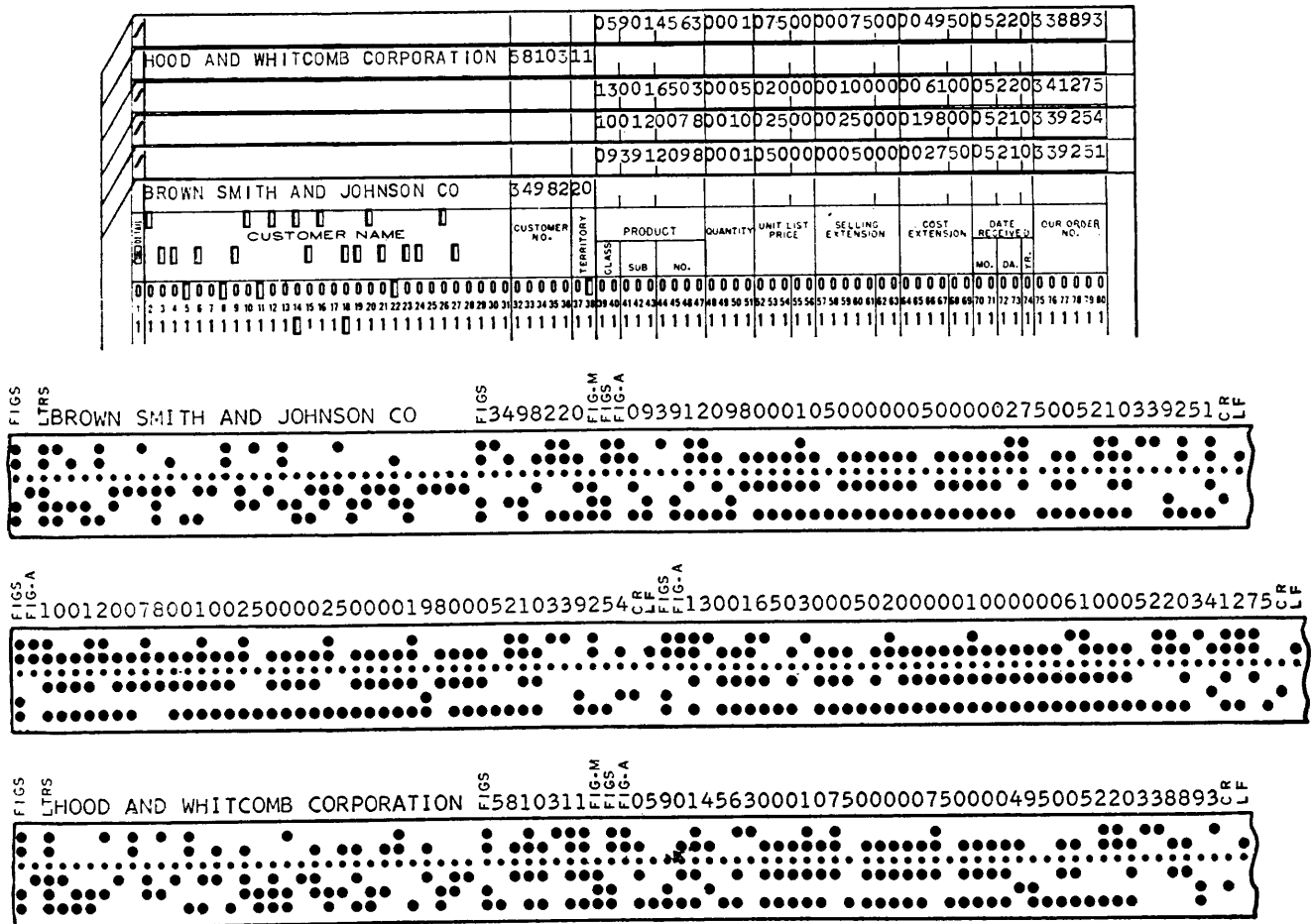

FIGURE 44.

Wiring (Figure 45)

1. Column 1 is wired to start card reading. Blank columns are wired to punch space codes; digit-for-digit punching is wired.

MASTER CARDS

2. Column 38 is wired to pick up program B, and through distributor 10 to release the card. This impulse can be wired directly as shown, as column 38 is read on a master card only. The S impulse controls the program unit.

3. Exit 1 of program B is wired to the M hub.

PRODUCT CARDS

4. The 11 is wired through distributor 3 to the A hub, and to SKIP. A skip-stop insert in the adjustable skip bar is set at column 39.

5. Column 39 is wired via column 1 to restart card reading after skipping.

6. Column 80 is wired to pick up program A, and through distributor 9 to release the card. This impulse can be wired directly, as shown, as column 80 is read on a product card only. The S impulse controls the program unit.

7. Exit 1 of program A is wired to CR.
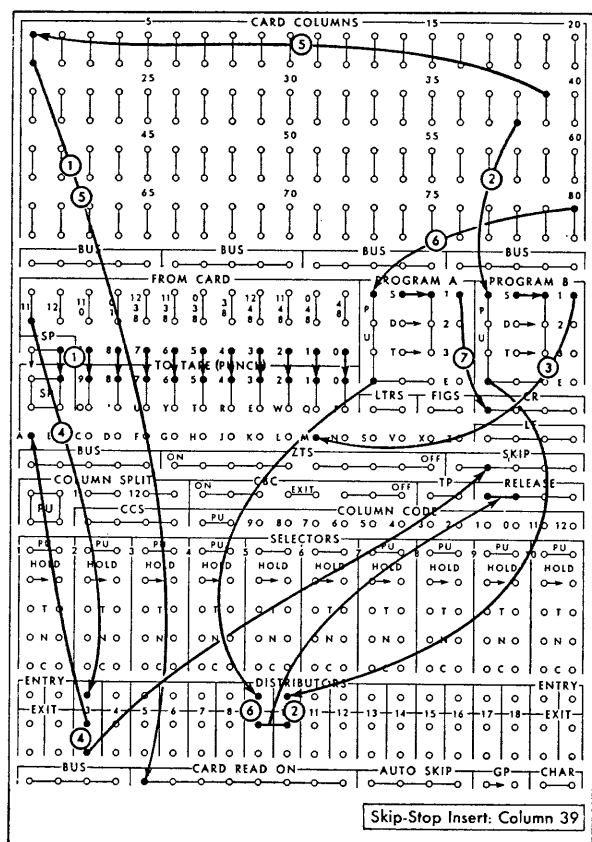

Skip-Stop Insert: Column 39

FIGURE 45.

CONSECUTIVE BLANK COLUMN DEVICE (CBC)

FREQUENTLY fields are not punched completely, making skipping of unused columns desirable. This is particularly true of alphabetic fields. Skipping over the unused columns is faster than spacing, and it conserves tape. Skipping can be accomplished automatically by using the consecutive blank column device. This device can analyze blank columns and emit an impulse when two blank columns are read consecutively. Consecutive blank columns are an indication that the information in the field is completed, while one blank column is only a space between words or groups of numerals.

The number of columns of data is likely to vary greatly on each card. Therefore, usually, the first column of the field is wired to CBC ON.

When CBC is picked up, all single blank columns within the field cause space codes to punch normally. If one blank column is followed by a second blank column, however, or if any card code punches a space and is followed by a blank column, not only is a second space code punched, but an impulse is also available from the common exit hubs to cause skipping, or releasing if the field is the last field to be read from the card. When skipping takes place, a skip code (fig-G) must be punched into the tape to cause skipping of unused columns in the cards reproduced by the tape. The fig-G will also cause tabulation without printing on telegraph machines which have the tabulation feature; on others, it will print an ampersand in most instances. When releasing takes place, a code must be punched into the tape for checking purposes when the tape reproduces cards, or CR and LF codes must be punched into the tape to control printing telegraph machines.

When two blank columns are read consecutively, an exit impulse is available. This impulse can:

Control program punching.
Control a selector.
Cause skipping (SKIP) or releasing.

At CBC exit time, the CBC device is turned off automatically. The CBC device is also turned off

automatically whenever skipping, releasing or gang punching takes place, when the stop button or the thumb lever is operated, or when the tape becomes taut and moves the tape tension guide to the left.

The OFF hubs can be wired from the first card column which is not to have CBC analysis. If consecutive blank columns have not been read before the last three columns of a field are reached, skipping and fig-G program punching will save no time; therefore, CBC is usually wired off from the third to the last column and the last three columns, if blank, will punch three spaces in the tape. The CBC device is not wired off, however, for the following exceptions:

a. If the field is the last field on the card to be read, the exit impulse can release the card whenever it may occur within the field.

b. When CR and LF are being program punched at the end of each address line, as in the instance of multiple line printing cards, (see page 53), the exit impulse can control the program unit whenever it may occur within the field.

As CR and LF must be program punched after the last column in the field is read, in both of these exceptions, time may be gained by allowing the program punching to take place when the CBC exit becomes available. Should the CBC exit activate the program unit and skipping on the last column in the field, program punching will take place and skipping will be stopped in the following column by the skip-stop insert.

When the CBC exit is available, normal escapement from the second blank column to the succeeding column does not take place. Therefore, skipping or releasing must be wired to take place before card reading is resumed. If skipping or releasing does not take place, the second blank column will be reread when card reading is resumed. Skipping or releasing can be activated by the CBC exit impulse, or it can be activated by an impulse from the program unit which is controlled by the CBC exit impulse.

When ZTS and CBC are on at the same time, CBC will not function until ZTS is turned off, either

automatically or by wiring. Programming also suspends the operation of the CBC device. When CBC becomes active after suspension, two consecutive blank columns must be read before CBC exit is available.

Two examples of CBC wiring illustrate the operation of this feature.

Wiring (Figure 46)

In this example, columns 1-20 are reserved for name, and CBC controls program punching and skipping, as follows:

1. Column 1 is wired through distributor 1 to CBC ON, and to start card reading.

2. *John Doe* is read in columns 1-8. Column 9 is blank and a space code is punched into the tape. As column 10 is the second (consecutive) blank column, (a) a second space code is punched into the tape, and (b) an impulse is available at CBC exit. The exit impulse is wired to pick up program A and to SKIP. The D impulse controls the program unit. A skip-stop insert in the adjustable skip bar is set at column 21.

3. Exit 1 of program A is wired to FIGS.

4. Exit 2 of program A is wired to the G hub.

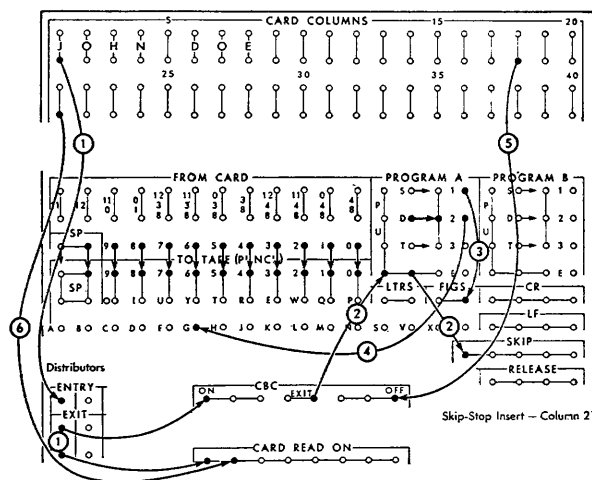5. When no CBC action occurs before column 18, this column is wired to CBC OFF.

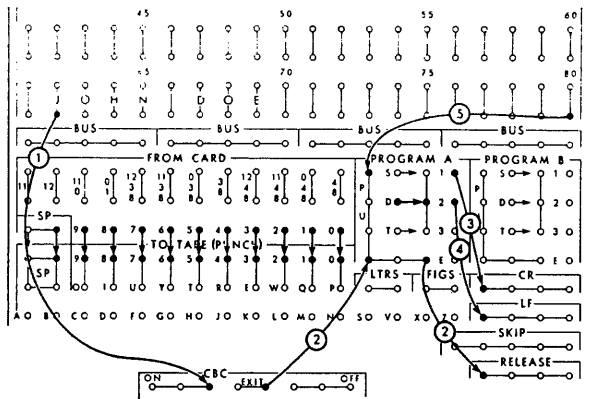FIGURE 46.   CBC CONTROLS PROGRAM PUNCHING
AND SKIPPING

FIGURE 47. CBC CONTROLS PROGRAM PUNCHING
AND RELEASING

6. Column 21 is wired to restart card reading after skipping.

Wiring (Figure 47)

In this example, columns 62-80 are reserved for name, and CBC controls program punching and releasing, as follows:

1. Column 62 is wired to the ON hub of CBC. (It is assumed that card reading is on when this column is reached.)

2. *John Doe* is read in columns 62-69. Column 70 is blank and a space code is punched into the tape. As column 71 is the second (consecutive) blank column, (a) a second space code is punched into the tape, and (b) an impulse is available at CBC exit. The exit impulse is wired to pick up program A, and to release the card. As this is the last field on the card to be read, CBC OFF is not wired and release comes whenever the exit impulse is available, or when column 80 is reached; both of these impulses are wired to activate program B. The D impulse controls the program unit.

3. Exit 1 of program A is wired to CR.

4. Exit 2 of program A is wired to LF.

5. Column 80 is wired to pick up program A, and to release the card. CR and LF are program punched as described in steps 3 and 4.

CONSECUTIVE BLANK COLUMN SKIPPING; RECODING 12 TO FIG-X FOR FRACTIONS (FIGURE 48)

IN THIS example, consecutive blank column control is started at column 42 and stopped at column 67. Therefore, when part description does not require the number of columns designated for it, CBC is active; it causes a fig-G to be program punched and skips the card to column 70.

Skip Control

In this example, there are two types of skipping:
    Skipping started by column 6, so that repetitive information in columns 7-14 is omitted from the tape.
    Skipping started by the CBC exit when the part description does not require the number of columns designated for it.

The CBC exit impulse, which controls the latter type of skipping, is wired to pick up program A, and to SKIP through distributor 10. If CBC exit were wired directly to SKIP from the program pickup hub, column 6 would cause undesired program punching when it causes skipping.

Recoding 12 to Fig-X for Fractions

In this example, fractions are frequently punched somewhere in the part description field, columns 42-69; their locations in the field vary. A fraction, such as 7/32, is punched in four columns, with a 12 in the second column between the 7 and the 32. The 12 can cause a diagonal (/) to print on IBM accounting machines. On printing telegraph machines equipped with standard keyboards, the diagonal is usually on the key with the letter X. Therefore, whenever a 12 is read from the card, it is recoded to punch a fig-x. As the 12 code is read as numerical, no FIGS need be punched ahead of the X in the tape.

ZTS Control

Part number is made up of a letter in column 1 followed by five numerals, i. e. D00508. As D 508 is to print on the report, column 2 is wired to ZTS ON to prepare the tape properly. Columns 15, 21, 26, 31, 36, and 75 are also wired to ZTS ON. Column 78 is wired to ZTS OFF so that any amount under ten cents will have a zero to the left.

PART NUMBER	PREVIOUS BALANCE	RECEIPTS	TRANSFERS	SALES	NEW BALANCE	PART NAME	UNIT OF MEASURE	UNIT COST
B13492	10	1	5	4	2	WASHING MACHINE MODEL 1700	EACH	115 50
D 508	982	4563	295		5250	10 PENNY WIRE NAILS	CWT	5 25
J90042	8000	3000		1000	10000	GROMMETS	DOZ	08
J90600		3169			3169	NO 3 X 1 1/2 LAG SCREWS	C	3 85

TELEGRAPH TAB STOP

FIGURE 48.

45

Wiring (Figure 49)

1. Column 1 is wired to start card reading. Blank columns are wired to punch space codes; digit-for-digit punching is wired. FROM CARD 12 is wired to PUNCH X.

2. Column 2 is wired to ZTS ON.

3. Column 6 is wired to SKIP. A skip-stop insert in the adjustable skip bar is set at column 15.

4. Column 15 is wired through distributor 1 to card read ON, and to ZTS ON.

5. Columns 21, 26, 31, and 36 are wired to ZTS ON via column 2.

6. Column 42 is wired to CBC ON.

WHEN CBC IS ACTIVE:

7. CBC exit is wired to pick up program A, and through distributor 10 to SKIP. The D impulse controls the program unit. A skip-stop insert is set at column 70.

8. Exit 1 of program A is wired to FIGS.

9. Exit 2 of program A is wired to the G hub.

FIGURE 49.

WHEN CBC IS INACTIVE:

10. Column 67 is wired to CBC OFF.

11. Column 70 restarts card reading after program punching and skipping.

12. Column 75 is wired to ZTS ON directly, or as shown.
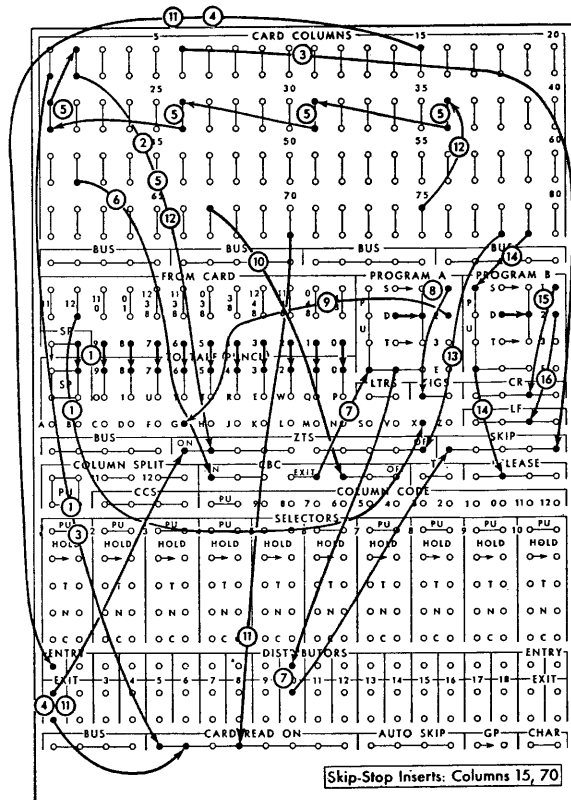
13. Column 78 is wired to ZTS OFF.

14. Column 79 is wired to pick up program B, and to release the card. The D impulse controls the program unit.

15. Exit 1 of program B is wired to CR.

16. Exit 2 of program B is wired to LF.

CBC SKIPPING OR RELEASING, AND CORRESPONDING PROGRAM PUNCHING (FIGURE 50)

IN THIS example, CBC is wired on at columns 12, 33, and 51 for three fields: part description, name, and address. When the part description or name field has unused columns, skipping is activated and FIGS and G are punched by program A; when the address field has unused columns, the card is release, and CR and LF are punched by program B. The CBC exit impulse is controlled through selector 5 to pick up the proper program unit. Selector 5 is normal for columns 1-50 and transferred for columns 51-80.

The CBC device is wired off at columns 23 and 48.

Wiring (Figure 51)

1. Column 1 is wired through distributor 1 to start card reading and to ZTS ON. Blank columns are wired to punch space codes; digit-for-digit punching is wired.
2. Columns 3 and 6 are wired to ZTS ON.
3. Column 12 is wired to CBC ON.

WHEN CBC IS ACTIVE:

4. CBC exit is wired through the normal hubs of selector 5 to pick up program A, and to cause skipping. The D impulse controls the program unit. A skip-stop insert in the adjustable skip bar is set at column 26.
5. Exit 1 of program A is wired to FIGS.
6. Exit 2 of program A is wired to the G hub.

FIGURE 50.

FIGURE 51.

WHEN CBC IS INACTIVE:

7. Column 23 is wired to CBC OFF

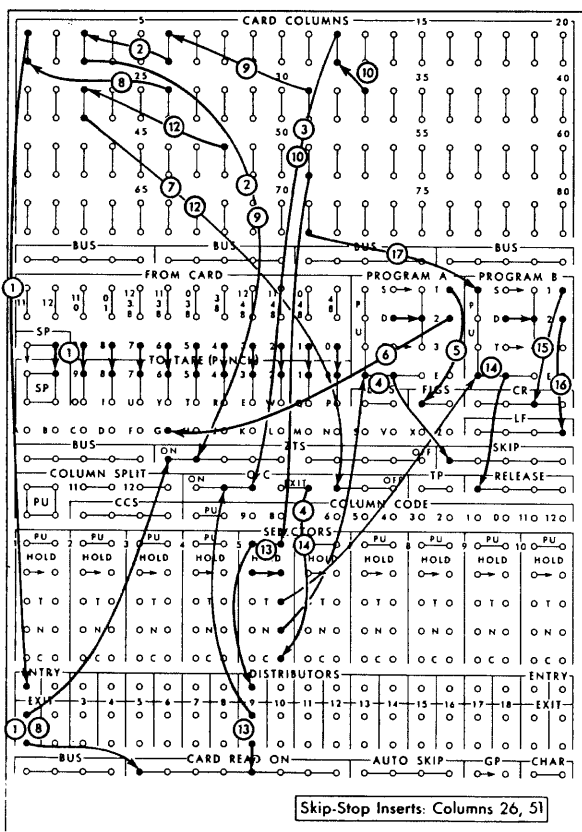8. Column 26 is wired via column 1 to restart card reading after program punching and skipping, and to ZTS ON.

9. Column 31 is wired to ZTS ON directly, or as shown.

10. Column 33 is wired to CBC ON via column 12.

WHEN CBC IS ACTIVE:

11. Fig-G is program punched as described in steps 4, 5, and 6, and skipping takes place. A skip-stop insert is set at column 51.

WHEN CBC IS INACTIVE:

12. Column 48 is wired to CBC OFF via column 23.

13. Column 51 is wired to pick up selector 5; it is also wired through distributor 9 to CBC ON, and to restart card reading after program punching and skipping. The hold hubs of selector 5 are connected so that the selector will remain transferred.

WHEN CBC IS ACTIVE:

14. CBC exit is wired through the transferred hubs of selector 5 to pick up program B, and to release the card. The D impulse controls the program unit.

15. Exit 1 of program B is wired to CR.

16. Exit 2 of program B is wired to LF.

WHEN CBC IS INACTIVE:

17. Column 71 is wired to pick up program B, and to release the card. CR and LF are program punched as described in steps 14, 15, and 16.

FRACTIONS: FROM THREE CARD CODES TO ONE TAPE CODE (Figure 52)

WHEN a card is punched with fractions in three *specific* card columns (⅛, ¼, ⅜, etc.), three codes for each fraction can be punched into the tape (as explained on page 44). If the printing area is limited on the report to be printed by telegraph, it may be necessary to limit the printing of each fraction to one type space by punching one code instead of three into the tape; the one code is a figures-shift character.

Figures-Shift Characters

Fraction-printing telegraph machines usually print the fractions corresponding to the following figures-shift characters:

FIGURES-SHIFT CHARACTER	FRACTION ON TELEGRAPH MACHINE
C	⅛
F	¼
V	⅜
K	½
B	⅝
L	¾
N	⅞
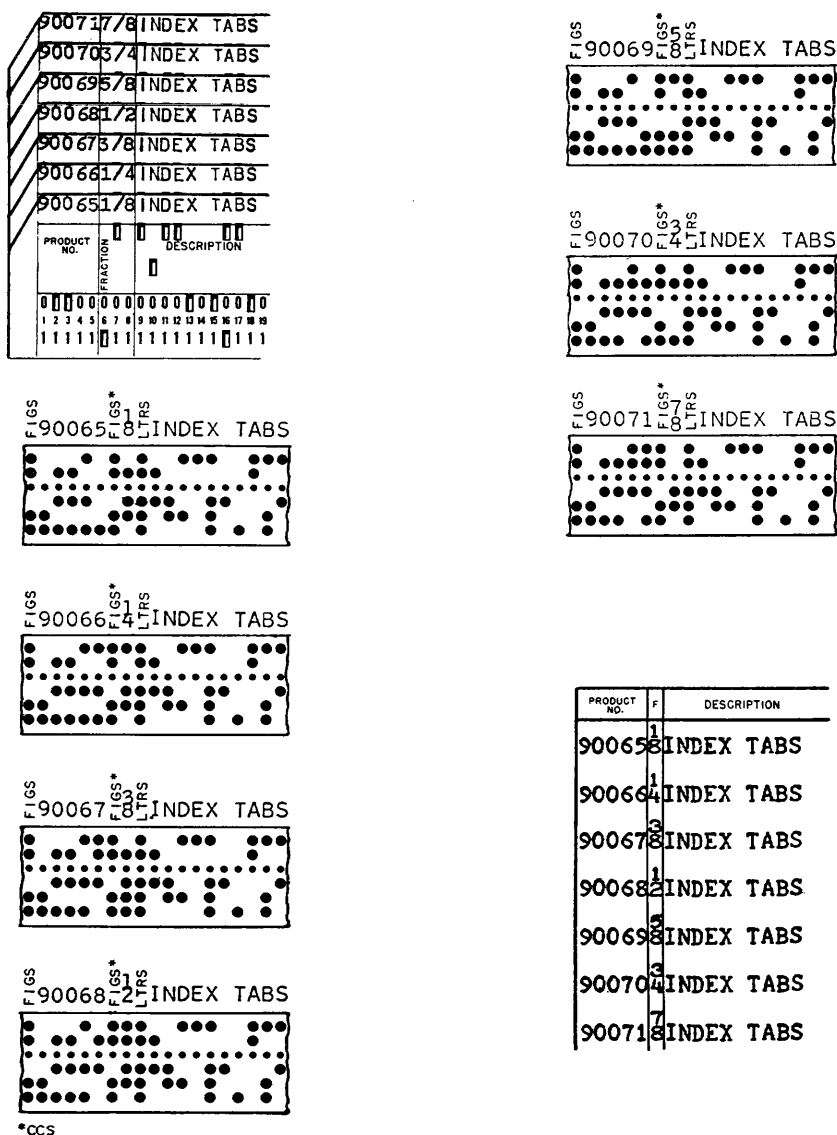
FIGURE 52.

In this example, three of the numerators (1, 3, and 5), which are read in column 6, are wired through the column code device to control selectors 7, 8, and 9. The fourth numerator (7) is handled on the exception basis. In other words, when none of these selectors transfer, the numerator is a 7. CCS is impulsed by column 6 so that the numerators will not punch the tape.

Column 7 is punched 12 in all cards. As only the numerator and the denominator of each fraction need to be read, this column is skipped.

Once a selector is picked up, it is kept transferred until the denominator (2, 4, or 8) is read in column 8. Thus, each denominator is controlled by the selectors to punch the proper figures-shift character on a recode basis.

Wiring (Figure 53)

1. Column 1 is wired to start card reading. Blank columns are wired to punch space codes; digit-for-digit punching is wired either directly or through the normal hubs of selectors 5 and 6.

2. Column 6 is wired (a) to CCS, (b) to pick up the column code device, and (c) to cause skipping. A skip-stop insert in the adjustable skip bar is set at column 8.

3. Code 1 is wired to pick up selector 9.

4. Code 3 is wired to pick up selector 8.

5. Code 5 is wired to pick up selector 7.

When selector 7, 8 or 9 is picked up, it remains transferred for the remainder of the card cycle, as the hold hubs in each are connected.

6. Column 8 is wired to pick up selectors 5 and 6.

7. One of the three denominators (2, 4, or 8) is read in column 8 and is controlled by the selectors to punch the proper figures-shift code as follows:

For $\frac{1}{2}$: Digit 2 is wired through the transferred hubs of selector 6 to the K hub.

For $\frac{1}{4}$: Digit 4 is wired through the transferred hubs of selectors 6 and 9 to the F hub.

For $\frac{3}{4}$: Digit 4 is wired through the transferred hubs of selector 6 and the normal hubs of selector 9 to the L hub.

For $\frac{1}{8}$: Digit 8 is wired through the transferred hubs of selectors 5 and 9 to the C hub.

For $\frac{3}{8}$: Digit 8 is wired through the transferred hubs of selector 5, the normal hubs of selector 9, and the transferred hubs of selector 8 to the V hub.

For $\frac{5}{8}$: Digit 8 is wired through the transferred hubs of selector 5, the normal hubs of selectors 9 and 8, and the transferred hubs of selector 7 to the B hub.

For $\frac{7}{8}$: Digit 8 is wired through the transferred hubs of selector 5, and the normal hubs of selectors 9, 8, and 7 to the N hub.
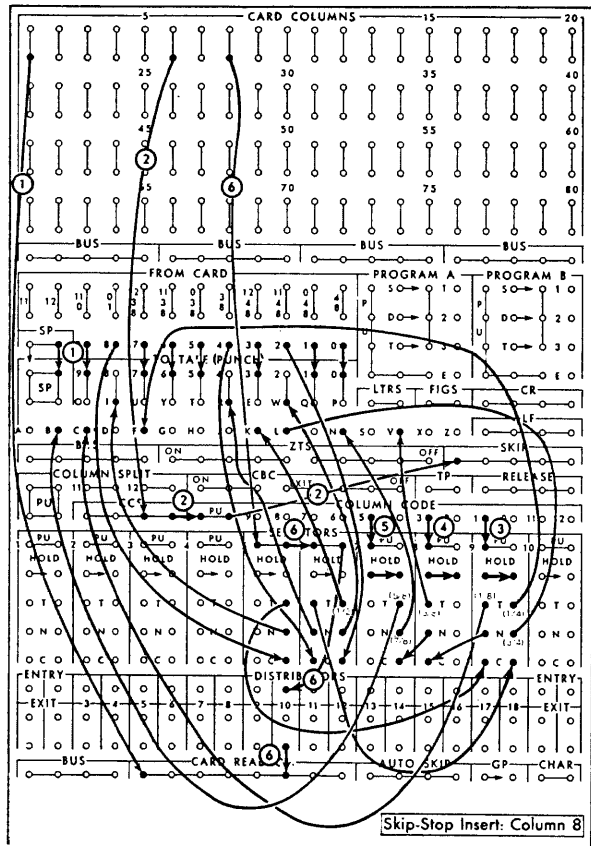
FIGURE 53.

SELECTIVE SKIPPING BY TYPE OF CUSTOMER
(FIGURE 54)

THE EXAMPLE shown in Figure 19 shows selective skipping controlled by the type of card. The following example shows selective skipping controlled by the type of customer. The previous example has one skip selected, while the following example has successive skips selected.

The type of customer is coded, as follows, in column 43:

          1 – Jobber
          2 – Dealer
          3 – Retailer
          4 – Special

These customer codes control card reading and skipping for columns 43-75 inclusive, as follows:

TYPE CUST.	SKIP	AUTO SKIP	CARD READ ON
1	52	53, 62, 71	
2	2 in 43, 61	62, 71	53
3	3 in 43, 70	53, 71	62
4	4 in 43,	53, 62	71

CUST. NAME	CUST. NO.	BRANCH	SWAN	PROD. NO.	QTY.	TYPE CUST.	JOBBER 1		DEALER 2		RETAILER 3		SPECIAL 4	COST
							UNIT PR.	EXT.	UNIT PR.	EXT.	UNIT PR.	EXT.	EXT.	
ROSALIND INC	49876	24	12	50180	10	4	0150	0150000	165	01650	0178	01780	0099	000850
LINCOLN WOODS	33561	24	12	30050	013	0077	00077	0080	000800	100	00100		00055
JOSEPH NYE	27940	24	12	1983	100	20475	47500	0500	500000	525	52500		30000
DAVID HOWARD	23247	24	12	0426	167	10100	16700	0110	18370	0115	19205		12500

FIGURE 54.

DAVID HOWARD 2324712042616710100167001250

JOSEPH NYE 279401219831002050050000030000

LINCOLN WOODS 335611230050013010000100000055

ROSALIND INC 4987612501801040099000850

Wiring (Figure 55)

ALL CARDS

1. Column 1 is wired through distributor 1 to start card reading, and to CBC ON to skip unused alphabetic columns. Blank columns are wired to punch space codes; digit-for-digit punching is wired.

WHEN CBC IS ACTIVE:

2. CBC exit is wired to pick up program B, and through distributor 10 to cause skipping. A skip-stop insert in the adjustable skip bar is set at column 27. The D impulse controls the program unit.

3. Exit 1 of program B is wired to FIGS.

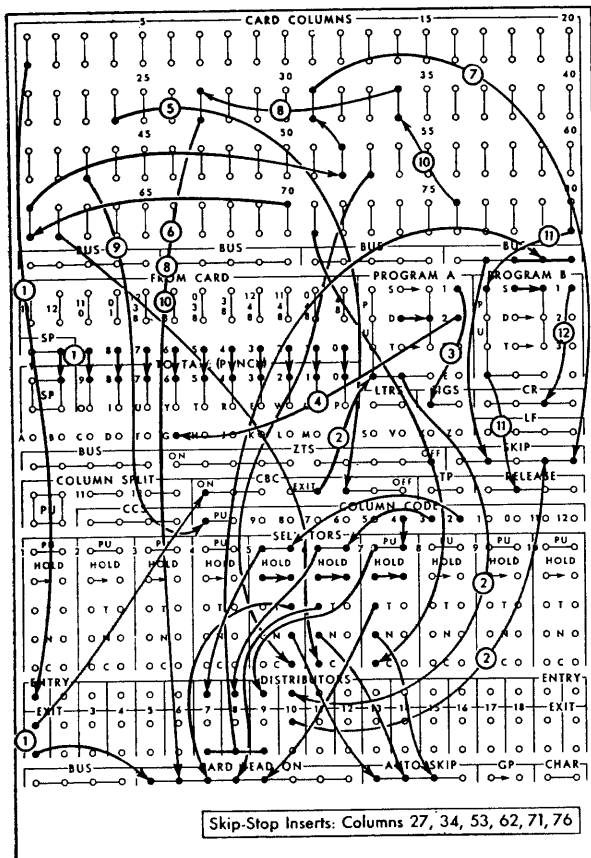4. Exit 2 of program B is wired to the G hub.

Skip-Stop Inserts: Columns 27, 34, 53, 62, 71, 76

FIGURE 55.

WHEN CBC IS INACTIVE:

5. Column 24 is wired to CBC OFF.

6. Column 27 restarts card reading after program punching and skipping.

7. Column 31 is wired to SKIP. A skip-stop insert is set at column 34.

8. Column 34 is wired to restart card reading via column 27.

9. Column 43 is wired to pick up the column code device. A 1, 2, 3, or 4 is read in this column. Selectors 5, 6, and 7 are controlled by codes 2, 3, and 4, respectively. Depending upon the type of customer code, one of these selectors transfers and remains transferred for the duration of the card cycle, as the hold hubs in each selector are connected.

TYPE 1

a. Column 52 is wired to SKIP via column 31. This column is read for this type of customer and skipped for all other types. Therefore, it need not be selected but can be wired directly, or as shown. A skip-stop insert at column 53 stops the skip.

b. Column 53 is wired through the normal hubs of selector 5 to AUTO SKIP. A skip-stop insert at column 62 stops the skip.

c. Column 62 is wired through the normal hubs of selector 6 to AUTO SKIP. A skip-stop insert at column 71 stops the skip.

d. Column 71 is wired through the normal hubs of selector 7 to AUTO SKIP. A skip-stop insert at column 76 stops the skip.

Steps b, c, and d cause successive skipping.

TYPE 2

a. Code 2 is wired from the pickup hub of selector 5 through distributor 7 to SKIP via bus.

b. Column 53 is wired through the transferred hubs of selector 5 to restart card reading.

c. Column 61 is wired to SKIP directly, or as shown.

d. Column 62 is wired through the normal hubs of selector 6 to AUTO SKIP.

e. Column 71 is wired through the normal hubs of selector 7 to AUTO SKIP.

TYPE 3

a. Code 3 is wired from the pickup hub of selector 6 through distributor 8 to SKIP via bus.

b. Column 53 is wired through the normal hubs of selector 5 to AUTO SKIP.

c. Column 62 is wired through the transferred hubs of selector 6 to restart card reading.

d. Column 70 is wired to SKIP directly, or as shown.

e. Column 71 is wired through the normal hubs of selector 7 to AUTO SKIP.

TYPE 4

a. Code 4 is wired from the pickup hub of selector 7 through distributor 9 to SKIP via bus.

b. Column 53 is wired through the normal hubs of selector 5 to AUTO SKIP.

c. Column 62 is wired through the normal hubs of selector 6 to AUTO SKIP.

d. Column 71 is wired through the transferred hubs of selector 7 to restart card reading.

ALL CARDS

10. Column 76 is wired to restart card reading for all cards when necessary.

11. Column 80 is wired to pick up program B, and to release the card. The S impulse controls the program unit.

12. Exit 1 of program B is wired to CR.

THREE LINES FROM ONE CARD (FIGURE 56)

WHEN NAME and address information is read from one card, tape can be punched to operate the printing telegraph machine automatically so that the information will be listed on three lines as shown in Figure 56. Cards of this type of operation are known as MLP (multiple line printing) cards.

This type of operation requires functional codes punched into the tape as follows:

(a) CR and LF codes are punched after the information which will complete each line on the document; i. e., after *name,* after *street,* and after *customer number.*

(b) It is assumed in this example that the telegraph machine will have the tabulation feature.
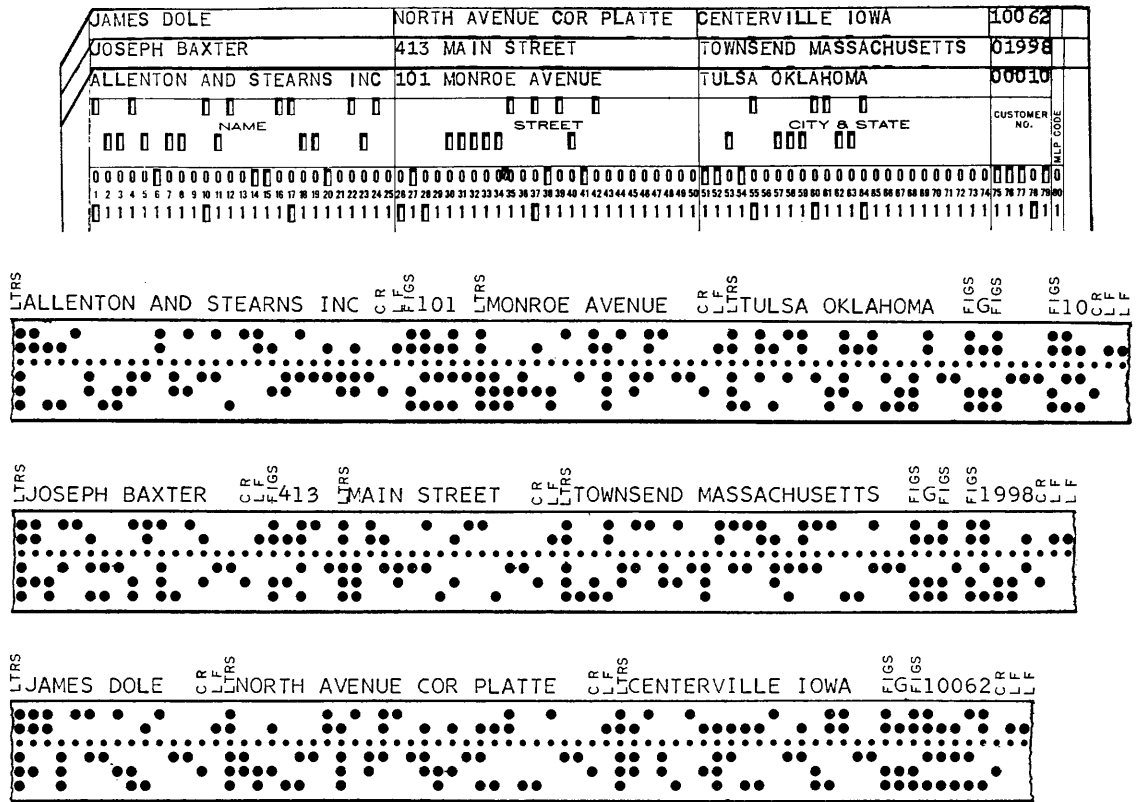
FIGURE 56.

Therefore, a fig-G is punched after *city and state* to cause the telegraph machine to tabulate to the column where *customer number* is to be printed.

(c) The name and address groups are separated by an additional line space. Therefore, an additional LF code is program punched after column 79 is read and its information is punched.

CBC Control

The CBC device is turned on at columns 1, 26, and 51. Whenever possible, the functional codes mentioned above are program punched simultaneously with skipping and releasing. The CBC exit controls this type of program punching. When no CBC action takes place, however, program punching is activated by the last column of the field. CBC is not turned off for any of the fields, as time may be gained by allowing the program punching to take place when the CBC exit becomes available.

Skip Control

Any CBC exit will cause skipping. When the exit impulse is available on the last column of a field, the skip-stop insert at the next column will stop the skip.

Program Control

Program B is controlled by column 25 or 50, or by a CBC exit impulse prior to column 52. It is also controlled by column 79.

Program A is controlled by column 74, or by a CBC exit after column 52 is read.

Column 52 is wired to pick up selector 6, which remains transferred until a new card is fed. CBC exit is wired through the normal hubs of this selector to pick up program B, and through the transferred hubs to pick up program A, which punches fig-G. The D impulse controls program A. The control of program B is selected; the D impulse is wired through the normal hubs of selector 6 to control the program unit, and CR and LF are punched prior to column 52, or the T impulse is wired through the transferred hubs of selector 6 to control the program unit, and CR and two LF's are punched when column 79 picks up program B.

Delayed Release

When either the impulses to control the punching cycles of a program unit, as in this example, or the exit impulses are wired through the transferred hubs of a selector at release time, the impulse to release must be delayed; the card must not be released until program punching is completed. This allows the selector to remain transferred long enough to select all impulses in the program unit. Release can be wired from the last program exit used, or from the program end impulse. In this example, the program exit 3 is used as it is available only when the card is to be released.

Wiring (Figure 57)

1. Column 1 is wired through distributor 1 to start card reading, and to CBC ON. Blank columns are wired to punch space codes; digit-for-digit punching is wired.

WHEN CBC IS ACTIVE:

2. CBC exit is wired through distributor 10 to SKIP, and through the normal hubs of selector 6, controlled by column 52, to pick up program B. A skip-stop insert in the adjustable skip bar is set at column 26.

3. The D impulse is wired through the normal hubs of selector 6 to control program B.

4. Exit 1 of program B is wired to CR.

5. Exit 2 of program B is wired to LF.

WHEN CBC IS INACTIVE:

6. Column 25 is wired to pick up program B. CR and LF are program punched as described in steps 3, 4, and 5.

7. Column 26 is wired to restart card reading after program punching and skipping, and to CBC ON via column 1.

WHEN CBC IS ACTIVE:

8. CBC exit is wired as described in step 2, and program punching of CR and LF follows as described in steps 3, 4, and 5. A skip-stop insert is set at column 51.
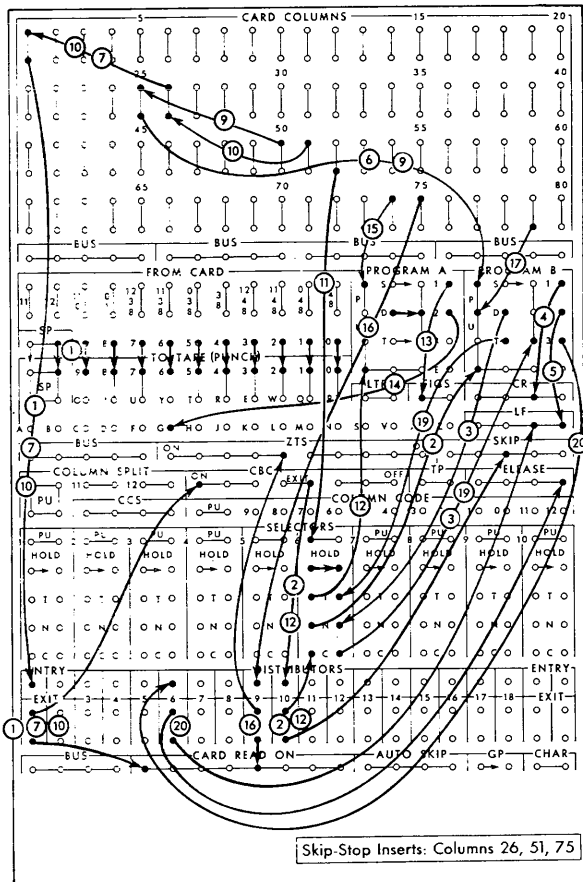
Skip-Stop Inserts: Columns 26, 51, 75

FIGURE 57.

WHEN CBC IS INACTIVE:

9. Column 50 is wired to pick up program B via column 25. Program punching of CR and LF follows as described in steps 3, 4, and 5.

10. Column 51 is wired to restart card reading after program punching and skipping and to CBC ON via columns 26 and 1.

11. Column 52 is wired to pick up selector 6. The hold hubs are connected.

WHEN CBC IS ACTIVE:

12. CBC exit is wired through distributor 10 to SKIP, and through the transferred hubs of selector 6 to program A. The D impulse controls program A. A skip-stop insert is set at column 75.

13. Exit 1 of program A is wired to FIGS.

14. Exit 2 of program A is wired to the G hub.

WHEN CBC IS INACTIVE:

15. Column 74 is wired to program A, and FIGS and G are program punched as described in steps 12, 13, and 14. A skip-stop insert is set at column 75.

16. Column 75 is wired through distributor 9 to restart card reading after program punching and skipping, and to ZTS ON.

17. Column 79 is wired to pick up program B.

18. The T impulse is wired through the transferred hubs of selector 6 to control program B. CR and LF are program punched from exits 1 and 2 as described in steps 4 and 5.

19. Exit 3 is wired through distributor 6 to LF and to release.

QUANTITY SYMBOLS (FIGURE 58)

PRICES ARE often quoted per dozen or per gross rather than per unit. When this type of price structure is used, a single code (1, 2, or 3) in the IBM card will identify the price applied. However, when the information in the tape is to be transmitted by telegraph and a document is to be printed simultaneously, it is usually preferred to decode the price by printing an EA, DZ, or GR symbol.

This example shows how the program punched codes are selected by the single digit code in the card, column 54, to punch the proper symbol into the tape.
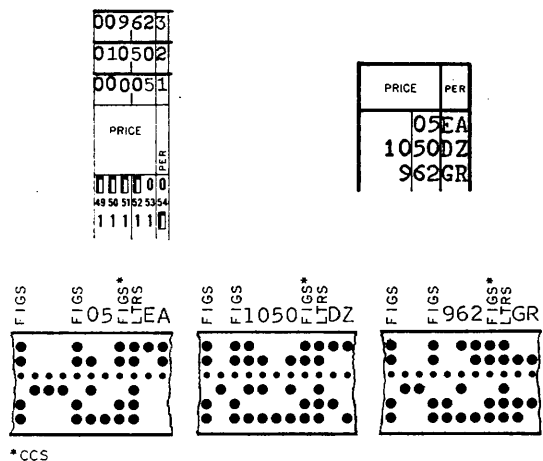

FIGURE 58.

Wiring (Figure 59)

Only the wiring pertinent to this example is shown; it is assumed that card reading is on when column 49 is reached.

ALL CARDS

1. Column 49 is wired to ZTS ON.

2. Column 52 is wired to ZTS OFF.

3. Column 54 is wired (a) to pick up program A, (b) to pick up the column code device, and (c) to CCS. The T impulse controls the program unit. Column code 1 is wired to pick up selector 9, and column code 2 is wired to pick up selector 8. The selectors remain transferred for the remainder of the card cycle, as the hold hubs for each selector are connected.

4. Exit 1 of program A is wired to LTRS.

CODE 1 CARDS

5. Exit 2 of program A is wired through the transferred hubs of selector 9 to the E hub.

6. Exit 3 of program A is wired through the transferred hubs of selector 9 to the A hub.

CODE 2 CARDS

7. Exit 2 of program A is wired through the normal hubs of selector 9 and the transferred hubs of selector 8 to the D hub.
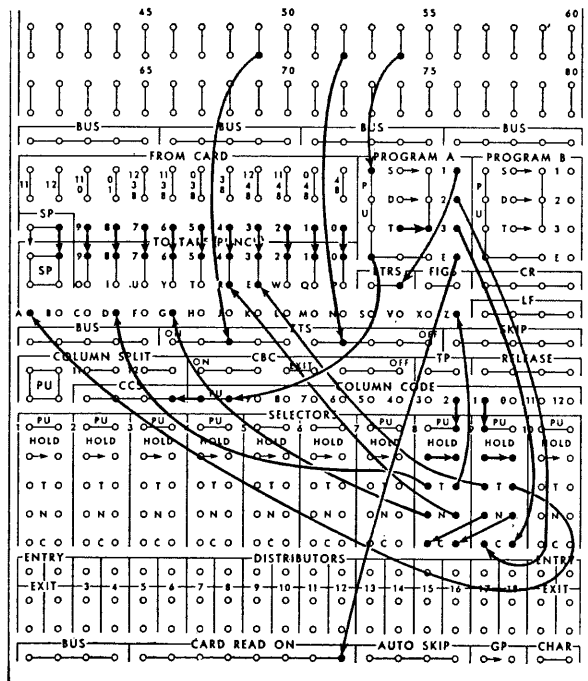
8. Exit 3 of program A is wired through the normal hubs of selector 9 and the transferred hubs of selector 8 to the Z hub.

CODE 3 CARDS

9. Exit 2 of program A is wired through the normal hubs of selectors 9 and 8 to the G hub.

10. Exit 3 of program A is wired through the normal hubs of selectors 9 and 8 to the R hub.

ALL CARDS

11. The E impulse of program A is wired to restart card reading, if desired.

TWELFTHS (FIGURE 60)

WHEN quantities are punched in dozens instead of units, the twelfths are usually punched in one column. The following list gives the twelfths and the corresponding tape codes:

TWELFTHS	CARD CODE	TAPE CODE	PRINTED ON THE TELEGRAPH DOCUMENT
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	11	*fig-K	10
11	12	*fig-L	11

*Usually standard codes for these special characters.

The wiring for these codes is shown in Figure 60. If 11's or 12's are read from the card in other columns for other functions, they will have to be wired to the K and L hubs through the transferred hubs of a selector controlled by column 12.
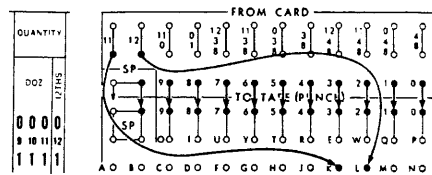

FIGURE 59.

FIGURE 60.

GANG PUNCHING (GP)

REPETITIVE information which is not punched in the cards, may be gang punched into the tape. The repetitive information may be gang punched for all cards or for specific cards.

Gang punching is punching codes from the card column impulses instead of the normal FROM CARD impulses. All codes may be gang punched, including LTRS and FIGS. Prior to this operation, LTRS and FIGS could be punched only by program exit impulses.

When gang punching is to take place, the gang punch (GP) hubs are connected. Even though gang punching is going on, card reading still must function so that the card will move from column to column as it does when normal punching is taking place. The columns in the card which are passed over as gang punching takes place may be blank or punched. If these columns are punched, they must contain information which is not to be punched into the tape. When the GP hubs are connected, normal shift testing and normal punching are suspended.

When information is gang punched, the proper shift codes must be punched prior to the desired gang punched information, (a) to insure proper printing by the telegraph machine, and (b) to insure proper punching when cards are reproduced by the tape. As shown in Figure 61, the number of columns needed on the card equal the number of codes to be punched including the shift codes, unless program punching is combined with the gang punching operation. When program punching is used, the number of codes which are program punched reduce the number of columns needed for gang punching. Figures 63 and 65 illustrate this point; Figure 63 has gang punching only while Figure 65 has program punching also.
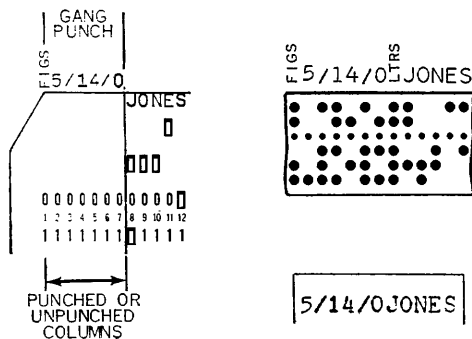
When normal punching is resumed after gang punching, the first column is analyzed and a shift code is automatically punched if a change in shift occurs.

Effect on Devices

If the ZTS device is on when gang punching is started, it is automatically turned off.

The column split and column code devices can be used whether normal punching or gang punching takes place, thus providing means for picking up selectors to control gang punching for different types of cards.

FIGURE 61.

FIGURE 62. WIRING FOR FIGURE 61

FIGURE 63.

FIGURE 64. WIRING FOR FIGURE 63

Selector Control for Gang Punching

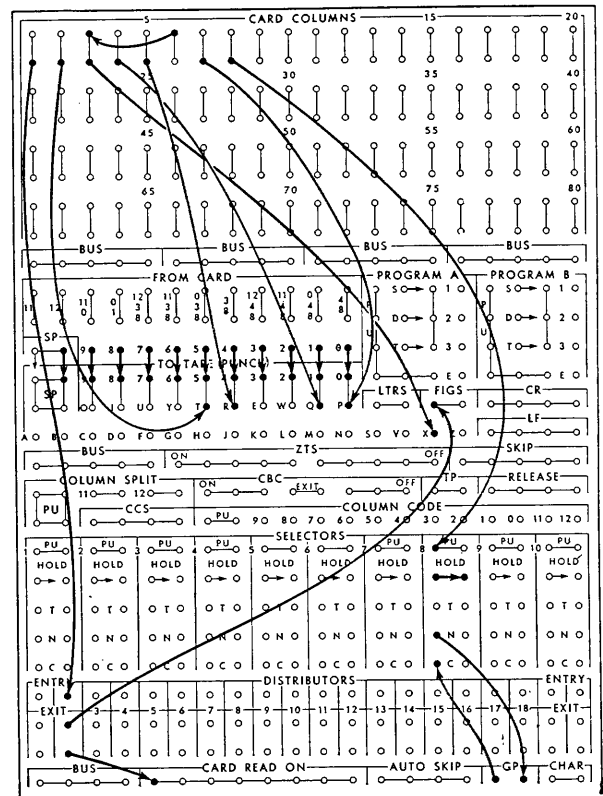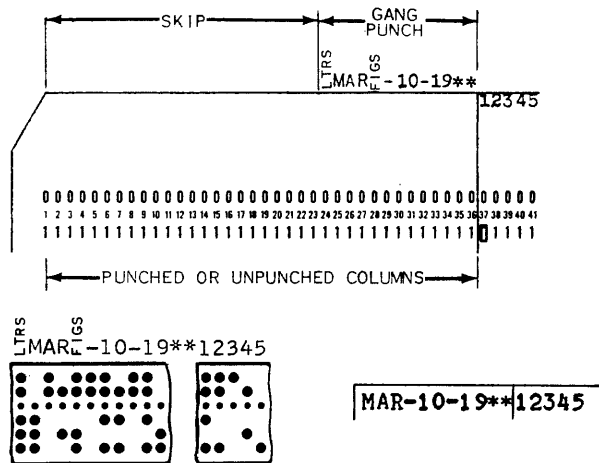The connection of the GP hubs must be made when gang punching is taking place and the connection must be broken when normal punching is taking place. Therefore, the connection is controlled by one or two selectors, depending on when gang punching is being done.

When gang punching takes place before normal punching, the GP hubs are connected through the normal hubs of a selector which is controlled by the first column where normal punching is effective, as shown in Figures 62, 64, and 66. The hold hubs of the selector are connected so that the selector will remain transferred for the remainder of the card cycle.

When gang punching takes place after normal punching is completed for a card cycle, the GP hubs are connected through the transferred hubs of a selector which is controlled by the first column where gang punching is effective, as shown in Figure 68. The hold hubs of the selector are connected so that the selector will remain transferred for the remainder of the card cycle.

When gang punching and normal punching are interspersed, two selectors are needed: one selector controls the GP connection and the second selector controls the hold circuit of the first selector, as

shown in Figure 70. Regardless of how many times gang punching is interspersed with normal punching, only these two selectors are needed, for additional controls can be added to those shown.

Gang Punching Shift Codes

When the first information punched during a card cycle is gang punched information, this information must be preceded by the proper shift code, as shown in Figures 61, 63, and 65. It will be noted that a column in each case is assigned to punch the required shift code.

When gang punched information follows normally punched information, a shift code need not be punched if the first gang punched code is in the same shift as the last normally punched code as shown in Figures 67 and 71.
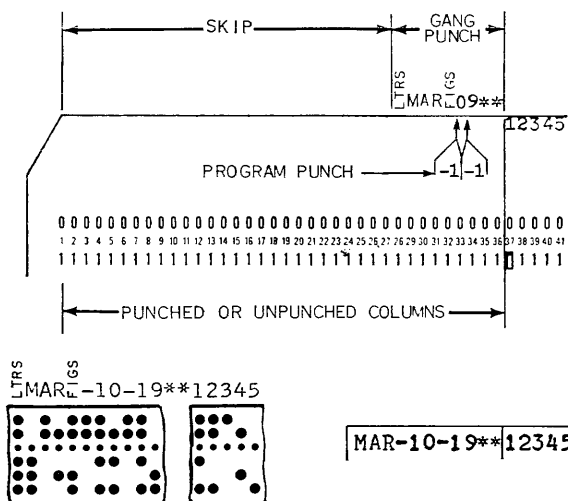
FIGURE 65.

FIGURE 67.

As previously mentioned, the space function of printing telegraph machines is normally independent of shift. However, some machines are arranged to shift automatically from figures to letters whenever a space follows a figures-shift character. Therefore, when a space code is gang punched, FIGS must be gang punched directly ahead of the first figures-shift character code
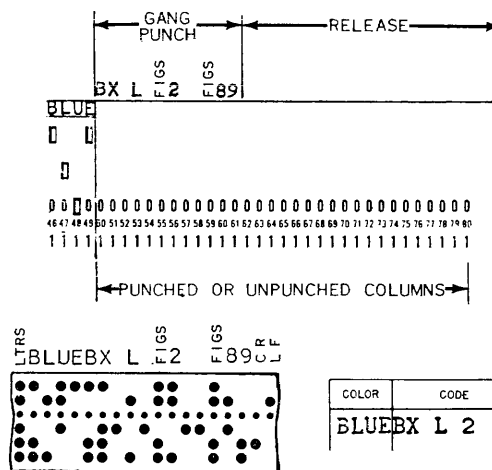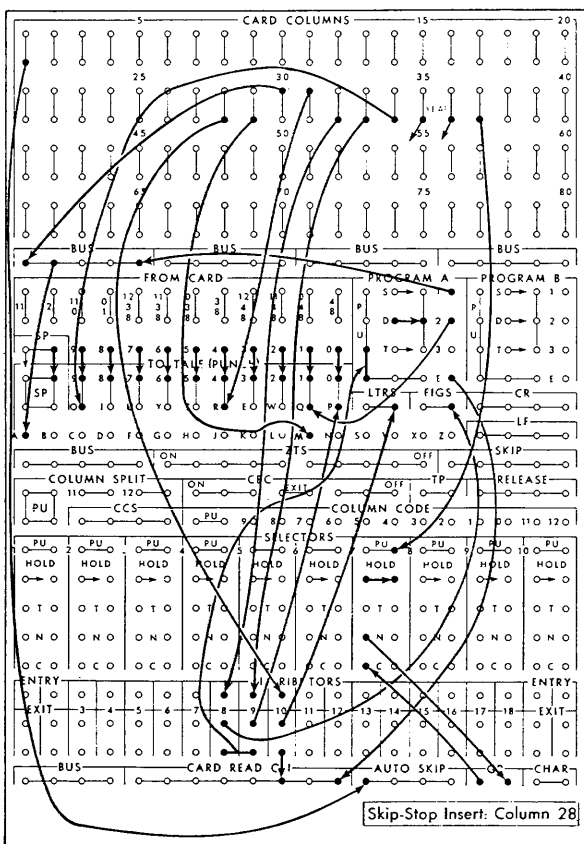
FIGURE 66. WIRING FOR FIGURE 65
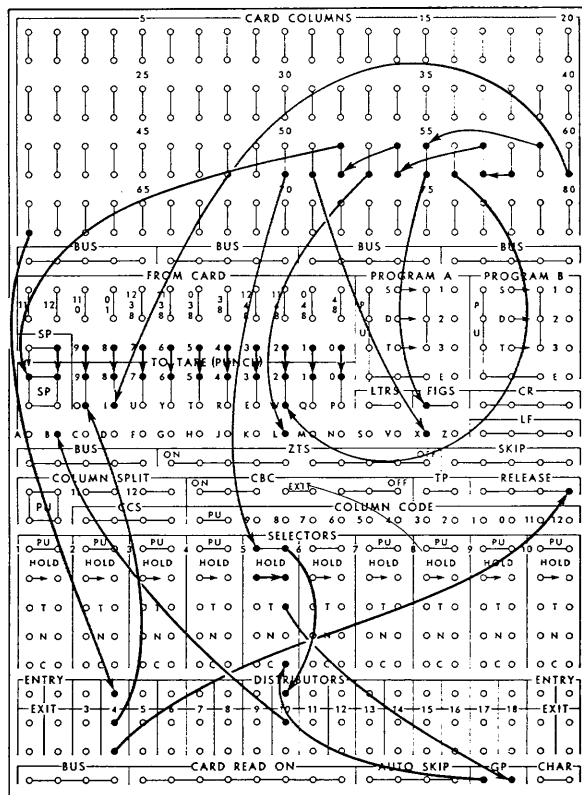
FIGURE 68. WIRING FOR FIGURE 67
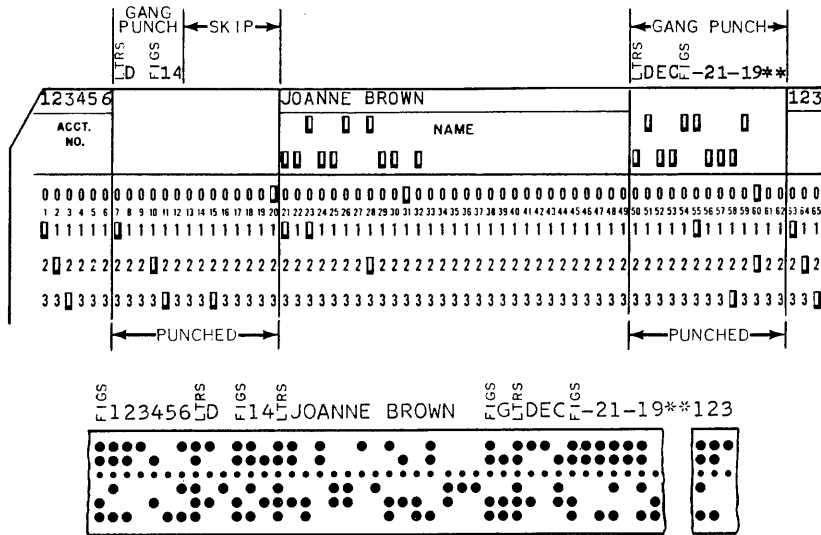
FIGURE 69.

which is gang punched after the space code, as shown in Figure 67. To reduce the number of codes gang punched, a diagonal, a hyphen, or some other symbol is used wherever possible instead of a space.

When gang punched information follows normally punched alphabetic information which is CBC controlled, a shift code must always be punched preceding the gang punched information, as shown in Figure 69, for it is impossible to ascertain what shift the machine is in when the gang punching starts. When CBC has been active and a fig-G has been program punched, the machine is in figures-shift, but when CBC has not been active, the machine is in letters-shift.

Selected Gang Punching

As previously mentioned, gang punching can be selected for different types of cards. An example of gang punch selection is shown in Figures 71 and 72; the information gang punched is alphabetic.
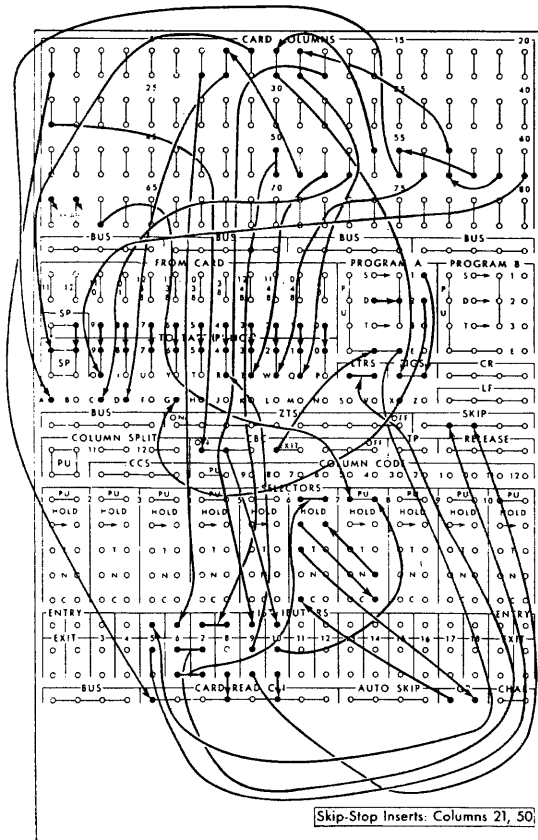
FIGURE 70. WIRING FOR FIGURE 69

A code in column 39 identifies the quarterly information on the cards, as follows:

QUARTER	CARD CODE	INFORMATION TO BE GANG PUNCHED
First	1	JAN
Second	2	APRIL
Third	3	JULY
Fourth	4	OCT.

The code is wired through the column code device, which is controlled by column 39. Three of the four codes are wired to control two selectors each. Any three of the four codes can be used to control the selectors but, as the 2 code in this example must print the longest month identification, the other three codes control selectors 1 to 6, inclusive. These selectors, in turn, control the information being gang punched.

The first letter of each month is gang punched at column 39. This column is not wasted even though the code is punched there. The code is read soon enough by the column code device to control selectors to route the card column impulse to the proper punch entry.

Gang Punching Fig-G and CR

If a fig-G is gang punched, a shift code must be gang punched immediately after it. This is an automatic feature when the machine is punching normally.

If CR is gang punched, two codes must be gang punched after it, such as LF and a shift code, two LF codes, or two shift codes. The codes must not be printing codes. Of course, an immediate return to normal punching would automatically provide one shift code.
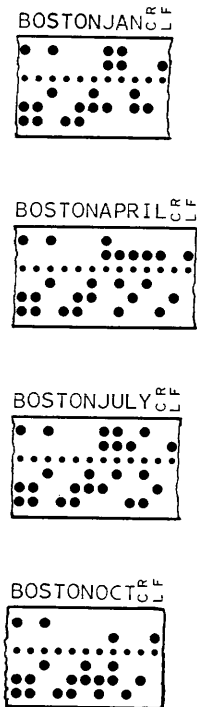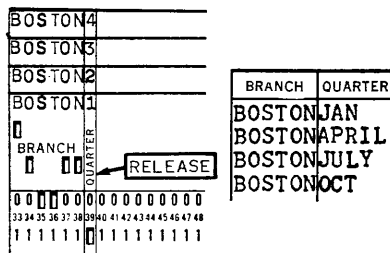
FIGURE 71.
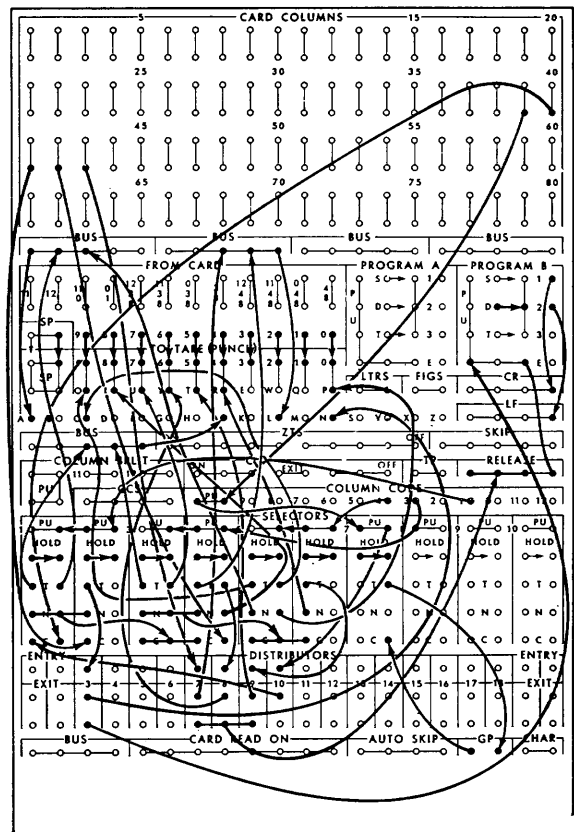
FIGURE 72. WIRING FOR FIGURE 71

PRINTING MONTH FROM ONE COLUMN

The month date is frequently punched in one column, as follows:

1	January
2	February
3	March
4	April
5	May
6	June
7	July
8	August
9	September
0	October
11	November
12	December

There is no problem in punching the codes for the single digits for January through October. However, November and December will need to be recoded in order to write a date on a telegraphed report. If the telegraphed report is a listing for intra-company use, it may be acceptable to recode the 11 and 12 to letters N and D, respectively. If however, two-digit codes are desired for October, November and December (10, 11, and 12), the following diagrams demonstrate how these codes can be punched into the tape.

Example A (Figure 73)

This example has been planned to position the units digit of the two-digit month beneath the units digit of the single-digit month:

<div align="center">

9

10

11

12

</div>

To do this, the month code is read through the column code device and selectors are picked up to control program punching of the month codes. When digits 1 to 9 are read, a space, FIGS, and the pertinent month digit must be program punched. When 0, 11, or 12 is read, a 1 and the pertinent second digit must be punched. This means that a code for January through September must cause three codes to be program punched:

1. A space to position the single digit properly.
2. A FIGS code. This is a precautionary measure, as a space causes some telegraph machines to go into letters-shift.
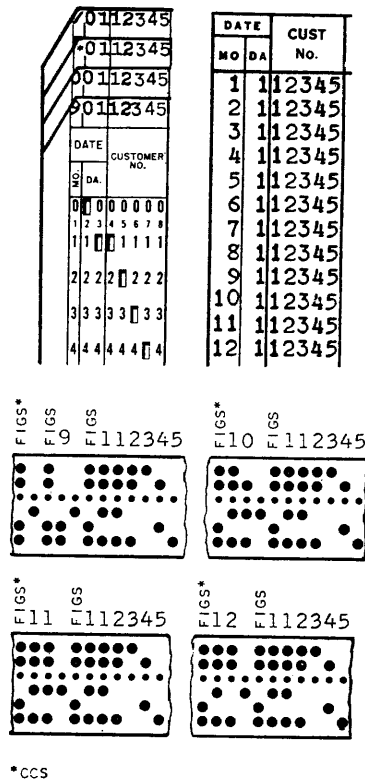
FIGURE 73.

3. The pertinent month digit.
A code for October through December picks up program punching for the two digits needed.

Selector Control

In order to limit the number of selectors used, combined controls have been wired to some of the selectors, as follows:

Selector 1 is controlled by 1 and 0.
Selector 2 is controlled by 2 and 11.
Selector 3 is controlled by 3.
Selector 4 is controlled by 4.
Selector 5 is controlled by 5 and 6.
Selector 6 is controlled by 7 and 8.
Selector 7 is controlled by 5 and 7.
Selectors 9 and 10 are controlled by 0, 11, and 12.

Distributors have been used to keep codes from combining to simulate alphabetic letters. For instance, selector 2 is controlled by 2 and by 11. If the 2 were wired to the selector pickup hubs directly from the column code exit, whenever an 11 picked up the selector the impulse could travel

back over the 2 wire, into the column code hub, and the machine would analyze the column as though both the 11 and the 2 were read in the card. As the code in column 1 is suppressed, LTRS would be punched instead of the desired FIGS if the code were allowed to simulate an alphabetic letter.

Analysis of Punching

| Col. 1 | | Program Cycles | | | Cols. 2 and 3 |
Read	Punch	1	2	3	Read and Punch
1 to 9	CCS	SP	FIGS	1 to 9	Day Date
0	CCS	1	0	none	Day Date
11	CCS	1	1	none	Day Date
12	CCS	1	2	none	Day Date

Wiring for Example A (Figure 74)

1. Column 1 is wired through distributor 1 to start card reading, to CCS, and to pick up the column code device. Blank columns are wired to punch space codes; digit-for-digit punching is wired.

FIGURE 74.

2. The column code exits are wired as follows:

Code 8 to pick up selector 6.

Code 7 through distributor 10 to pick up selectors 6 and 7.

Code 6 to pick up selector 5.

Code 5 through distributor 9 to pick up selectors 5 and 7.

Code 4 to pick up selector 4.

Code 3 to pick up selector 3.

Code 2 through distributor 7 to pick up selector 2.

Code 1 to pick up selector 1.

Code 0 through distributor 2 to pick up selector 1, and to pick up selectors 9 and 10 via bus.

Code 11 through distributor 3 to pick up selector 2, and to pick up selectors 9 and 10 via bus.

Code 12 to pick up selectors 9 and 10.

When these selectors are picked up, they remain in a transferred condition for the remainder of the card cycle as the hold hubs in each selector are connected.

3. Column 1 is also wired to pick up program A. The T hub is wired through the normal hubs of selector 9 to control the program unit for January through September; the D hub is wired through the transferred hubs of selector 9 to control the program unit for October through December.

4. Exit 1 is wired through the normal hubs of selector 9 to space for January through September, and through the transferred hubs of selector 9 to the 1 hub via bus for October through December

5. Exit 2 is wired through the normal hubs of selector 10 to FIGS when a space has been punched for January through September, and through the transferred hubs of selector 10, and as follows:

October: Through the transferred hubs of selector 1 to the 0 hub.

November: Through the normal hubs of selector 1 and the transferred hubs of selector 2 to the 1 hub via bus.

December: Through the normal hubs of selectors 1 and 2 to the 2 hub via bus.

6. Exit 3 is wired as follows:

January: Through the transferred hubs of selector 1 to the 1 hub via bus.

February: Through the normal hubs of selector 1 and the transferred hubs of selector 2 to the 2 hub via bus.

March: Through the normal hubs of selectors 1 and 2, and the transferred hubs of selector 3 to the 3 hub.

April: Through the normal hubs of selectors 1, 2, and 3, and the transferred hubs of selector 4 to the 4 hub.

May: Through the normal hubs of selectors 1, 2, 3, and 4, and the transferred hubs of 5 and 7 to the 5 hub.

June: Through the normal hubs of selectors 1, 2, 3, and 4, the transferred hubs of selector 5, and the normal hubs of selector 7 to the 6 hub.

July: Through the normal hubs of selectors 1, 2, 3, 4, and 5, and the transferred hubs of selectors 6 and 7 to the 7 hub.

August: Through the normal hubs of selectors 1, 2, 3, 4, and 5, the transferred hubs of selector 6, and the normal hubs of selector 7 to the 8 hub.

September: Through the normal hubs of selectors 1, 2, 3, 4, 5, and 6 to the 9 hub.

7. The E impulse of program A is wired to restart card reading when program punching is finished; the remainder of the wiring is not shown.

It will be noted that the year has not been included in this or the following examples as normal wiring will provide for it.

Example B (Figure 75)

Many times it is not necessary to position the units of the single and double digits as has been planned for in Example A; it is only necessary to print the whole date in a given area on the form. Therefore, another approach to the problem of punching the two digits for October through December is presented in this example, and it will be
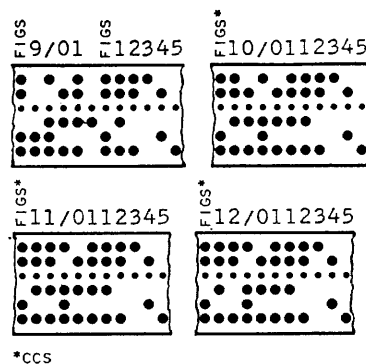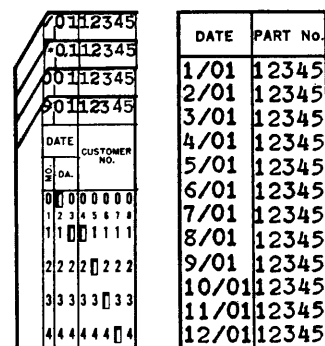
FIGURE 75.

noted that fewer selectors are needed for this wiring and for that shown in Example C, the third approach to this problem.

The diagonal character is on the X key on most printing telegraph machines, so fig-x is program punched between the month and day dates. The digit lacking in the printed field for January through September is compensated for by program punching a space after the day is punched into the tape. Therefore, the subsequent field is always started in the same printing location regardless of what month date has preceded it.

Analysis of Punching

Col. 1		Program Cycles			Cols. 2 and 3	Program Cycle
Read	Punch	1	2	3	Read & Punch	1
1 to 9	1 to 9	/	none	none	Day date	space
0	CCS	1	0	/	Day date	none
11	CCS	1	1	/	Day date	none
12	CCS	1	2	/	Day date	none

Wiring for Example B (Figure 76)

1. Column 1 is wired to pick up the column code device, and through distributor 1 to start card reading and to pick up program A. Blank columns are wired to punch spaces; digit-for-digit punching is wired.
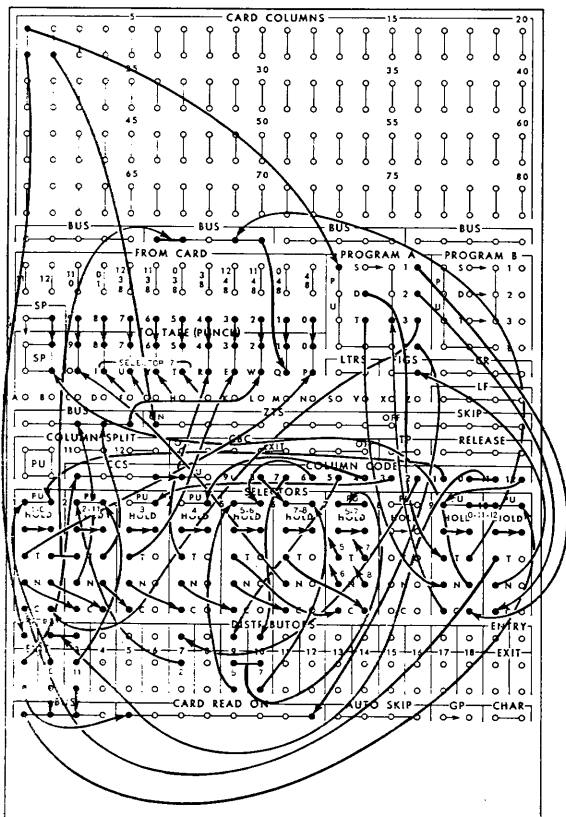
2. The column code exits are wired as follows: Code 0 is wired through distributor 8 to pick up selectors 5 and 6 via bus. Code 11 is wired through distributor 9 to pick up selector 8, and to pick up selectors 5 and 6 via bus. Code 12 is wired through distributor 10 to pick up selector 9, and to pick up selectors 5 and 6 via bus. When these selectors are picked up, they are held in a transferred position for the remainder of the card cycle, since the hold hubs in each selector are connected.

JANUARY THROUGH SEPTEMBER

3. The code read in column 1 is punched into the tape.

4. The S impulse of program A is wired through the normal hubs of selector 6 to control this program unit.

5. Exit 1 is wired through the normal hubs of selectors 7 and 6 to the X hub via bus.

6. The end impulse of program A restarts card reading.

7. The day date is punched into the tape. Column 3 is wired to pick up selector 7, and through distributor 3 and the normal hubs of selector 5 to pick up program A again. The hold hubs are connected so that the selector will remain transferred while program punching takes place.

8. The S hub controls program A as described in step 4.

9. Exit 1 of program A is wired through the transferred hubs of selector 7 to a space hub.

FIGURE 76.

10. Card reading is restarted by the E impulse of program A. The remainder of the wiring is not shown.

October Through December

11. Column 1 is wired through the transferred hubs of selector 5 to ccs.

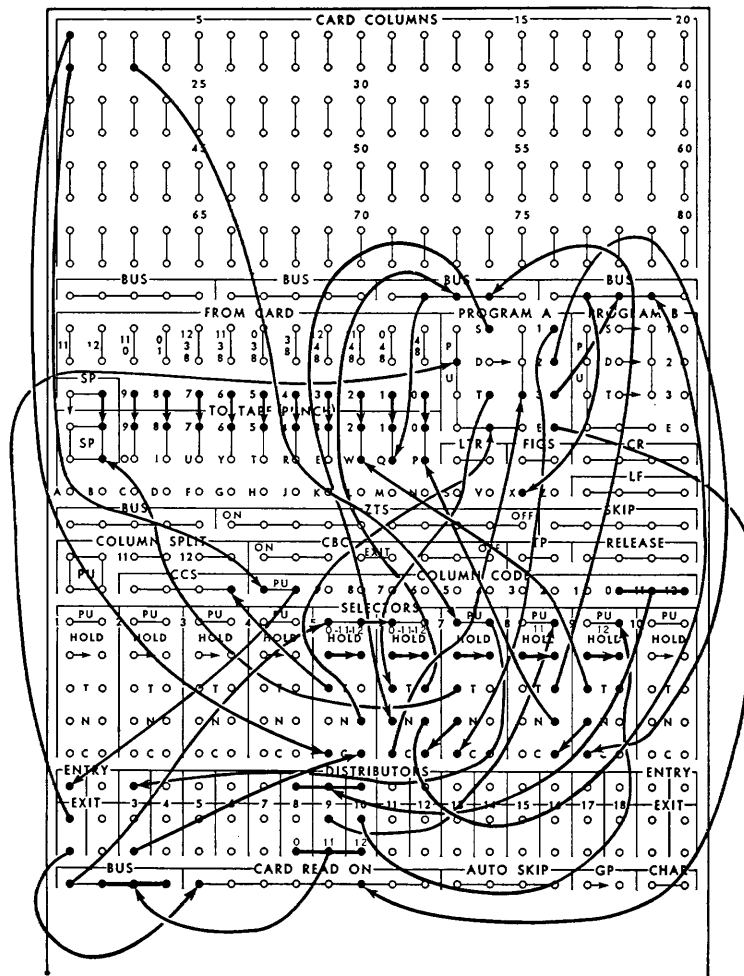12. The T impulse of program A is wired through the transferred hubs of selector 6 to control the program unit.

13. Exit 1 of program A is wired through the normal hubs of selector 7 and the transferred hubs of selector 6 to the 1 hub via bus.

14. Exit 2 of program A is wired as follows:

October: Through the normal hubs of selectors 9 and 8 to the 0 hub.

November: Through the normal hubs of selector 9 and the transferred hubs of selector 8 to the 1 hub via bus.

December: Through the transferred hubs of selector 9 to the 2 hub.

15. Exit 3 of program A is wired to the X hub via bus.

16. The end impulse of program A restarts card reading. The day date and subsequent fields are punched into the tape. No program punching takes place after column 3 for these months.
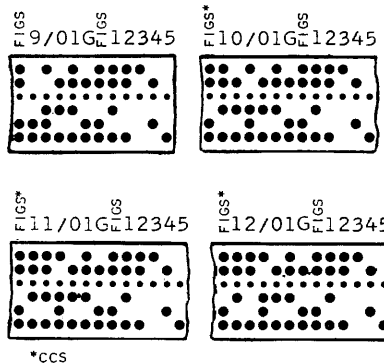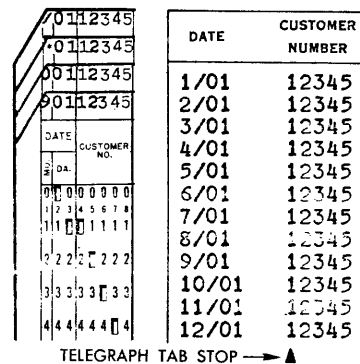
Example C (Figure 77)

This example shows the date printed as it was printed in Example B, but instead of a space following the date for January through September, skipping takes place for all months after the day date. This type of dating is particularly useful for document writing by telegraph.

Analysis of Punching

	Col. 1		Program Cycles			Cols. 2 & 3	Program Cycle
Read	Punch	1	2	3	Read & Punch	1
1 to 9	1 to 9	/	none	none	Day date	G
0	CCS	1	0	/	Day date	G
11	CCS	1	1	/	Day date	G
12	CCS	1	2	/	Day date	G

DATE	CUSTOMER NUMBER
1/01	12345
2/01	12345
3/01	12345
4/01	12345
5/01	12345
6/01	12345
7/01	12345
8/01	12345
9/01	12345
10/01	12345
11/01	12345
12/01	12345

TELEGRAPH TAB STOP ⟶ ▲

Figure 77.

Wiring for Example C (Figure 78)

1. Column 1 is wired to pick up the column code device, and through distributor 1 to start card reading and to pick up program A. Blank columns are wired to punch spaces; digit-for-digit punching is wired.

2. The column code exits are wired as follows: Code 0 is wired through distributor 8 to pick up selectors 5 and 6 via bus. Code 11 is wired through distributor 9 to pick up selector 8, and to pick up selectors 5 and 6 via bus. Code 12 is wired through distributor 10 to pick up selector 9, and to pick up selectors 5 and 6 via bus. When these selectors are picked up, they are held in a transferred position for the remainder of the card cycle, as the hold hubs in each selector are connected.

January Through September

3. The code read in column 1 is punched into the tape.

4. The S impulse of program A is wired through distributor 7 and the normal hubs of selectors 6 and 7 to control the program unit.

5. Exit 1 is wired through the normal hubs of selectors 7 and 6 to the X hub via bus.

October Through December

6. Column 1 is wired through the transferred hubs of selector 5 to ccs.

7. The T impulse of program A is wired through the transferred hubs of selectors 6 and the normal hubs of selectors 7 to control the program unit.

8. Exit 1 of program A is wired through the normal hubs of selector 7 and the transferred hubs of selector 6 to the 1 hub via bus.

9. Exit 2 of program A is wired as follows:

October: Through the normal hubs of selectors 9 and 8 to the 0 hub.

November: Through the normal hubs of selec-

tor 9 and the transferred hubs of selector 8 to the 1 hub via bus.

December: Through the transferred hubs of selector 9 to the 2 hub.

10. Exit 3 of program A is wired to the X hub via bus.

All Months

11. The end impulse of program A restarts card reading.

12. The day date is punched into the tape. Column 3 is wired to pick up selector 7, and through distributor 3 to pick up program A.

13. The S impulse is wired through distributor 7 and the transferred hubs of selector 7 to control the program unit.

14. Exit 1 is wired through the transferred hubs of selector 7 to the G hub.
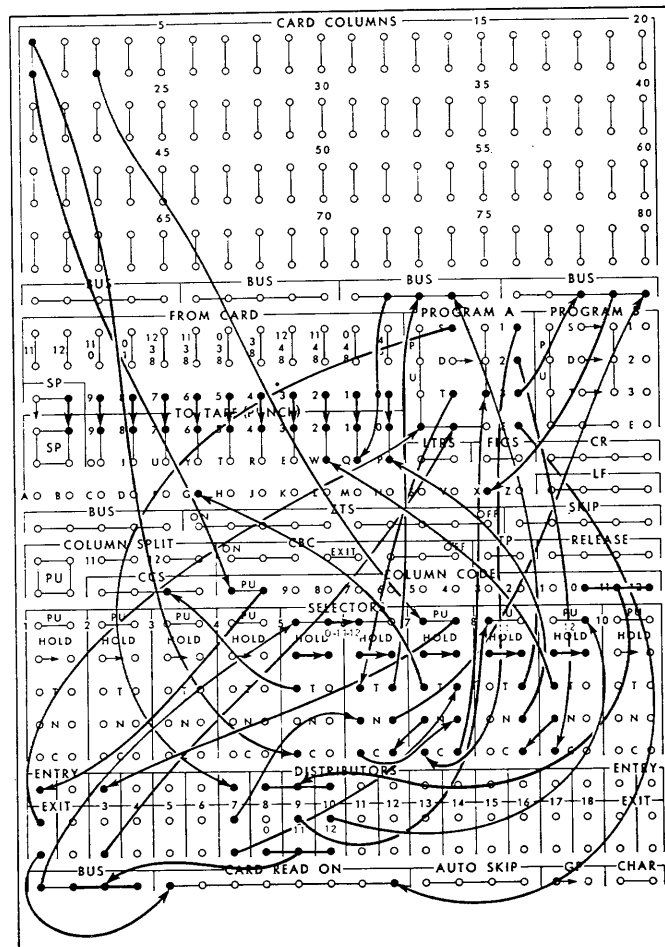
Figure 78.

FOUR UNCODED CARDS PER LINE; EXTENDING NORMAL SELECTOR CONTROL (FIGURE 79)

IN THIS example, the tape is punched so that the information in the first four inventory cards will be printed by the telegraph machine on the first line of the inventory list, the information in the second four cards will be printed on the second line, etc., *yet no card codes are available to control the required tape punching.* The cards can be in any sequence desired, or in no sequence, when the tape is punched.

As there are no codes to control the punching of the tape, selectors are used to recognize each group of four cards. Unlike those in previous examples, the selectors in this example must remain transferred beyond a card cycle—they must remain transferred until the information from four cards has been punched into the tape. Therefore, the normal selector hold circuit cannot be used. There is a constant impulse from the GP exit (left) hub which is used in this instance to hold a selector transferred. If this impulse were wired directly into the hold entry hub of a selector, the selector would remain transferred until the power to the machine were shut off. By controlling this impulse through another selector, however, the hold circuit can be interrupted when desired. In this example

PART NO.	QTY.	PART NO.	QTY.	PART NO.	QTY.	PART NO.	QTY.
571202	1215	780953	110	204569	10000	210195	490
303090	36	500241	5	473065	5000	190051	251

FIGURE 79.

selectors 3, 4, and 5 are held transferred by the GP exit which is controlled by selectors 1 and 2.

Printing and Program Punching

The information from the first card is followed by three program punched spaces. The same is true for the second and third cards. These three spaces are punched by program A. After the fourth card, CR and LF are punched by program B, which completes the line of information. The information from the next card will be recognized as the first information for the second line. Both program units are controlled by column 61, which is selected.

By recording the information in the tape in this fashion, a check list (Figure 79) can be printed by the telegraph machine as the inventory information is transmitted from the branch to the main office. It can be printed on a ruled form, as shown, or on blank paper.

Progressive Selector Control

Selectors are picked up progressively in order to recognize every fourth card so that CR and LF, instead of the three spaces, can be program punched.

As shown in Figure 80, column 61 is wired to pick up program A through the normal hubs of selector 5 for the first, second and third cards; three spaces are program punched. Exit 3 of program A is wired through distributor 10 on the first card cycle to pick up selector 3, which remains transferred through the normal hubs of selector 1 until the end of the fourth card cycle. When program punching for the second card takes place, selector 3 is transferred and allows exit 2 of program A to pick up selector 4, which remains transferred until the end of the fourth card cycle. When program punching for the third card takes place, selector 4 is transferred and allows exit 1 of program A to pick up selector 5, which remains transferred until the end of the fourth card cycle. During the fourth card cycle, column 61 is wired through the transferred hubs of selector 5 to pick up program B; CR and LF are program punched. The E impulse of program B is wired to pick up selectors 1 and 2. When this selector is transferred, the hold circuits of selectors 3, 4, and 5 are
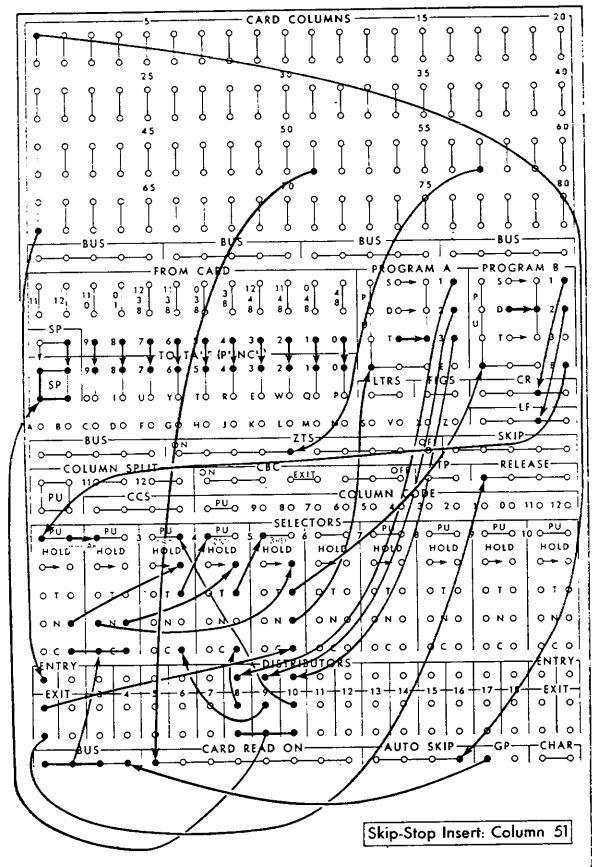
FIGURE 80.

interrupted, and these selectors return to normal. The following card is recognized as the first card of the second line and the entire four-card cycle is repeated. Schematically, this four-card cycle appears as shown in Figure 81. As one or more
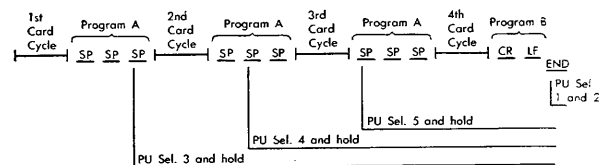
FIGURE 81. SCHEMATIC DIAGRAM OF FOUR-CARD CYCLE

selectors are transferred at all times except at the end of the four-card cycle, it is advisable to turn the line switch off when an operation of this type is completed, to drop all selectors which are picked up. Only the line switch can terminate the constant GP impulse.

PRODUCT DESCRIPTION	PROD. NO.	QTY.	JOBBER [1] PR.	JOBBER [1] EXT.	DEALER [2] PR.	DEALER [2] EXT.	RETAILER [3] PR.	RETAILER [3] EXT.	SPECIAL [4] PR.	SPECIAL [4] EXT.
*CAP	36935	005	0475	02375	0488	02440	0494	02470		
*GUARD	15738	0100	0315	03150	0319	03190	0323	03230		
*SPRING	05089	0250	0740	18500	0748	18700	0752	18800		
/992012 WILLIAM WATSON										
*BELLOWS	10579	0100	0025	00250	0027	00270	0028	00280	0024	00240
/753254 SMITH INC										
*PIN UNIT	08202	0200	0268	05360	0271	05420	0275	05500		
*FUSE	10653	0100	0005	00500	0006	00600	0007	00700		
/010961 STEVEN DOTY										
*HINGE	05694	0100	0643	06430	0650	06500	0660	06600		

CODE [ ] [ ] PRODUCT DESCRIPTION PROD. NO. QTY.

/007913 RAYMOND BARBER

CODE CUST. NO. TYPE CUST NAME

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 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
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

FIGS* FIGS* FIGS 7913 LTRS RAYMOND BARBER CR LF FIGS G FIGS HINGE FIGS G FIGS 5694 FIGS 10 FIGS 660 FIGS 6600 CR LF

FIGS* FIGS* FIGS 10961 LTRS STEVEN DOTY CR LF FIGS G FIGS FUSE FIGS G FIGS 10653100 FIGS 05 FIGS 500 CR LF

FIGS G LTRS PIN UNIT FIGS G FIGS 8202 FIGS 20 FIGS 268 FIGS 5360 CR LF

FIGS* FIGS* FIGS 753254 LTRS SMITH INC CR LF FIGS G FIGS BELLOWS FIGS G FIGS 10579 FIGS 10 FIGS 24 FIGS 240 CR LF

FIGS* FIGS* FIGS 992012 LTRS WILLIAM WATSON CR LF FIGS G FIGS SPRING FIGS G FIGS 5089 FIGS 25 FIGS 74818700 CR LF

FIGS G LTRS GUARD FIGS G FIGS 15738 FIGS 10 FIGS 319 FIGS 3190 CR LF FIGS G FIGS CAP FIGS G FIGS 36935 FIGS 5 FIGS 488 FIGS 2440 CR LF

*CCS

FIGURE 82.

PRODUCT PRICE SELECTION GOVERNED BY PRECEDING MASTER CARD (FIGURE 82)

When MASTER customer name cards, which are coded with the type of customer, precede product cards which are priced for all types of customers, it is necessary to read the type of customer code from the master card and to use it to select the proper unit price and extension for each product. To do this, a selector must be transferred when the type of customer code is read and the selector must be held in this transferred position while all of the product cards for the customer are read. This is another type of application using the constant impulse from the GP exit hub.

Coding

The master cards have a 12 punched in column 1. This 12 controls selectors 2, 3, and 4, and activates CCS.

The type of customer code is punched in these cards in column 7, as follows:

        1 – Jobber
        2 – Dealer
        3 – Retailer
        4 – Special

The product cards have an 11 punched in column 1. This 11 causes a G to be punched in the tape in order to cause tabulation on the printing telegraph machine to the product description column.

CBC Control

Column 3 is wired to CBC ON. Normally, column 2 would be wired to CBC ON and to ZTS ON through a distributor. However, as there will always be several columns punched in the product description field, CBC can be turned on at column 3 just as well as at column 2. This wiring turns the CBC device on for both the master and the product cards.

CBC is turned off at column 19 for product cards.

When CBC is active on a master card, the exit picks up program B, and releases the card. CR and LF are program punched.

When CBC is active on a product card, the exit picks up program A, and skips the card to column 36 FIGS and G are program punched.

ZTS Control

ZTS is turned on at columns 2, 36, 41, 44, 48, 53, 57, 62, 66, 71, and 75. ZTS is turned off at columns 46, 51, 55, 60, 64, 69, 73, and 78.

Price Selection

The column code device is picked up by column 7 on a master card. Codes 1 to 3 control selectors 9 to 7, respectively. These selectors control card reading, skipping, and releasing within the price fields on the product cards. Only one of these selectors is transferred for a customer group.

CUSTOMER			PRODUCT				
NO.	TYPE	NAME	DESCRIPTION	NO.	QTY.	UNIT LIST PRICE	EXT.
7913	3	RAYMOND BARBER	HINGE	5694	10	660	6600
10961	1	STEVEN DOTY	FUSE	10653	100	05	500
			PIN UNIT	8202	20	268	5360
75325	4	SMITH INC	BELLOWS	10579	10	24	240
99201	2	WILLIAM WATSON	SPRING	5089	25	748	18700
			GUARD	15738	10	319	3190
			CAP	36935	5	488	2440

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FIGURE 82B

Whenever a selector is picked up, the constant impulse from the GP exit hub enters the hold hub and keeps the selector transferred until a new master card is read. When a new master card is read, selector 4 is transferred and the selector hold circuit is broken. All selectors will be normal at the time the next type of customer code is read.

Wiring (Figure 83)

ALL CARDS

1. Column 1 is wired to pick up selector 1 and through distributor 1 to card read ON. Blank columns are wired to punch spaces; digit-for-digit punching is wired.*

MASTER CARDS

2. FROM CARD 12 is wired through the transferred hubs of selector 1 to pick up selectors 2, 3, and 4, and to CCS. The hold hubs for selectors 2

Skip-Stop Inserts: Columns 36, 53, 62, 71

FIGURE 83.

and 3 are connected so that these selectors will remain transferred for the master card cycle.

3. Column 2 is wired to ZTS ON.

4. Column 3 is wired to CBC ON.

5. Column 7 is wired through the transferred hubs of selector 2 to pick up the column code device. Code 1 is wired to pick up selector 9; code 2 is wired to pick up selector 8; code 3 is wired to pick up selector 7.

6. The constant impulse from the GP exit hub is wired through the normal hubs of selector 4 to the hold entry hubs of selectors 7 to 9 inclusive via bus.

WHEN CBC IS ACTIVE:

7. The CBC exit is wired through the transferred hubs of selector 3 to pick up program B, and to release the card. The D impulse controls the program unit.

8. Exit 1 of program B is wired to CR.

9. Exit 2 of program B is wired to LF.

WHEN CBC IS INACTIVE:

10. Column 35 is wired to pick up program B, and to release the card. CR and LF are program punched as described above.

PRODUCT CARDS

11. FROM CARD 11 is wired through the transferred hubs of selector 1 to the G hub via bus.

12. Column 3 is wired to CBC ON.

WHEN CBC IS ACTIVE:

13. The CBC exit is wired through the normal hubs of selector 3 to pick up program A, and through distributor 10 to SKIP. The D impulse controls the program unit. A skip-stop insert in the adjustable skip bar is set at column 36.

14. Exit 1 of program A is wired to FIGS.

15. Exit 2 of program A is wired to the G hub via bus.

WHEN CBC IS INACTIVE:

16. Column 19 is wired through the normal hubs of selector 2 to CBC OFF.

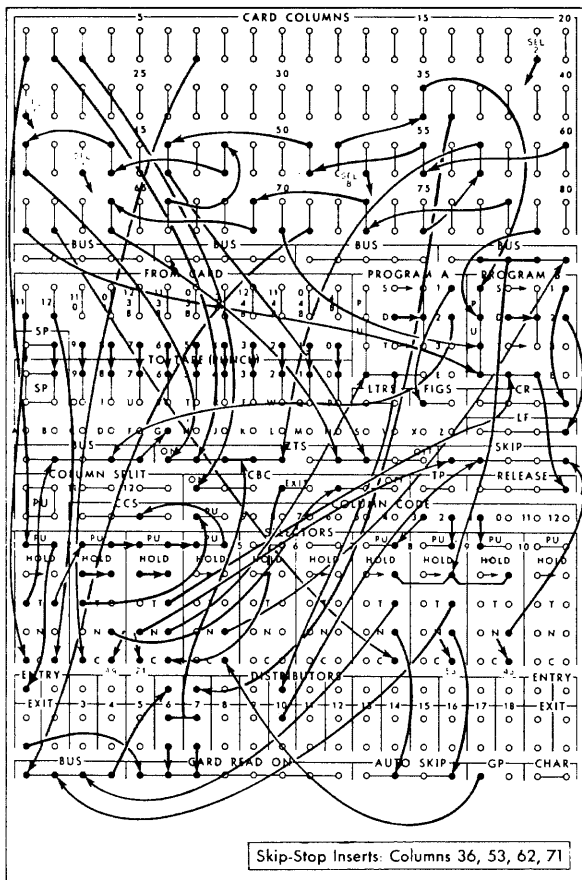17. Column 21 is wired through the normal hubs of selector 3 to SKIP.

18. Column 36 is wired through distributor 7 to restart card reading after skipping, and to zts on.

19. Column 41 is wired to zts on.

TYPE 1

20. Columns 44 and 48 are wired to zts on.

21. Columns 46 and 51 are wired to zts off.

22. Column 52 is wired, directly or as shown, to pick up program B, and to release the card. CR and lf are program punched.

TYPE 2

23. Column 43 is wired through the normal hubs of selector 9 to skip. A skip-stop insert is set at column 53.

24. Column 53 is wired through the transferred hubs of selector 8 to distributor 6 via bus. From distributor 6 the impulse is wired to restart card reading, and to zts on.

25. Columns 55 and 60 are wired to zts off, directly or as shown.

26. Column 57 is wired to zts on.

27. Column 61 is wired to pick up program B, and to release the card. CR and lf are program punched.

TYPE 3

28. Column 43 is wired through the normal hubs of selector 9 to skip. A skip-stop insert is set at column 53.

29. Column 53 is wired through the normal hubs of selector 8 to auto skip. A skip-stop insert is set at column 62.

30. Column 62 is wired through the transferred hubs of selector 7 to distributor 6 via bus. From distributor 6 the impulse is wired to restart card reading, and to zts on.

31. Columns 64 and 69 are wired to zts off.

32. Column 66 is wired to zts on, directly or as shown.

33. Column 70 is wired to pick up program B, and to release the card. CR and lf are program punched.

TYPE 4

34. Column 43 is wired through the normal hubs of selector 9 to skip. A skip-stop insert is set at column 53.

35. Column 53 is wired through the normal hubs of selector 8 to auto skip. A skip-stop insert is set at column 62.

36. Column 62 is wired through the normal hubs of selector 7 to auto skip. A skip-stop insert is set at column 71.

37. Column 71 is wired through distributor 6 via bus to restart card reading, and to zts on.

38. Columns 73 and 78 are wired to zts off, directly or as shown.

39. Column 75 is wired to zts on, directly or as shown.

40. Column 79 is wired to pick up program B, and to release the card. CR and lf are program punched.

SPECIAL CHARACTER DEVICE

THE SPECIAL characters on the Type 407 Accounting Machine are punched in a card as shown in Figure 84.

As previously stated, the 12, 11, 11-0, and 0-1 are standard on the Type 63 Card-Controlled Tape Punch, while the others are provided as as an optional feature in this machine. This optional feature is the Special Character device.
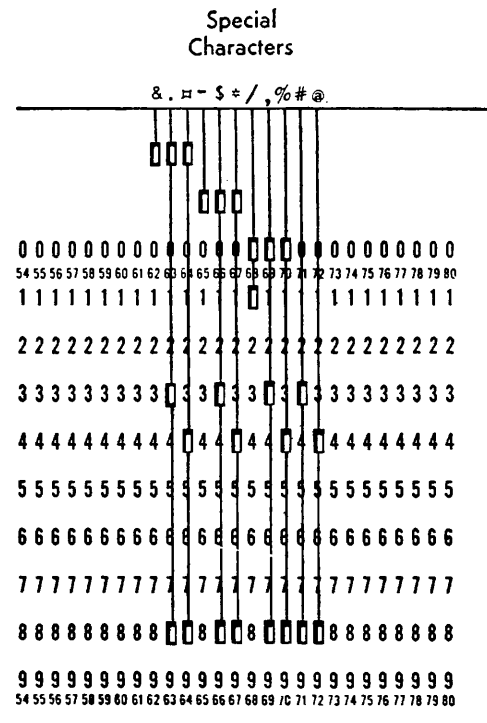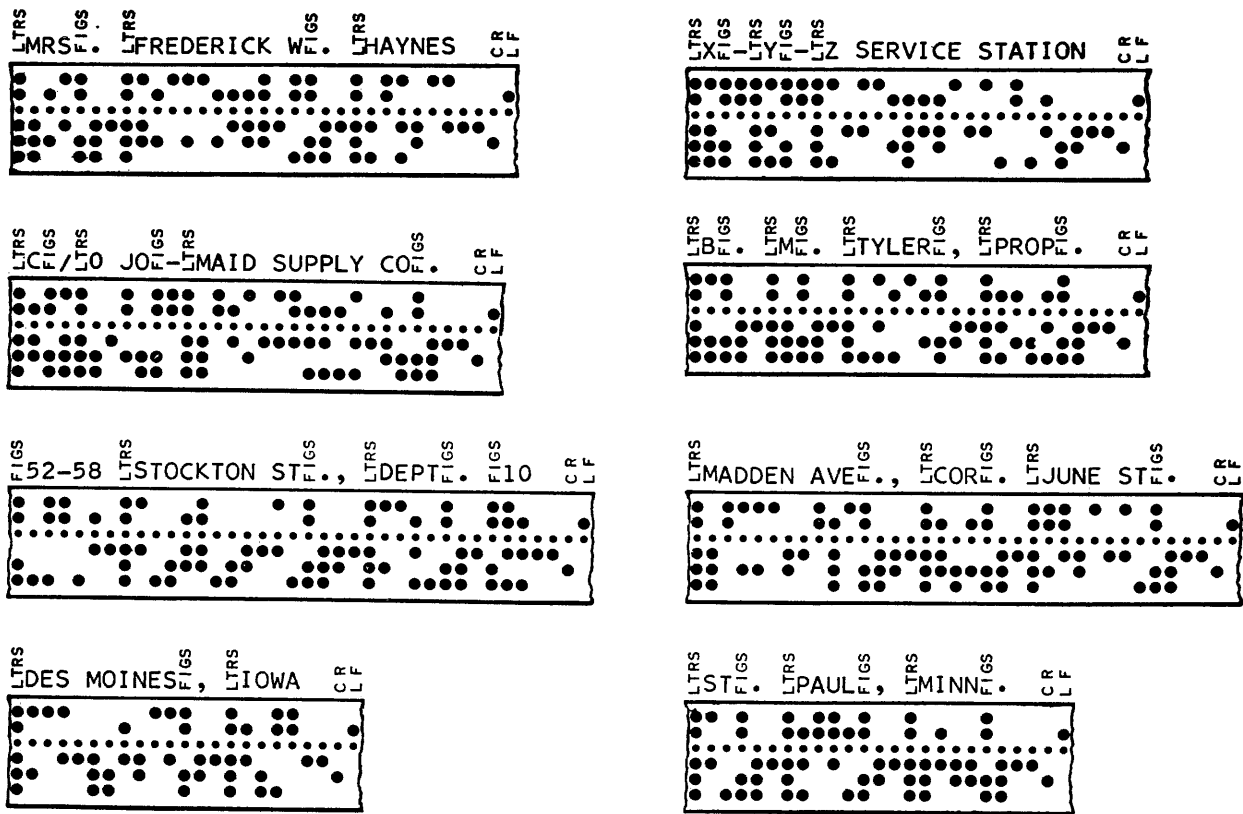
When these special characters are punched in

FIGURE 84.

MRS. FREDERICK W. HAYNES
C/O JO-MAID SUPPLY CO.
52-58 STOCKTON ST., DEPT. 10
DES MOINES, IOWA

X-Y-Z SERVICE STATION
B. M. TYLER, PROP.
MADDEN AVE., COR. JUNE ST.
ST. PAUL, MINN.

FIGURE 85.

cards which are read by the Type 63 Card-Controlled Tape Punch equipped with the special character device, they provide impulses to punch figures-shift characters for signs and punctuation marks for document writing by telegraph. For instance, names and addresses can be clarified, as shown in Figure 85.

On a standard telegraph machine the punctuation marks are usually found on the following keys:

CARD CODE	SPECIAL CHARACTERS	KEY
12-3-8	Period (.)	Fig-M
0-1	Diagonal (/)	Fig-X
11	Hyphen (-)	Fig-A
0-3-8	Comma (,)	Fig-N

Wiring

The wiring for these punctuation marks and normal punching is given in Figure 86. The wiring for other punctuation marks and signs can be added to the wiring shown.
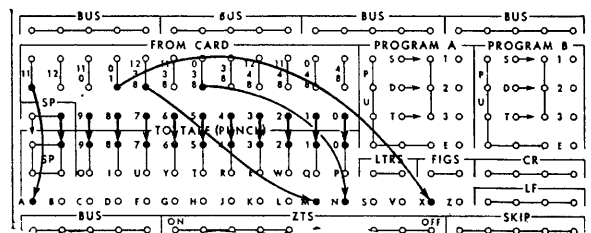

FIGURE 86.

DOCUMENTS can be written by telegraph machines operated automatically by tape prepared from cards. A tape-controlled telegraph machine is operated by codes in the tape in the same way as by manual key depressions.

Design of Forms

Card and document forms should be planned jointly, and the following points are offered for consideration:

1. *Sequence of information.* The sequence of information required on the document must be the sequence of information read from the cards. When different types of cards are required for a document, as for an invoice, the card design and the design of the document to be printed from the tape are worked out together. The documents can be planned on spacing charts, and the cards on card layout forms.

Cards which are to be used for accounting machine purposes as well as to prepare tape, should be designed with both requirements in mind. Most of the card arrangements shown in this section of the manual are designed for such dual use.

2. *Location of the information on the form.* When addressing is done and the form is to be mailed in window envelopes, consideration should be given to the printing location of the address so that it will be visible when the form is placed in an envelope. No printing should appear on the form less than 5/8 inches from the top, to provide a satisfactory tear-off margin.

Whenever possible, the data to be printed by telegraph should occupy the left-hand portion of the form, and the data should not be separated by many spaces or long tabulations, in the interest of printing as many forms as possible in a given time.

3. *Printing several lines from one card.* The information in a card can be recorded only once in the tape as the card is read. As the information is punched into the tape, however, carriage return and line feed codes can be interspersed so that several lines can be printed from one card.

4. *Tabulations.* Whenever possible, telegraph tabulation stops should be arranged so that the first stop is at the point where printing is to take place. This will avoid the requirement for retabulation and will speed production.

5. *Zero suppression.* Each line and each field is independent, and zero suppression on the telegraph machine need not be considered. What is punched into the tape will be printed on the document so that it is considered for each field when the tape is prepared. Zero suppression may have to be considered on a general basis, however, when the cards are designed to print documents on certain types of accounting machines as well as to prepare tapes for telegraph document writing.

6. *Line spacing.* Whenever possible, plan a document for double spacing, to reduce the operation time between forms. Double spacing is generally required if fractions are to be printed.

Tapes

When documents are to be written by tape-controlled telegraph machines, functional codes must be punched into the tape to control automatic line spacing on each form and from form to form, and to position the data across each form properly.

A tape, which automatically controls a sending telegraph machine, will print identical forms simultaneously at as many locations as may be desired. A form set may be split, as in the case of invoices, and the needed copies may be printed at the sending location while the remaining copies are printed at the receiving location. This type of form writing usually eliminates all passage of copies back and forth between locations.

When information is automatically printed by a receiving telegraph machine, the information may also be reproduced simultaneously into a tape by means of a reperforator. In turn, a reperforator tape can be used to reproduce cards in a Type 43 Tape-Controlled Card Punch or a Type 46 or 47, Model 1, Tape-to-Card Punch.

RAILROAD OUTBOUND CONSIST (FIGURE 87 A and B)

A RAILROAD outbound consist is a list of cards which represent the cars in an outbound freight train.

In this example, each loaded car in the train is represented by two cards and each empty car is represented by one card, as shown in Figure 87A. The information on the cards corresponds to that written on the waybills or other documents on which the cars are moving. Thus, the cards become mechanical counterparts of the source documents. The cards are arranged in car sequence of the train and a tape is prepared by the cards in the Type 63 Punch.

As the tape is run through the telegraph machine, an outbound consist (Figure 87B) is automatically printed at the sending station and an inbound consist is simultaneously printed at the next switching station or yard that the cars will reach. At the same time, the consist can also be printed at other locations, such as the switching tower, the car tracing bureau, etc.

Coding

The code read in column 1 identifies each card for a loaded car and punches the tape, as follows:

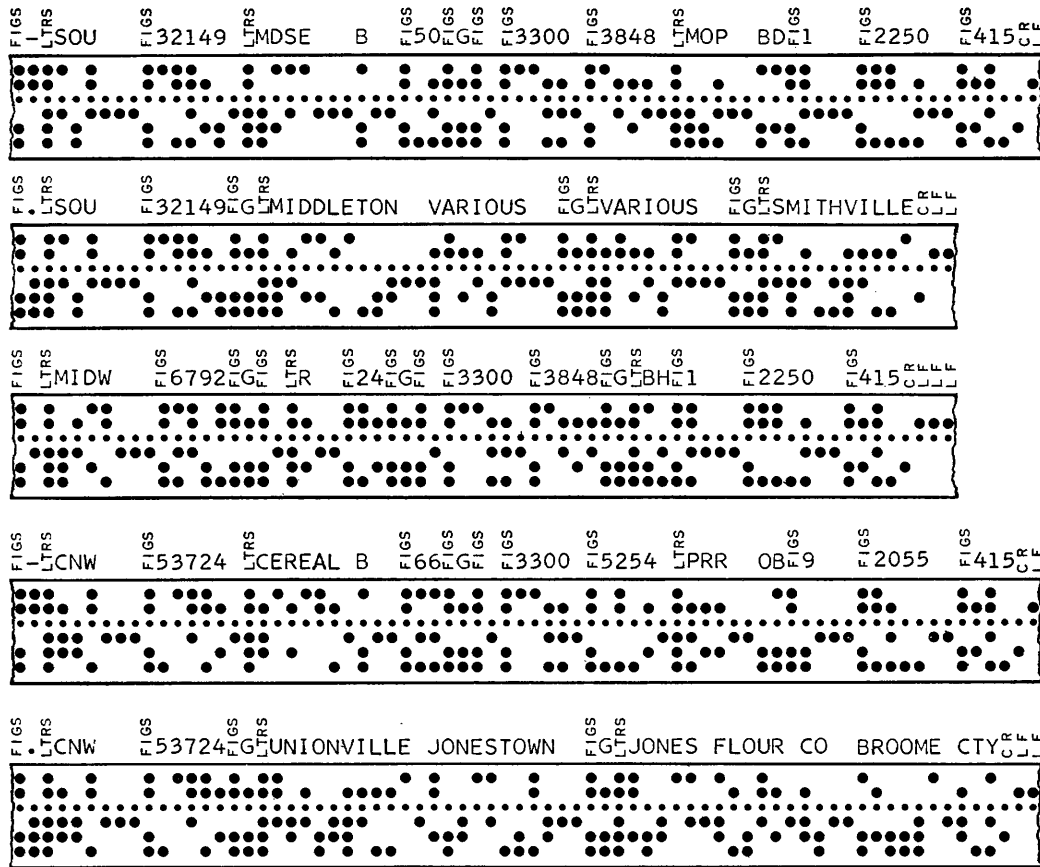| CODE	CARD	PUNCHES	To PRINT
12	Loaded Car (1st card)	Fig-A	-
11	Loaded Car (2nd card)	Fig-M	.

There is no code in column 1 on the card for an empty car. This blank column punches a space code which causes spacing on the telegraph machine.

Skipping and Tabulation

In this example, card skipping may or may not be accompanied by fig-G program punching, depending upon whether or not tabulation is to take place when the consist is printed on the telegraph machine. Wiring is based on the following analysis:

LOADED CAR

COL.	1ST CARD	2ND CARD	EMPTY CAR	PROGRAM PUNCH
12		Skip	Skip	Fig-G
25	Skip		Skip	Fig-G
40			Skip	Fig-G
46	Skip			
47			Auto Skip	

FIGURE 87A.

FIGS –LTRS SOU FIGS 32149 LTRS MDSE   B FIGS 50 LTRS G FIGS 3300 LTRS 3848 FIGS MOP BD 1 FIGS 2250 LTRS 415 CR LF

FIGS .LTRS SOU FIGS 32149 LTRS G LTRS MIDDLETON   VARIOUS LTRS G LTRS VARIOUS LTRS G LTRS SMITHVILLE CR LF LF

FIGS LTRS MIDW FIGS 6792 LTRS G LTRS R FIGS 24 LTRS G FIGS 3300 FIGS 3848 LTRS G LTRS BH LTRS 1 FIGS 2250 FIGS 415 CR LF LF LF

FIGS –LTRS CNW FIGS 53724 LTRS CEREAL B FIGS 66 LTRS G FIGS 3300 FIGS 5254 LTRS PRR OB 9 FIGS 2055 FIGS 415 CR LF

FIGS .LTRS CNW FIGS 53724 LTRS G LTRS UNIONVILLE JONESTOWN LTRS G LTRS JONES FLOUR CO   BROOME CTY CR LF LF

	INITIAL	NUMBER	CONTENTS	KIND	CROSS TIES	STATION FROM	STATION TO	FINAL DEST.	BILLING ROAD	NUMBER	TRAIN HR. MIN.	MO. DAY	DESTINATION	
O				ORIGIN			SHIPPER			CONSIGNEE				O
O	–SOU	32149	MDSE	B	50	3300	3848	MOP	BD1		2250	415	SMITHVILLE	O
	.SOU	32149		MIDDLETON		VARIOUS			VARIOUS					
O	MIDW	6792		R	24	3300	3848		BH1		2250	415		O
O	–CNW	53724	CEREAL	B	66	3300	5254	PRR	OB9		2055	415	BROOME CTY	O
	.CNW	53724		UNIONVILLE		JONESTOWN			JONES FLOUR CO					

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FIGURE 87B. RAILROAD OUTBOUND CONSIST

The CBC device is turned on at columns 31 and 47 on the second card for a loaded car and it is turned off at columns 44 and 60. When CBC skipping occurs, it is always accompanied by fig-G program punching.

CR and LF Codes

A 12 in column 78 on the first card of a loaded car and in the card for an empty car is recoded to CR. A single program cycle follows to punch the LF and to release the 1st card of a loaded car. Three program cycles take place for the other two types of cards; three LF codes are program punched for the card of an empty car, and a CR code and two LF codes are program punched for the 2nd card of a loaded car. Exit 3 of program B releases both of these cards as the last code is program punched.

Wiring (Figure 88)

ALL CARDS

1. Column 1 is wired to pick up the column code device and to pick up selector 2; it is also wired through distributor 5 to start card reading. Blank columns are wired to punch space codes; digit-for-digit punching is wired. The column code device controls selectors as follows: The 11 impulse is wired to pick up selectors 8, 7, and 6. The 12 impulse is wired to pick up selectors 5, 4, and 3.

LOADED CAR (1ST CARD)

2. The 12 read in column 1 is wired through the transferred hubs of selector 2 to the A hub.

3. Column 25 is wired through the normal hubs of selector 6 to pick up program A and, through distributor 8, to cause skipping. The D impulse controls the program unit. A skip-stop insert is set in the adjustable skip bar at column 31.

4. Exit 1 of program A is wired to FIGS.

5. Exit 2 of program A is wired to the G hub.

6. Column 31 is wired through the normal hubs
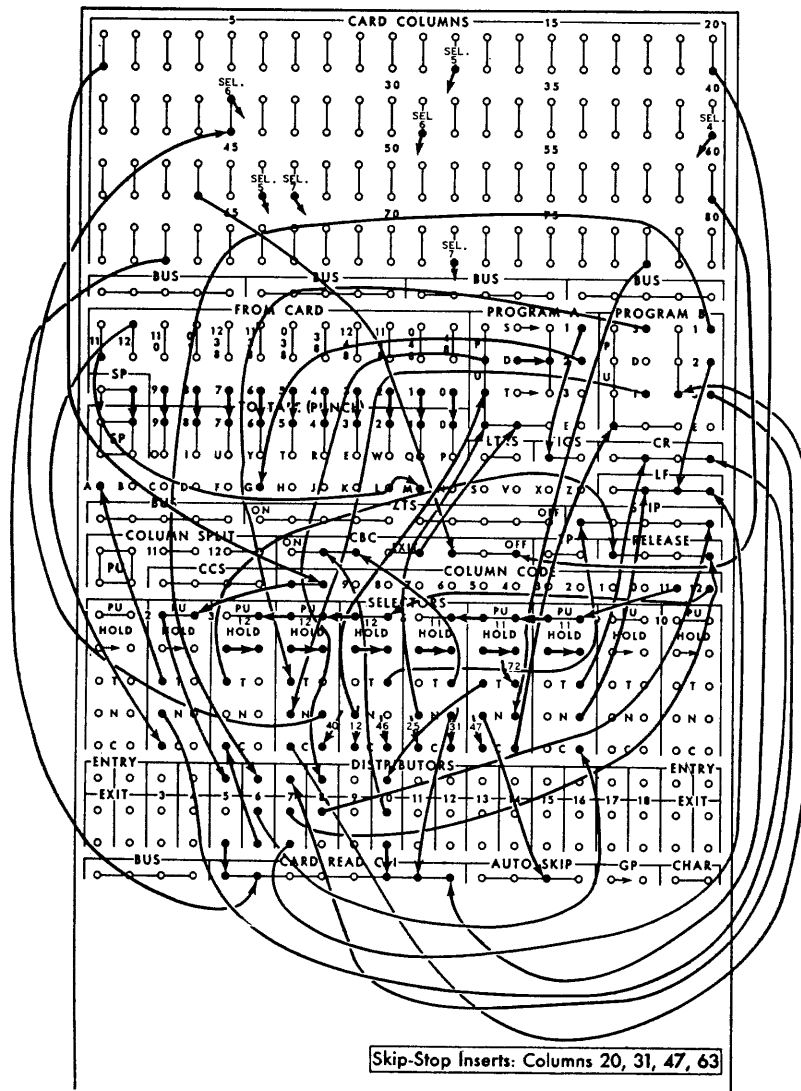

Skip-Stop Inserts: Columns 20, 31, 47, 63

FIGURE 88.

of selector 6 to restart card reading.

7. Column 46 is wired through the transferred hubs of selector 5 to SKIP.

8. As a skip-stop insert, which is set at column 47 for the second card of a loaded car, stops skipping, an automatic skip is started by column 47 through the normal hubs of selector 7. A skip-stop insert is set at column 63.

9. Column 63 is wired to restart card reading.

10. Column 78 is wired through the normal hubs of selector 7 to pick up program B. The 12 read in this column is wired through the normal hubs of selector 2 to CR.

11. The S impulse is wired through the transferred hubs of selector 4 to control the program unit.

12. Exit 1 of program B is wired through distributor 6 and the normal hubs of selector 8 to LF, and through the transferred hubs of selector 3 to release the card.

LOADED CAR (2ND CARD)

13. The 11 read in column 1 is wired to the M hub.

14. Column 12 is wired through the normal hubs of selector 5 to pick up program A, and through distributor 8 to SKIP. A fig-G is program punched as described in steps 4 and 5. A skip-stop insert is set at column 20.

15. Column 20 is wired to restart card reading after skipping.

16. Column 31 is wired through the transferred hubs of selector 6 to CBC ON.

WHEN CBC IS ACTIVE:

17. CBC exit is wired to pick up program A and, through distributor 8, to SKIP. A fig-G is program punched as described in steps 4 annd 5. A skip-stop insert is set at column 47.

WHEN CBC IS INACTIVE:

18. Column 44 is wired to CBC OFF.

19. Column 47 is wired through the transferred hubs of selector 7 and through distributor 10 to CBC ON, and to restart card reading, if necessary.

WHEN CBC IS ACTIVE:

20. Same as step 17. A skip-stop insert is set at column 63.

WHEN CBC IS INACTIVE:

21. Column 60 is wired to CBC OFF.

22. Column 63 is wired to restart card reading, if necessary.

23. Column 72 is wired through the transferred hubs of selector 7 to pick up program B.

24. The T impulse is wired through the normal hubs of selector 4 to control the program unit.

25. Exit 1 is wired through distributor 6 and the transferred hubs of selector 8 to CR.

26. Exit 2 is wired to LF.

27. Exit 3 is wired through distributor 7 to LF, and to release the card.

EMPTY CAR

28. Column 1 is blank and a space is punched into the tape for this card.

29. Column 12 is wired through the normal hubs of selector 5 to pick up program A, and through distributor 8 to SKIP. A fig-G is program punched as described in steps 4 and 5. A skip-stop insert is set at column 20.

30. Column 20 is wired to restart card reading after skipping.

31. Column 25 is wired through the normal hubs of selector 6 to pick up program A, and through distributor 8 to SKIP. A fig-G is program punched as described in steps 4 and 5. A skip-stop insert is set at column 31.

32. Column 31 is wired through the normal hubs of selector 6 to restart card reading after skipping.

33. Column 40 is wired through the normal hubs of selector 4 to column 25; from column 25 it is wired through the normal hubs of selector 6 to pick up program A, and through distributor 8 to SKIP. A fig-G is program punched as described in steps 4 and 5. A skip-stop insert is set at column 47.

34. Column 47 is wired through the normal hubs of selector 7 to AUTO SKIP. A skip-stop insert is set at column 63.

35. Column 63 is wired to restart card reading.

36. Column 78 is wired through the normal hubs of selector 7 to pick up program B. The 12 read in this column is wired through the normal hubs of selector 2 to CR.

37. The T impulse is wired through the normal hubs of selector 4 to control the program unit.

38. Exit 1 is wired through distributor 6 and the normal hubs of selector 8 to LF.

39. Exit 2 is wired to LF.

40. Exit 3 is wired through distributor 7 to LF and to release the card.

PAYROLL CHECK AND EARNINGS STATEMENT (FIGURE 89)

A PAYROLL check and earnings statement can be written simultaneously by tape-controlled telegraph. This means of preparing payroll checks

makes it possible to pay employees at distant locations from a central point with no loss in delivery time. Figure 89 shows the check; its carbon copy is the earnings statement which the employee keeps as his record.

The information to be printed on each check is punched into the tape from an employee summary earnings card (Figure 89).

The check form has been designed to use double spacing in order to minimize line spacing and, thus, shorten operating time. The length of the form is equivalent to nine double-spaced lines. It will be noted by studying the chart that the first printed line is on line 1; the second, line 2. The
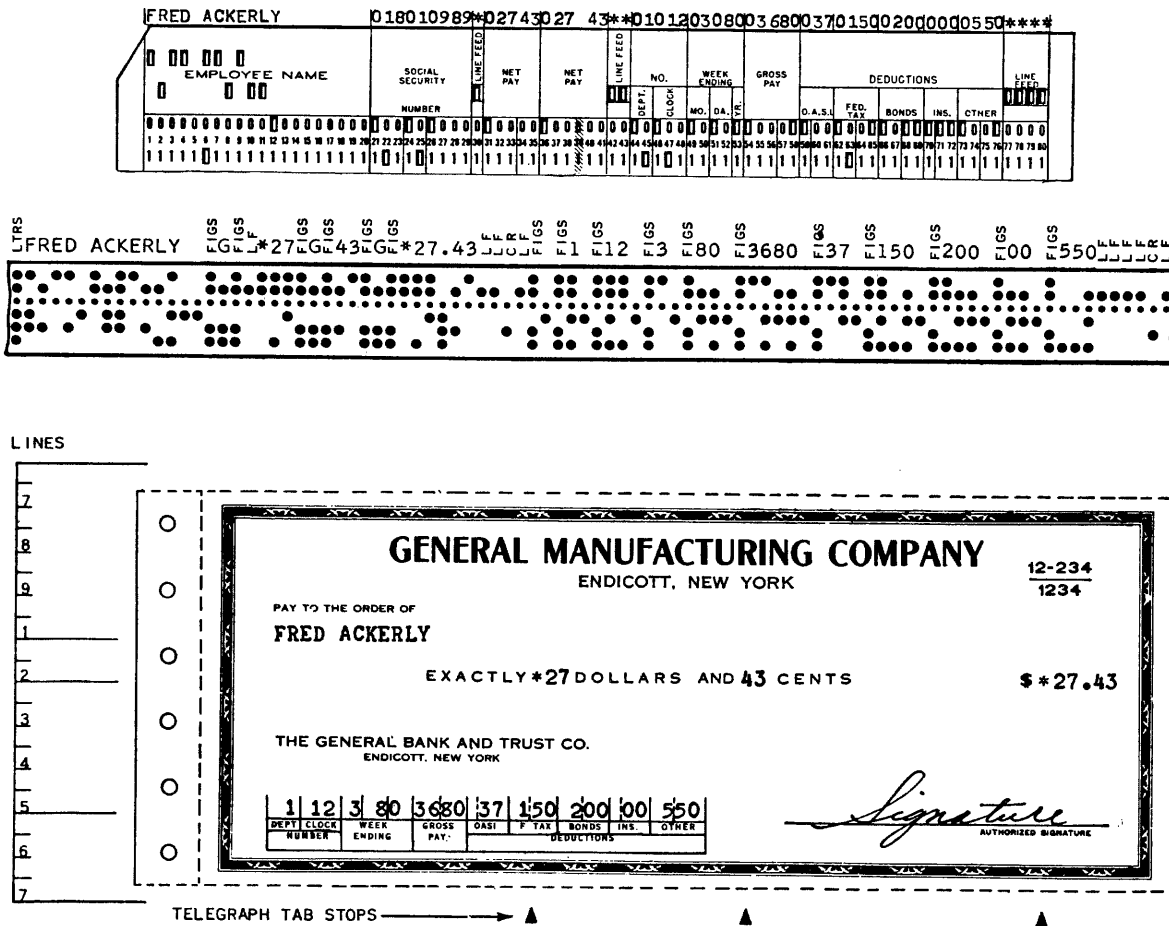

FIGURE 89. PAYROLL CHECK AND EARNINGS STATEMENT

third printed line is on line 5 and the first line on the next check is again on line 1.

No carriage return is necessary at the end of the first line when it is fully printed or when fig-G causes tabulation to complete the line, since the first character of the second line is printed in the next type space, one line lower. However, after the information for the second line, and that for the third line, a CR is program punched into the tape.

To simplify wiring, columns have been set aside for prepunched 11's to punch LF codes into the tape. As there are nine lines double-spaced, nine LF codes are necessary. The 11's in columns 30, 42-43, and 77-80 provide seven of these LF codes, and the other two are program punched after CR at the end of the information for the second and third lines.

Selected Program Punching and Skipping

The CBC device is turned on at column 1, the beginning of the employee name field. If the CBC exit is available before column 20, it causes the card to skip and picks up program A; a fig-G is program punched. When column 20 is reached, it is wired to skip the card to column 30; if the CBC exit is available at this column, it is not allowed to pick up program A.

After the net pay dollars are punched into the tape, a fig-G is program punched, and it is program punched again after the cents. These fig-G's are not accompanied by card skipping. Each fig-G will cause tabulation on the telegraph machine which must be equipped with the tabulation feature.

Figures-shift Characters

For this example, the A has arbitrarily been chosen as the key on the telegraph machine where the asterisk is to be found; the M, for the decimal point.

ZTS Control

The ZTS device is turned on at columns 31, 36, 44, 46, 49, 51, 54, 59, 62, 66, 70, and 73. The ZTS device is turned off at columns 34, 40, 57, 60, 64, 68, 71, and 75, so that any amount under ten cents will have a zero ahead of it.

Check Protection

An asterisk is desirable to the left of the dollars for net pay registrations when the amount is under $100.00. The printing of an asterisk, known as check protection, is made possible by the CHAR (character) impulse.

In this example, CHAR is wired to pick up selector 9 which controls the hold circuit for selector 8. Selector 8 is picked up by column 31 and all zeros pass through its transferred hubs to the A hub until a character impulse is available. The ZTS device is turned on at column 31 to limit the CHAR impulse to significant digits. Whether or not ZTS is on, a zero impulse is emitted from the 0 FROM CARD hub. This allows all zeros preceding the net pay to be routed through transferred selector 8 to the A hub for asterisk printing rather than allow the zeros to enter the zero hub where they would be internally converted to spaces.

When selector 9 is transferred by CHAR, the hold circuit of selector 8 is broken and any succeeding zeros pass through the normal hubs of selector 8 to the 0 hub to punch zeros until the selector is again transferred. Selector 9 is also picked up by column 34 so that any amount under ten cents will have a zero ahead of it. Therefore, amounts will be punched into the tape to cause printing, as follows:

CARD AMOUNTS	CHECK AMOUNTS	
$ ¢		
10052	100	52
05060	*50	60
00500	**5	00
00009	***	09

Column 36 is wired to pick up selector 8 and column 40 is wired to pick up selector 9. These columns control the protection of the second net pay amount.
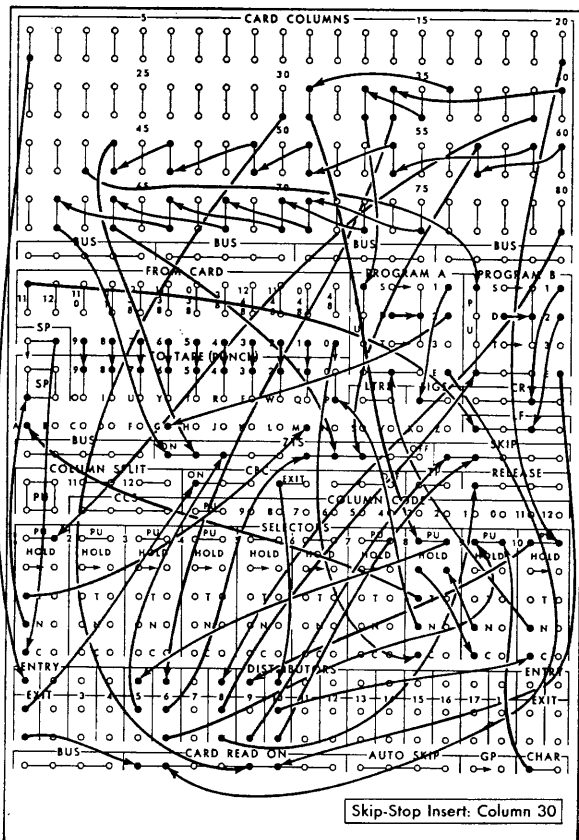
Skip-Stop Insert: Column 30

FIGURE 90.

Wiring (Figure 90)

1. Column 1 is wired through distributor 1 to start card reading, and to CBC ON. Digit-for-digit punching for 9 to 1 is wired.

2. The impulse for zero is wired to the 0 hub through the normal hubs of selectors 8, which is controlled by columns 31 and 36.

3. The impulse from a blank column is wired to SP through the normal hubs of selector 1, which is controlled by column 39.

WHEN CBC IS ACTIVE:

4. CBC exit is wired through distributor 10 to SKIP. It is also wired from distributor 10 to pick up program A through the normal hubs of selector 10, which is controlled by column 20. The D impulse controls the program unit. A skip-stop insert in the adjustable skip bar is set at column 30.

5. Exit 1 of program A is wired to FIGS.

6. Exit 2 of program A is wired to the G hub.

WHEN CBC IS INACTIVE:

7. Column 20 is wired to SKIP via selector 10 and distributor 9.

8. Column 30 restarts card reading after program punching and skipping.

9. The 11 read in column 30, and in all other columns, is wired to LF.

10. Column 31 is wired to pick up selector 8. The hold hubs of selector 8 are connected through the normal hubs of selector 9, which is controlled by CHAR and by columns 34 and 40. All zeros pass through the transferred hubs of selector 8 to the A hub until selector 9 is picked up. Column 31 is also wired from selector 8 through distributor 5 to ZTS ON.

11. CHAR is wired to pick up selector 9, which terminates the hold circuit of selector 8. All zeros then pass through the normal hubs of selector 8 to the 0 hub.

12. Column 33 is wired to pick up program A. Program punching of fig-G follows as described in steps 5 and 6.

13. The E impulse of program A restarts card reading.

14. Column 34 is wired through distributor 6 to pick up selector 9, which breaks the hold circuit of selector 8 if it has not previously been broken by a CHAR impulse, and allows a zero to punch a zero. Column 34 is also wired from distributor 6 to ZTS OFF.

15. Column 35 is wired to pick up program A via column 33. Program punching of fig-G follows as described in steps 5 and 6.

16. Column 36 is wired to pick up selector 8 and to turn ZTS ON via column 31 as described in step 10.

17. Card reading is restarted by the E impulse of program A.

18. Column 39 is wired to pick up selector 1. The impulse for this blank column is wired through the transferred selector to M(.).

19. Column 40 is wired to pick up selector 9 and to ZTS OFF via column 34 as described in step 14.

20. Column 43 is wired to pick up program B. The D impulse controls the program unit.

21. Exit 1 of program B is wired to CR.

22. Exit 2 of program B is wired to LF.

23. The E impulse of program B is wired to restart card reading.

24. Columns 44, 46, 49, 51, 54, and 59 are wired to ZTS ON.

25. Columns 57 and 60 are wired to ZTS OFF.

26. Columns 62, 66, 70, and 73 are wired to ZTS ON.

27. Columns 64, 68, 71, and 75 are wired to ZTS OFF.

28. Column 80 is wired through distributor 8 to release the card, and to pick up program B. Program punching of CR and LF follows as described in steps 21 and 22.

INVOICING BY TELEGRAPH

SEVERAL types of invoices are included in the following pages. There are as many different ways to plan an invoice as there are invoices to be designed. However, a basic approach is maintained in these invoices to explain the general operating principles. The basic approach has been purposely varied to bring to the reader's attention possibilities in form design, card design and wiring.

By varying the coding on the cards and the placement of the information on the form to a greater degree, each operation could be accelerated.

INVOICE A (FIGURES 91, 92A AND B, AND 93)

THE DESIGN for this invoice is shown on a planning chart in Figure 91. The cards for this invoice, and for the succeeding invoices, have been designed with the possibility of their being used for electric accounting machine work as well as for tape punching for telegraphed invoices. The cards are shown in Figure 92.

The name and address cards for *sold to* and *ship to*, along with the shipping instructions card, can be pulled from a master file for each invoice; the product cards can be pulled from a prepunched file or they can be key punched. The variable data card is punched for each invoice.

It is necessary with telegraphic invoicing to prepare a total card to print the amount of the in-

voice. This card may be summary punched. When this card is summarized, the number of cards for the body of the invoice is counted and also summary punched. After interpretation, these cards are associated by customer number with the rest of the invoice cards. The total cards, which are dated, may become debits to Accounts Receivable after invoicing.

A prepunched form feed card is pulled to complete each invoice set. This card has the necessary number of line feed codes to position the succeeding form properly for the printing of the next *sold to* name. For the invoice form, shown in Figure 93, there are 29 lines from the first body line of one form to the first address line of the succeeding form. The total card and the form feed card reduce this number to 27. In the first example there are two product cards. Therefore, two body lines are provided for and 25 line feed operations will be needed. These 25 operations are provided by the 25 line feed codes (12's) punched into the line feed card (Figure 92A). The 02 punched in columns 64-65 on the line feed card agrees with the number of lines summarized in the same columns on the total card. This number is the pulling and refiling medium. The prepunched form feed cards, kept in a file in line number sequence, can be refiled for future use.

Coding

Each card is coded in column 1 as follows:

1 – Sold to name and address cards
2 – Ship to name and address cards
3 – Shipping instructions card
4 – Variable data card
5 – Product cards
6 – ⎫ For special product description cards
    ⎬ and credit allowance cards when they
7 – ⎭ are needed; not shown in this example
8 – Total card
9 – Form feed card

Additional Line Feed Operations

As there must be an extra space between the *sold to* address and the *ship to* address, and an extra space preceding the shipping instructions,
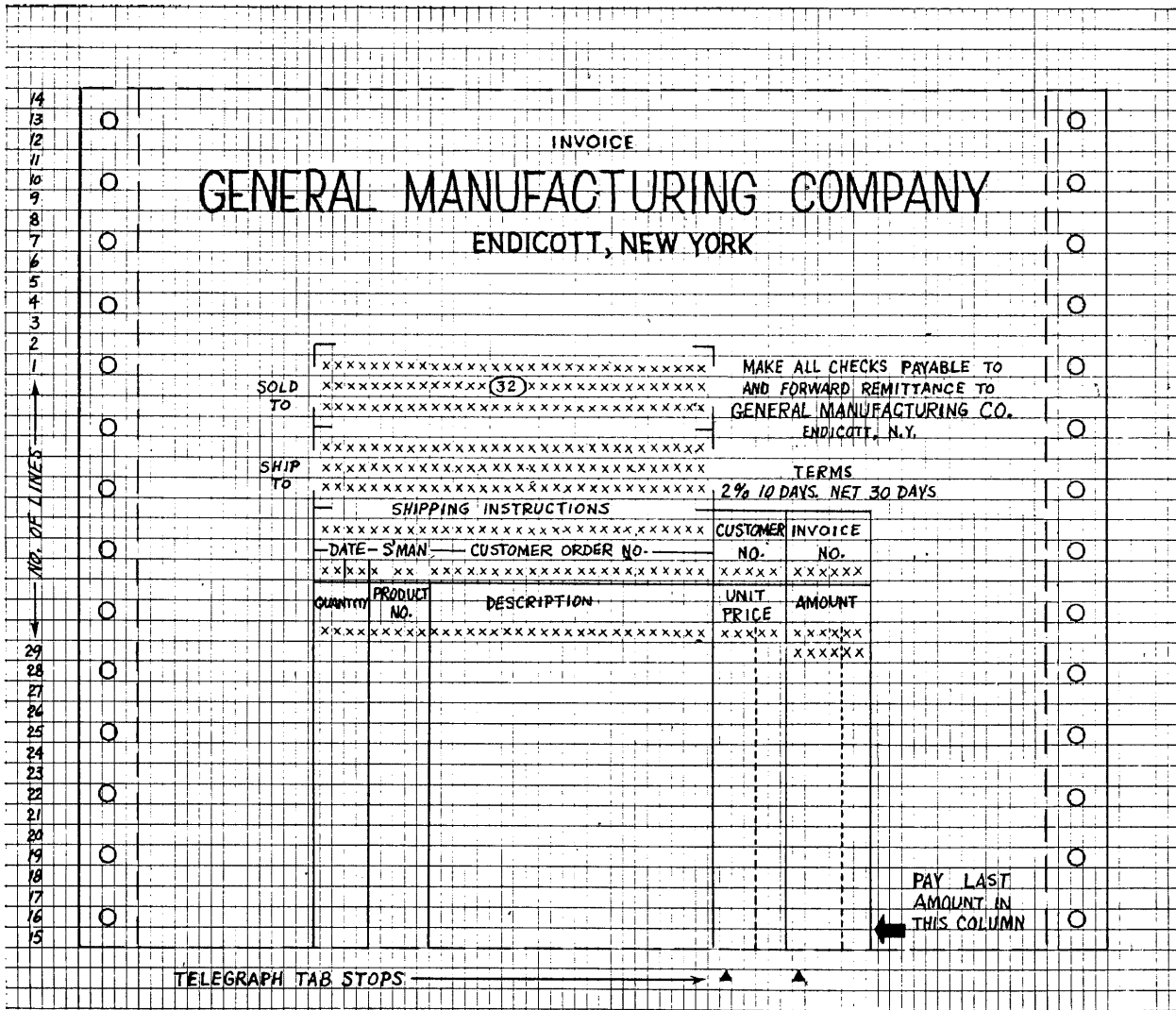
FIGURE 91. PLANNING CHART OF INVOICE A

and the variable data, the following cards have a 12 punched in column 2:

Ship To *Name* card (first card of the *ship to* set)
Shipping instructions card
Variable data card

When the *ship to* address is the same as the *sold to* address, only one card is needed in which the word *SAME* is punched in columns 3-6. However, a 12 must be punched in column 7 and in column 8. These 12's will cause line feed operations for the unused second and third cards in the set. An 11 in column 9 releases the card.

CCS Control

Column 1 is wired to ccs so that the card codes read in this column, which are used to control selectors, will not be punched into the tape.

When column 2 is blank, ccs must be activated in order to keep a space code from punching into the tape. Therefore, a space impulse to operate ccs is selected at column 2 through selector 1.

Both the total card and the form feed card are punched with an 11 to release them. The 11 on the total card is punched in column 11 while the 11 on the form feed card is punched adjacent to the last 12 punched for line feeding. The 11 code is wired to release the card, and to ccs so that the tape will not be left blank.

Printing Telegraph Machine Tabulations

When an invoice is written by a printing telegraph machine, it is necessary to position data across the form in designated locations. The fastest method of doing this is to cause the machine to tabulate whenever possible. For instance, when the customer order number does not fill the alloted spaces, the CBC exit impulse causes a fig-G to be program punched while skipping the card. This fig-G in the tape will cause the printing telegraph machine to tabulate to the customer number column. In like manner, when a product description does not fill the alloted spaces, the CBC exit impulse again causes a fig-G to be program punched while skipping the card. This fig-G in the tape will cause the printing telegraph machine to tabulate to the unit price column.

When all items have been written on the body of the invoice, the printing telegraph machine must be told where to print the total invoice amount; in other words, it must be told to tabulate twice before writing the amount punched into the tape. This is done by the special character 0-1 read in column 3 and in column 4, ahead of the total amount. This special character, wired to the G hub, punches two fig-G's in the tape without card skipping. The fig-G's will cause the printing telegraph machine to tabulate twice — the first tabulation will bring the unit price field into registration and the second tabulation will bring the amount field into registration where printing can begin.

CBC Control

The CBC device is turned on at column 3 for all cards except the variable data and product cards. It is turned on at column 12 and turned off at column 33 for the variable data and product cards. If the CBC device is active on the address cards or the shipping instructions card, the CBC exit impulse releases the card and picks up program B to punch CR and LF. If the CBC device is active on the variable data card or a product card, the exit impulse skips the card and picks up program A to punch fig-G.

ZTS Control

The ZTS device is turned on at columns 36 and 42 for all cards. It is also turned on at columns 3, 5 and 9 for the variable data card, at columns 3 and 7 for the product cards, and at column 4 for the total card. The ZTS device is turned off at columns 39 and 46 for the product cards so that any amount under ten cents will have a zero ahead of it. If there were any possibility of a total amount being under ten cents, ZTS would also have to be wired off at column 8 on the total card.

Wiring (Figure 94)

ALL CARDS

1. Column 1 is wired to pick up the column code device, and through distributor 6 to start card reading and to CCS. Code 4 is wired to pick up selector 10, and through distributor 9 to pick up selectors 8 and 9. Code 5 is wired to pick up selectors 7 and 6, and through distributor 8 to pick up selectors 9 and 8. Code 8 is wired to pick up selector 5. When these selectors are picked up, they remain transferred for the remainder of the card cycle, as the hold hubs in each are connected.

2. Blank columns are wired through the normal hubs of selector 1 to punch space codes except at column 2; digit-for-digit punching is wired.

3. Column 2 is wired to pick up selector 1. Space is wired through the transferred hubs of this selector to CCS so that a space code will not be punched into the tape when this column is blank.

4. When a 12 is read at column 2 (or at any other column), the 12 punches LF into the tape.

CARDS 1, 2 AND 3

5. Column 3 is wired through the normal hubs of selector 8 to CBC ON.

WHEN CBC IS ACTIVE:

6. CBC exit is wired through the normal hubs of selector 8 to pick up program B and to release the card. The D impulse controls the program unit.

7. Exit 1 of program B is wired to CR.

8. Exit 2 of program B is wired to LF.

FORM FEED PUNCHING

| | | 02 | | NO. OF LINES |

8 001795 02 06 1 00 0034 8

| | TOTAL INVOICE AMOUNT | | | NO. OF LINES | INVOICE DATE | CUSTOMER NO. |

| CARD CODE | I-SKIPS | TOTAL INVOICE AMOUNT | REC | | NO. OF LINES | INVOICE DATE MO. DA. YR. | CUSTOMER NO. |

6 000109003 DRILL AZ 01295 001295

6 010000098 BOLTS 00005 000500

| CARD CODE | QUAN-TITY | PROD-UCT NO. | PRODUCT DESCRIPTION | UNIT PRICE | AMOUNT |

4 06100 02 XRY 89682 00348 004981

| CARD CODE | INVOICE DATE MO. DA. YR. | SALESMAN | CUSTOMER ORDER NO. | CUSTOMER NO. | INVOICE NO. | LF |

3 SHIP BERMAN TO BOSTON TRANSF ACE 00348

SHIPPING INSTRUCTIONS — CUSTOMER NO.

2 SAME//* 00348

SHIP TO NAME AND ADDRESS — CUSTOMER NO.

1 PORTLAND MAINE 00348

1 216 BROWN BUILDING 00348

1 ABC METHOD COMPANY 00348

SOLD TO NAME AND ADDRESS — CUSTOMER NO.

COL.	CARD LEGEND
1	SOLD TO NAME & ADDRESS
2	SHIP TO NAME & ADDRESS
3	SHIPPING INSTRUCTIONS
4	VARIABLE DATA
5	PRODUCT
8	TOTAL
9	FORM FEED

ABC METHOD COMPANY 216 BROWN BUILDING PORTLAND MAINE SAME

SHIP BERMAN TO BOSTON TRANSF ACE 6100 2 XRY 896 2 348 4981

100 98 BOLTS 05 500 1 9003 DRILL AZ 1295 1295

1795 25 LF'S

*CCS

FIGURE 92A.

86

FORM FEED PUNCHING

03

NO. OF LINES

8 0104 30

C.C. TOTAL INVOICE AMOUNT

03 06 1 00 90670

NO. OF LINES INVOICE DATE CUSTOMER NO.

CARD CODE
1-1 SHIPS
TOTAL
INVOICE AMOUNT

INVOICE DATE
MO. DA. YR.
CUSTOMER NO.

6 000517203EXT SHANK WITH BRK   00162 000810

5 007513102FLAT TOP RIGID CASTERS 00084 006300

5 004011202SQ SHANK SWIVEL CASTERS 00083 003320

QUAN-TITY   PROD-UCT   PRODUCT DESCRIPTION   UNIT PRICE   AMOUNT
NO.

4/06100 12 TELEPHONE ORDER JUN 10 90670 004982 //

CARD CODE   L.F.   INVOICE DATE MO. DA. YR.   SALESMAN   CUSTOMER ORDER NO.   CUSTOMER NO.   INVOICE NO.   L.F.

3/BEST WAY   90670

SHIPPING INSTRUCTIONS   CUSTOMER NO.

2 CLEVELAND OHIO   90670

2 1487 SMITH STREET   90670

2 ARNOLD SIMPSON   90670

SHIP TO NAME AND ADDRESS   CUSTOMER NO.

1 CLEVELAND OHIO   90670

1 255 ESSEX STREET   90670

1 SQUARE DEAL OIL COMPANY   90670

SOLD TO NAME AND ADDRESS   CUSTOMER NO.

FIGS* FIGS* FIGS   C R L F FIGS* FIGS   LTRS   C R L F FIGS* FIGS LTRS   C R L F
SQUARE DEAL OIL COMPANY   255 ESSEX STREET   CLEVELAND OHIO

FIGS* L F LTRS   C R L F FIGS* FIGS   LTRS   C R L F FIGS* FIGS LTRS
ARNOLD SIMPSON   1487 SMITH STREET   CLEVELAND OHIO   C R L F

FIGS* L F LTRS   C R L F FIGS* L F   FIGS   FIGS   LTRS   FIGS   FIGS   FIGS   L F F C R L F
BEST WAY   6100 12 TELEPHONE ORDER JUN 10   90670   4982

FIGS* FIGS*   FIGS   LTRS   FIGS   FIGS   C R L F FIGS* FIGS   FIGS   LTRS   FIGS   FIGS   C R L F
4011202 SQ SHANK SWIVEL CASTERS   83   3320   7513102 FLAT TOP RIGID CASTERS   84   6300

FIGS* FIGS*   FIGS   LTRS   FIGS   FIGS   FIGS   C R L F FIGS* FIGS   FIGS   FIGS   C R L F FIGS*   24 LF'S   FIGS* C R L F
517203 EXT SHANK WITH BRK   162   810   162   10430

*CCS

FIGURE 92B.

87

GENERAL MANUFACTURING CO.
ENDICOTT N Y

SOLD TO: ABC METHOD COMPANY
216 BROWN BUILDING
PORTLAND MAINE

SHIP TO: SAME

MAKE ALL CHECKS PAYABLE TO
AND FORWARD REMITTANCE DIRECTLY
TO
GENERAL MANUFACTURING CO
ENDICOTT N Y

TERMS
2% 10 DAYS 30 DAYS NET

SHIPPING INSTRUCTIONS				CUSTOMER NO	INVOICE NO
SHIP BERMAN TO BOSTON TRANSF ACE					
DATE	S MAN	CUSTOMER ORDER NO			
6100	2	XRY 896B2		348	4981
QTY	PRODUCT NO	DESCRIPTION		UNIT PRICE	AMOUNT
100	98	BOLTS		05	500
1	9003	DRILL AZ		1295	1295
					1795

← PAY LAST AMOUNT IN THIS COLUMN

GENERAL MANUFACTURING CO.
ENDICOTT N Y

SOLD TO: SQUARE DEAL OIL COMPANY
255 ESSEX STREET
CLEVELAND OHIO

SHIP TO: ARNOLD SIMPSON
1487 SMITH STREET
CLEVELAND OHIO

MAKE ALL CHECKS PAYABLE TO
AND FORWARD REMITTANCE DIRECTLY
TO
GENERAL MANUFACTURING CO
ENDICOTT N Y

TERMS
2% 10 DAYS 30 DAYS NET

SHIPPING INSTRUCTIONS				CUSTOMER NO	INVOICE NO
BEST WAY					
DATE	S MAN	CUSTOMER ORDER NO			
6100	12	TELEPHONE ORDER JUN 10		90670	4982
QTY	PRODUCT NO	DESCRIPTION		UNIT PRICE	AMOUNT
40	11202	SQ SHANK SWIVEL CASTERS		83	3320
75	13102	FLAT TOP RIGID CASTERS		84	6300
5	17203	EXT SHANK WITH BRK		162	810
					10430

← PAY LAST AMOUNT IN THIS COLUMN

NO. OF LINES
29 27 25 23 21 19 17 15 13 11 9 7 5 3 1

FIGURE 93. INVOICE A
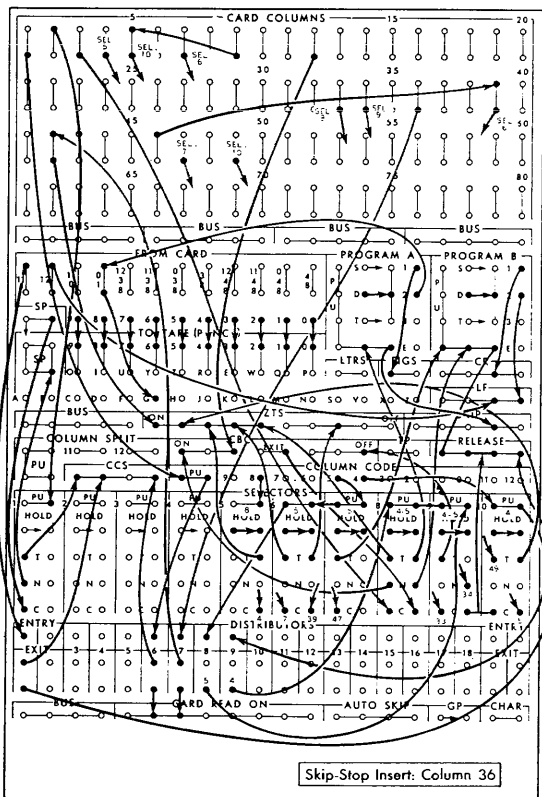
FIGURE 94.

WHEN CBC IS INACTIVE:

CBC OFF is not wired for these cards as this is the last field to be read. Therefore, time may be gained if the CBC exit is allowed to release the card from any column within the field.

9. Column 34 is wired through the normal hubs of selector 9 to release the card and to pick up program B. CR and LF are program punched.

CARD 4

10. Column 3 is wired through the transferred hubs of selector 8 to ZTS ON.

11. Columns 5 and 9 are wired through the transferred hubs of selector 10 to ZTS ON.

12. Column 12 is wired to CBC ON.

WHEN CBC IS ACTIVE:

13. CBC exit is wired through the transferred hubs of selector 8 to pick up program A, and to SKIP. A skip-stop insert in the adjustable skip bar is set at column 36. The D impulse controls the program unit.

14. Exit 1 of program A is wired to FIGS.

15. Exit 2 of program A is wired to the G hub directly, or as shown.

WHEN CBC IS INACTIVE:

16. Column 33 is wired through the transferred hubs of selector 9 to CBC OFF.

17. Column 36 is wired through distributor 7 to restart card reading after program punching and skipping, and to ZTS ON directly, or as shown.

18. Column 42 is wired to ZTS ON.

19. Column 49 is wired through the transferred hubs of selector 10 to release the card, and to pick up program B. CR and LF are program punched.

CARD 5

20. Column 3 is wired through the transferred hubs of selector 8 to ZTS ON.

21. Column 7 is wired through the transferred hubs of selector 6 to ZTS ON.

22. Column 12 is wired to CBC ON.

WHEN CBC IS ACTIVE:

23. Same as steps 13-15.

WHEN CBC IS INACTIVE:

24. Same as step 16.

25. ZTS ON — Same as steps 17-18.

26. Columns 39 and 46 are wired through the transferred hubs of selector 6 to ZTS OFF.

27. Column 47 is wired through the transferred hubs of selector 7 to pick up program B, and to release the card. CR and LF are program punched.

CARD 8

28. The 0-1's read in columns 2 and 3 are wired to the G hub. As this special character is analyzed as numerical by the machine, G need not be preceded by FIGS.

29. Column 4 is wired through the transferred hubs of selector 5 to ZTS ON.

30. The 11 read in column 10 is wired through distributor 1 to CCS, to release the card and to pick up program B. CR and LF are program punched.

CARD 9

31. The 11 read immediately after the last 12 for line feeding is wired to CCS, to release the card and to pick up program B. CR and LF are program punched.

FORM FEED PUNCHING

8 001795

5 00010900 3DRILL AZ 01295 001295

5 01000 0098BOLTS 00005 000500

QUAN' PROD PRODUCT DESCRIPTION UNIT AMOUNT

4 06100 02 XRY 89 6B2 00348 004981

INVOICE DATE SALESMAN CUSTOMER ORDER NO. CUSTOMER INVOICE NO.

3SHIP BERMAN TO BOSTON TRANSF ACE 00348
SHIPPING INSTRUCTIONS CUSTOMER NO.

2SAME//* 00348
SHIP TO NAME AND ADDRESS CUSTOMER NO.

1PORTLAND MAINE 00348
1216 BROWN BUILDING 00348
1ABC METHOD COMPANY 00348
SOLD TO NAME AND ADDRESS CUSTOMER NO.

COL 1	CARD LEGEND
	SOLD TO NAME & ADDRESS
2	SHIP TO NAME & ADDRESS
3	SHIPPING INSTRUCTIONS
4	VARIABLE DATA
5	PRODUCT
8	TOTAL
9	FORM FEED

ABC METHOD COMPANY 216 BROWN BUILDING PORTLAND MAINE SAME

SHIP BERMAN TO BOSTON TRANSF ACE 6100 2 XRY 896 B2 348 4981

100 98 BOLTS 05 500 1 9003 DRILL AZ 1295 1295

1795 25 LF'S

*CCS

FIGURE 95.

90

INVOICE B: LINE SPACING FROM CODE IN

COLUMN 1 (FIGURE 95)

THE INVOICE for this example is the same design as that in the preceding example, Figure 93. However, the cards which are shown in Figure 95 differ from those in Figures 92A and B in one respect: the code read in column 1 not only identifies the card but also punches LF when an additional line feed operation is needed. Therefore, column 2 is not needed for this purpose and all subsequent fields on these cards start one column to the left of those on the cards for the preceding example.

The only card having a 12 in column 1 is the first *ship to* card. All *ship to* cards are identified with a 2 in column 1 but the first one is further identified by a 12 in this column also.

Column 1 is wired to pick up the column code and column split devices. The column split device is needed in order to recognize the punchings in column 1 as codes, not letters. The column code device is needed in order to bring the codes in column 1 to the control panel so that they may be used to control selectors.

The LF punching is controlled through selectors 1, 2, and 3. Selector 1 is picked up by a 12 in
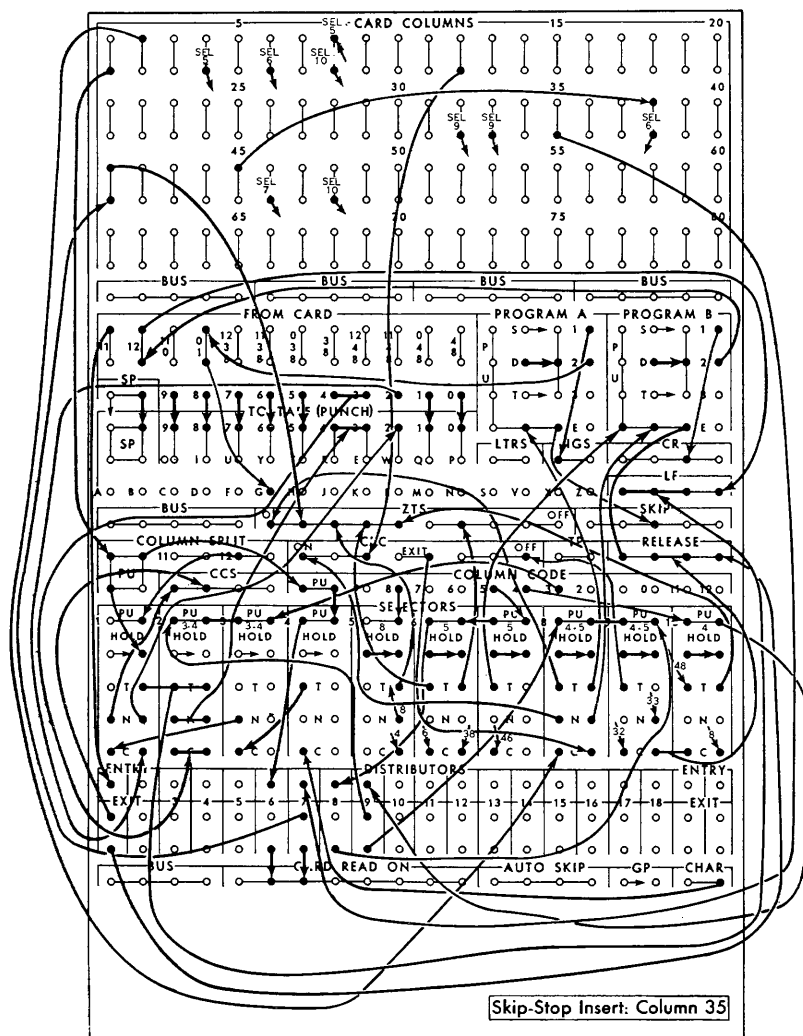
FIGURE 96.

column 1 from the 12 hub of the column split device. Selectors 2 and 3 are picked up by the 3 in column 1 in the shipping instructions card or the 4 in the variable data card.

The code impulse emitted from the column split device is too short to hold a selector up for a *full* card column. However, once a selector is picked up, a card column impulse wired to the hold entry hub can keep the selector transferred for that column. Therefore, column 1 is wired to the hold entry hub of selector 1.

At column 1: Selector 4 is transferred and selectors 1, or 2 and 3 may be transferred. When selectors 1, or 2 and 3 are transferred, digit 2, 3, or 4 is allowed to punch LF. When these selectors are not transferred, the CHAR impulse is allowed to reach CCS through the transferred hubs of selector 4 and the normal hubs of selectors 3 and 1, and FIGS is substituted for the code read.

At all other columns: Selectors 1 and 2 are not transferred and digits 2, 3, and 4 are allowed to punch corresponding codes.

Character Impulse

As stated above, the character impulse is used to CCS the code in column 1 whenever a 12, 3, or 4 is read in this column.

CHAR is used rather than the column 1 impulse in order to give selectors 1 and 3 time to pick up before the impulse reaches them for selection. Otherwise, an earlier impulse, such as a card column impulse, could pass through the normal hubs to CCS before either selector has time to transfer and every code would be CCS'd rather than just the ones desired.

Wiring (Figure 96)

The wiring for the above explanation is shown in Figure 96; the remainder of the wiring is comparable to that in the preceding figure with this additional exception: the card column in most instances is one number lower than that for the same function in the preceding example, because of the deletion of column 2 for LF coding.

INVOICE C (FIGURES 97, 98 A AND B, AND 99)

THE INVOICE for this example is designed so that the *sold to* and *ship to* name and addresses will be printed side by side. This makes it possible, if desired, to print shipping labels at the top of the packing slip (which is one of the form copies) simultaneously with addressing the invoice.

Each name and address set may consist of a maximum of five cards. The first card is released after column 59 is read, while all other name and address cards are released by an 11. When less than five cards are included in the set, as many 12's as there are cards missing must be punched in the last card of the set, beginning at column 52, to provide the necessary line feed operations, as follows:

Card	Col. 52	Card	Col. 52	53	Card	Col. 52	53	54
Second	11	Second	11		Second	11		
Third	11	Third	11		Third	12	12	11
Fourth	11	Fourth	12	11				
Fifth	11							

Coding

Each card is coded in column 1 as follows:

  1 – Name and address cards
  2 – Variable data card
  3 – Shipping instructions card
  4 – Product cards
  5 – ⎤
  6 – ⎬ For special product description cards and credit allowance cards when they
  7 – ⎦ are needed; not shown in this example
  8 – Total card
  9 – Form feed card

Selector Control

As in the previous invoice examples, the card codes in column 1 control selectors which, in turn, control wiring. It will be noted that whenever two codes control a selector, the codes are wired through distributors to the pickup hubs of the selector, with the exception of selector 10. Codes 1 and 3 are wired directly to pick up selector 10. This is possible as column 1 is CCS'd and FIGS will punch as the combination of codes 1 and 3 do not represent a letter.
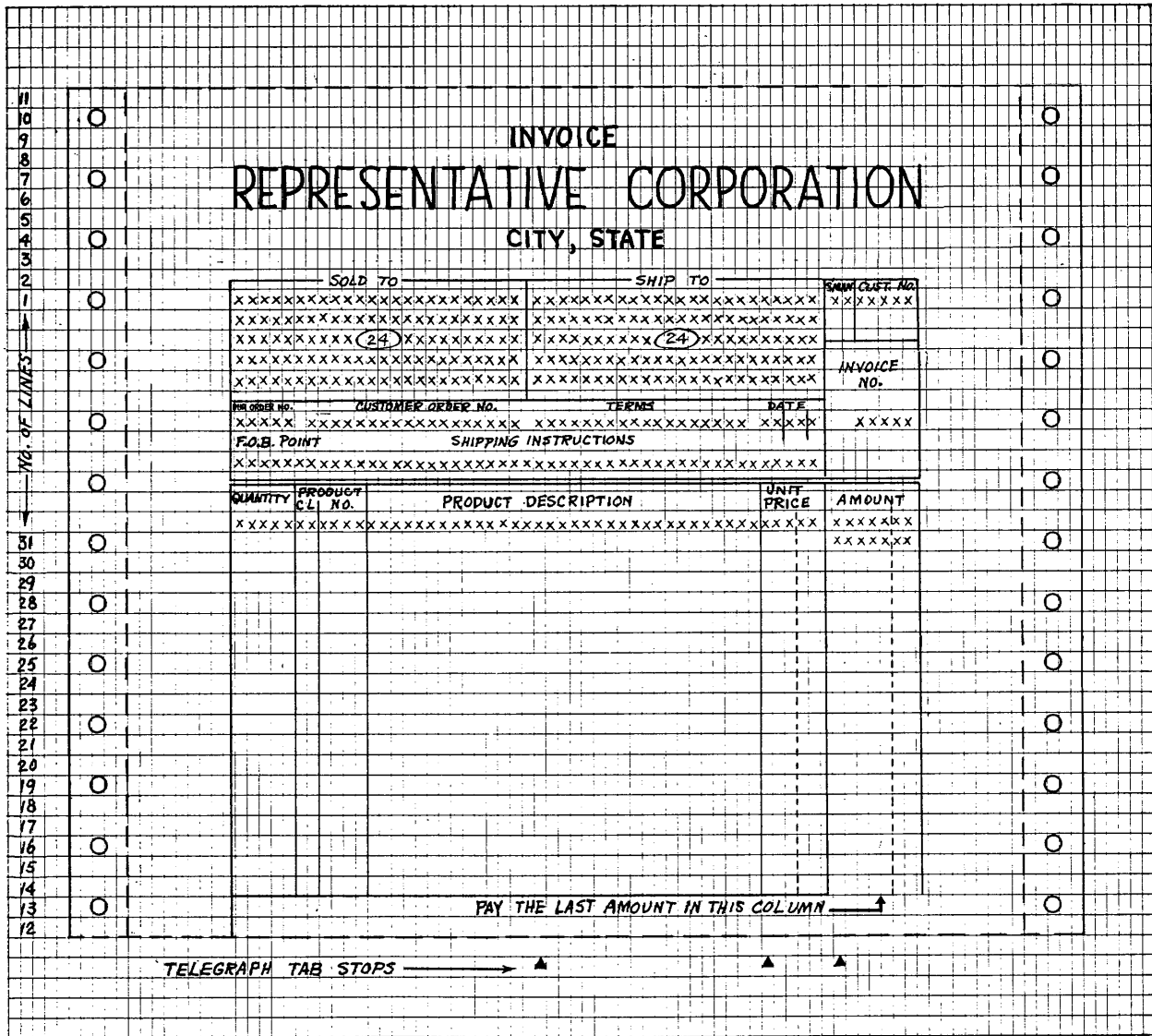
FIGURE 97. PLANNING CHART OF INVOICE C

Additional Line Feed Operations

As for Invoice A, column 2 is used for line feed coding; a 12 is punched in this column on the variable data card and on the shipping instructions card.

CBC Control

Columns 3 and 28 are wired to CBC ON and columns 25 and 44 are wired to CBC OFF for all cards. Column 47 is wired to CBC ON and column 50 is wired to CBC OFF for the name and address and the shipping instructions cards. All words or groups of information in the fields which have CBC control are separated by one space only.

When the CBC device is active, it causes program A to punch FIGS with exit 1, and to punch G and to cause skipping with exit 2.

Skips and Tabulations

When there are skips on the card, tabulations are required on the printing telegraph machine for Invoice C.

When the CBC is active, the first skip stop is at column 28 — the beginning of the *ship to* field on name and address cards or terms on the

FIGURE 98A.

*CCS

FIGURE 98B.

variable data card. After a short shipping instructions or product description, the CBC device is turned on again, two more blank columns are read, and another fig-G is punched while the card is skipped.

The second skip stop is at column 47 — the beginning of the date field on the variable data card, or unit price on the product cards. After a short *ship to* name and address or shipping instructions, however, the CBC device is turned on again, two more blank columns are read, and another fig-G is punched while the card is skipped. Skipping is stopped at column 53.

Additional fig-G's are recoded from the 0-1's which are read in columns 2, 3, and 28 on the total card; these 0-1's also cause skipping. The fig-G's will cause the printing telegraph machine to tabulate three times before printing the total amount on the invoice. Since the 0-1 at column 2 causes skipping as well as at columns 3 and 28, a skip-stop insert in the adjustable skip bar is set at column 3; this insert stops the skipping from column 2 so that column 3 can be read.

CCS Control

Column 1 is wired to CCS so that the codes read in this column, which are used to control selectors, will not be punched into the tape. The release 11 is also wired to CCS.

ZTS Control

The ZTS device is turned on at columns 53 and 55 for the name and address cards, at columns 3, 47, 49, and 55 for the variable data card, at columns 3, 8, 10, 47 and 53 for the product cards, and at column 47 for the total card. The ZTS device is turned off at columns 50 and 58 for the product cards so that any amount under ten cents will have a zero ahead of it.

Releasing

The *first* name and address card, the variable data card, and the product cards are released after column 59 is read, while all other cards have a variable point of release. Therefore, these latter cards are released by an 11 punched in the last column to be read. The 11 code is wired to release the card, and to activate CCS, so that the tape will not be left blank.

Wiring (Figure 100)

ALL CARDS

1. Column 1 is wired to pick up the column code device, and through distributor 6 to start card reading, and to CCS. Code 1 is wired to pick up selector 10. Code 2 is wired to pick up selector 7. Code 3 is wired to pick up selector 10. Code 4 is wired to pick up selector 6. Code 8 is wired to pick up selector 5. When these selectors are picked up, they remain transferred for the remainder of the card cycle as the hold hubs in each are connected.

2. Blank columns are wired through the normal hubs of selector 1 to punch space codes; digit-for-digit punching is wired.

3. Column 2 is wired to pick up selector 1. Space is wired through the transferred hubs of this selector to CCS so that a space code will not be punched into the tape when this column is blank.

4. When a 12 is read at column 2 (or at any other column), the 12 impulse punches LF into the tape.

5. Column 3 is wired through distributors 3 and 4 to start card reading (needed for the total card), and to CBC ON.

CARD 1

WHEN CBC IS ACTIVE:

6. CBC exit is wired to pick up program A. The D impulse controls the program unit.

7. Exit 1 of program B is wired to FIGS.

8. Exit 2 of program B is wired to SKIP and to the G hub directly, or as shown. A skip-stop insert in the adjustable skip bar is set at column 28.

WHEN CBC IS INACTIVE:

9. Column 25 is wired to CBC OFF.

10. Column 28 is wired through distributor 5 to restart card reading after program punching and skipping, and to CBC ON.

WHEN CBC IS ACTIVE:

11. CBC exit is wired to pick up program A. Fig-G is program punched and skipping is activated as described above. A skip-stop insert is set at col-

INVOICE

REPRESENTIVE CORPORATION
CITY STATE

SOLD TO	SHIP TO	S MAN CUST NO
JOHNSON LAKE AND GREEN ATWOOD STREET SOUTHVILLE UTAH	SAME	4 9003

INVOICE NO

OUR ORDER NO	CUSTOMER ORDER NO	TERMS	DATE	
1095 J4092		2PC 10 DAYS NET 30	5 20	9890

F O B POINT   SHIPPING INSTRUCTIONS
LOS ANG BEST WAY

QUANTITY	PRODUCT CL. NO.	PRODUCT DESCRIPTION	UNIT PRICE	AMOUNT
10	1 43	HAWTHORNE SOFA IN COLONIAL FABRIC	15000	15000C
6	15 502	MAPLE BEDROOM SUITE	42500	25500
				40500

PAY LAST AMOUNT IN THIS COLUMN

INVOICE

REPRESENTIVE CORPORATION
CITY STATE

SOLD TO	SHIP TO	S MAN CUST NO
ROBERT FINCH CO ATT A H MEAD DEPT 611 UNION STREET NORTON VIRGINIA	BRUCE K JONES 521 MAIN STREET BLISSVILLE PENNSYLVANIA	10 7906

INVOICE NO

OUR ORDER NO.	CUSTOMER ORDER NO	TERMS	DATE	
1096	TEL ORDER APRIL 29 NET 30 DAYS		5 20	9891

F.O.B. POINT   SHIPPING INSTRUCTIONS
CHICAGO MONTROSE AND TAYLOR TRUCK CO

QUANTITY	PRODUCT CL. NO.	PRODUCT DESCRIPTION	UNIT PRICE	AMOUNT
12	42 109	ANTIQUE MIRROR	1500	18000
1	609 013	DINING SET	25000	25000
1	23 45	BREAKFAST SET	7500	7500
				50500

PAY LAST AMOUNT IN THIS COLUMN

NO. OF LINES

31 29 27 25 23 21 19 17 15 13 11 9 7 5 3 1

FIGURE 99. INVOICE C

97

Skip-Stop Inserts: Columns 3, 28, 47, 53
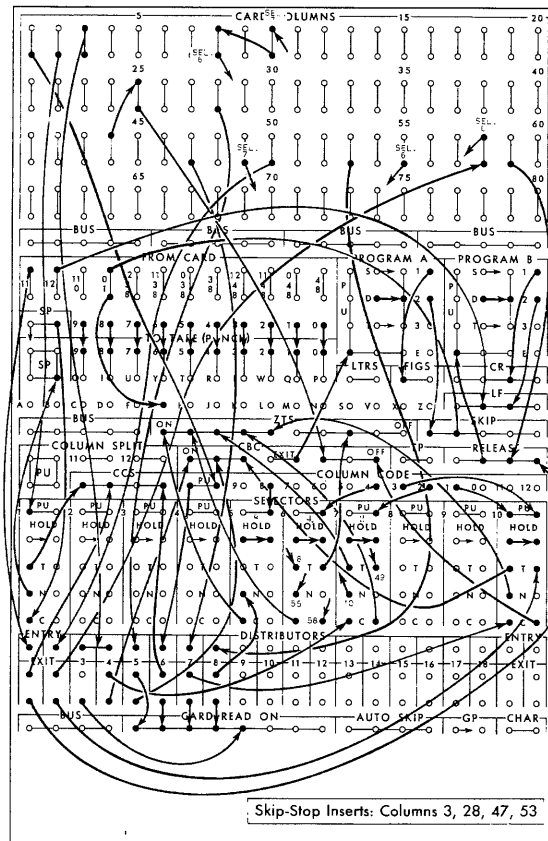
FIGURE 100.

umn 47 for the No. 2 and 4 cards; therefore, the insert stops skipping on *all* cards.

WHEN CBC IS INACTIVE:

12. Column 44 is wired via column 25 to CBC OFF.

13. Column 47 is wired through distributor 7 to restart card reading after program punching and skipping, and through the transferred hubs of selector 10 to CBC ON.

WHEN CBC IS ACTIVE:

14. CBC exit is wired to pick up program A. Fig-G is program punched and skipping is activated as described above. A skip-stop insert is set at column 53.

WHEN CBC IS INACTIVE:

15. Column 50 is wired through distributor 2 and the transferred hubs of selector 10 to CBC OFF.

16. Column 53 is wired through distributor 8

to restart card reading after program punching and skipping, and through the normal hubs of selector 5 to ZTS ON.

FIRST NAME AND ADDRESS CARD IN THE SET

17. Column 55 is wired through the normal hubs of selector 6 to ZTS ON.

18. Column 59 is wired to release the card, and to pick up program B. CR and LF are program punched.

ALL OTHER NAME AND ADDRESS CARDS
IN THE SET

19. The 12 impulse, if any, is wired to LF.

20. The 11 is wired through distributor 1 to CCS, and to release the card and pick up program A. CR and LF are program punched.

CARD 2

21. Column 3 is wired through distributor 4 and the transferred hubs of selector 7 to ZTS ON.

WHEN CBC IS ACTIVE OR INACTIVE:

22. Same as steps 6 to 12 inclusive.

23. Column 47 is wired through distributor 7 to start card reading after skipping, and through the normal hubs of selector 10 to ZTS ON.

24. Column 49 is wired through the transferred hubs of selector 7 to ZTS ON.

25. Column 55 is wired through the normal hubs of selector 6 to ZTS ON.

26. Column 59 is wired to release the card, and to pick up program B. CR and LF are program punched.

CARD 3

The wiring for this card is the same as that for the card 1 through step 15, and as follows:

27. Column 53 is wired through distributor 8 to start card reading after skipping.

28. The 12 impulses are wired to LF.

29. The 11 is wired through distributor 1 to CCS, and to release the card and pick up program A. CR and LF are program punched.

CARD 4

30. Column 3 is wired through distributor 4 and through the normal hubs of selector 7 to column 10, which is wired to column 8.

31. Columns 8 and 10 (and 3) are wired through the transferred hubs of selector 6 to ZTS ON.

WHEN CBC IS ACTIVE OR INACTIVE:

32. Same as steps 6 to 12 inclusive.

33. Column 47 is wired through distributor 7 to restart card reading after program punching and skipping, and through the normal hubs of selector 10 to ZTS ON.

34. Column 50 is wired through distributor 2 to column 58, which is wired through the transferred hubs of selector 6 to ZTS OFF.

35. Column 53 is wired through distributor 8 and the normal hubs of selector 5 to ZTS OFF.

36. Column 59 is wired to release the card, and to pick up program A. CR and LF are program punched.

CARD 8

37. The 0-1's read in columns 2, 3, and 28 are wired to the G hub and to SKIP. As this special character is analyzed as numerical by the machine, G need not be preceded by FIGS. The skipping at column 2 is stopped at column 3; the skipping at column 3 is stopped at column 28; the skipping at column 28 is stopped at column 47.

38. Columns 3 and 28 are wired through distributors 3 and 5 to start card reading after skipping.

39. Column 47 is wired through distributor 7 to start card reading after skipping, and through the normal hubs of selector 10 to ZTS ON.

40. The 11 read in column 54 is wired through distributor 1 to CCS, and to release the card and pick up program B. CR and LF are program punched.

CARD 9

41. The 12 impulses are wired to LF.

42. The 11 impulse is wired through distributor 1 to CCS, and to release the card and pick up program B. CR and LF are program punched.

Cards for Tape Punching Only

For comparison purposes, an alternate set of cards is presented as shown in Figures 101A and B. This set of cards is used to prepare tape only, while the original set could prepare tape or could be used for document writing on an electric accounting machine. These two sets of cards differ in one respect only: the alternate set has an 11 punched after the last code to be read on cards 1 and 3. The 11 releases each card immediately and eliminates the need for CBC analysis in one or more fields. This release punching shortens the time of tape preparation because fewer codes are punched into the tape, and a shorter tape, in turn, shortens the time of document writing on the tele-

graph machine. Therefore, it is always desirable to incorporate any punching which will speed production when the cards are used for tape production only, and it is often advisable in a dual operation to maintain two files of cards, when such a saving can be made, one to punch tape to write documents on a telegraph machine and one to write documents on an electric accounting machine.

The wiring for use with the original set of cards is unchanged for the alternate set of cards.

The tape produced by the alternate set of cards is shown in Figures 101A and B. By comparing this tape with that shown in Figures 98A and B, it will be noted that, although it has fewer codes, it can print the document shown in Figure 99.

FIGURE 101A.

CHICAGO MONTROSE AND TAYLOR TRUCK CO//*

FOB & SHIPPING INSTRUCTIONS

01096 TEL ORDER APRIL 29 NET 30 DAYS 05020 09891

OUR ORDER NO.	CUSTOMER ORDER NO.	TERMS	INVOICE DATE		INVOICE NO.
			MO	DA	

NORTON VIRGINIA*
UNION STREET*
DEPT 611   BLISSVILLE PENNSYLVANIA*
ATT A H MEAD   521 MAIN STREET*
ROBERT FINCH CO   BRUCE K JONES   1007906

	SOLD TO	SHIP TO	SALESMAN	CUSTOMER NO.

ROBERT FINCH CO   BRUCE K JONES   10   7906   ATT A H MEAD   521   MAIN STREET

DEPT 611   BLISSVILLE PENNSYLVANIA   UNION STREET

NORTON VIRGINIA   1096   TEL ORDER APRIL   29   NET   30   DAYS   5   20   9891

CHICAGO MONTROSE AND TAYLOR TRUCK CO

*CCS

FIGURE 101B.

101

INVOICE D (FIGURES 102, 103A AND B, AND 104)

INVOICE D differs from the preceding invoices on two major points:

1. The first card of each set contains the *sold to* name and address while the second card contains the *ship to* name and address. These cards are called MLP (multiple line printing) cards and they are designed so that they can also be used on an IBM Accounting Machine which has the multiple line printing feature.

2. The lines printed on the body of the invoice are double-spaced. When pre-invoicing is done and the shipping copy is part of the invoice set,

it is particularly advantageous to have these lines double spaced to aid the shipper.

Coding

Each card is coded in column 1 as follows:

1 – Sold to name and address card
2 – Ship to name and address card
3 – Shipping instructions card
4 – Variable data card
5 – Product cards
6 –⎫ For special product description cards
     ⎬ and credit allowance cards when they
7 –⎭ are needed; not shown in this example
8 – Total card
9 – Form feed card
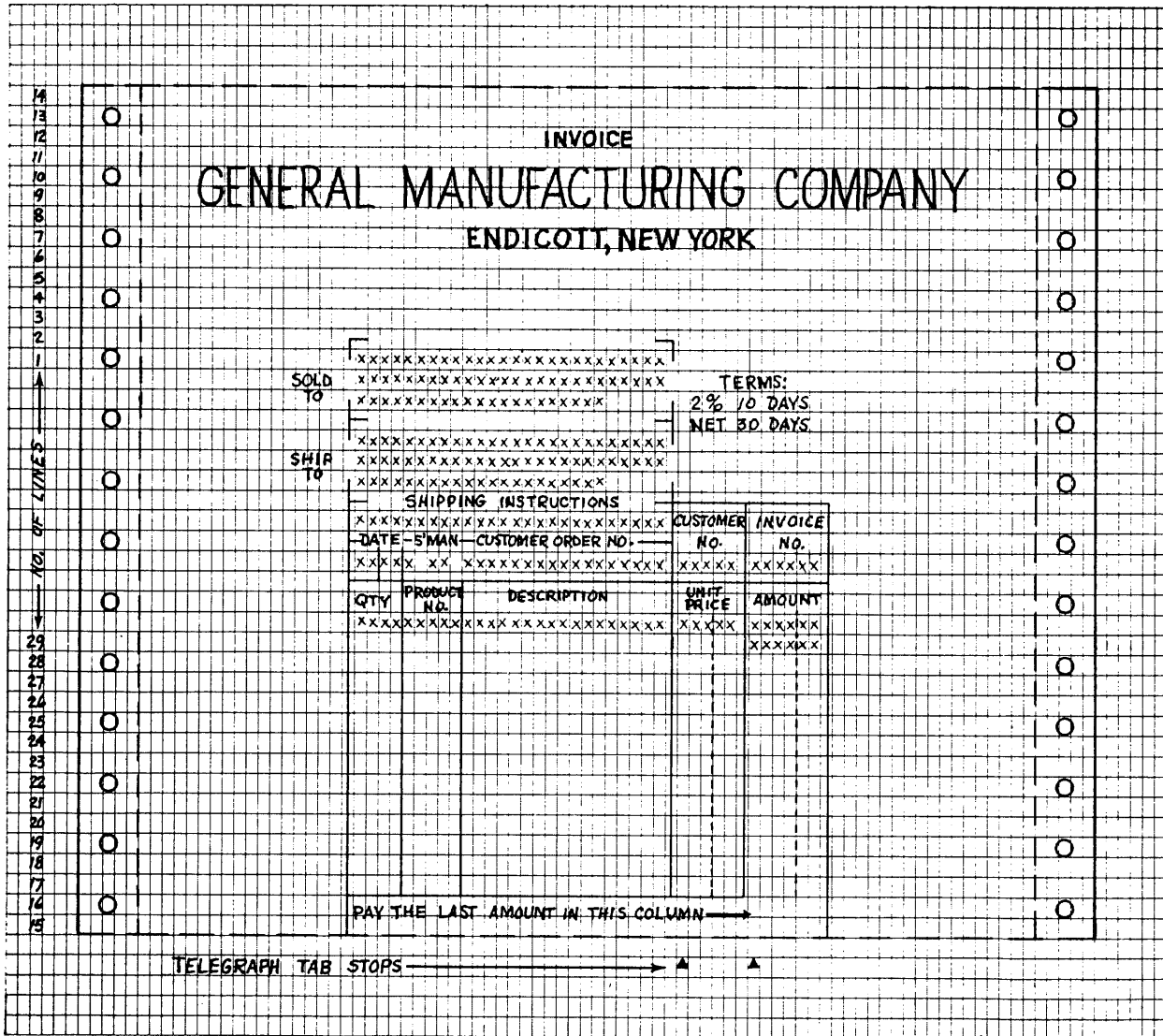
FIGURE 102. PLANNING CHART OF INVOICE D

Carriage Return Codes

CR is program punched after the information for each line of address, as shown in Figure 56. It is also program punched as each card is released.

Line Feed Codes

One LF code is program punched after the CR except at the end of the data on each card when two LF's are program punched. The extra LF provides the extra line space below the address groups and the shipping instructions, and separates the product items so that double spacing is effected. Three LF codes are needed after the variable data. One is recoded from the 11 in column 41 and the other two are the program punched LF's mentioned above. The 11's which release the total card and the form feed card are also recoded to LF's.

When the *ship to* name and address is the same as the *sold to* name and address, SAME is punched in columns 2-5, a 12 is punched in column 6, and an 11 is punched in column 7. By this punching, only seven columns are read on this card, which speeds the tape punching operation, as follows:

The 12 and the 11 are recoded to LF's; the 11 also causes CR and two LF's to be program punched before the card is released. These LF codes compensate for the address lines which will not be written on the form.

Form Feeding

There are 29 lines from the first printing location on the body of one form to the *sold to* name line of the succeeding form. The needed 29 LF codes for the first invoice in this example are obtained as follows:

	LF CODES	
	PUNCHED	NEEDED
6 product cards (2 LF's each card)	12	29
Total card	3	
Form feed card itself	3	
	18	
Form feed card chosen which has 11 LF codes	11	
	29	29

CBC Control

CBC is turned on at column 2 on all cards. It is not needed for cards 8 and 9 but, as it does no

harm, the column 2 impulse is wired through distributor 1 to CBC ON without selection. CBC is also turned on at columns 28 and 54 for cards 1 and 2.

The CBC exit is selected to pick up program A for cards 4 and 5; for all other cards it picks up program B.

The CBC device is turned off at column 25 for cards 4 and 5. It is not turned off on the other cards as there must be program punching at the end of the fields. Therefore, time may be gained when CBC action is allowed to take place whenever it is available within each field.

Program A Control

When this program unit is picked up by the CBC exit on cards 4 and 5, a fig-G is punched to accompany skipping, which is also controlled by the CBC exit.

Program B Control

This program unit is picked up as follows:

Card 1—By the CBC exit when the CBC device is active; by columns 27, 53, and 74 when the CBC device is inactive.

Card 2—By controls identical to those for card 1 except when the address is SAME and then the program unit is picked up by the 11 in column 7.

Card 3—By the CBC exit when the CBC device is active; by column 27 when the CBC device is inactive.

Card 4—By the 11 in column 41.

Card 5—By column 40.

Card 8—By the 11 in column 10.

Card 9—By the 11 which follows the last 12 code read from the card.

As stated above, two program exit impulses are needed after the name and again after the street address when the *sold to* and *ship to* cards are read. At all other times, three program exit impulses are needed. The D impulse is wired through the transferred hubs of selector 10 and the T impulse is wired through the normal hubs of selector 10 to control the program unit. Selector 10 is picked up for cards 1 and 2; its hold circuit is controlled by selector 8. Therefore, this selector remains transferred until selector 8 is picked up by col-

FORM FEED PUNCHING

		NO. OF LINES

8 039550

	06	10 160	00165
		INVOICE DATE	CUSTOMER NO.

| | | TOTAL INVOICE AMOUNT | | | | INVOICE DATE MO. DA. YR. | CUSTOMER NO. |

5010010653FUSE 00005 000500
500200 5073VALVE 00468 009360
500053 6935CAP 00488 002440
500250 5089SPRING 00748 018700
500101 5738GUARD 00319 003190
500200 8202PIN UNIT 00268 005360

CARD CODE	QUANTITY	PRODUCT NO.	DESCRIPTION	UNIT PRICE	AMOUNT

4 10160 15 TEL ORDER OCT 15 00165 008103*

CARD CODE	DATE MO. DA	SALESMAN	CUSTOMER ORDER NO.	CUSTOMER NO.	INVOICE NO.	REL

3 TRUCK BEST WAY OVER 10 LBS

SHIPPING INSTRUCTIONS

2 SAME/*   00165

CARD CODE	SHIP TO NAME	STREET	CITY AND STATE	CUSTOMER NO.	M L P

1 JOEL ADAMS   RIVER STREET AT STONE AVE   CAMBRIDGE MASS   00165

CARD CODE	SOLD TO NAME	STREET	CITY AND STATE	CUSTOMER NO.	M L P

COL. I	CARD LEGEND
1	SOLD TO NAME & ADDRESS
2	SHIP TO NAME & ADDRESS
3	SHIPPING INSTRUCTIONS
4	VARIABLE DATA
5	PRODUCT
6	TOTAL
9	FORM FEED

JOEL ADAMS   RIVER STREET AT STONE AVE   CAMBRIDGE MASS   SAME

TRUCK BEST WAY OVER 10 LBS 10160 15 TEL ORDER OCT 15 165 8103

20 8202 PIN UNIT 268 5360 1015738 GUARD 319 3190

25 5089 SPRING 748 18700 536935 CAP 488 2440

20 5073 VALVE 468 9360 10010653 FUSE 05 500

39550   11 LF'S

*CCS

FIGURE 103A.

104

FIGURE 103B.

umn 55, or by the 11 in column 7 when *SAME* is punched in card 2.

Exit 1 of program B is wired to CR and exits 2 and 3 are wired to LF.

Release Control

Although selection of program controls is taking place in this example, release need not be delayed, for, when release takes place, selector 10 is normal. Therefore, release has no effect on the selection of the program controls.

Skips and Tabulations

When the CBC device is active before column 55 on cards 1 and 2 and when it is active on cards 4 and 5, CBC exit is wired to SKIP. The skipping of cards 1 and 2 is simultaneous with the program punching of CR and LF; the skipping of cards 4 and 5 is simultaneous with the program punching of fig-G. The first skip-stop insert in the adjustable skip bar is set at column 28; the second, at column 54.

A fig-G will cause tabulation on the printing telegraph machine. The tabular stop is set at the column where customer number or unit price is to be printed for cards 4 and 5.

Additional fig-G's without card skipping are punched by the 0-1's read in columns 2 and 3 on card 8. These fig-G's will cause the printing telegraph machine to tabulate twice before printing the total invoice amount. The first fig-G positions the machine at the unit price column and the second fig-G positions the machine at the amount column, where a second tabular stop is set.

CCS Control

Column 1 is wired to CCS so that the codes read in this column, which are used to control selectors, will not be punched into the tape.

ZTS Control

The ZTS device is turned on at columns 2, 4, 8, 29, and 35 for card 4, at columns 2, 6, 29, and 35 for card 5, and at column 4 for card 8. The ZTS device is turned off at columns 32 and 39 for card 5 so that any amount under ten cents will be preceded by a zero.

Wiring (Figure 105)

ALL CARDS

1. Column 1 is wired to pick up the column code device, and through distributor 6 to start card reading and to CCS. Codes 1 and 2 are wired to pick up selectors 9 and 10. Code 3 is wired to pick up selector 8 via column 55. Code 4 is wired to pick up selector 7, and through distributor 10 to pick up selectors 5 and 4. Code 5 is wired to pick up selectors 3 and 2, and through distributor 2 to pick up selectors 4 and 5. Code 8 is wired to pick up selector 1. The hold hubs of each of these selectors, except selector 10, are connected so that, when they are picked up, the selectors will remain transferred until a new card is fed into reading position. The hold circuit of selector 10 is controlled by selector 8.

2. Blank columns are wired to punch space codes; digit-for-digit punching is wired. FROM CARD 12 is wired to LF. FROM CARD 11 is wired through distributor 5 to pick up selector 8. It is also wired through distributor 4 to punch LF and to pick up program B. FROM CARD 0-1 is wired to punch G.

3. Column 2 is wired through distributor 1 to CBC ON.

4. Column 55 is wired to pick up selector 8.

CARDS 1 AND 2

WHEN CBC IS ACTIVE:

5. The CBC exit is wired through the normal hubs of selector 5 and through distributor 8 to pick up program B, and through the normal hubs of selector 8 to SKIP. A skip-stop insert is set at column 28 in the adjustable skip bar.

6. The D impulse is wired through the transferred hubs of selector 10 to control the program unit.

7. Exit 1 of program B is wired to CR.

8. Exit 2 of program B is wired to LF.

WHEN CBC IS INACTIVE:

9. Column 27 is wired through the normal hubs of selector 4 to pick up program B. CR and LF are program punched as described above.

INVOICE

GENERAL MANUFACTURING CO.
ENDICOTT N. Y

SOLD
TO
JOEL ADAMS
RIVER STREET AT STONE AVE
CAMBRIDGE MASS

TERMS:
2% 10 DAYS, 30 DAYS NET

SHIP
TO
SAME

SHIPPING INSTRUCTIONS TRUCK BEST WAY OVER 10 LBS			CUSTOMER NO.	INVOICE NO.
DATE 10 60 15	S MAN	CUSTOMER ORDER NO. TEL ORDER OCT 15	165	8103
QTY	PRODUCT NO.	DESCRIPTION	UNIT PRICE	AMOUNT
20	8202	PIN UNIT	2 68	53 60
10	15738	GUARD	3 19	31 90
25	5089	SPRING	7 48	187 00
5	36935	CAP	4 88	24 40
20	5073	VALVE	4 68	93 60
100	10653	FUSE	05	5 00
				395 50

PAY LAST AMOUNT IN THIS COLUMN ➡

INVOICE

GENERAL MANUFACTURING CO.
ENDICOTT N. Y

SOLD
TO
JOSEPH STONER AND COMPANY
522 MAIN STREET
ENDICOTT NEW YORK

TERMS:
2% 10 DAYS, 30 DAYS NET

SHIP
TO
CHARLES LANE
781 JUNE STREET
JOPLIN MISSOURI

SHIPPING INSTRUCTIONS BEST WAY			CUSTOMER NO.	INVOICE NO.
DATE 10 60	S MAN 2	CUSTOMER ORDER NO. 19246	91192	8104
QTY	PRODUCT NO.	DESCRIPTION	UNIT PRICE	AMOUNT
15	15738	GUARD	3 19	47 85
10	5694	HINGE	6 60	66 00
25	5073	VALVE	4 68	117 00
10	10579	BELLOWS	24	2 40
				233 25

PAY LAST AMOUNT IN THIS COLUMN ➡

FIGURE 104. INVOICE D

Skip-Stop Inserts: Columns 28, 54
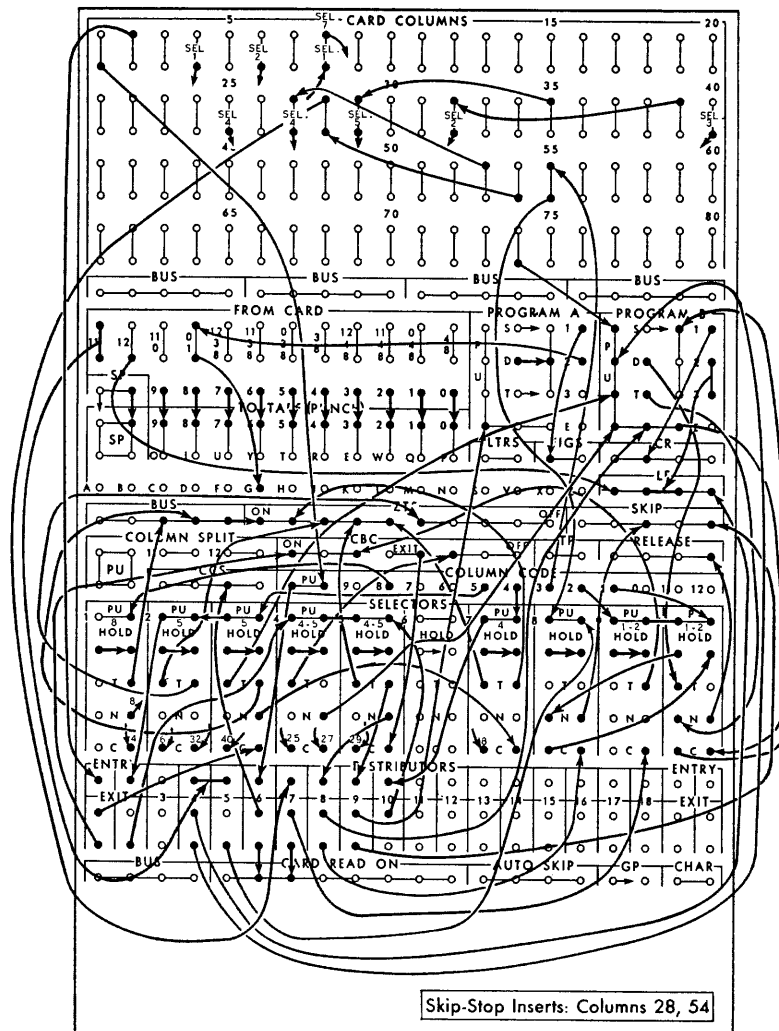
FIGURE 105.

10. Column 28 is wired through distributor 7 to restart card reading after program punching and skipping, and through the transferred hubs of selector 9 to CBC ON.

WHEN CBC IS ACTIVE:

11. CR and LF are program punched and skipping occurs as for the preceding field. A skip-stop insert is set at column 54.

WHEN CBC IS INACTIVE:

12. Column 53 is wired via column 27 through the normal hubs of selector 4 to pick up program B. CR and LF are program punched.

13. Column 54 is wired via column 28 through distributor 7 to restart card reading after program punching and skipping, and through the transferred hubs of selector 9 to CBC ON.

WHEN CBC IS ACTIVE:

14. CBC exit picks up program B as for the previous fields. It also releases the card through the normal hubs of selector 10.

15. The T impulse is wired through the normal hubs of selector 10 to control the program unit.

16. Exit 1 of program B is wired to CR.

17. Exits 2 and 3 of program B are wired to LF.

WHEN CBC IS INACTIVE:

18. Column 74 is wired to pick up program B and to release the card through the normal hubs of selector 10. CR and two LF's are program punched.

CARD 2 (SAME)

The 12 in column 6 punches LF. Through dis-

tributors 4 and 5, the 11 in column 7 picks up selector 8, punches LF, picks up program B, and releases the card through the normal hubs of selector 10. CR and two LF's are program punched.

CARD 3

WHEN CBC IS ACTIVE:

19. The CBC exit is wired through the normal hubs of selector 5 to pick up program B and to release the card through the normal hubs of selector 10. CR and two LF's are program punched.

WHEN CBC IS INACTIVE:

20. Column 27 is wired through the normal hubs of selector 4 to pick up program B, and to release the card through the normal hubs of selector 10. CR and two LF's are program punched.

CARD 4

21. Column 2 is wired through distributor 1, through the normal hubs of selector 3, and through the transferred hubs of selector 7 to ZTS ON.

22. Column 4 is wired through the normal hubs of selector 1 to column 8.

23. Column 8 (with column 4) is wired through the transferred hubs of selector 7 to ZTS ON.

WHEN CBC IS ACTIVE:

24. The CBC exit is wired through the transferred hubs of selector 5 and through distributor 9 to pick up program A, and to SKIP. The D impulse controls the program unit. Skipping is stopped at column 28.

25. Exit 1 of program A is wired to FIGS.

26. Exit 2 of program A is wired to the G hub directly, or as shown.

WHEN CBC IS INACTIVE:

27. Column 25 is wired through the transferred hubs of selector 4 to CBC OFF.

28. When CBC has been active, column 28 restarts card reading after program punching and skipping through distributor 7.

29. Columns 29 and 35 are wired through the transferred hubs of selector 5 to ZTS ON.

30. Through distributor 4, the 11 read in column 44 punches LF, picks up program B, and re-

leases the card through the normal hubs of selector 10. CR and two LF's are program punched.

CARD 5

31. Column 2 is wired through distributor 1 and through the transferred hubs of selector 3 to ZTS ON via bus.

32. Column 6 is wired through the transferred hubs of selector 2 to ZTS ON.

WHEN CBC IS ACTIVE:

33. The CBC exit is wired through the transferred hubs of selector 5 and through distributor 9 to pick up program A, and to SKIP. The D impulse controls the program unit. Skipping is stopped at column 28.

34. Exit 1 of program A is wired to FIGS.

35. Exit 2 of program A is wired to the G hub directly, or as shown.

WHEN CBC IS INACTIVE:

36. Column 25 is wired through the transferred hubs of selector 4 to CBC OFF.

37. When CBC has been active, column 28 restarts card reading through distributor 7.

38. Columns 29 and 35 are wired through the transferred hubs of selector 5 to ZTS ON.

39. Columns 32 and 39 are wired through the transferred hubs of selector 2 to ZTS OFF.

40. Column 40 is wired through the transferred hubs of selector 3 to pick up program B and to release the card through the normal hubs of selector 10. CR and two LF's are program punched.

CARD 8

41. The 0-1's in columns 2 and 3 punch G's. As the 0-1's are analyzed as numerical by the Type 63 Punch, which was automatically put into figures-shift at column 1, the G's will be fig-G's.

42. Through distributor 4 the 11, which is read in column 10, punches LF, picks up program B, and releases the card through the normal hubs of selector 10. CR and two LF's are program punched.

CARD 9

LF's are punched by the 12's and the 11 read from this card. Through distributor 4, the 11 also picks up program B and releases the card through the normal hubs of selector 10. CR and two LF's are program punched.

BROKERAGE CONFIRMATIONS

CONFIRMATIONS of purchases and sales for brokerage customers can be sent by telegraph to a distant brokerage branch office. There the confirmations are automatically written on the telegraph machine as they are received. They are addressed and mailed to the customer on the same day that the trade is made at the home office. This method of delivering confirmations from the main office to a distant branch office cuts the delivery time of the confirmation to the customer from days to hours.

Coding

Usually, one card (Figure 106) is sufficient to record all of the information necessary for a confirmation (Figure 107). A few cases, however, need a second card, and even a third, to complete the description. Therefore, this example is designed for all three conditions.
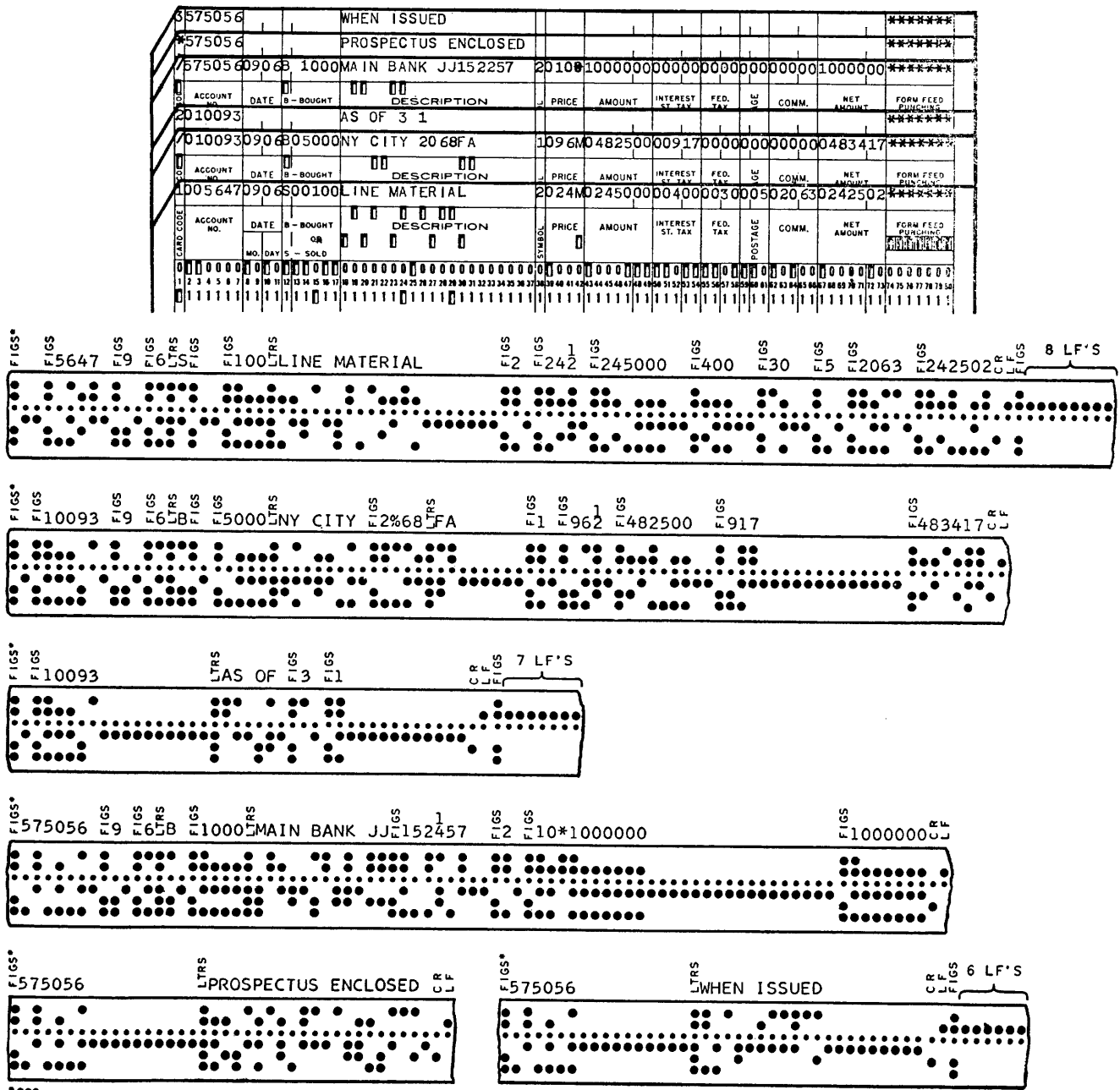
FIGURE 106.

The cards for each group are coded in column 1 as follows:

One-card Group	1
Two-card Group: 1st card	12
2nd card	2
Three-card group: 1st card	12
2nd card	11
3rd card	3

It will be noted that the last card of each group is punched with the number of the cards in the group, and that the first card of each multiple card group is punched with a 12. These codes govern the card reading, skipping, releasing, and program punching.

FIGURE 107. BROKERAGE CONFIRMATIONS

Line Feed Codes

The form is equivalent to 9 double-spaced lines. Not only is double spacing faster but, in this instance, double spacing is necessary as the fractions, which are printed on this form, are so tall that they require almost two spaces to print.

For each group, nine line feed codes are needed to space from the first line of one form to the first line of the next form. Some of the line feed codes are read from card columns 74-80, which are punched with 11's on all cards, and some of the line feed codes are program punched. The punching of the LF codes into the tape is controlled on each card by the card code read in column 1.

Recoding

A digit code for a fraction is punched in column 33, and the digit code punched in column 42 is also for a fraction if that column is overpunched with an 11. When column 42 is not punched with an 11, the digit read in that column punches a corresponding code into the tape. The digit codes and fractions are as follows:

CARD CODE	TAPE CODE
1	fig-c (⅛)
2	fig-F (¼)
3	fig-v (⅜)
4	fig-k (½)
5	fig-b (⅝)
6	fig-l (¾)
7	fig-n (⅞)

Other recoding is as follows:

a. A zero in columns 27, 29, 31, 33, 35, and 37 punches a fig-z (%) while a zero in columns 28, 30, 32, 34, and 36 punches a fig-d ($). Selectors 5 and 6 control this recoding.

b. When an 11 is read over a zero in column 42, the zero punches a fig-a (*). Selector 4 controls this recoding.

c. When the code 0-1 is read anywhere on the card, it punches a zero.

d. After column 1, any 11 which is read alone in a column punches LF, and any 12 punches fig-g (&). The telegraph machine for this application does not need to be equipped with the tabulation feature. If it is, the ampersand (&) must be on some key other than G, and the wiring must be changed accordingly.

Selector Control

Column 42 is wired to the column split device, and the 11 is wired from the device to pick up selectors 4 to 1, which, in turn, control recoding of fractions for column 42.

The 11 impulse from the column split device is a short impulse, which is available ahead of punching time. It is sufficient in length to pick up the selectors but it will not hold them in a transferred condition long enough to control punching impulses. Therefore, column 42 is used to hold the selectors transferred once they have been picked up; it is wired into the hold entry hub of all four selectors either directly or via the pickup hubs of the column split device. When these selectors are transferred, digits 1-7 are selected to punch figures-shift characters for fractions as listed above. Also, a zero is wired through the transferred hubs of selector 4 and the normal hubs of selector 5 to the A (*) hub.

CCS Control

Column 1 is wired to ccs so that the codes read in this column, which are used to control selectors, will not be punched into the tape.

ZTS Control

The zts device is turned on at columns 2, 8, 10, 13, 39, 43, 50, 55, 59, 62, and 67. It is turned off by an 11 in column 42 via the column split device.

Analysis of Machine Functions

The wiring for this example is based on the following analysis:

One-card group (1 in column 1):
Read columns 1-73.
Program punch CR and LF (program B).
Read columns 74-80.
Release the card and program punch LF (program A).

Two-card group:
1st card (12 in column 1):
Read columns 1-73.
Release the card and program punch CR and LF (program B).

2nd card (2 in column 1):

Read columns 1-37.

Skip and program punch CR and LF (program B).

Read columns 74-80.

Release card without program punching.

Three-card group:

1st card (12 in column 1):

Read columns 1-73.

Release card and program punch CR and LF (program B).

2nd card (11 in column 1):

Read columns 1-37.

Release card and program punch CR and LF (program B).

3rd card (3 in column 1):

Read columns 1-37.

Skip and program punch CR and LF (program B).

Read columns 74-79.

Release card without program punching.

Program Control

Both program units are used in this example, rather than select the controls for one program unit. Program A is used when a single code (LF) is program punched; program B is used when two codes (CR and LF) are program punched.

Wiring (Figure 108)

ALL CARDS

1. Column 1 is wired (a) to pick up the column code device, (b) to ccs, and (c) through distributor 5 to start card reading. The exits of the column code device are wired as follows: Code 12 is wired through distributor 6 to pick up selector 10. Code 1 is wired to pick up selector 9, and through distributor 9 to pick up selector 10. Code 2 is wired to pick up selector 7. Code 3 is wired to pick up selector 8, and through distributor 10 to pick up selector 7. When these selectors are picked up, they remain transferred for the remainder of the card cycle as the hold hubs in each are connected.

2. Blank columns are wired to punch space codes; digit-for-digit punching is wired either directly or through the normal hubs of se-

lectors 1 to 6 inclusive. (See steps 4-6 and 9 for the controls of these selectors.) The 11 is wired to LF; the 12 is wired to G; the 0-1 is wired to zero.

3. Columns 2, 8, 10, and 13 are wired to ZTS ON.

4. Columns 27, 29, 31, 33 (through distributor 1), 35, and 37 (through distributor 7) are wired to pick up selector 5. A zero read in these columns (with the exception of column 33) passes through the normal hubs of selector 4 and the transferred hubs of selector 5 to punch a fig-z (%) via bus. At column 33, a zero passes through the transferred hubs of selectors 4 and 5 to fig-z (%) via bus.

5. Columns 28, 30, 32, 34, and 36 are wired to pick up selector 6. A zero read in these columns passes through the normal hubs of selectors 4 and 5 and the transferred hubs of selector 6 to punch a fig-D ($).

6. Column 33 is also wired through distributor 1 to pick up selectors 1 to 4 inclusive. When these selectors are transferred, digits 1-7 are selected to punch figures-shift characters for fractions as listed above.

ONE-CARD GROUP (1 IN COLUMN 1)

7. Column 39 is wired to ZTS ON directly, or as shown.

8. Column 42 is wired to pick up the column split device.

9. The 11 exit of column split is wired through distributor 2 to ZTS OFF, and to pick up selectors 4 to 1 inclusive.

10. Column 42 is wired to the hold entry hubs of selectors 1 to 4 either directly or via the pickup hubs of the column split device. When these selectors are transferred, digits 1-7 are selected to punch figures-shift characters for fractions as listed above. Also, a zero is wired through the transferred hubs of selector 4 and the normal hubs of selector 5 to the A (*) hub.

11. Columns 43, 50, 55, 59, 62, and 67 are wired to ZTS ON directly, or as shown.

12. Column 73 is wired through the transferred hubs of selector 10 and distributor 8 to pick up program B. The D impulse controls the program unit.

Skip-Stop Insert: Column 74
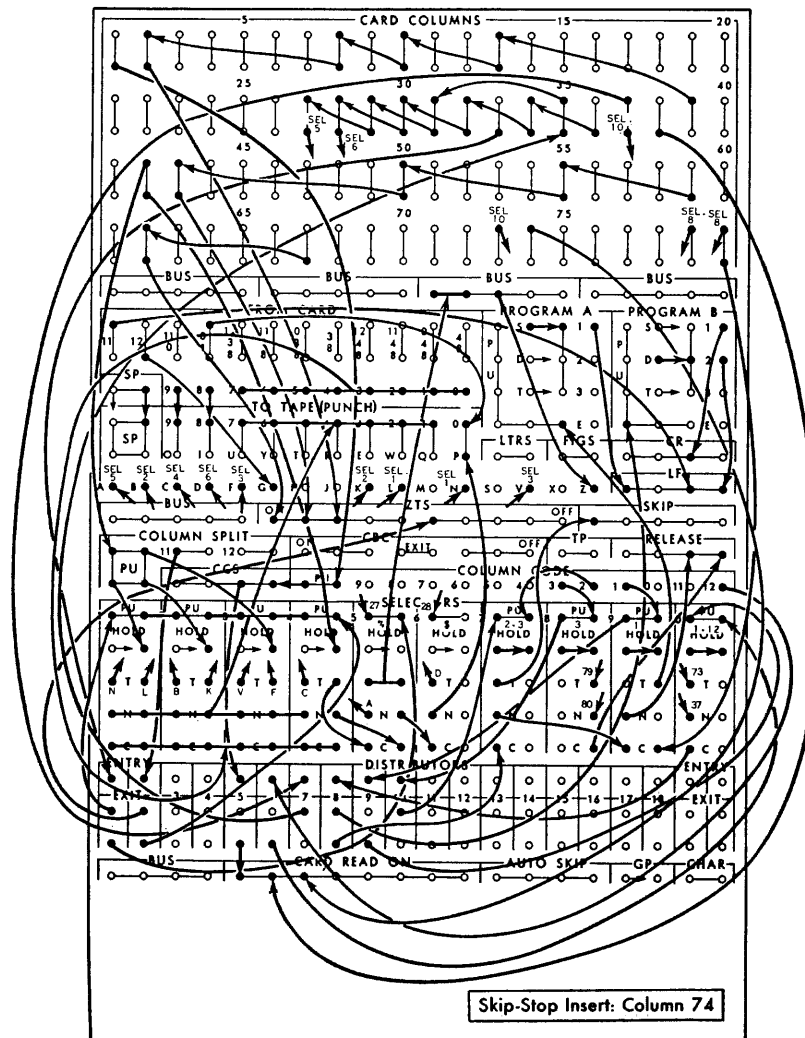
FIGURE 108.

13. Exit 1 of program B is wired to CR.

14. Exit 2 of program B is wired to LF.

15. Column 74 is wired to restart card reading. Columns 74 to 80 are read and seven LF codes are punched by the 11 impulses.

16. Column 80 is wired through the transferred hubs of selector 9 to pick up program A. The S impulse controls the program unit.

17. Column 80 is also wired through the normal hubs of selector 8 to release the card.

18. Exit 1 of program A is wired to LF.

TWO-CARD GROUP

FIRST CARD (12 IN COLUMN 1)

This card is read and controlled through column

73 as the card in the one-card group, steps 7 to 14. The remainder of the wiring follows:

19. Column 73 is wired through the transferred hubs of selector 10, through distributor 8, and through the normal hubs of selectors 7 and 9 to release the card.

SECOND CARD (2 IN COLUMN 1)

This card is read and controlled through column 37 as the card in the one-card group. The remainder of the wiring follows.

20. Column 37 is also wired through the normal hubs of selector 10 and through distributor 8 to pick up program B, and through the transferred hubs of selector 7 to SKIP. CR and LF are program punched. A skip-stop insert in the adjustable skip bar is set at column 74.

21. Column 74 is wired to restart card reading. Columns 74 to 80 are read and seven LF codes are punched by the 11 impulses.

22. Column 80 is wired through the normal hubs of selector 8 to release the card.

THREE-CARD GROUP

FIRST CARD (12 IN COLUMN 1)

This card is read and controlled the same as the 1st card of the two-card group.

SECOND CARD (11 IN COLUMN 1)

This card is read and controlled through column 37 as the card in the one-card group. The remainder of the wiring follows.

23. Column 37 is also wired through the normal hubs of selector 10 and through distributor 8 to pick up program B, and through the normal hubs of selectors 7 and 9 to release the card. CR and LF are program punched.

THIRD CARD (3 IN COLUMN 1)

This card is read and controlled through column 79 the same as the 2nd card in the two-card group. The remainder of the wiring follows.

24. Column 79 is wired through the transferred hubs of selector 8 to release the card.

IBM 963 CODE GENERATING UNIT

THE IBM 63 Card-Controlled Tape Punch can be equipped with the 963 Code Generating Unit (Figure 109) in order to process either standard five-channel tape or telegraphic checkable code tape. With this unit, tape can be checked automatically and economically in a single transmission, and errors, if any, are pinpointed to a single record. Once the unit is installed, it must remain cable-connected to the tape punch at all times.

When telegraphic checkable code tape is being created, each individual portion of a transmission is known as a unit record. The beginning and end of each unit record is identified by a special sequence of codes. The codes automatically punch in the tape and remain an integral part of the record both before and after transmission.

The beginning of each unit record is defined by a figures (FIGS) shift code. The end-of-unit-record codes (carriage return, figures shift, line feed and the tape check code) define the end of each unit record (Figure 110).

During the perforation of the tape at the point of origin, the entry of the figures shift code at the beginning of each unit record instructs the machine to begin accumulating a tape check code. Throughout the conversion of the unit record, a counter in the telegraphic checkable-code generating feature counts the number of holes punched in the tape. The counter accumulates on a units base of ten; the carries are thrown away and only the units position count is retained.
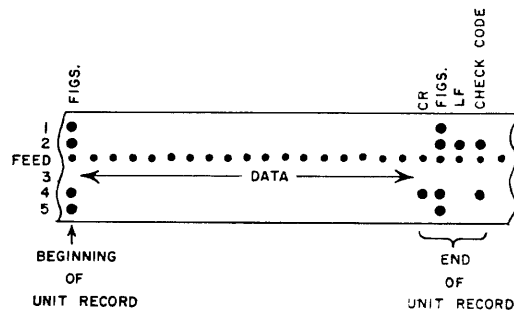
FIGURE 110

FIGURE 109

116
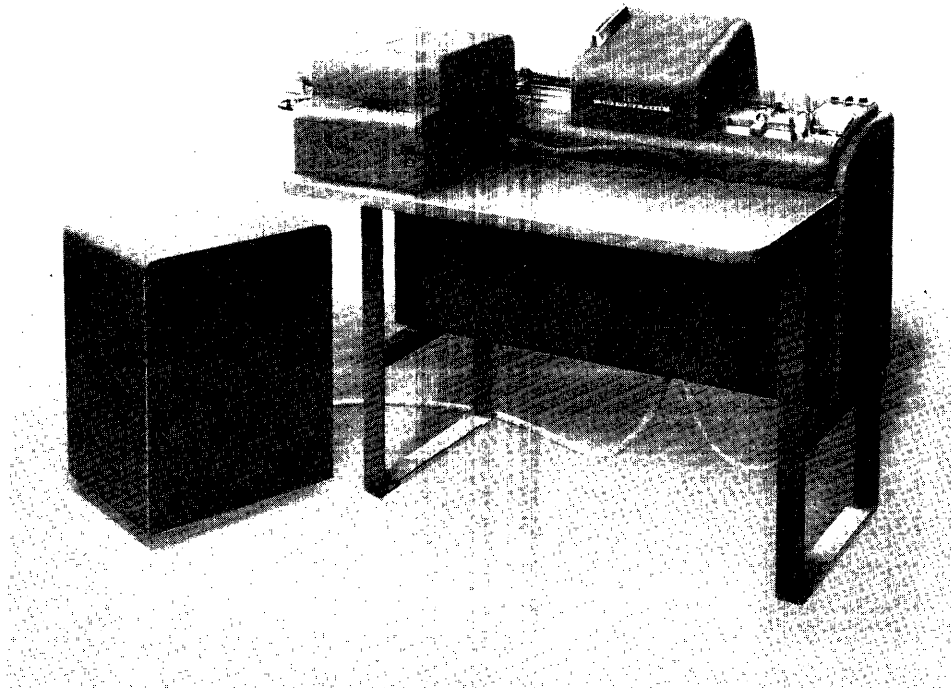
After the line feed code is punched in the tape as a portion of the end-of-unit-record codes, the accumulated count is automatically punched as the tape check code (Figure 111). The counter resets during the punching of the figures shift code for the next unit record and the operation is repeated.

Control Panel Hubs

The following additional hubs are provided in the extreme lower left corner of the IBM 63 Card-Controlled Tape Punch control panel when it is to be used with the 963 Code Generating Unit.

FIGURE 111
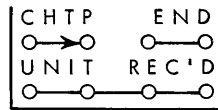
1. *CH TP (Checkable Tape)*. This is a pluggable switch that must be connected to make the telegraphic checkable-code tape generating feature active. When this switch is not wired, the IBM 63 functions as a standard five-channel card-to-tape punch.

2. *Unit Rec'd (Unit Record)*. The wiring of this hub causes the end-of-unit-record codes to punch in the tape. When CH TP is wired, and the machine is in a record condition, four punch cycles take place. The punching of the tape check code normally drops the machine out of a record condition. Unit record may be impulsed from one of the following hubs:

Card Column.

Card column wired directly from the from-card hubs (punch hubs when alphabetic information is being read) or through a column split or column code device.

CHAR (character).

TP (tape punch during card reading).

CBC exit (consecutive blank columns).

E (program end).

NOTE: A fifth punch cycle is available through internal wiring. This cycle may be used to punch either a space code or a G code. When the telegraphic page printer is being used, the tape check code of the previous record prints as the first character on each line. (The G code causes the page printer to tabulate after printing the tape check
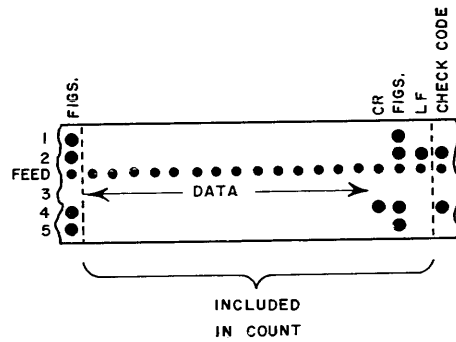
code in the left margin.) When this cycle is wired to occur, the machine drops out of record condition during this cycle instead of after the punching of the tape check code.

3. *END (End of Unit Record)*. This hub emits during the last punching cycle initiated by impulsing unit record. It may be used to:

Start card reading when *no skipping or releasing* takes place.

Control CBC or ZTS hubs.

Control a selector.

Cause automatic skipping or releasing.

It cannot be wired to the skip hubs or to program PU.

NOTE: The figures shift code designating the beginning of each unit record is automatically punched by impulsing card read ON when the machine is not in a record condition. The punching of this code places the machine in a record condition.

Control Panel Wiring Rules

1. The CR (carriage return) hubs are not wired when the CH-TP hubs are wired. A carriage return code should appear on the tape only as part of the end-of-unit-record codes.

2. The LF (line feed) entry hubs may be used as on a standard 63, with one exception — a programmed line feed should be preceded by a programmed letters shift.

3. The release and unit record hubs should not be impulsed at the same time.

CONTROL PANEL SUMMARY
(Figure 112)

1. *Card Columns 1-80.* As a card advances column by column under the reading mechanism in the machine, each card column hub in turn is an exit for a constant impulse which can:

Start card reading.

Cause releasing or skipping (SKIP) after the punching cycle, or cause immediate skipping (AUTO SKIP) when card reading is not active.

Control a program unit.

Control a selector.

Control the column code, column split, CCS, CBC, and ZTS devices.

Gang punch when the GP hubs are connected.

Note: at no other time are the column impulses to be wired to the PUNCH hubs.

FIGURE 112

If a column is passed by skipping or releasing, no impulse is available. Also, no impulse is available at a card column hub while program punching is taking place.

2. *Bus.* Groups of common hubs to eliminate split wiring.

3. *From Card.* Exits for punching impulses for special codes, blank columns and digits when card reading is on. There are 12 pairs of exit hubs for special code impulses from the card; 11, 12, 11-0, and 0-1 are standard, while the others are optional. An impulse is available at the common SP hubs as a blank column is read from the card. An impulse is available at each digit hub as the corresponding digit is read from the card. The space hubs and the digit hubs, 9 to 0, are normally wired to the TO TAPE (PUNCH) hubs directly beneath them. The FROM CARD hubs do not emit impulses when gang punching is operative, or when CCS is activated by a card column. When the column split device is active, no 11 or 12 FROM CARD impulse is available.

An impulse from one of these hubs can normally:

Punch itself, or be recoded to punch any tape code except LTRS and FIGS.

Control a selector.

Control CCS, or cause skipping (SKIP) or releasing after the punching cycle.

Control a program unit.

Impulses for letters which are read in the cards are internally connected to the tape punching mechanism. When a column is read which is not alphabetic, however, the machine must be wired so that one of these impulses punches the tape, or CCS must be activated when normal punching is operative. Otherwise, only a feed hole will be punched which will automatically stop the machine.

4. *To Tape (Punch).* These hubs are entries for impulses to punch digit and figures-shift character codes into the tape. Figures-shift char-

acters (fractions, punctuation marks, etc.) and their locations vary on different types of printing telegraph equipment. Therefore, only the standard letter and digit identifications are given.
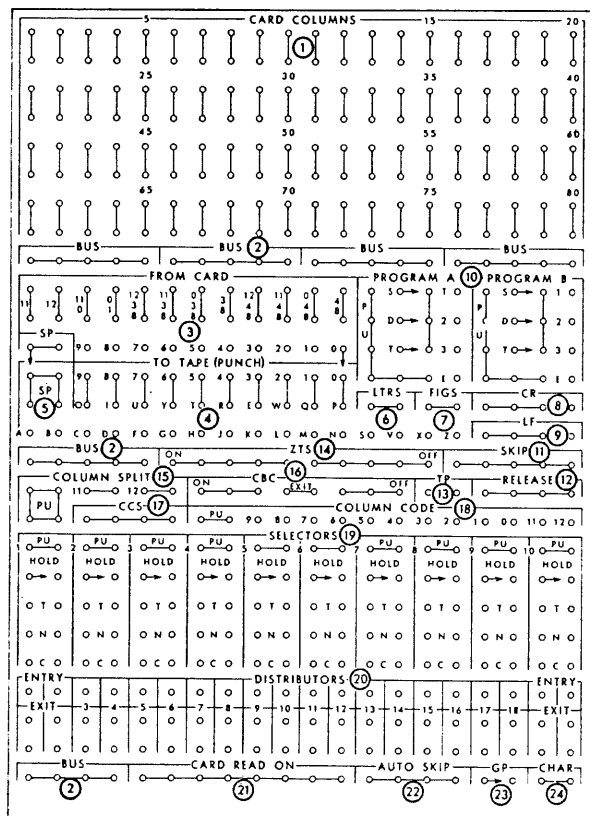
These hubs can be impulsed by any card code impulse in the FROM CARD group of hubs, or by a program punching impulse. Also, these hubs can be impulsed by the card column impulses when gang punching is operative.

These hubs, with the exception of the G hub which is only an entry hub, are connected directly to the tape punching mechanism internally and are, therefore, exits when alphabetic information is read from the card. For example, if an A were being read, the A hub would emit an impulse; and if an E were being read, the E (3) hubs would emit an impulse. Therefore, no two of these hubs should be connected together or to any other hub; such impulses should pass through distributors.

FUNCTIONAL CODES (NOS. 5 TO 9)

These hubs are entry hubs to punch tape codes. When normal punching is operative, space, CR and LF can be activated by an impulse from the FROM CARD hubs, column code exits, program exits 1, 2, and 3, or CHAR hubs; LTRS and FIGS can be activated by program exits 1, 2, and 3. When gang punching is operative, all of these functional hubs can be impulsed by card column impulses including LTRS and FIGS.

5. *SP:* space code.

6. *LTRS:* letters-shift code. When these hubs receive an impulse, the machine not only punches LTRS but it is also placed in letters-shift.

7. *FIGS:* figures-shift code. When these hubs receive an impulse, the machine not only punches FIGS but it is also placed in figures-shift.

8. *CR:* carriage return code.

9. *LF:* line feed code.

10. *Program.* This device has two punching units, program A and program B. Either unit can be picked up by one of the following impulses:
Card column.
Card code wired directly from the FROM
CARD hubs (from the PUNCH hubs when

alphabetic information is being read), or through the column split or column code device.
CHAR (character).
TP (Tape punch) during card reading.
CBC exit.

Program punching starts as soon as the normal or gang punch cycle is completed, automatically stopping card reading. Each punching impulse which is emitted from the exit hubs must be wired to punch a code or only a feed hole will be punched into the tape, which automatically stops the machine. Therefore, each program unit must be controlled to emit the proper number of punching impulses needed. While programming takes place, no card column impulse is available.

When either program unit is picked up and controlled for one, two, or three additional punch cycles, impulses are available at the comparable exit hubs to punch extra codes. A program exit impulse can punch any tape code. An exit impulse can also control selectors, and can cause skipping (SKIP) or releasing.

At the end of the program cycles, the E (end) hub in the program unit emits an impulse which can:
Start card reading *when no skipping or releasing takes place.*
Control CBC or ZTS.
Control a selector.
Cause automatic skipping (AUTO SKIP), or releasing.

See pages 17, 23, and 120 for a full explanation of this device.

11. *Skip.* Common entries to cause skipping after the normal or gang punch cycle is completed. These hubs can be impulsed by one of the following impulses:
Card column.
Card code wired directly from the FROM
CARD hubs (from the PUNCH hubs when alphabetic information is being read), or through the column split or column code device.
Character.
TP (tape punch).
Program exit 1, 2, or 3.
CBC exit.

When skipping is started, card reading is automatically stopped.

12. *Release.* Common entries to cause releasing after the normal or gang punch cycle. These hubs can be impulsed by the same impulses as the SKIP hubs. Unlike the SKIP hubs, however, release can be impulsed by a program end impulse. When a release is started, card reading is automatically terminated.

13. *TP (Tape Punch).* Common exits for an impulse which is available after each code is punched into the tape, regardless of whether the code is punched from the card, program punched, or gang punched. This impulse, when selected, can normally:

    Pick up a program unit.
    Control a selector.
    Control ZTS or CBC.

14. *ZTS (Zero to Space).* This device is normally controlled by a card column. When one of the common ON hubs of the ZTS device is impulsed from a card column, all zeros read in that and subsequent card columns, which are wired to the 0 punch hub, punch space codes until the OFF hubs are impulsed from the first column *not* to have a zero converted to a space.

The ZTS device is automatically turned off:

    When a significant digit (1 to 9), any special character except 12 or 11 alone, or an alphabetic character is read from the card.
    When the GP (Gang Punch) hubs are connected.
    When a new card is fed.
    When the thumb lever or the stop button is operated, or the tape becomes taut and moves the tape tension guide to the left.

When ZTS is active, the automatic analyzing functions of the machine are the same as though a space were read from the card instead of a zero. However, when CBC and ZTS are on at the same time, CBC will not function until ZTS is turned off.

15. *Column Split.* When an 11 or a 12 is punched for control purposes over a digit (1 to 9) in a card column, these holes must not be read

as a letter. When the column split device is picked up by the card column impulse, the digit is read as though there were no overpunching. The impulse for the overpunching is available at the corresponding 11 or 12 hub in the column split device and can be used or not as desired. Either of these impulses can:

    Control a selector.
    Control program punching.
    Cause skipping (SKIP) or releasing.

These impulses are early impulses which are terminated before punching time and, therefore, cannot punch codes into the tape.

When the column split device is picked up for a column immediately following one which has controlled program punching, card reading must be started by the card column impulse rather than by the program end impulse. Otherwise, the machine analyzes the information read as alphabetic before the column split device can be activated.

When the column split device is active, no 11 or 12 FROM CARD impulse is available. When the column code device is active at the same time as the column split device, no 11 or 12 column code impulse is available. If wired, the column split device is active during gang punching.

16. *CBC (Consecutive Blank Column device).* This device can be controlled by a card column. When ON hubs are impulsed, this device analyzes blank columns until consecutive blank columns are read or until OFF hubs are impulsed from the first card column *not* to have CBC analysis.

When two blank columns are read consecutively, or when a blank column follows a space punched by a card code, an exit impulse is available. This exit impulse can:

    Control program punching.
    Control a selector.
    Cause skipping (SKIP) or releasing.

At CBC exit time, the CBC device is turned off automatically. CBC is also turned off automatically (a) when skipping, releasing, or gang punching takes place, (b) when the stop button or the thumb lever is operated, or (c) when the tape becomes taut and moves the tape tension guide to the left.

After CBC action and before card reading is resumed, skipping or releasing must take place as

there is no normal escapement from the second blank column to the succeeding column when the exit impulse is available.

When ZTS and CBC are on at the same time, CBC will not function until ZTS is turned off either automatically or by wiring. Programming also suspends the operation of the CBC device. When CBC becomes active after suspension, two consecutive blank columns must be read before CBC exit is available.

17. *CCS (Column Code Suppression device).* These are common entries to suppress normal code punching. This device can be activated by one of the following impulses:

> Card column. There are no impulses available at the FROM CARD hubs when CCS is activated from a card column.
>
> Card code wired directly from FROM CARD hubs (from PUNCH hubs when alphabetic information is being read), or through the column split or column code device.
> Character.

When this device is activated, the proper shift code is substituted for the code normally punched. For example, LTRS is punched for letters, and FIGS is punched for numerals, etc. This allows a code in the card to be read for control purposes but not to be punched. When the code being read also causes a change in shift, immediate CCS action will cause only one shift code to be punched into the tape. The only impulse listed above which does not give immediate action is the FROM CARD impulse. When this impulse is used to control CCS, the normal shift code is punched and followed by a second shift code which is substituted for the code proper. The CCS device is inactive during gang punching.

CCS and SKIP (or RELEASE) cannot be activated by the same FROM CARD impulse; rather, the column code or column split device is picked up and the exit impulse corresponding to the FROM CARD impulse is wired to CCS and SKIP (or RELEASE).

18. *Column Code.*

PU (Pickup hubs). Common entries for a card column impulse.

Digit hubs. Exits for impulses read in the column wired to the pickup hubs. If an N is being read, both the 11 and the 5 hubs are active; if a 6 is being read, the 6 hub emits an impulse. An impulse from any of the exit hubs can normally:

> Control a selector.
> Control program punching.
> Control CCS.
> Cause skipping (SKIP) or releasing after normal or gang punching is completed.

These impulses are early impulses which are available at the same time as the column split impulses and they last through punching time. When the column split device is active at the same time, no 11 or 12 column code impulse is available.

If wired, the column code device is active during gang punching.

When column code is picked up for a column immediately following one which has controlled program punching, card reading must be started by the card column impulse rather than by the program end impulse. Otherwise, certain close timing conditions within the machine may cause erratic operation.

19. *Selectors.* Each of the 10 selectors has PU (pickup) hubs, hold hubs, and two sets of C (common), N (normal), and T (transferred) hubs. A selector may be picked up by one of the following impulses:

> Card column.
> Card code wired directly from FROM CARD hubs (from PUNCH hubs when alphabetic information is being read), or through the column split or column code device.
> CBC exit.
> Program exit 1, 2, or 3, or end.
> Character.
> TP (tape punch).

Normally, an internal path is maintained between the C and N hubs in a selector. However, when a selector is picked up or *transferred*, the internal path is immediately established between C and T. The transferred condition lasts for the duration of the impulse wired to the pickup hubs.

A selector may be held transferred for a specific number of card columns or for the remainder of

the card cycle by use of the hold hubs. The exit (left) hold hub emits a constant impulse; the entry (right) hold hub can accept an impulse when the selector is transferred. When the hold hubs are connected directly, the selector remains transferred until the card cycle is completed. The hold impulse emitted from the left hub is terminated when a new card is automatically fed into reading position, or when the thumb lever or the stop button is operated, or the tape becomes taut and moves the tape tension guide to the left. By using the constant impulse from the left GP hub, a selector can be held transferred for more than one card cycle. When this impulse is used, a selector will remain transferred until the hold impulse is interrupted by control panel wiring (the impulse is routed through another selector) or until the line switch is turned off.

20. *Distributors.* There are 10 distributors on a standard machine; each distributor has an entry hub and two exit hubs. An impulse can pass through a distributor in only one direction; i. e., into the entry and out of the exits. Distributors facilitate multiple control wiring by eliminating "back circuits."

21. *Card Read ON.* Common entries to start card reading. A card column or program end impulse can be wired to these hubs. Card reading stops automatically after a normal or gang punch cycle, when column 80 is read, or when programming, skipping (SKIP), or releasing is activated.

22. *Auto Skip.* Common entries for an impulse to cause *immediate* skipping. These hubs are used mainly for skipping from column 1 when card reading is not started in this column, and for successive skipping from card column impulses when card reading has been stopped by programming or delayed skipping (SKIP). The end impulse of a program unit also can be wired to these hubs. The AUTO SKIP hubs can only be used when card reading is not taking place.

23. *GP (Gang Punch).* When these hubs are connected, shift testing is suspended, the FROM CARD hubs cannot emit impulses, and ZTS or CBC is automatically turned off if it is operative. Shift

codes will have to be gang punched, as described on pages 57-61, and whenever LTRS or FIGS is gang punched, the card advances one column as it does for all other gang punched codes.

The left GP hub emits a constant impulse which can be used to hold a selector transferred for more than one card cycle.
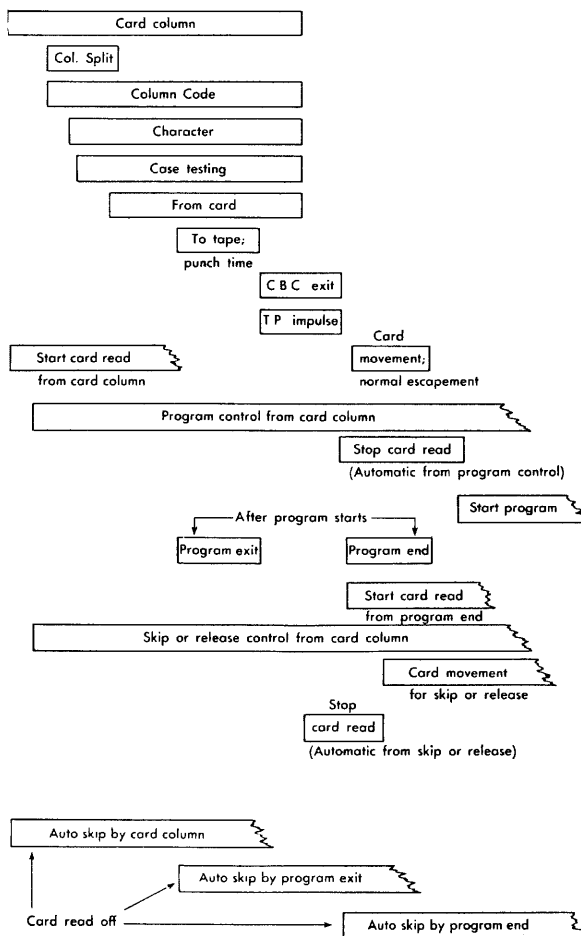
FIGURE 113. SEQUENCE, DURATION AND RELATIONSHIP OF ALL IMPULSES

24. *CHAR (Character)*. Common exits for an impulse for each code card. No impulse is available when a zero is converted to a space, or when a blank column is read. Gang punching has no effect on a CHAR impulse.

This impulse comes after a column code exit impulse, so that it can be selected by a column code impulse. It comes before and lasts through punching time, however, so that it, in turn, can control a selector through which a pulse impulse is wired.

25. *CH TP (Checkable Tape)*. A switch which must be connected to make the code generating feature active. If the switch is not wired, the machine functions as a standard five-channel card-to-tape punch.

26. *Unit Rec'd (Unit Record)*. Wiring this hub causes the end-of-unit record codes to punch in the tape. This hub may be wired from card columns, CHAR, TP, CBC exits or E (program end).

TIMING CHARTS

Two TIMING charts are included in this manual in order to give a picture of the sequence of impulses. The chart in Figure 113 shows the sequence, duration, and the relationship of all impulses. Figure 114 shows an example of a two-cycle program operation after column 15 is read and punched. This chart shows the following:

1. Card reading must be on in order to pick up a program unit.

2. Normal punching of column 15 takes place before program punching, skipping, or releasing is started.

3. Card reading is automatically turned off before program punching is started or when skipping or releasing takes place.

4. Card reading cannot be restarted until program punching is completed.
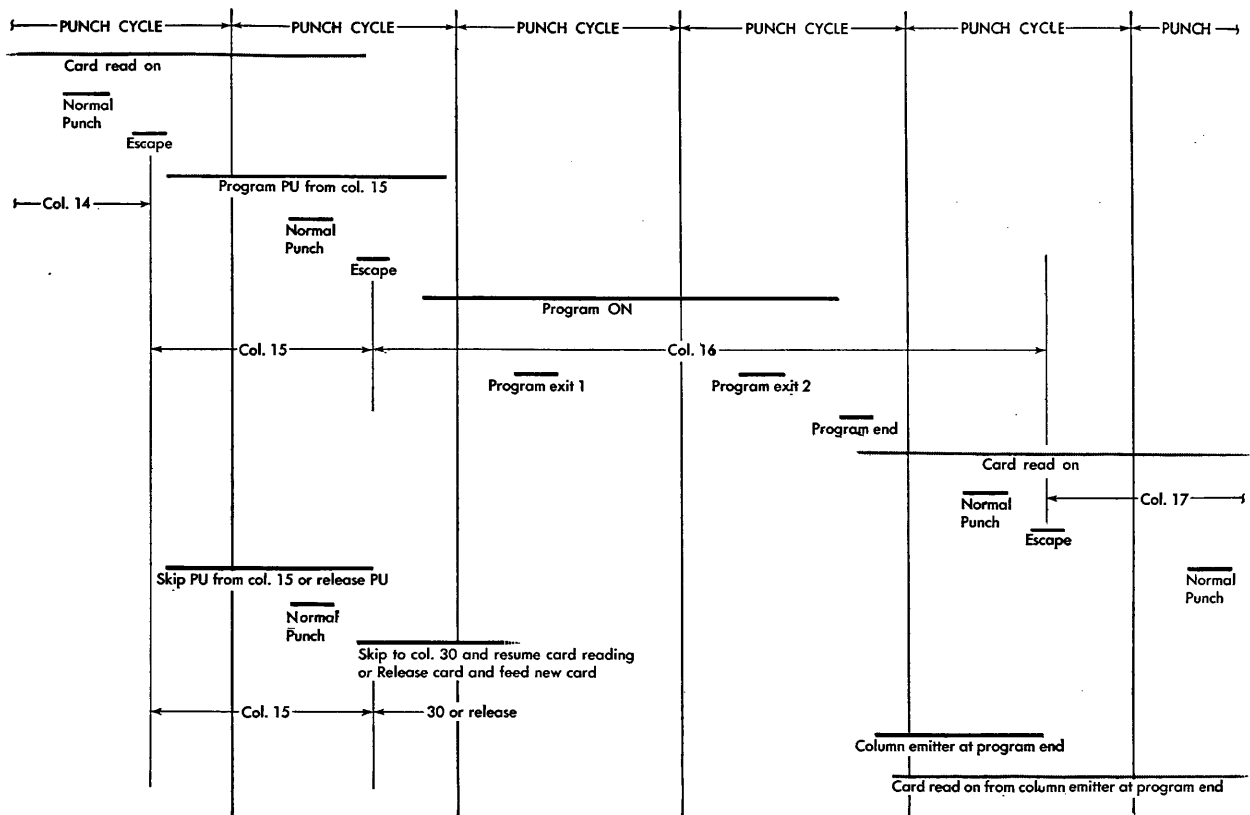
FIGURE 114. SEQUENCE OF PROGRAM PUNCHING

CODE AND DECODE CHARTS

(Figure 115)

THE code and decode charts are included in this manual to facilitate visual tape reading. Numbers 1 to 5 represent the punching positions on the tape. The small holes between the 2 and 3 punching positions are for feeding purposes only.

The code chart shows 26 character codes arranged in alphabetic sequence, followed by the 5 functional codes.

The decode chart shows the same 31 codes arranged in code sequence. Any character or functional code punched in the tape can be readily interpreted by reference to this decode chart.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	Ltrs.	Figs.	Space	C.R.	L.F.
FIGURES					3				8						9	0	1	4		5	7		2		6						
LETTERS	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	Ltrs.	Figs.	Space	C.R.	L.F.
	1	1		1	1	1				1	1						1		1		1		1	1	1	1	1	1			
	2		2				2		2	2	2	2				2	2	2			2	2	2				2	2			2
CODE	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
CHART			3			3		3	3		3		3	3		3	3		3		3	3		3	3		3		3		
		4	4	4		4	4			4	4		4	4	4			4				4		4			4	4		4	
		5					5	5				5	5		5	5	5			5		5	5	5	5	5	5	5			

CODE CHART

	E	A	U	K	Ltrs.	Q	J	Figs.	W	S	F	X	Y	D	B	Z	L.F.	I	C	V	P	R	G	L	Space	N	M	H	C.R.	O	T
FIGURES	3		7			1			2				6					8			0	4								9	5
LETTERS	E	A	U	K	Ltrs.	Q	J	Figs.	W	S	F	X	Y	D	B	Z	L.F.	I	C	V	P	R	G	L	Space	N	M	H	C.R.	O	T
	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1															
		2	2	2	2	2	2	2	2								2	2	2	2	2	2	2	2							
DECODE	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
CHART			3	3	3	3				3	3	3	3					3	3	3	3				3	3	3	3			
				4	4		4	4			4	4		4	4				4	4		4	4			4	4		4	4	
					5	5		5	5			5	5		5	5				5	5		5	5			5	5		5	5

DECODE CHART
FIGURE 115

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