

# MACHINE METHODS OF ACCOUNTING

## REPRODUCING PUNCHES (Type 512)

**A**MONG the marked advances which have recently been made in punching mechanisms for use in the International Electric Bookkeeping and Accounting Machine Method are the machines for performing various types of punching which have previously involved manual or semi-automatic operations of transcribing repetitive data. The reproducing punches constitute an auxiliary machine in those installations of the Electric Accounting

Method where the data appearing on a large number of cards are a repetition, in whole or in part, of the data appearing on other tabulating cards.

The reproducing punches perform more quickly and more automatically most of the functions which were heretofore performed by the duplicating key punches and motor drive gang punches.

### International Reproducing Punch

The International Reproducing Punch is used to perform card punching automatically, by copying the holes already punched in one card, into a group of cards; or by copying the holes already punched in one set of cards, into another set of cards. The automatic punching mechanism is coordinated with certain other units of the machine that are capable of performing a number of different functions in connection with the copying. This brings about a flexibility which makes the machine useful under a wide variety of conditions. It has become, in fact, one of the essential units in many modern installations of International Electric Bookkeeping and Accounting Machines.

#### Reproducing

All, or any part of, the information which has been punched in one set of cards may be copied into another set of cards. The cards which supply the information are called the source cards, and those receiving the information the reproduced cards. The reproduced information may be either in the same sequence as in the source cards, or in an altered sequence. This transposition of information is made possible through the use of the automatic plugboard.

#### Gang-Punching

All, or any part of, the information which has been punched in a master set-up card may be copied into a set of detail cards. Or the information which has been punched in several or many different master set-up cards may be copied into as many different groups of detail cards—all in the same run. Set-ups and set-up changes take place automatically as the successive master cards pass through the machine.

#### Combinational Reproducing and Gang-Punching

Both reproducing and gang-punching may be performed simultaneously—that is, while certain information is being reproduced into a

group of cards, additional data may be gang-punched into the same cards from master set-up cards.

#### Class Selection (Not a Standard Feature)

Class-selection devices are supplied on this machine at an additional charge. If the machine is so equipped, the following additional uses become possible.

*Class - Selected Reproducing* — Information may be selected from one of two punched fields of the source cards and copied into a single field of the reproduced cards. Or information punched in a single field of the source cards may be copied into either one of two fields of the reproduced cards. Or certain data punched in the source cards may be eliminated from the reproduced cards.

*Offset Gang - Punching* — Although gang-punching is usually direct—that is, column for column from the master card—information may be punched into the detail cards in fields other than those occupied by it in the master card.

#### X-Elimination and Transfer

Control holes punched in the "11" and "12" positions in the source cards or the master cards may be reproduced or gang-punched into the same columns of the new cards; or they may be transferred to any other columns, or eliminated entirely. The reproducing or gang-punching of numerical data into the 0 to 9 positions of the columns involved is not affected by any special treatment of the control punching.

#### Increasing Size of Card Field

The size of any card field in the source cards may be increased automatically in the reproduced cards. For example, if a 6-digit field is to be copied into an 8-digit field, the two extra columns may be automatically punched with zeros.

## Features

### Speed

The machine operates at a constant speed of 100 cards a minute for all types of work, regardless of the number of columns to be reproduced or gang-punched into each card, or the number of holes to be copied into any one column of the card.

### Card-Column Capacities

The machine is furnished for the use of either 45- or 80-column cards. It may also be furnished for the use of 45-column source cards and 80-column reproduced cards, or vice versa.

### Alphabetic and Numerical Punching

Both alphabetic and numerical data may be reproduced or gang-punched. Multiple numerical punching in a single column may be reproduced or gang-punched.

### Card Feeds

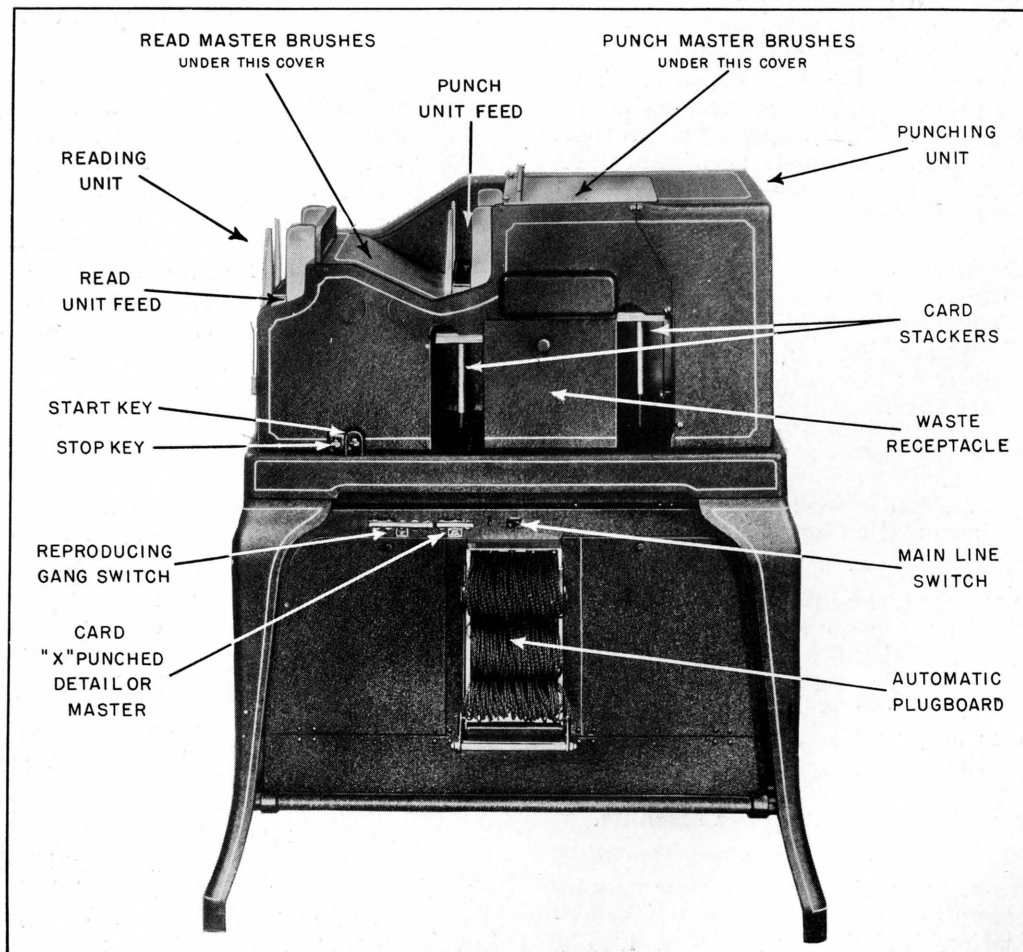
Card feeding is continuous, the operation of the two card-feed mechanisms being similar to that of the Type 80 Horizontal Sorter. The capacity of each feed hopper is 800 cards; that of each card stacker 1,000 cards. If the supply of cards in either feed hopper should become exhausted, or if a card should fail to feed, the machine stops automatically, thus enabling the operator to correct the condition.

### Automatic Plugboard

All plugging is accomplished through the use of an automatic plugboard.

### Current

The machine is designed to operate on 110- or 220-volt direct current only.



## Operating Principles

The machine as a whole is composed of two units—the reading unit and the punching unit. These units are so named from the fact that in reproducing, the source cards are placed in the one unit, and it is in this unit that the reading which actuates the punching mechanism takes place; the punching mechanism itself is located in the other unit, and it is in this unit that the cards which are to receive the punching are placed.

For all operations, cards are placed in the feed hoppers face down, with the top edge toward the feed rolls. The card feeds of both units are synchronized, the feeding time of one card being designated as a card cycle. The operating principles for both reproducing and gang-punching are illustrated in the accompanying diagram.

### Reproducing Principle

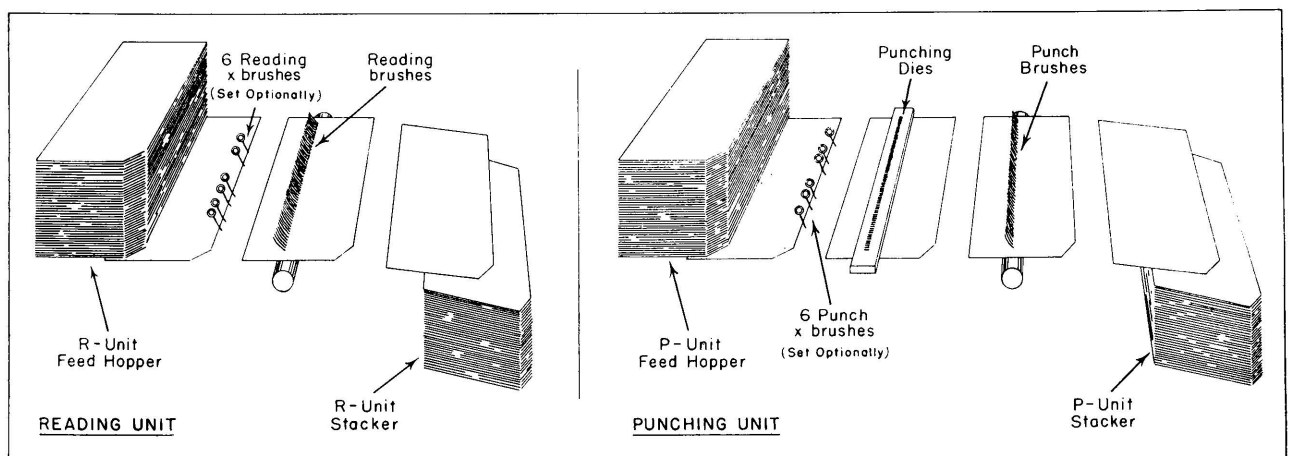
For reproducing, both units operate simultaneously. As each card in the reading unit passes the reading brushes, it is read and the impulses are transmitted directly to the punch magnets of the punching unit, which actuate the individual punches. Since there is a separate punch for each column of the card, and since each card passes the punching position with its top edge foremost, all "12" positions are punched simultaneously, and the "12" punching is the first which takes place. All "11" positions are punched next, etc., through the last, or "9" positions. Thus the card is punched completely in twelve stations of the card cycle. The columns to be read and the columns to be punched are determined by proper plugging between the reading brushes and the punch magnets.

The machine is equipped also with reading X brushes, whose relative location is indicated in the diagram. These X brushes are used to read the control X-punching which causes the class selector to become operative, as will be described later.

### Gang-Punching Principle

For gang-punching, only the punching unit is used. Gang-punching requires the use of one or more master set-up cards. The master card is the first card fed. When this card has reached the punch brushes, the blank card following it is at the punching-die position. The master card is read by the punch brushes and the impulses are transmitted to the punch magnets, which cause the detail card following the master card to be punched. The next card cycle then advances the punched detail card to the punch brushes where it in turn is read and serves as the set-up card for the following detail card. Thus every card passing through the machine serves in turn as the set-up card for the card directly behind it.

When it is desired to intersperse master cards with detail cards (each master card to bring about a new set-up), it is necessary only to prevent the last detail card of a group from punching the incoming master card. For this purpose, the master cards must be punched with a control X—or a distinguishing hole as explained later. For this reason also, that one of the *punch* X brushes (whose function is similar to that of the *reading* X brushes) corresponding to the X-punched column must be made operative.



Operating Principles

The punch X brushes are located between the feed hopper and the punching position. As a new master card approaches, the X-punching is sensed by the punch X brush which is operative, and causes the circuit between the punch brushes and the punch magnets to be broken. This allows the master card to pass the punching position without being punched from the preceding detail card. Since, however, the following detail card contains no X-punching, the circuit is re-made as this card reaches the punch X brushes, and when it has advanced to the punching position it is punched with the in-

formation contained in the master card, then at the punch brushes.

When a single master set-up card is used for an entire gang-punching run, it is not necessary that the master card contain a control X, or that a punch X brush be made operative.

### Combinational Reproducing and Gang-Punching

For combinational reproducing and gang-punching, both units of the machine are operative, and perform their prescribed functions simultaneously.

## Keys and Switches

### Main Line Switch

This switch controls the driving motor and must be ON for all operations of the machine.

### Start and Stop Keys

The functions to be performed by these keys are self-evident.

### Reproducing Gang Switch

This switch controls the reading unit. It must be ON for any operations which involve

this unit, and OFF when the reading unit is to be inoperative.

### Detail-Master Switch

This switch is used only for gang-punching operations. It is set to "Master" when the master cards contain the control X, and the detail cards No-X. It is set to "Detail" when the detail cards contain the control X, and the master cards No-X. This switch merely permits the reading of the distinguishing control X from either type of card—master or detail.

## Plugboard Arrangement

The machine is equipped with an automatic plugboard which renders it entirely flexible for the transposition of data as desired. The automatic plugboard eliminates the necessity of plugging the machine each time it is to be run. The plugboard is small, compact, and removable. It affords the flexibility of the manual plugboard, and at the same time provides for quick complete changes in machine plugging.

The illustration on the opposite page is a sketch of the plugging positions of the automatic plugboard. The dotted positions indicate the hubs which are supplied only when class selection devices are present.

### Reading Brushes

Eighty hubs serve as the plugboard outlets for the reading brushes located in the reading unit. These hubs are plugged to the punch magnets for straight reproducing, to a class selector for selected reproducing, and to the X-eliminator for X-elimination or X-transfer.

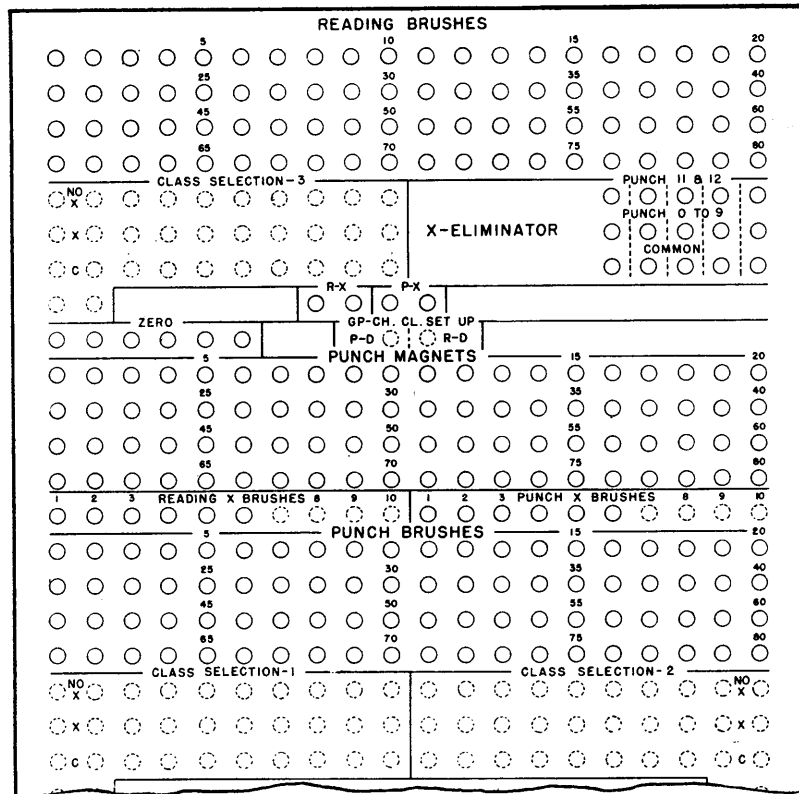
### Punch Magnets

Eighty hubs serve as the plugboard inlets for

the punch magnets which actuate the punches located in the punching unit. These hubs are plugged from the reading brushes for reproducing, and from the punch brushes for gang-punching. When class selection, X-elimination, or automatic zeros are to be used, the punch magnets are plugged from these positions of the plugboard respectively.

### Reading X Brushes

Six reading X brushes, which may be set to read any columns of the card, are located under a cover at the top of the reading unit. In order to dispense with the necessity of raising this cover and manually setting an X brush on the desired column for each operation involving X-control, six outlets for the X brushes have been brought to the plugboard and labelled "Reading X Brushes." After it has been determined which card columns are to contain the most frequently used control X's (as many as six of them), the six reading X brushes under the machine cover are set on these columns. (Any six columns may be selected for X-controlling, provided only that at least two columns inter-



Plugboard Diagram

vene between any two consecutive X-punched columns.) Thereafter, in order to make operative any one of these six reading X brushes, it is necessary only to plug from the corresponding hub of the Reading X Brushes on the plugboard. This hub is plugged to one of the R-X hubs, whose purpose is stated later, under the caption "R-X Hubs."

Since the reading X brushes are used only for X-controlling, and since the only occasion for X-controlling from cards in the reading unit is in the case of class-selected reproducing, the Reading X Brush hubs are supplied on the plugboard only for those machines provided with class selectors.

**Punch X Brushes**

Six Punch X Brush hubs perform the same function for the punching unit as the Reading X Brush hubs for the reading unit. Since X-controlling from cards in the punching unit is necessary for all gang-punching which is performed from master cards interspersed among detail cards, Punch X Brush hubs are supplied on all Reproducing Punches.

**Punch Brushes**

Eighty hubs serve as the plugboard outlets for the punch brushes located in the punching unit. These hubs are plugged to the punch magnets for all gang-punching operations. This plugging must be direct, column for column. Gang-punched information can be transposed only by directing it through a class selector.

For X-elimination and X-transfer, the punch brushes are plugged to the X-eliminator as required.

**X-Eliminators**

These are permanent selectors which are used to transfer or eliminate control punching—"11" and "12" holes. These selectors are used, in connection with both gang-punching and reproducing, to transfer the control punching into a column other than the one from which it is read, or to eliminate it altogether—at the same time permitting all other holes in both columns to be copied exactly. As each selector is an independent unit, it is possible to perform as many as five eliminations or transfers at one time.

For X-elimination or X-transfer in reproducing operations, the X-punched column is plugged from the reading brush to the lower, or common, hub of one of the X-eliminators. If the X is to be eliminated, the middle hub of the X-eliminator is wired to the desired punch-magnet position, and the top hub of the X-eliminator remains unplugged. If the X-punching is to be transferred to another position, and the 0 to 9 punching is to remain unchanged, an additional wire is inserted connecting the top hub of the X-eliminator with the punch-magnet position selected for the transferred X-punching.

For gang-punching, the plugging of the X-eliminator is the same as that for reproducing, except that the lower hubs are plugged to the punch brushes.

### Zero Bus

A row of six common hubs supplies zeros for increasing automatically the size of reproduced or gang-punched fields. The required number of these hubs are wired directly to the desired punch-magnet positions. Zeros are then punched automatically in these positions of every card (except master cards) passing through the punching unit.

### R-X Hubs

These two hubs are common, and whenever a reading X brush is active (that is, in connection with all class-selected reproducing), must be interposed between the Reading X Brush hubs and the class selector. This interposition is necessary to energize an internal mechanism which, in this machine, is essential for class selection. One of the R-X hubs is plugged from

the proper Reading X Brush hub, and the other to the control hub of the class selector.

### P-X Hubs

The two P-X hubs perform the same function for the punching unit as the R-X hubs for the reading unit. One of these hubs is plugged from the proper Punch X Brush hub for all operations requiring an X-control impulse from cards in the punching unit. (The other remains unplugged.)

The P-X hubs serve also, in the case of offset gang-punching, as *inlets* for an internal mechanism necessary to delay the action of a class selector for one card cycle after the X-punching has been sensed by the punch X brushes.

### GP-CH CL Set-Up Hubs

The "Class-Selection Set-up hubs for Gang-Punching and Checking" are the plugboard *outlets* for the internal delay mechanism mentioned in the preceding paragraph. For offset gang-punching, gang-punch checking, and reproducing checking (described in a later section of this booklet) the *delayed* action of a class selector is necessary. One of the GP-CH CL Set-Up hubs is plugged to the control hub of the class selector—the Punch Delay (P-D) hub in the case of offset gang-punching (and the Read-Delay (R-D) hub for gang-punch checking and reproducing checking, as described later).

### Class Selectors

If specified, standard 10-position class selectors are provided, to permit selected reproducing and offset gang-punching.

## Examples of Plugging and Operation

The following series of plugging diagrams and explanatory paragraphs are presented in order to clarify the various operating features of the International Reproducing Punch.

### Reproducing

The illustration shows the plugging arrangement for reproducing, X-eliminating, and automatic zero punching. Columns 1 to 7 and 12 to 16 are reproduced into columns 21 to 27 and 55 to 59, respectively. An X punched in column 16 of the source cards is eliminated from the reproduced cards and automatic zeros are punched in columns 53 and 54.

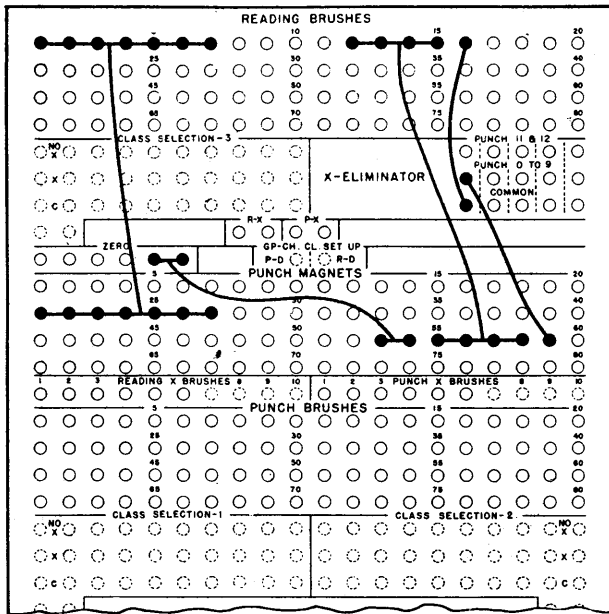
The reproducing gang switch and the main line switch are set to the ON position. Cards

are placed in both feed magazines, the source cards in the reading unit and the blank cards in the punching unit. The machine cannot be started unless there are cards in both feed hoppers.

### Class-Selected Reproducing

For reproducing, just as for most other tabulating machine operations, the action of the class selector is governed by pre-determined X-punching—that is, control punching.

The illustration shows the plugging arrangement for a field-selection problem. Either columns 1 to 7, or 14 to 20, are selected and punched into columns 34 to 40 of the reproduced

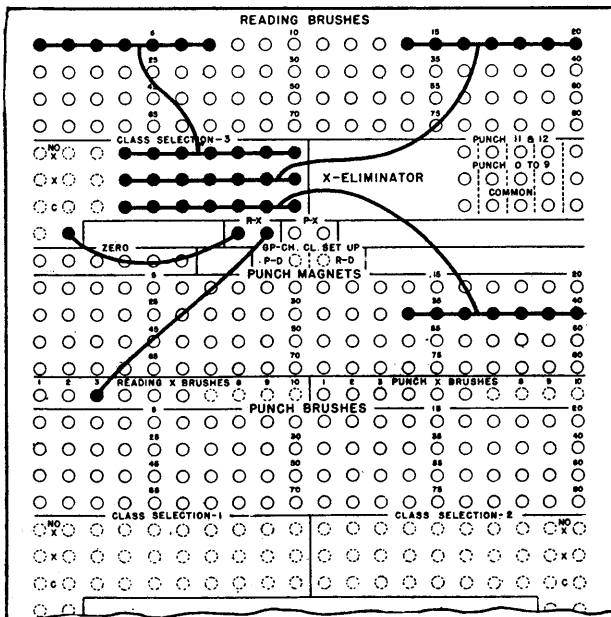


Reproducing

card. The X-punch is contained in the cards from which columns 14 to 20 are read.

A particular Reading X Brush hub (representing that reading X brush which is set on the X-punched column) is plugged to one of the R-X hubs. The other R-X hub is plugged to the control hub of the selector.

The reproducing gang switch and the main line switch are set to ON.



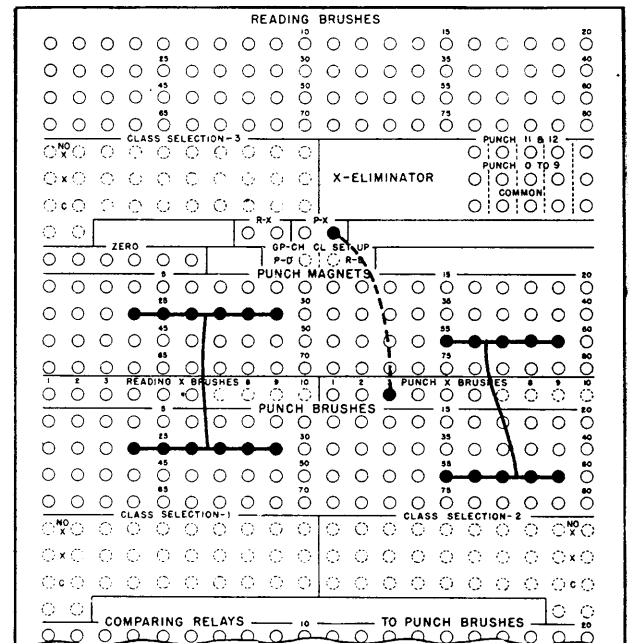
Class-Selected Reproducing

Note: For either class-selected or field-selected reproducing, if the occasion should arise that it is desirable for the control punching to be contained in the cards to be punched instead of in the source cards, the proper Punch X Brush hub (instead of the Reading X Brush hub) is plugged to the R-X hub.

Gang-Punching

For straight gang-punching operations, only the punching unit of the machine is operative.

Straight gang-punching may be performed by two methods—by using a single master set-up card for the entire run, or by using a number of master set-up cards interspersed among



Gang-Punching

the detail cards to effect set-up changes automatically. For either method the plugging arrangement is the same, except the X-control plugging. The wiring diagram shows the plugging to gang-punch columns 24 to 29 and 55 to 59 into detail cards. As stated previously, gang-punching must be direct—column for column—except where a class selector is interposed for offsetting.

The reproducing gang switch is set OFF and the main line switch ON.

Single Master-Card Method.—The single master set-up card is placed at the front of the de-

tail cards, and all cards are placed in the feed hopper of the punching unit, face down with the top edges toward the feed rolls.

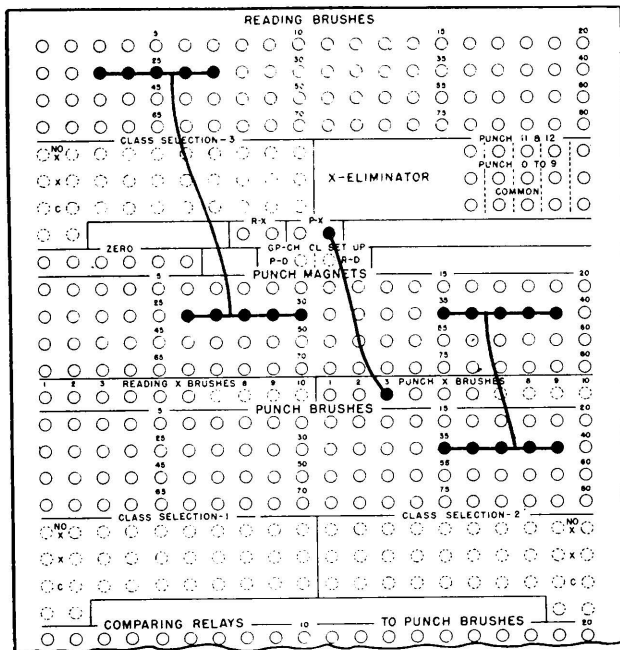
Under the single master-card method, no X-punching of the master card and no X-control plugging are required.

*Interspersed Master-Card Method*—The master set-up cards, each properly X-punched, are interspersed among the detail cards—the master card always at the front of the corresponding group of detail cards.

The proper Punch X Brush hub is plugged to one of the P-X hubs as shown by the dotted line. This control plugging causes automatic change of set-up at the passage of each master card. The operation of the machine is continuous until the feed hopper is exhausted of cards.

**Combinational Reproducing and Gang-Punching**

For all combinational operations, the separate



*Combinational Reproducing and Gang-Punching*

reading and punching units operate, in unison, in the way already described.

If, however, the gang-punching is to be performed from a single master card, special provision for the gang-punching must be made as follows: *Either* the master card must be X-punched, and the punching unit plugged for X-

control (as with the use of interspersed master cards), *or* a blank card must precede the detail cards in the reading unit. The reason for this special treatment is that the master set-up card must be one card cycle in advance of the first detail card in the reading unit.

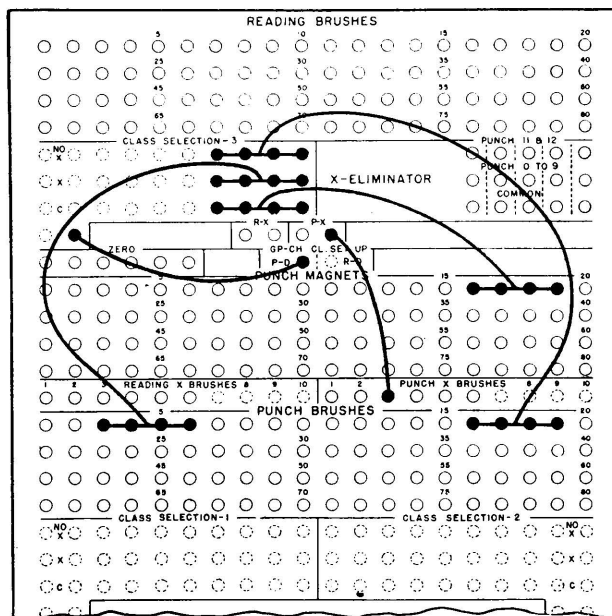
The illustration shows the plugging arrangement for a combinational operation.

**Offset Gang-Punching**

The next illustration shows the plugging arrangement for gang-punching information contained in a particular field of the master card into a different field of the detail cards.

Columns 3 to 6 of the master cards are to be gang-punched into columns 16 to 19 of the detail cards.

The reproducing gang switch is set OFF and the main line switch ON. The proper Punch X Brush hub is plugged to the P-X hub to read



*Offset Gang-Punching*

the control X-punching in the master set-up cards.

The class selector, in this case, must operate one card cycle later than normal. This delay is accomplished by plugging from the Punch Delay hub of the GP-CH CL Set-Up hubs to the selector control hub, as previously described.



### International Comparing Reproducer

The International Comparing Reproducer performs all the functions of the International Reproducing Punch and, in addition, accomplishes several card-comparing operations. These additional operations are made possible by the inclusion of an electrical comparing circuit in the reading unit of the machine. The following paragraphs present the functions of this machine which are additional to those performed by the Reproducing Punch.

#### Card Comparing

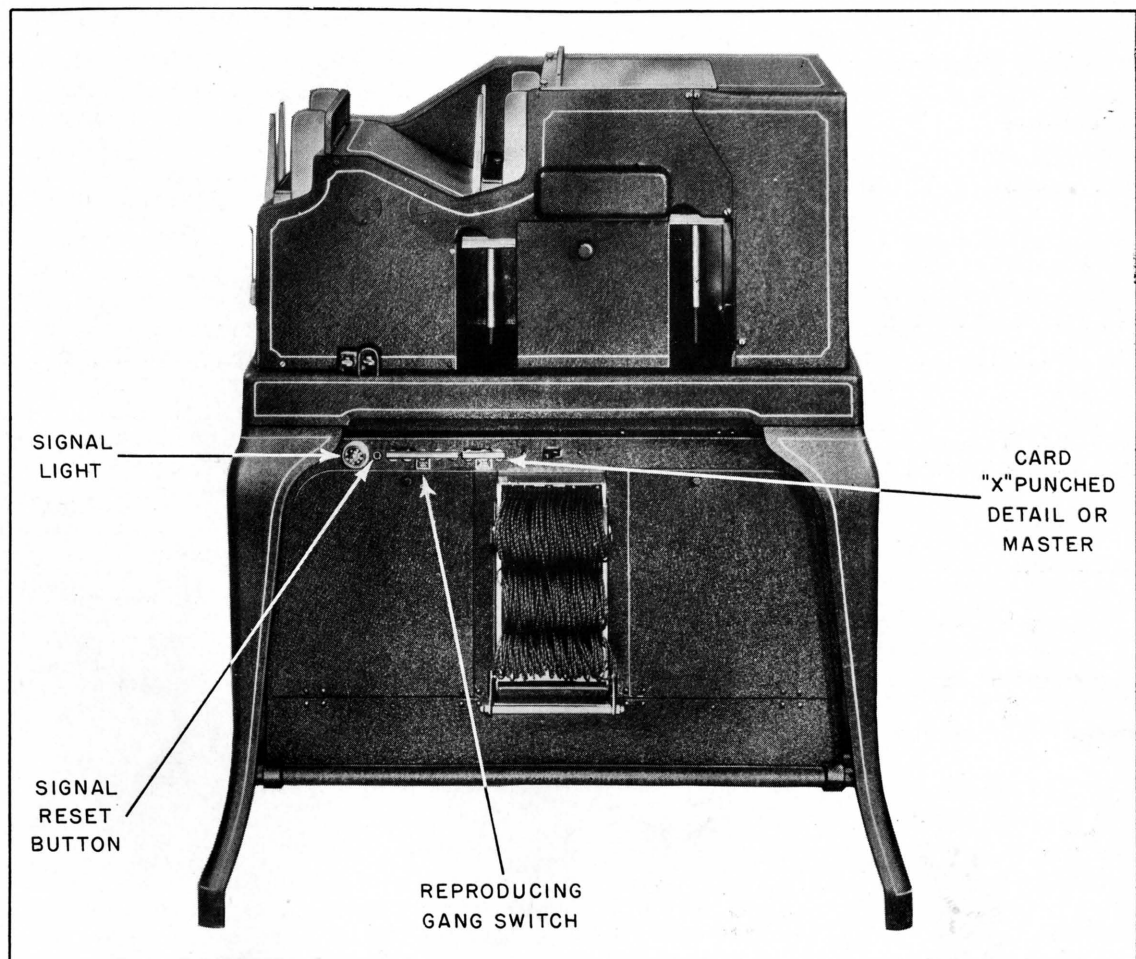
Two identical sets of punched cards (or identical sections thereof) are checked for agreement with each other. This card-for-card comparison is performed automatically and the machine stops when dissimilarity in punching is encountered.

#### Automatic Control

In reproducing operations, where control punching already appears both in the source cards and in the cards to be punched, an automatic control is established between the two sets of cards to insure that the new punching is placed in the correct cards. Any discrepancy between the punched control numbers in the two sets of cards causes the machine to stop automatically.

#### Verified Reproducing

The reproduced cards are verified for the accuracy of the reproduced data. This verification is performed simultaneously with the reproducing operation. Any discrepancy (in reproduced data) between the source cards and the reproduced cards is signalled by an automatic machine stop.



### Gang-Punch Verification

Cards which have been gang-punched are verified for the accuracy of the gang-punched data. Or, cards about to be gang-punched are verified to insure that all detail cards follow the correct master cards. In this case, both detail and master cards must be punched in some control field.

### Simultaneous Gang-Punching and Verification

Gang-punching and gang-punch verification operations are carried on simultaneously, i.e., cards are gang-punched in the punch unit and at the same time other cards are verified in the reading unit. Both units operate simultaneously although functionally they are independent of each other.

### Operating Principles

The following diagram and explanatory paragraphs present a general outline of the action of the electrical comparing circuits. All other operating principles are identical with those of the International Reproducing Punch.

The comparing brushes are located in the reading unit between the reading brushes and the card stacker, as shown on the diagram.

#### Verified Reproducing Principle

In reproducing operations, verification is accomplished by making the proper plugwire connections between the comparing brushes in the reading unit and the punch brushes in the punching unit.

The cycle station of these brushes is the same—that is, one card passes the comparing brushes at the same time that the corresponding card is passing the punch brushes. Thus verification is performed during the reproducing run, each card being verified one card cycle after its actual punching.

If the punched holes sensed by the comparing brushes are exactly the same as those simultaneously sensed by the punch brushes, all circuits are complete. The card has therefore been reproduced correctly and the machine continues

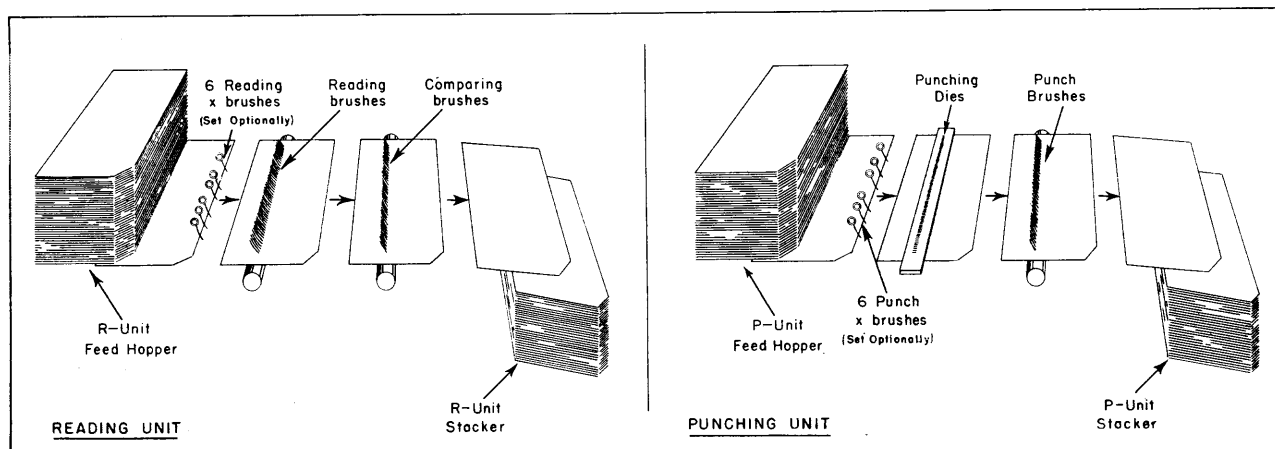
in operation. If, however, any discrepancy exists between the two brush sensings, all circuits are not complete. The card, therefore, has not been reproduced correctly and the machine stops automatically. Any automatic machine stop causes a red signal light to appear, in the position shown on the preceding diagram. The signal remains lighted until the operator has made the necessary corrections and reset the machine for continued operation.

#### Card-Comparing Principle

The operating principle for card comparing is the same as that for verified reproducing. For comparing, however, the machine is not plugged for reproducing, and only the comparing and punch brushes are operative. The automatic machine stop and the signal light are the same as described above.

#### Automatic Control Principle

The principle of automatic control is the same as that for card comparing. In the case of automatic control, the control punching in the source card is compared with that in the reproduced card. Any discrepancy causes the machine to stop and the signal light to appear.



Operating Principles

**Gang-Punch Verification Principle**

In verifying gang-punching, all cards (master and detail) are placed in the reading-unit feed. The verification is made by comparing the punched-hole sensings of the card at the comparing-brush station with those of the card which at that same moment is at the reading-brush station. The relationship of cards for card comparison is identical with that for gang-punching (explained in connection with the Reproducing Punch). That is, the first detail card is compared with the master card, and each subsequent detail card is compared with the card which immediately precedes it. When discrepancies occur the machine stops and the signal light appears.

For verifying gang-punching, one of the six reading X brushes is set on the X-punched column of the master cards. The X-punch sensing causes the machine to pass each master card without making a comparison between it and the last detail card of the preceding group. This action is similar in principle to that of passing master cards in the gang-punching operation,

the X sensing causing the comparing circuit to be inoperative for one card cycle.

**Simultaneous Gang-Punching and Gang-Punch Verification Principles**

In simultaneous gang-punching and gang-punch verification, the principles of operation are the same as those described previously for each function separately. That is, the reading unit is used for gang-punch verification and at the same time the punching unit is used for gang-punching. In the event of a discrepancy in gang-punch verification, the machine stops and the signal light appears.

**Keys and Switches**

The keys and switches of this machine are the same as those of the Reproducing Punch. In addition, however, this machine has both a signal light and a signal-light reset button. The signal lights whenever the machine stops because of a discrepancy in card comparison. The machine cannot be started again until the operator presses the signal-light reset button.

**Plugboard Arrangement**

The accompanying diagram shows the plugging positions of the automatic plugboard for the Comparing Reproducer. All the positions described for the Reproducing Punch are the same for the Comparing Reproducer. In addition, the latter machine has plugboard positions for the comparing relays and comparing brushes, which are used only when comparing circuits are to be operative.

The dotted hub positions are not standard, being provided only when class selection devices are installed.

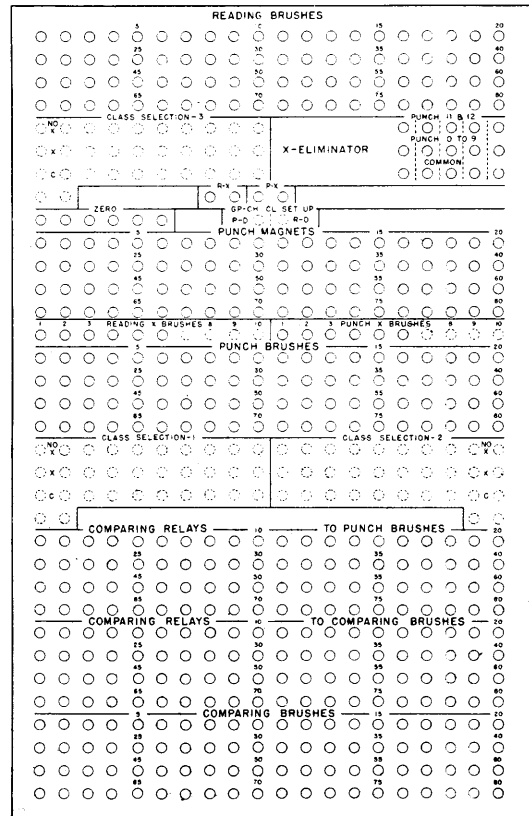
**R-X Hubs—Reading X Brushes**

These hubs are standard on the Comparing Reproducer.

**Comparing Relays**

These hubs represent the plugboard inlets for the comparing relays, which perform the actual card comparisons and cause the signal light to appear. Machines are available with either 45 or 80 comparing relays.

Each individual relay has an upper inlet hub and a lower inlet hub. The diagram shows 80 upper and 80 lower hubs, representing 80 individual comparing circuits. Each of these may



be used for comparing any column of the card. That is, the numerical designations of the comparing relay hubs merely facilitate the plugging of individual relays and have no relation, numerically, to the columns of the cards being compared.

The upper inlet hubs are plugged from the punch brushes (except in cases of gang-punch verification, when they are plugged from the reading brushes) and the *corresponding* lower

inlet hubs are always plugged from the comparing brushes.

**Comparing Brushes**

These hubs represent the plugboard outlets for the comparing brushes located in the reading unit. They are always plugged to the lower inlet hubs of the comparing relays.

*Note:* Where class selection devices are installed, the plugging between the brushes and the comparing relays may be carried through one or more of these selectors.

**Examples of Plugging and Operation**

The following paragraphs and diagrams serve to clarify the plugging of the Comparing Reproducer for the several functions described.

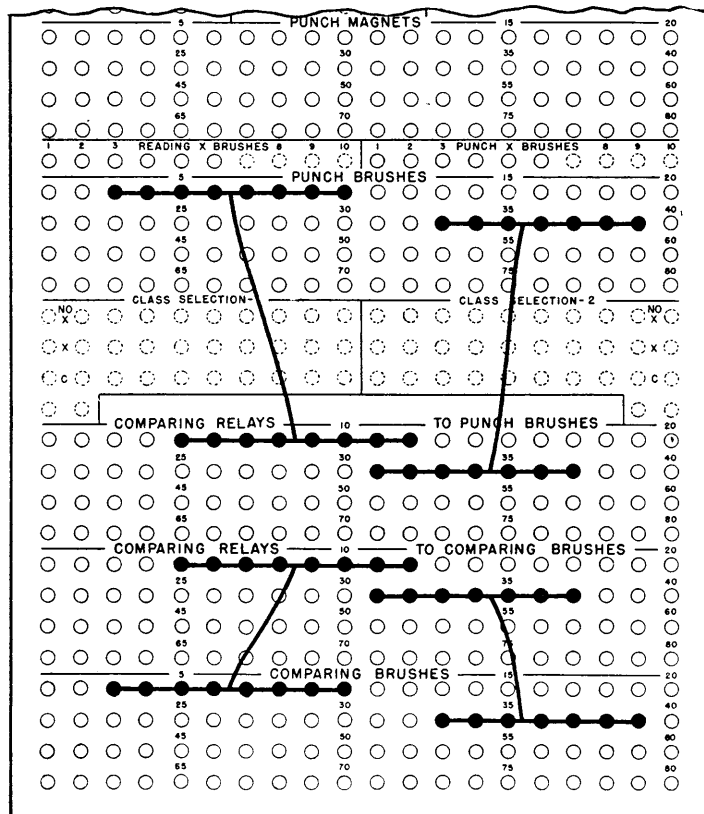
**Card Comparing**

In the example, two sets of cards, punched identically, are to be checked for agreement with each other.

The information is punched in columns 3 to 10, and 33 to 39. One set of cards is placed in the reading-unit feed and the other set of cards is placed in the punching-unit feed. The main line switch and the reproducing gang switch

should be ON. It should be noted that any of the comparing relays may be used, provided that identity is maintained between the upper and lower positions selected.

When a discrepancy is detected between any two cards, the machine stops and the signal light appears. The cards in error are those which are about to enter the stackers. The correct cards already in the stackers are removed, the signal light is reset, and the machine is started. The first pair of cards which next enter the stackers is the pair containing the error, and the two cards are removed for correction.



Card Comparing

**Automatic Control**

In this example, the data contained in one set of cards are to be reproduced into another set of cards which already contain a control punching. The control numbers are punched in columns 4 to 8 of the source cards and in columns 1 to 5 of the cards to be punched.

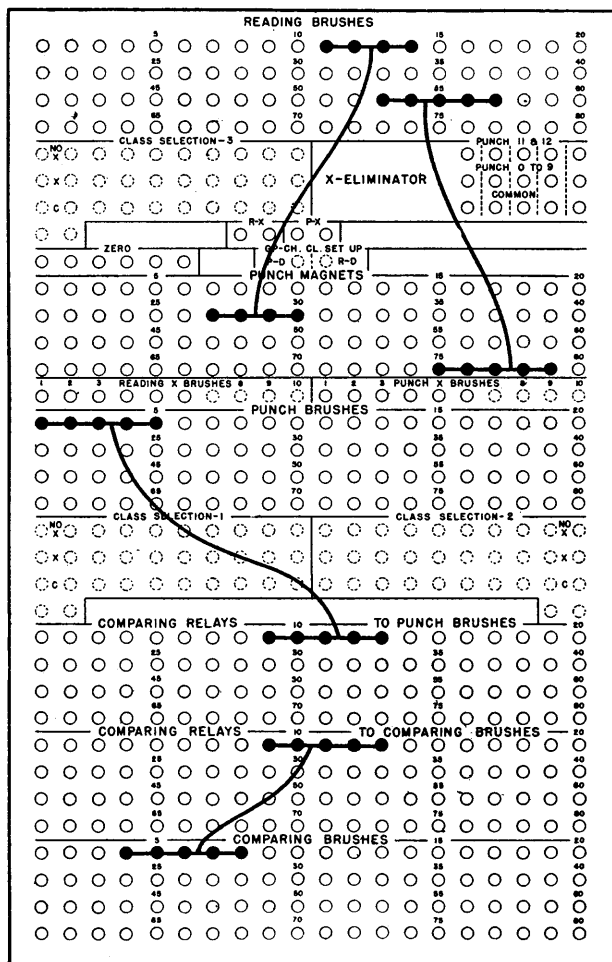
The main line switch and the reproducing gang switch should be ON.

When a discrepancy between the control numbers is detected, the automatic machine stop and signal light operate as described previously.

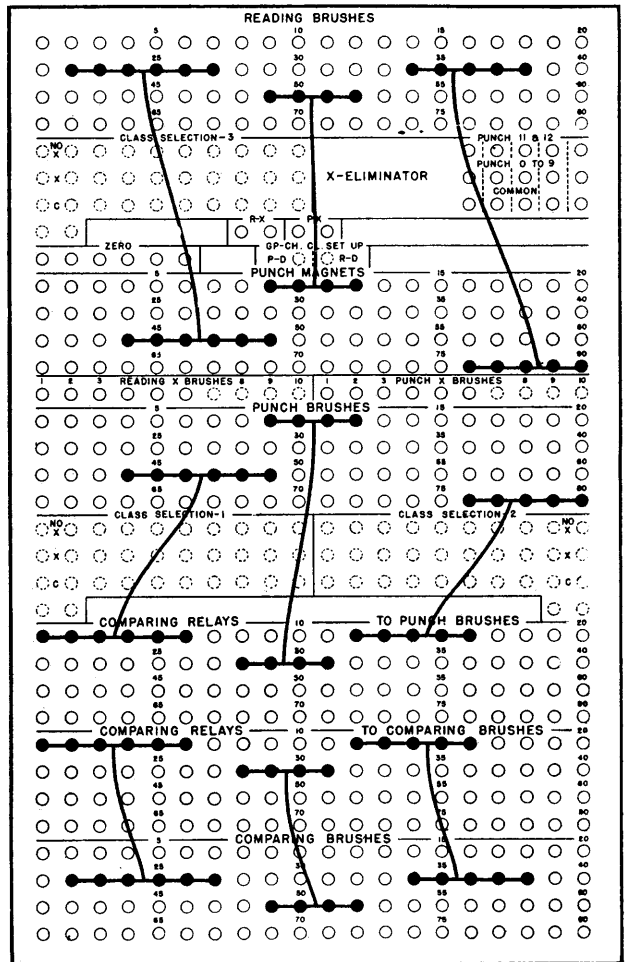
**Verified Reproducing**

In this example the fields being reproduced are to be verified. Columns 22 to 27, 34 to 38, and 49 to 52 of the source cards are to be reproduced into columns 44 to 49, 76 to 80, and 9 to 12, respectively, of the new cards. The following diagram illustrates the plugging.

The main line switch and the reproducing gang switch should be ON. When errors are detected, the usual signals become operative, and corrections can be made.



*Automatic Control*



*Verified Reproducing*

**Verified Class Selected Reproducing**

If class-selection devices are present, class-selected reproducing may be verified. The following diagram illustrates the plugging for such an operation.

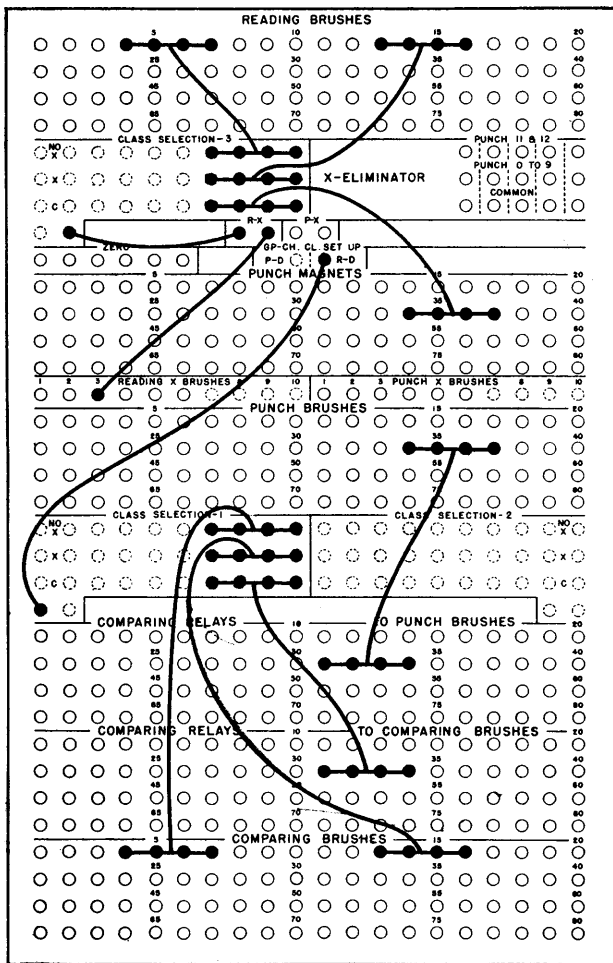
The main line switch and the reproducing gang switch are set to ON. The proper Reading X Brush hub is plugged to an R-X hub and the other R-X hub is plugged to the selector control hub.

It should be noted that when class selection is used in a reproducing operation, class selection must be used in the verification plugging also.

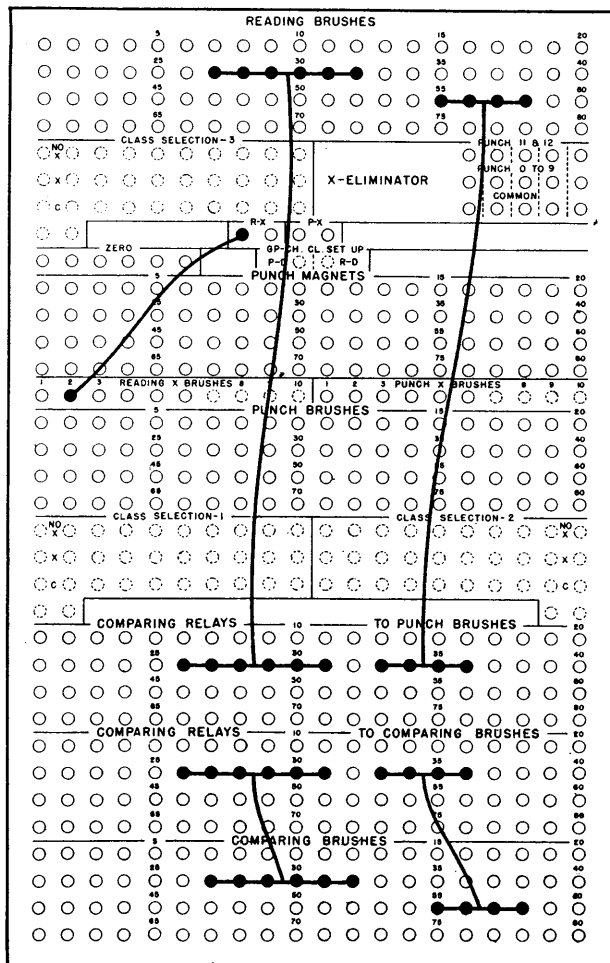
The class selector used in plugging the comparing relays must be controlled one card cycle *after* the sensing of the X-punch. The reason for this delayed action is that since the card comparison is made one card cycle after the actual punching, the selection must be made a second time when the two sets of cards reach the comparing and punch brushes respectively.

**Gang-Punch Verification**

In this operation, all cards, both master and detail, are placed in the reading-unit feed of the machine. The diagram shows the plugging for verifying the punching in columns 27 to 32, and 55 to 58.



*Verified Class Selected Reproducing*



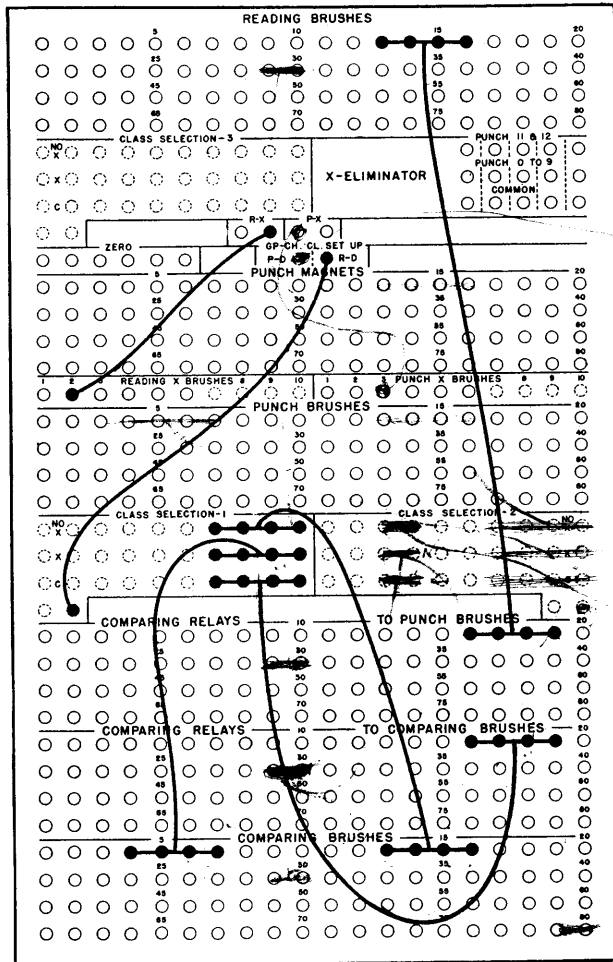
*Gang-Punch Verification*

The main line switch and the reproducing gang switch should be ON. The proper Reading X Brush hub is plugged to an R-X hub to cause the master cards to pass through the machine without being compared with the last detail card of the preceding group.

The presence of any error in the gang-punched data (discrepancies between the mas-

ter card and the detail cards in each group, or between the several detail cards within any single group) causes the machine to stop and the signal light to appear.

If offset gang-punching is to be verified, the class selector used for reading the offset fields must be controlled by the GP-CH CL Set-Up hub to effect the necessary delayed action.



Verification of Offset Gang-Punching

### Special Devices for Reproducers

#### Reproducer Independent Selector Control

For certain gang-punching or reproducing and checking operations it is necessary not only to install class selectors, but also to make their operation independent of the normally X-controlled punch and checking circuits.

A typical problem requiring this feature is that of simultaneous date-punching and X-mas-

ter gang-punching. Another useful application is simultaneous "major" and "minor" gang-punching.

In both of these examples it is necessary to use a selector to prevent the punching of certain columns in a master card from a preceding detail card, without interfering with the punching of other columns which must be the same in both cards.

These operations are not possible on a standard reproducer equipped only with a class selector, because the master X must be plugged to the selector via the P-X (or R-X) hubs, which automatically causes suspension of *all* punching (or checking) in each master card. This difficulty cannot be avoided by plugging the master X directly to the selector pick-up hub, because in the reproducing punches an unusual timing condition requires the use of an auxiliary holding circuit, which is normally provided by plugging through the P-X (or R-X) hubs.

When independent selector operation is required, separate Punch Selector Control (PSC) and Read Selector Control (RSC) circuits may be installed for this purpose. Each circuit is represented on the plugboard by a common pair of hubs. A master X must be plugged to a selector via these hubs if not via the standard P-X (or R-X) hubs. If this X is plugged via these PSC (or RSC) hubs, the main punching and checking circuits will not be affected and, if necessary, these circuits may then be controlled for larger groups by X's in another column.

As many as four of these selector control circuits may be installed in any reproducing punch, but these must be divided between a maximum of two PSC circuits and a maximum of two RSC circuits.

#### **Reproducer Gang-Punching Emitter**

The gang-punching emitter is an attachment for Type 512 Reproducing Punches which

provides a means for gang-punching common information without the use of prepunched master set-up cards. The emitter supplies punching impulses which are identical in every respect with those normally obtained from punched cards passing the reading brushes of the machine. Such impulses, when plugged to the desired punch magnets, cause the punching of the predetermined common data in every card passing the punch dies (the normal punching cutout for master cards remains operative). The emitter does not in any way affect the normal punching operations of the machine.

The plugboard arrangement for the emitter consists of three X "commoned" hubs for each of the twelve punching positions of a card. These hubs are located on the plugboard in the space normally reserved for Class Selection No. 3. The plugging is from the emitter hubs to the punch magnets selected.

Emitter impulses can be class- or field-selected at will since they have the same characteristics as card impulses. Emitter impulses can be plugged for multiple-punching in a single column of a card provided that any impulse used for such punching is not plugged also to any other card column at the same time. This provision is obvious because of back circuits which develop. Where it is necessary to plug more than three punching positions from a single emitter position, split wires can be used. Thus, the capacity of the emitter for gang-punching is not limited.