IBM

IBM 89

Alphabetic Collator

Manual of Operation

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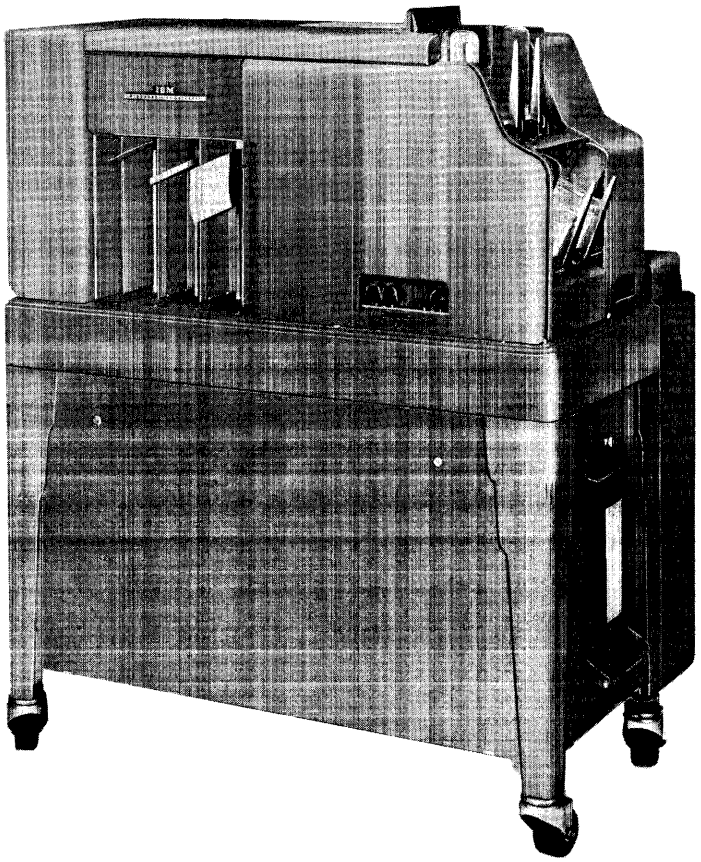
CONTENTS



IBM 89 ALPHABETIC COLLATOR

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THE ALPHABETIC COLLATOR will merge or match two groups of alphabetically or numerically punched cards into one file in one run of the cards through the machine. At the same time, the order (sequence) of one of the groups can be checked and cards can be selected from both groups. It is also possible to search a file of cards for a particular name or number without disturbing the arrangement of the file. The control field may be punched with numerical or alphabetic information or special characters.

The speed of the Alphabetic Collator will depend on the operation being performed and varies from 240 cards per minute to 480 cards per minute.

Functions

The functions of the Alphabetic Collator fall under five general classifications:

SEQUENCE CHECKING
PRIMARY CARD SELECTION
MERGING
MATCHING
MERGING WITH SELECTION

Sequence Checking is an operation by which the Collator checks a file of cards to determine whether or not they are in order. As the file passes through the machine, each card is compared with the card ahead, and if it is out of sequence the machine will stop and turn on an error light.

Primary Card Selection is the operation by which a particular card may be selected from a file in the lower (primary) feed. The type of card to be selected may be an X or NX card, first card of a group, last card of a group, single card, zero card, a card with a particular name or number, or cards out of sequence.

Merging is the operation by which the Collator merges two files of cards already in sequence, into a single file. One file is placed in each feed and as the cards pass through the machine they are compared one with the other to determine which should precede the other into the merge pocket.

Matching is the operation by which the Collator compares two files of cards to determine that there is a card or group of cards in one file to match each card or group of cards in the other file. Matched cards are filed in separate pockets. Unmatched cards in either or both files are selected.

Merging with Selection is the operation by which two files of cards are compared and merged into a single file. Unmatched cards in either or both files are selected.

MACHINE FEATURES

Operating Switches and Signals (Figure 1)

Main Line Switch. The main line switch controls the power and must be ON before the machine can be operated. This switch must not be turned off during operation without first depressing the stop key.

Start Key. Depression of the start key will start card feeding. It must be held in a depressed position for three cycles before automatic operation begins.

Stop Key. The stop key is depressed to stop card feeding.

Run Out. When the machine stops after the last card is fed from either hopper, the run out key must be depressed to move the cards remaining in the machine to the pockets.

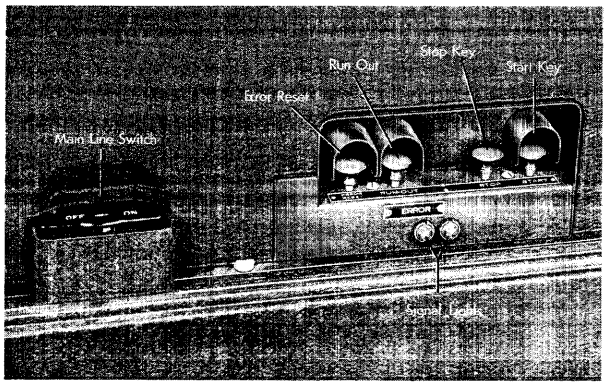


FIGURE 1. CONTROL KEYS

Error Light. A red error light may be made to turn on for any irregular condition, such as an error in sequence. When the error light turns on, the machine stops.

Error Reset. When the error light turns on, the error reset key must be depressed before the machine can be restarted.

Running Indicator Light. The running indicator light will turn on whenever the main line switch is on and cards are not passing through the machine.

Card Feeds

The Alphabetic Collator has two separate feed units; the lower feed unit is referred to as the primary unit and the upper as the secondary unit. Cards placed in the primary hopper are called primary cards; cards placed in the secondary hopper are called secondary cards.

Hoppers (Figure 2)

Cards are placed in the hoppers face down, 9's toward the throat. Each hopper holds about 800 cards and is equipped with a hopper stop contact. As soon as the last card is fed from either hopper, the machine automatically stops. Additional cards can be placed in the hopper, and card feeding can be resumed by depressing the start key.

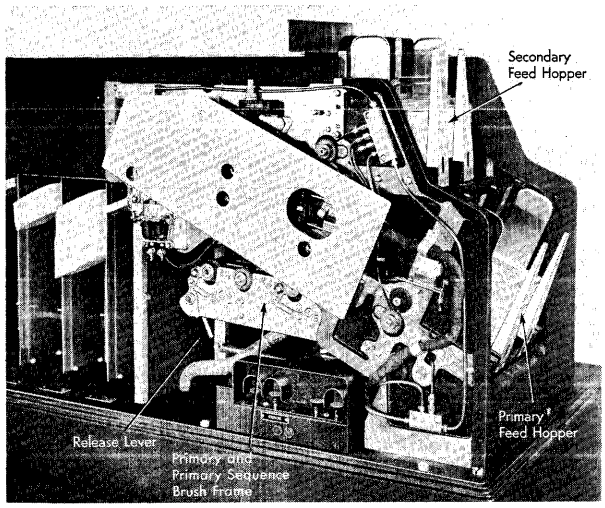


FIGURE 2. CARD HOPPERS

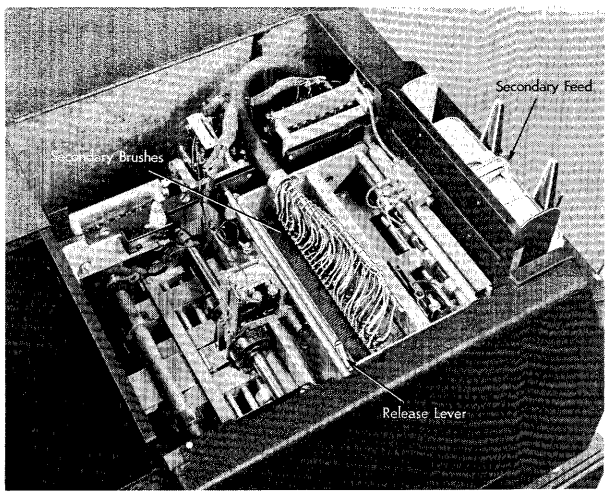


FIGURE 3. SECONDARY READING BRUSHES

Primary Card Reading

Cards in the primary feed pass two sets of brushes (primary and primary sequence) each set capable of reading all 80 columns of the card. The brushes are located on an angle when locked into position and become accessible when the release lever is pulled down as shown in Figure 2.

Secondary Card Reading (Figure 3)

Cards in the secondary feed pass only one set of brushes. These brushes are located on the top of the machine and become accessible when the release lever is moved to the extreme right and the brushes are raised.

Pockets — Figure 4

After cards are read by the brushes, they pass into one of four pockets or stackers. Each pocket holds approximately 1000 cards and is equipped with a contact to stop the machine when the pocket is full. The four pockets are numbered from 1 to 4, from right to left. Pocket 1 is for selected primary cards, 2 is for merged cards, 3 and 4 are for selected secondary cards. Primary cards can stack in either pockets 1 or 2 but cannot stack in 3 or 4. Secondary cards can stack in pockets 2, 3, or 4 but cannot stack in pocket 1. If two sets of cards are to be merged, the merged cards will stack in pocket 2.

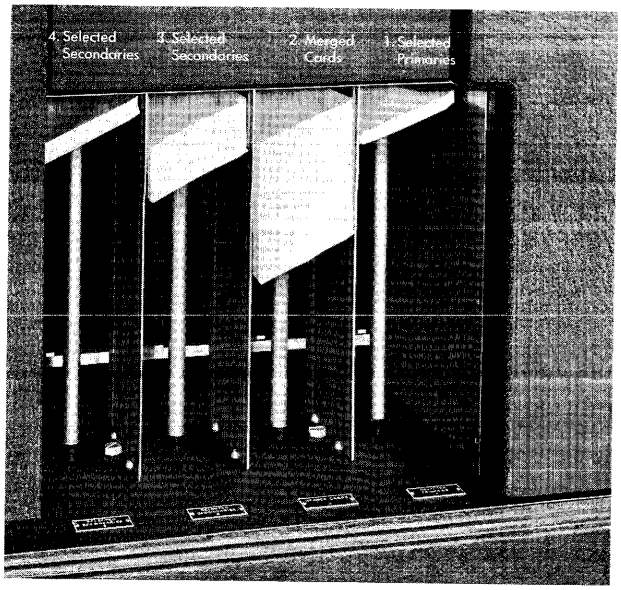


FIGURE 4. CARD POCKETS

Principle of Operation

A collating operation, whether manual or automatic, is accomplished by means of comparing two control fields. If the two sets of cards to be merged are in alphabetic or numerical sequence, a card in the first file can be compared with a card in the second file. The comparison will have one of three results: the field on the card in the first file is lower than that on the card in the second file (Figure 5A); the field on the card in the second file is lower than that on the card in the first (Figure 5B); or the fields on the cards in both files are equal (Figure 5D). The card having the lower field is placed in front of the merged file; the comparison then continues and the two files are arranged together in an ascending alphabetic and numerical sequence.

Sequence

The sequence in which cards punched with the various types of information will be arranged is as follows (low to high):

1. Blank column
2. Special Characters:

12-3-8	(.)	Type 407
12-4-8	(¤)	
12	(&)	
11-3-8	($)	
11-4-8	(*)	
11	(-)	
0-1	(/)	
0-3-8	(,)	
0-4-8	(%)	
3-8	(#)	
4-8	(@)	

3. Letters: A to Z
4. Digits: 0 to 9

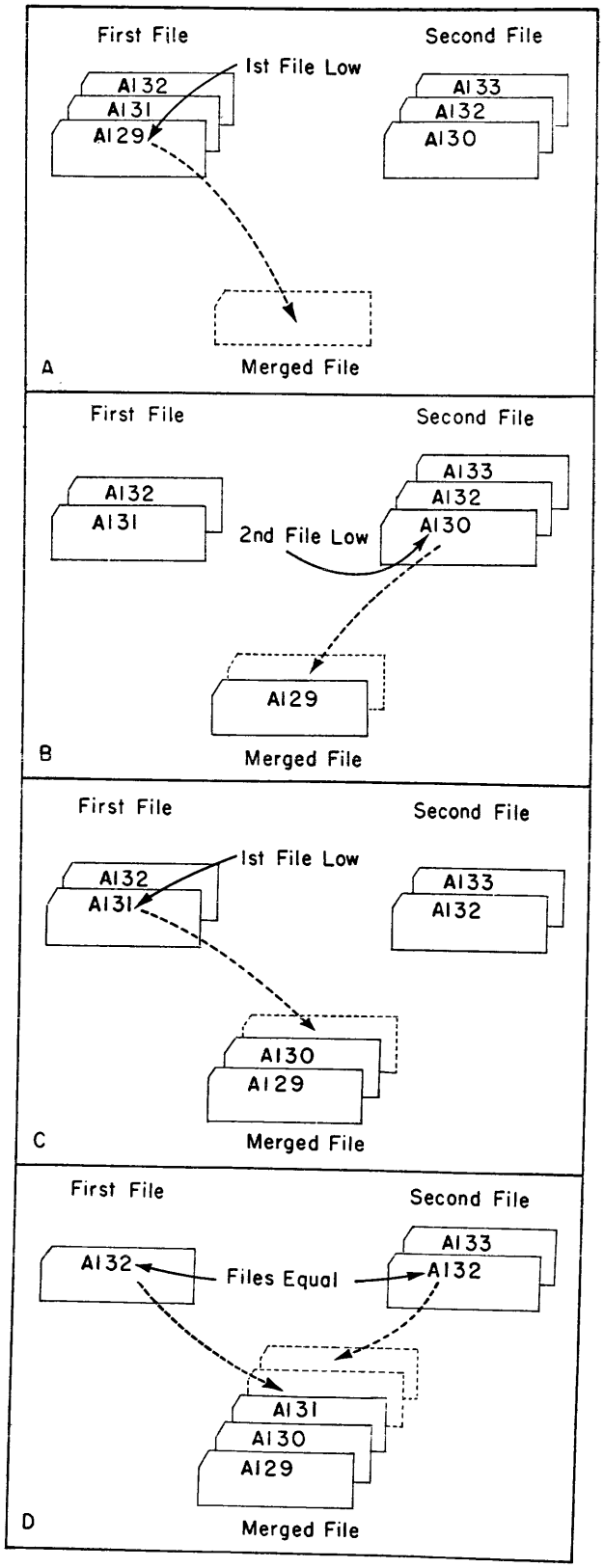


FIGURE 5. PRINCIPLE OF COLLATING

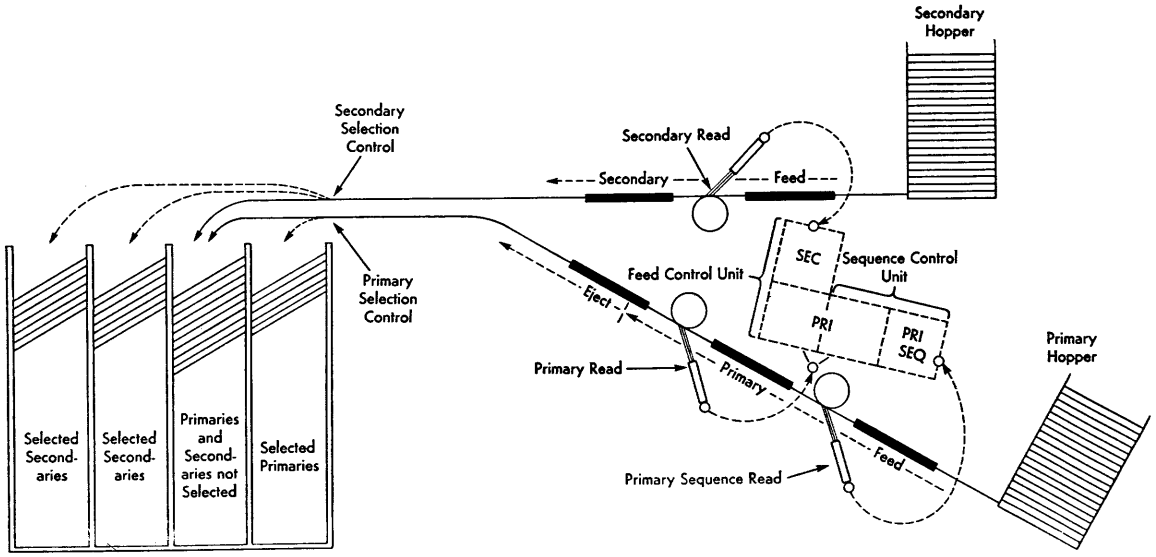


FIGURE 6. SCHEMATIC DIAGRAM OF FEED UNITS

Schematic Diagram

The schematic diagram of the alphabetic collator (Figure 6) is in effect a cutaway view of the primary and secondary feed units, the three sets of brushes, and the control (memory) units. The lower line drawn at an angle represents the primary feed unit and the upper line the secondary feed unit. The four pockets are shown at the left.

Primary Feed Unit

As cards are fed from the primary hopper they pass two reading stations, one consisting of a set of 80 primary sequence brushes and the other a set of 80 primary brushes. These brushes are normally connected by control panel wiring to the primary sequence unit and the primary unit for the purpose of making comparisons between cards at both stations.

There are three card stations in the primary feed unit, as shown in the diagram, one station before the primary sequence brushes, one station between the two sets of brushes, and one after the primary brushes (eject station).

Secondary Feed Unit

As cards are fed from the secondary hopper they pass a set of 80 secondary brushes. These brushes are normally connected to the secondary unit by control panel wiring for the purpose of making comparisons between cards passing the secondary brushes and cards passing the primary brushes.

There are two card stations in the secondary feed unit, one station before and one after the secondary brushes.

Feed Control Unit

The feed control unit is made up of two 16-position comparing sections: a primary section and a secondary section. These sections are "memory units" and are normally used to make comparisons between primary and secondary cards to determine whether they are equal, or if unequal, which of the two is lower. These conditions may be recognized by control panel wiring to cause feeding and selection of primary or secondary cards.

Sequence Control Unit

The sequence control unit is made up of two 16-position comparing sections: a primary section and a primary sequence section. The sequence control unit is normally used to compare a card passing the primary brushes with a card passing the primary sequence brushes to determine whether they are equal or whether one card is higher or lower than the other. These conditions may be recognized by control panel wiring to indicate errors in sequence and to cause feeding and selection of primary and secondary

cards. The primary section in the sequence control unit is the same as the primary section in the feed control unit, and one set of entry hubs is provided on the control panel. Thus, a reading into primary entry serves both the feed control unit and the sequence control unit.

Method of Analysis

The schematic diagram is presented not only for the purpose of describing machine functions but also as a method of analyzing problems before wiring the control panel. The use of the feed and sequence control part of the schematic diagram is of particular value when analyzing problems, since representative letters or numbers can be written into these blocks to determine the condition resulting from a comparison between two cards. For example, a file of cards may be represented by the numbers 1-2-3-*4*-2-6-7-8-9, or letters A-B-C-*D*-*B*-F-G-H. If the ascending sequence is to be checked, an error condition such as 4-2 or D-B is singled out, and these numbers or letters are written in the schematic diagram as shown in Figure 7.

It can readily be seen that whenever a card is out of sequence, such as the 4 card followed by a 2 card, or D followed by B, one of the sequence control sections is low. This low sequence condition, translated into control panel terminology, is a *low primary sequence* which may be wired to entry hubs to stop the machine and turn on the error light.

This method of analyzing will be used in subsequent problems when it contributes to a better understanding of the wiring.

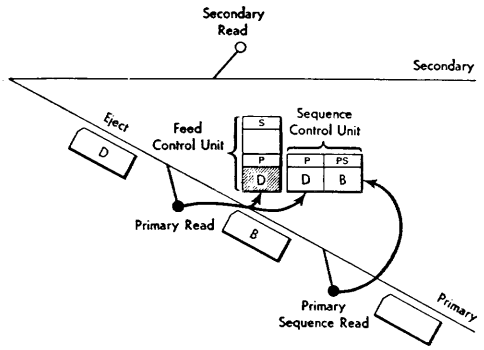


FIGURE 7. SCHEMATIC FOR PROBLEM ANALYSIS

Control Panel

The control panel is the medium through which card reading and card feeding are controlled. When a hole punched in a card is sensed by one of the brushes, an electrical circuit is completed which may be directed by control panel wiring to the comparing units. These units determine a high, low or equal condition and make a corresponding impulse available on the control panel for the purpose of controlling card feeding and selection.

The control panel (Figure 8) is divided into sections, some of which are directly related to the schematic diagram. A more detailed explanation of the hubs in each section will be given when they are first used in a problem.

Control Exit hubs emit impulses resulting from a high, low, or equal comparison in the feed control and sequence control units. They are normally wired to functional entry hubs.

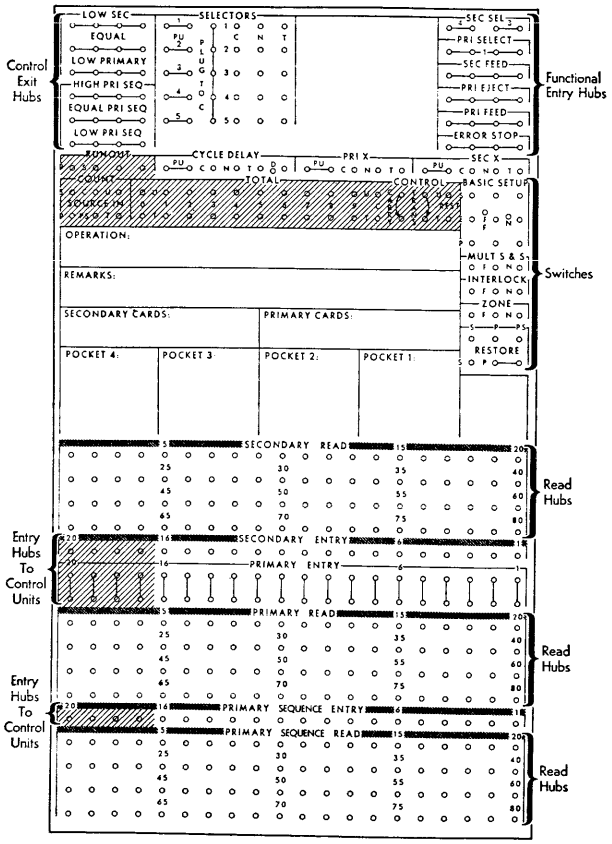


FIGURE 8. CONTROL PANEL

Functional Entry hubs accept impulses to control selection, feeding, and ejection or to stop the machine. They are normally wired from control exits.

Read hubs are the exits for the three sets of brushes, secondary read for the secondary brushes, primary read for the primary brushes, and primary sequence read for the primary sequence brushes. Read hubs impulses correspond to the number or letter read by the brushes.

Entry hubs (secondary, primary, and primary sequence) are the entries to the feed control and sequence control units. They are normally wired from the read hubs and are used to make a comparison between one card and another. Positions 1 to 16 are standard; 17 to 19 are optional.

Switches are used to supplement or eliminate wiring from the control exit hubs, to clear out reading in the control units, to signal the presence of alphabetic punching, or to control feeding under specific conditions. They will be explained as they are used.

The middle section of the control panel, labelled *operation,* should be used to record information about the operation being performed and will be filled in for every example shown. Shaded hubs show additional or optional features which may be added to the standard machine.

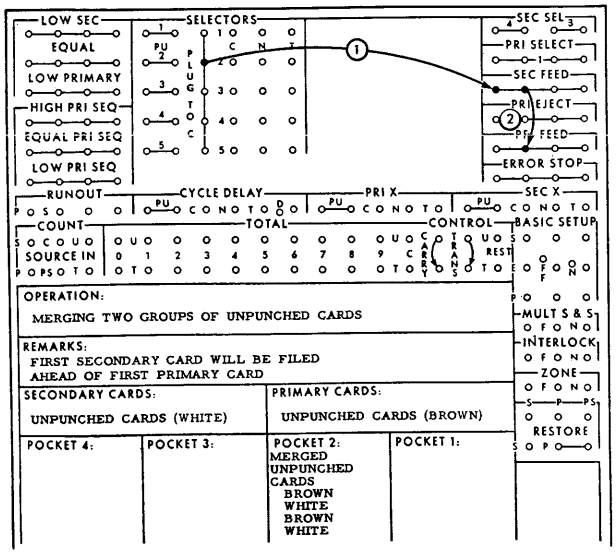


FIGURE 9

MERGING TWO GROUPS OF UNPUNCHED CARDS

TWO FILES of unpunched cards, each of a different color, may be merged into one in such a way that the colors will alternate throughout the file. Since there is nothing punched in the cards, no comparisons can be made, and the merging operation is based entirely upon the control of primary and secondary feeding. As shown in Figure 6, the primary feed unit has one more station than the secondary feed unit, and since the feeding of cards from both the secondary and primary will occur simultaneously, the card in the secondary unit will fall into pocket 2 ahead of the card in the primary unit. Thus, if white cards are placed in the secondary and brown cards in the primary, the merged file will contain alternating white and brown cards in that order.

Plug to C. These five exit hubs emit an impulse as each card feeds. They are normally wired to functional entry hubs to cause primary and secondary feeding and selection, or to the C hub of a selector, when the plug to C must be selected.

Sec Feed (Secondary Feed). These four common functional entry hubs are normally wired from the control exit hubs or from plug to C, directly or through selectors, to cause feeding and ejection of secondary cards.

Pri Feed (Primary Feed). These four common functional entry hubs are normally wired from the control exit hubs or from plug to C, directly or through selectors, to cause feeding and ejection of primary cards. Whenever primary feed is impulsed, primary ejection is automatic.

Wiring (Figure 9)

1. Secondary cards feed and eject continuously by wiring a plug to C to secondary feed.

2. Primary cards feed and eject continuously by wiring a plug to C (from common hubs of secondary feed) to primary feed. Primary cards, in this operation, stack alternately behind secondary cards.

SELECTING X CARDS FROM PRIMARY FEED

CARDS punched with an X may be selected from the primary feed and stacked in pocket 1. All NX cards will stack normally in pocket 2. This operation may be performed separately or in combination with other operations.

Primary Read. The 80 primary read hubs are outlets from the 80 primary brushes. They are normally wired to the primary entry hubs or to the pickup of the primary X selector.

Pri X Selector. The primary X selector is used for the purpose of selecting either a plug to C or a control exit impulse to one of the functional entry hubs, to control primary feeding, ejecting, and selection. The selector has two common pickup hubs and a C (common), N (normal), and T (transferred) hub. When the pickup hub is not impulsed there is an internal connection between C and N. When the pickup hub is impulsed there is an internal connection between C and T. The pickup is normally wired from primary or primary sequence read, to transfer the selector on the same cycle. The selector remains transferred until the card from which it was picked up moves to the next station.

The schematic diagram of selector operation (Figure 10) is shown to explain the primary X selector as well as all other selectors to be discussed in later examples. The side labelled NORMAL shows the path of an impulse (C to N) when the pickup hub is not impulsed. The side labelled TRANSFERRED shows the path of an impulse (C to T) when the pickup hub is impulsed.

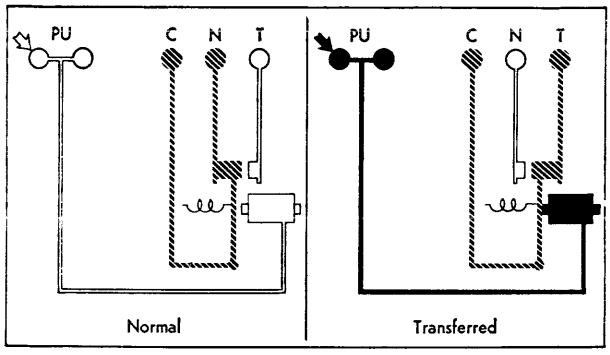


FIGURE 10. SCHEMATIC DIAGRAM OF SELECTOR OPERATION

Pri Select (Primary Select). These four common functional entry hubs are normally wired from plug to C or from control exit hubs directly or through selectors to cause a primary card to stack in pocket 1. Normally, all primary cards stack in pocket 2. A secondary card cannot be directed to pocket 1.

Wiring (Figure 11)

1. A plug to C to primary feed causes continuous feeding and ejection of primary cards.

2. The X in column 20 is wired from primary read to primary X pickup. This selector is transferred as the X card reaches the eject station.

3. A plug to C is wired to C of the selector. This impulse will be available out of the N hub for all NX20 cards and out of the T hub for all X20 cards.

4. The transferred side of the selector is wired to primary select, thus causing all X20 cards to stack in pocket 1. All NX cards will stack in pocket 2.

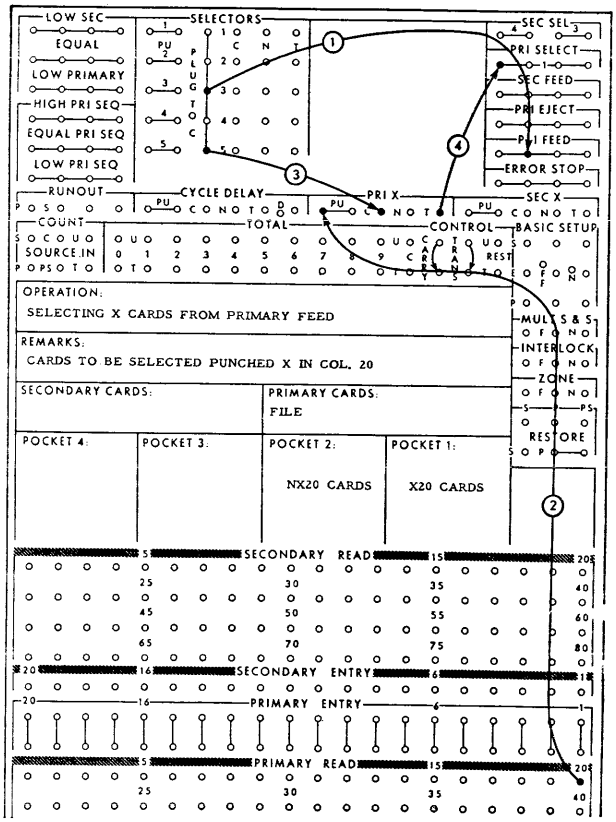


FIGURE 11

SELECTING X CARDS FROM BOTH FEEDS

CARDS with X punches may be selected from both feeds at the same time, thus allowing half the file to be placed in the secondary and the other half in the primary feed. All four pockets would be used in this operation, the X cards stacking in pockets 1 and 4 and the NX cards stacking in pockets 2 and 3.

Secondary Read. The 80 secondary read hubs are outlets from the 80 secondary brushes. They are normally wired to the secondary entry hubs or to the pickup of the secondary X selector.

Sec X Selector. The secondary X selector is used for the purpose of selecting either a plug to C or a control exit impulse to one of the functional entry hubs, to control secondary feeding and selection. It is like the primary X selector in every respect except that the pickup is wired from secondary read instead of from primary or primary sequence read.

Sec Sel 3-4. The two common secondary select 3 hubs are functional entry hubs which, when impulsed, cause a secondary card to stack in pocket 3. The two common secondary select 4 hubs are functional entry hubs which, when impulsed, cause a secondary card to stack in pocket 4. Both sets of hubs are normally wired from plug to C or from control exit hubs.

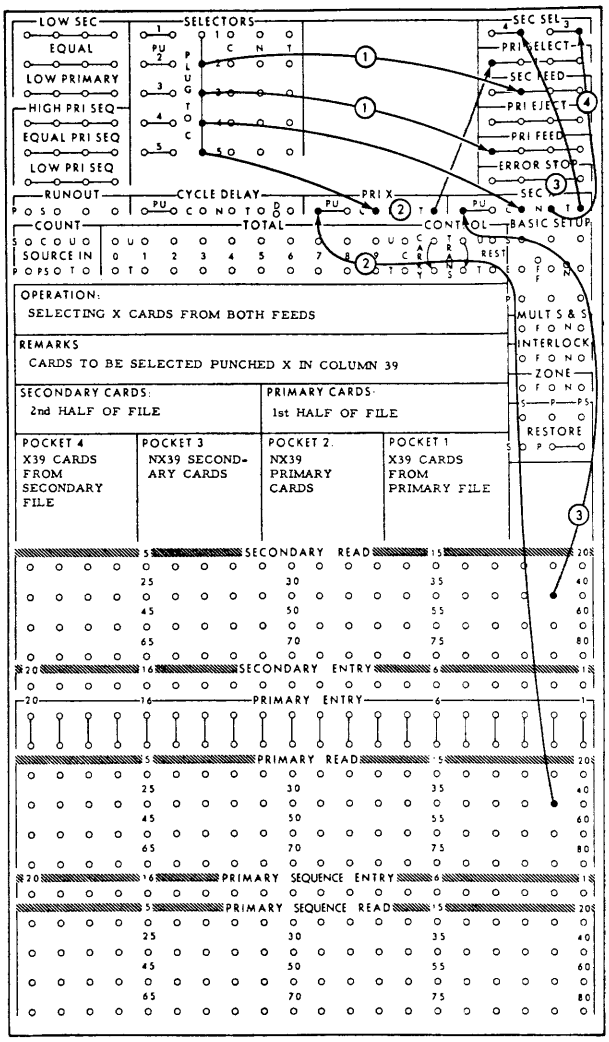


FIGURE 12

Wiring (Figure 12)

1. A plug to C wired to primary feed and secondary feed causes continuous feeding and ejection of primary and secondary cards.

2. X cards in the primary feed are selected by wiring column 39 from primary read to Pri X pickup and a plug to C through the transferred side of this selector to primary select. All X cards in the primary feed will stack in pocket 1, all NX cards in pocket 2.

3. X cards in the secondary feed are selected by wiring column 39 from secondary read to secondary X pickup and a plug to C through the transferred side of this selector to secondary select.

4. The normal side of this selector is wired to secondary select 3 so that all NX cards in the secondary feed will fall in pocket 3. If this wire were omitted, NX secondary cards would merge with NX primary cards in pocket 2.

CHECKING SEQUENCE WITH ERROR STOP

THE SEQUENCE of a file of cards can be checked to insure that no card in the file is out of order. The two sets of brushes in the primary feed make it possible to compare each card twice; once with the card ahead and once with the card behind. Each comparison may be either high, low, or equal. If a card is either equal to or higher than the card ahead of it, both cards are in order. However, if the card is lower than the card ahead of it (Figure 13), it is out of order.

As will be seen by reference to Figure 13, card 125 has just passed the primary brushes and the number has been stored in the primary section of both the feed control unit and the sequence control unit. Since primary cards are fed continuously, the reading in the feed control unit may be disregarded. At the same time, card 124 has just passed the primary sequence brushes and the number is stored in the primary sequence unit. Since the file should be in ascending sequence, any "step down" is an error. A step down in sequence is recognized as a low primary sequence condition and will make an impulse available out of the corresponding control exit hubs on the panel. This impulse may be used to stop the machine and turn on the error light.

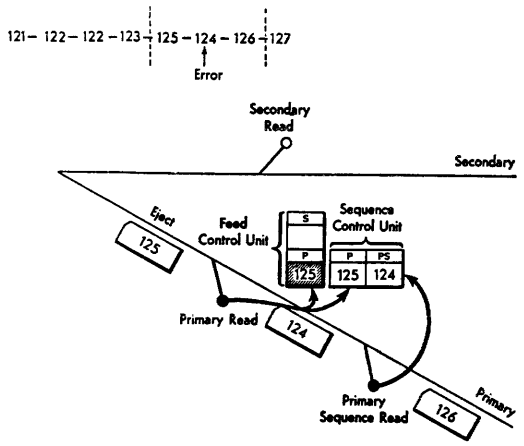


FIGURE 13. CHECKING SEQUENCE WITH ERROR STOP

Primary Entry. There are 16 primary entry positions on the standard machine, each position having two common hubs. Positions 17-19 are optional. The primary entry positions are numbered from right to left and are normally wired from primary read. They are entries to the primary section in the feed control unit and the primary section in the sequence control unit.

Primary Sequence Read. The 80 primary sequence read hubs are outlets from the 80 primary sequence brushes. They are normally wired to primary sequence entry or to the pickup of the primary X selector.

Primary Sequence Entry. There are 16 primary sequence entry positions on the standard machine. Positions 17-19 are optional. They are numbered from right to left and are normally wired from primary sequence read. They are entries to the primary sequence section in the sequence control unit.

Control Exit — Sequence Control Unit. Whenever a comparison is made in the sequence control unit, the results will be available from the last three rows of control exit hubs. Each row has 4 common hubs and is normally wired to a functional entry hub to control card feeding, ejection and selection. These hubs emit impulses under the following conditions:

1. The *high primary sequence* hubs emit impulses when the reading in the primary sequence section of the sequence control unit is higher than that in the primary section. In normal sequence checking operations this impulse represents a change in sequence in ascending order.

2. The *equal primary sequence* hubs emit impulses when the reading in the primary sequence section is equal to that in the primary section.

3. The *low primary sequence* hubs emit impulses when the reading in the primary sequence section is lower than that in the primary section. In nor-

mal sequence checking operation this impulse represents a change in sequence in descending order, and therefore an error.

When more than one field is used for a control, the major field must be wired to the left of the intermediate field, which in turn is wired to the left of the minor field, as shown in the example below:

Major	*Intermediate*	*Minor*
1. Surname	First Initial	Second Initial
2. State Code	County Code	City Code

Both the feed control and the sequence control units hold a reading until they are restored.

After the feed and sequence control units have determined the equal, high, or low condition between two readings, they are ready to be restored or cleared. Both the clearing and the subsequent read-in of a unit is controlled by the restore hubs.

Restore. There is an entry hub for restoring each of the sections: S (secondary); P (primary); PS (primary sequence). The two common exit hubs labelled Restore P emit impulses when the primary feed operates, and are normally used to restore P (primary) and PS (primary sequence) sections. The single hub labelled S emits an impulse when the secondary feed operates, and is used normally to restore the secondary section of the feed control unit. When the restore hubs are wired, depression of the run-out key will automatically restore all units.

Zone. When the zone switch is wired ON, all control units will recognize zone punches (0, 11, 12) as well as digit punches, thus making it possible to compare alphabetic as well as numerical information. When the zone switch is wired OFF, the control units will recognize only digit punches (1-9). This switch should be ON whenever alphabetic or special character positions are to be compared.

Error Stop. These four common functional entry hubs are normally wired from low primary sequence to detect an error in sequence. When impulsed, they cause the machine to stop and

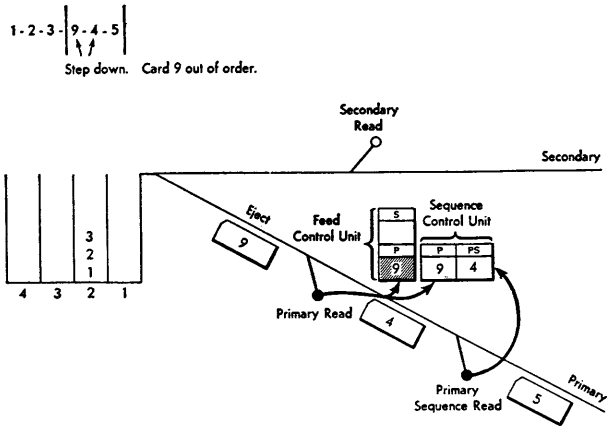


FIGURE 13A. FIRST CARD OUT OF SEQUENCE

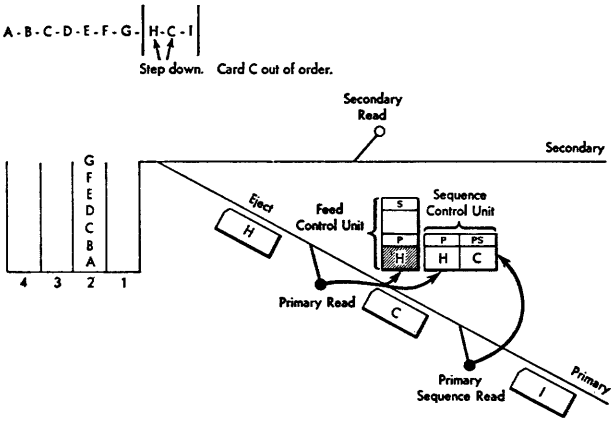


FIGURE 13B. SECOND CARD OUT OF SEQUENCE

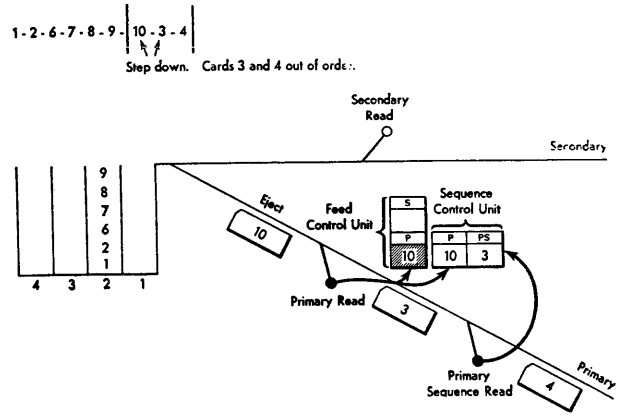


FIGURE 13C. SECOND AND THIRD CARDS OUT OF SEQUENCE

an error light to turn on. In order to locate the error the cards should first be removed from the feed hopper. The error reset key is then depressed to turn off the error light and the run-out key is depressed to feed the three cards remaining in the machine.

Error stop does not indicate the specific card or cards out of sequence. Errors are detected on the basis of a step down in sequence and a check must be made to determine the card or cards out of order as shown in examples, Figure 13 A, B, and C.

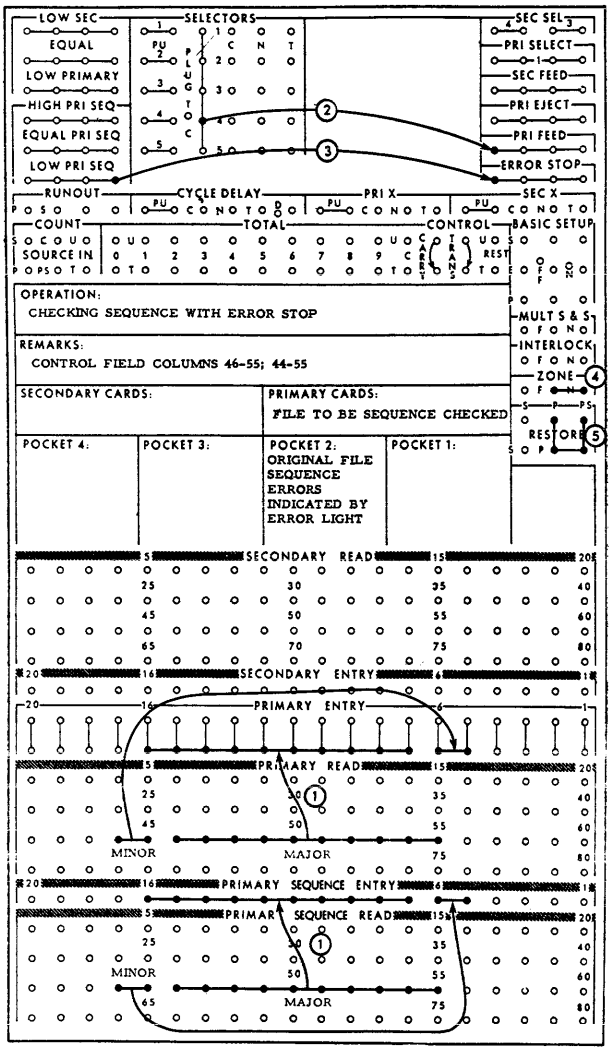


FIGURE 14

Wiring (Figure 14)

1. The card columns to be checked for sequence are wired from primary read to primary entry and from primary sequence read to primary sequence entry. Any of the 16 entry positions may be used, since these positions are tested successively from left to right. If sequence checking is to be done on more than one control field, the major field must be wired to the left, followed by the minor field. In this example the major field is punched in columns 46-55 and is wired to the left of the minor field, columns 44-45.

2. Continuous feeding and ejection of cards in the primary feed is accomplished by wiring a plug to C to primary feed.

3. A comparison is made between a card passing the primary brushes and the card behind it passing the primary sequence brushes. A card out of order will be indicated by a low primary sequence impulse. A wire from low primary sequence to error stop will stop the machine and turn on the error light.

4. The zone switch is wired ON whenever alphabetic information is to be sequence checked. It is wired OFF when only numerical information is to be sequence checked.

5. The primary and primary sequence control sections must be restored after each card is read. This is done by wiring the P and PS restore entry hubs from the primary restore exit.

CHECKING SEQUENCE, CARDS IN DESCENDING ORDER

CARDS in descending sequence may be checked by changing one wire in the previous diagram; that is, by wiring error stop from high primary sequence instead of from low primary sequence. The example (Figure 15) shows the error card to be a step up in sequence rather than a step down. A step up in sequence is recognized as a high primary sequence and would make an impulse available at the corresponding control exit hubs.

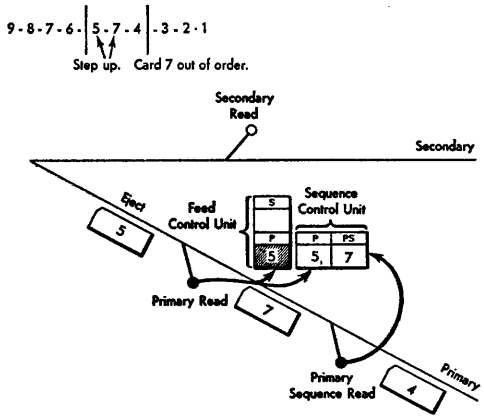


FIGURE 15. CHECKING DESCENDING SEQUENCE

Another method of checking cards in descending order is to reverse the brush wiring; that is, from primary read to primary sequence entry and primary sequence read to primary entry. The error will then be indicated by a low primary sequence.

CHECKING SEQUENCE, INSERTING INDEX CARDS

WHILE checking sequence, it is possible to insert an index card each time a step down or step up in sequence occurs. This operation can be used in place of the error stop feature; instead of stopping the machine, an error causes an index card to be inserted while the machine remains in continuous operation. The index cards are placed in the secondary feed hopper, and the cards to be sequence checked are placed in the primary feed hopper.

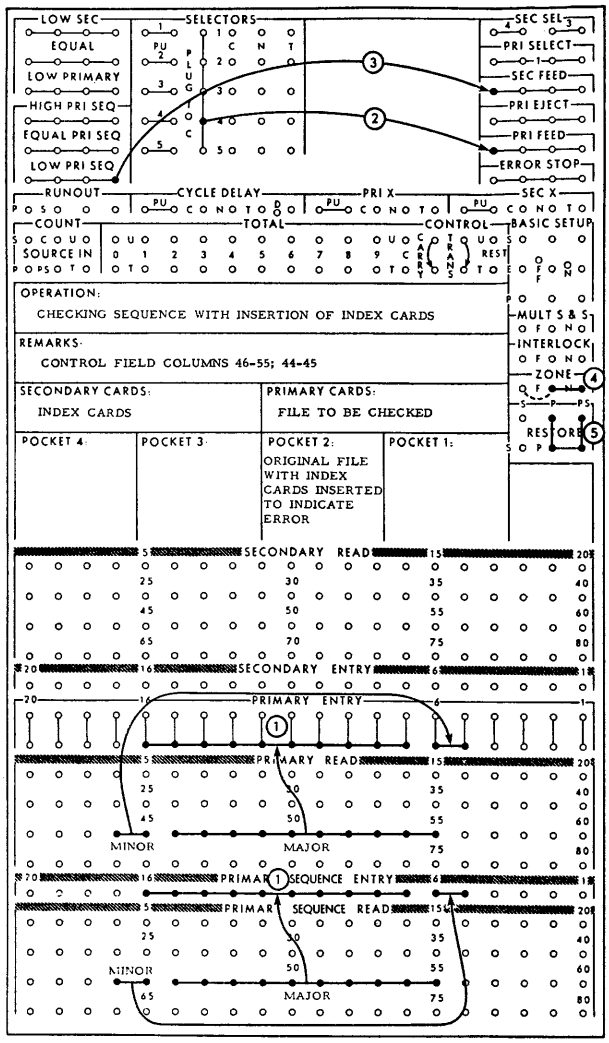


FIGURE 16

Wiring (Figure 16)

The wiring for this operation is identical to that shown in Figure 14 except that the low primary sequence control exit (number 3) is wired to secondary feed rather than to error stop. This will cause a secondary card to feed whenever a step down in sequence occurs, thereby inserting the index card immediately preceding the low card.

If index cards are to be inserted for errors in a file in descending sequence, high primary sequence would be wired to secondary feed.

INSERTING AN INDEX CARD BEHIND EACH CONTROL GROUP

INDEX CARDS may be inserted behind each control group by using the same wiring principles as described for sequence checking. The index cards are placed in the secondary hopper and the punched cards in the primary hopper. The end of one control group and the beginning of another is indicated by a high primary sequence condition as shown in Figure 17.

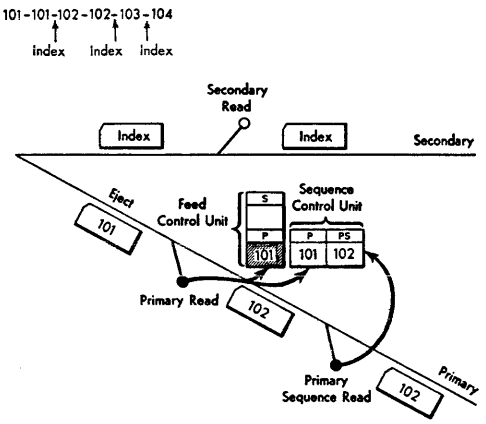


FIGURE 17. INSERTING AN INDEX CARD BEHIND EACH CONTROL GROUP

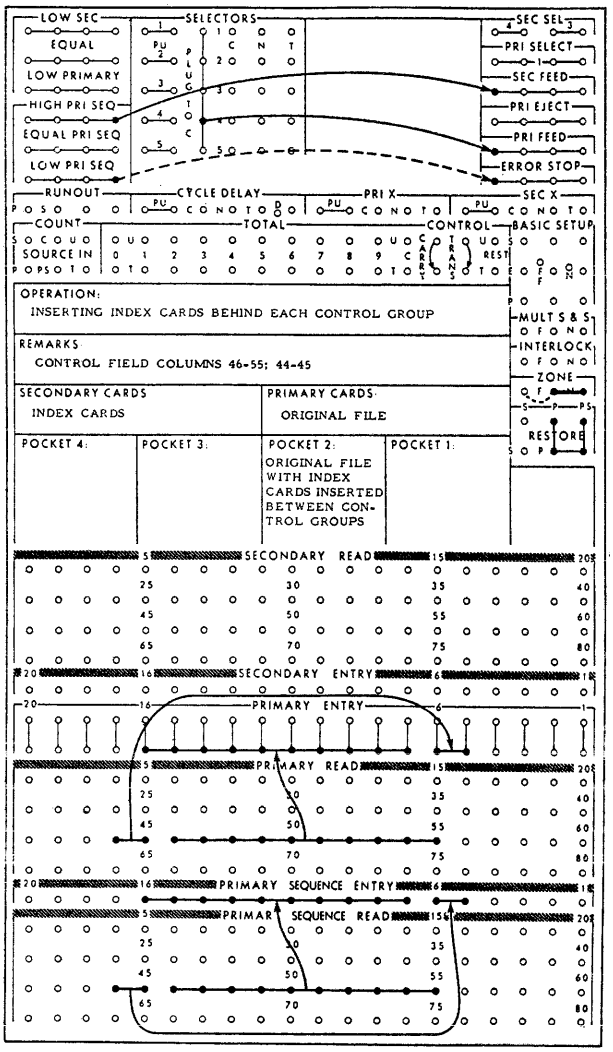


FIGURE 18

When the reading in the primary sequence section is higher than that in the primary section, a high primary sequence impulse is available. When wired to secondary feed, this impulse causes an index card and the last card of the group to stack simultaneously. The last primary card of each group and an index (secondary) card feed together into pocket 2, the index card stacking behind the primary card.

Wiring (Figure 18)

The wiring for this operation is identical to that shown in Figure 16 except that high primary sequence instead of low primary sequence is wired to secondary feed. This will cause the index card to fall behind the last primary card of each group, if the file is in sequence. The dotted wire may be added for sequence checking.

SELECTING THE LAST CARD OF A GROUP

THE LAST card of a group may be selected into pocket 1 by using the same wiring principles described in the preceding problem. The last card of a group may be recognized by a change in control numbers as shown in Figure 19. When

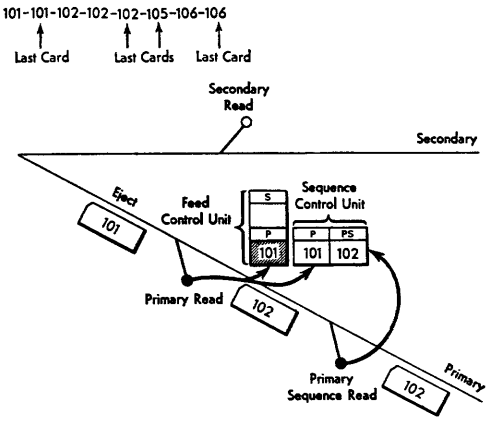


FIGURE 19. SELECTING THE LAST CARD OF A GROUP

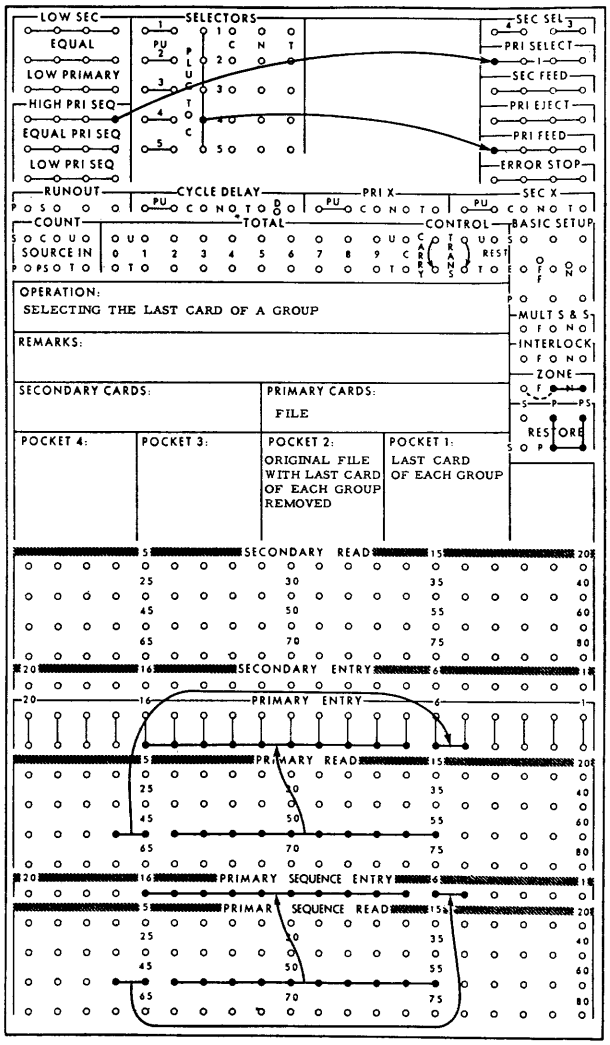


FIGURE 20

card 101 is passing the primary brushes, card 102 is passing the primary sequence brushes and a comparison between the two cards results in a high primary sequence condition. Since card 101 is at the eject station at this time, a wire from high primary sequence to primary select will cause it to stack in pocket 1. All other 101 cards preceding the last card will stack in pocket 2.

Wiring (Figure 20)

The wiring for this operation is identical with that shown in Figure 18 except that high primary sequence is wired to primary select, causing the last card of every group to stack in pocket 1.

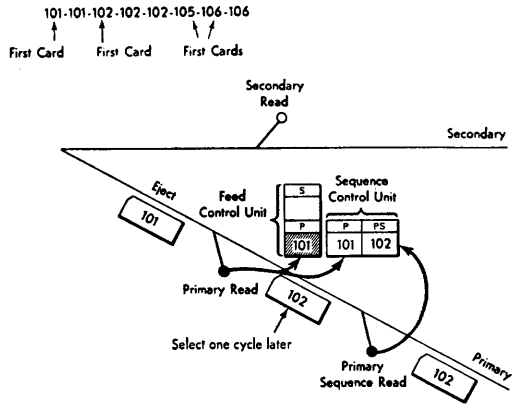


FIGURE 21. SELECTING THE FIRST CARD OF A GROUP

SELECTING THE FIRST CARD OF EACH CONTROL GROUP

THE FIRST card of a control group, like the last card, is recognized by a change in control number.

As shown in Figure 21, the first card of a group is recognized by a high primary sequence condition. Since card 102 is not at the eject station at this time, the impulse to select the card must be made available one cycle later. This is accomplished by wiring the high primary sequence to the pickup of a selector which transfers one cycle later. This selector is called a "Cycle Delay" selector to distinguish it from other selectors in the machine which transfer immediately.

Cycle Delay. The cycle delay unit is a selector with PU (pickup), C (common), N (normal) and T (transferred) hubs.

The cycle delay selector differs from other types of selectors in this machine in two respects:

1. The cycle delay selector transfers one cycle after pickup; other selectors transfer immediately.

2. The cycle delay selector, once transferred, remains transferred until dropped out by external wiring. Other selectors, once transferred, remain transferred for the rest of the cycle and drop out automatically.

To drop out the cycle delay selector, an impulse must be wired to the DO (drop out) hub. The selector will be normal on the following cycle. The pickup is normally wired from a control exit. The drop out is normally wired from a plug to C, or from primary or secondary feed either directly or through other selectors.

Wiring (Figure 22)

1. The control information from the card is wired from primary read to primary entry and from primary sequence read to primary sequence entry.

2. A plug to C wired to primary feed causes continuous feeding and ejecting of primary cards.

3. High primary sequence is wired to the pickup of the cycle delay unit. A plug to C wired through the transferred side of the selector will be effective one cycle after a high primary sequence condition. When wired to primary select, it causes the first card of a group to stack in pocket 1.

4. The cycle delay unit receives an impulse to drop out on every primary feed cycle from the common hubs of primary feed. The selector is normal on the next card cycle.

5. The zone switch is wired ON only when the control field contains alphabetic information or special characters.

6. The primary and primary sequence sections are restored on every primary feed cycle.

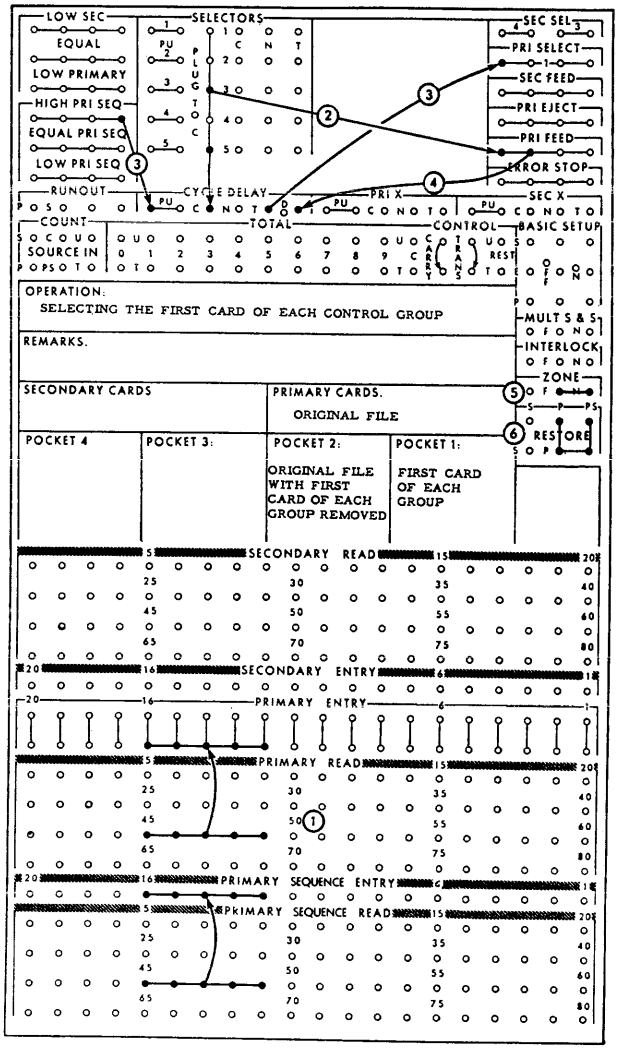


FIGURE 22

SELECTING SINGLE CARD GROUPS

SINGLE card groups are recognized by a high primary sequence followed by a high primary sequence as shown in Figure 23. Card 101 followed by card 103 is recognized as a high primary sequence condition. Card 103 followed by card 104 immediately causes another high primary sequence condition. Therefore, a single card is always recognized when two consecutive high primary sequence conditions occur. When the second high primary sequence condition occurs the single card is at the eject station and may be selected by wiring a high primary sequence impulse through the transferred side of the cycle delay unit.

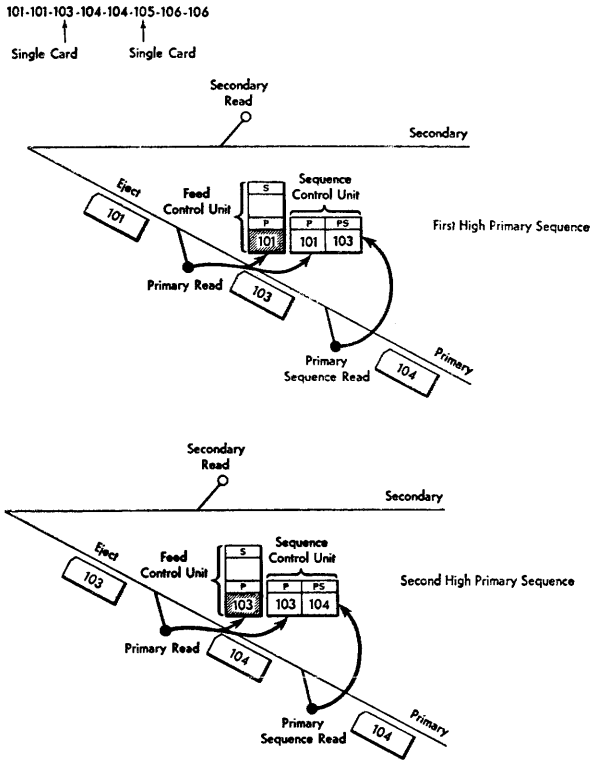


FIGURE 23. SELECTING SINGLE CARD GROUPS

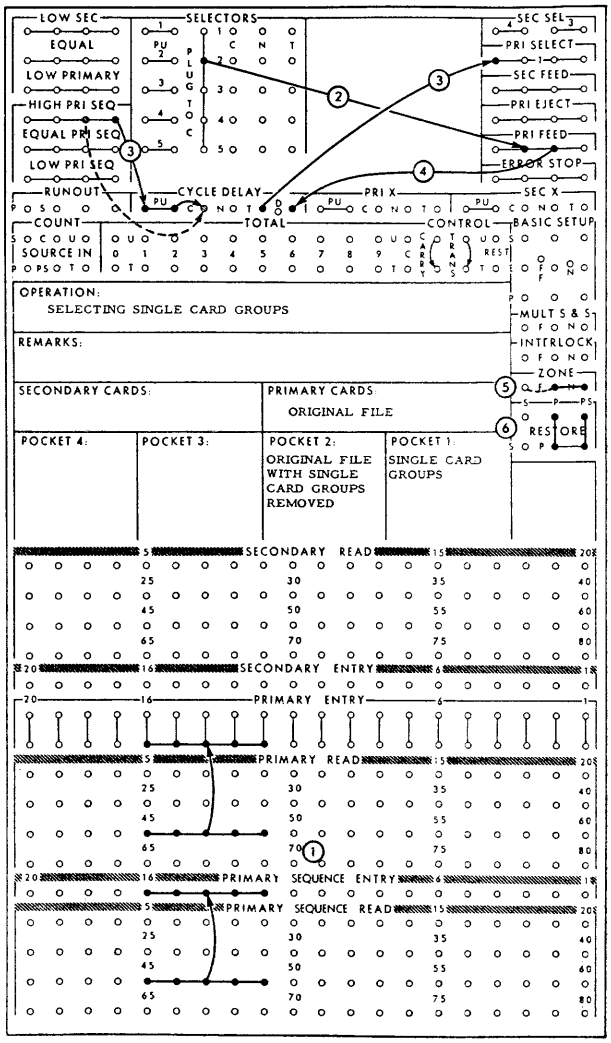


FIGURE 24

Wiring (Figure 24)

1. The control information (alphabetic or numerical) from the card is wired from primary read to primary entry and from primary sequence read to primary sequence entry.

2. A plug to C wired to primary feed causes continuous feeding and ejection of primary cards.

3. Two consecutive high primary sequence conditions identify a single card. The first high primary sequence identifies it as the first card of the following group and the second high primary sequence condition identifies it as a single card. High primary sequence is wired to both the pickup and C of the cycle delay unit. It is wired from the transferred hub to primary select and causes a single card to stack in pocket 1.

4. The dotted wire may be substituted for the jackplug from PU to C. The cycle delay is dropped out on every primary feed cycle.

5. The zone switch is wired ON only when the control field is punched with alphabetic information or special characters.

6. The primary and primary sequence control sections are restored on every primary feed cycle.

ZERO BALANCE SELECTION — TWO FEEDS

ZERO BALANCES in 16 columns may be selected from either the primary or the secondary feed. They may also be selected from both feeds simultaneously. One-half of the file is placed in the primary and the other half in the secondary, thereby reducing the processing time.

By wiring primary read to primary sequence entry and nothing to primary entry, a zero reading will be recognized as an *equal primary sequence* condition and the primary card may be selected into pocket 1. By wiring secondary read to secondary entry and nothing to primary entry, a zero reading will be recognized as an *equal* condition and the secondary card may be selected into pocket 4.

Blank control fields will be treated as zeros and will be selected with the zero cards if the zone switch is off. If it is on, only blank cards will be selected, since zeros will be treated as zones.

Secondary Entry. There are 16 entry hubs to the secondary section of the feed control unit, numbered from right to left. Three more are optional. These hubs are normally wired from secondary read.

Wiring (Figure 25)

1. The control columns in the primary cards are wired from primary read to primary sequence entry.

2. The control columns in the secondary cards are wired from secondary read to secondary entry.

3. Zeros in the secondary feed control section compare against nothing in the primary feed control section, resulting in an equal condition. With equal wired to secondary select 4, all zero secondary cards will select into pocket 4.

4. Zeros in the primary sequence control section compare against nothing in the primary feed control section, resulting in an equal primary sequence condition. With equal primary sequence wired to primary select, all zero primary cards will stack in pocket 1.

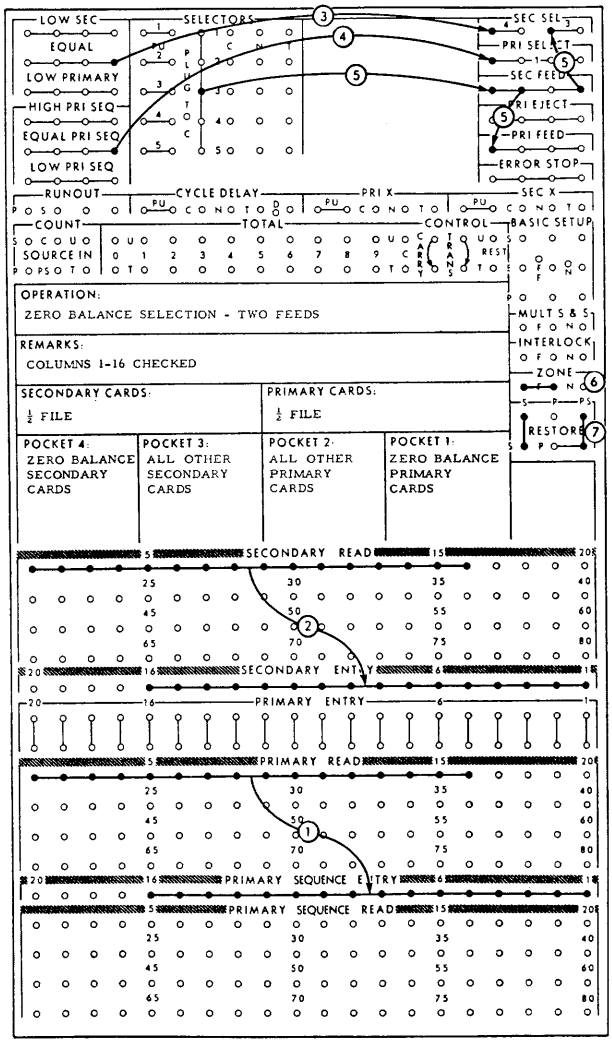


FIGURE 25

5. A plug to C is wired to both primary and secondary feed to cause continuous feeding and ejection of cards. It is also wired to secondary select 3 to keep other secondary cards separated from other primary cards which stack in pocket 2. When pockets 3 and 4 are impulsed at the same time, pocket 4 takes precedence.

6. If the zone switch is wired off, both zeros and blanks will be selected. If it is wired ON, only blanks will be selected.

7. Only the units into which reading is entered need to be restored.

ZERO BALANCE SELECTION — ONE FEED

AS MANY AS 32 columns may be checked for zeros or blanks, if only one feed is used. Sixteen columns are checked in the feed control unit and 16 columns in the sequence control unit. In this example the primary feed is used.

Cards having zeros or blanks in all 32 columns will cause an equal condition in the feed control unit and an equal primary sequence condition in the sequence control unit. Both of these conditions may be used to pick up two selectors through which a plug to C is wired to primary select.

Selectors. There are five selectors, each having a pair of PU (pickup) hubs, and a C, an N, and a T hub. The C (common) hub is normally connected internally to the N (normal) hub when the selector is not transferred, and to the T (transferred) hub when the selector is picked up, as shown in Figure 10. The pickup hubs are normally wired from a control exit hub, to transfer the selector immediately. The selectors return to normal at the end of the same cycle.

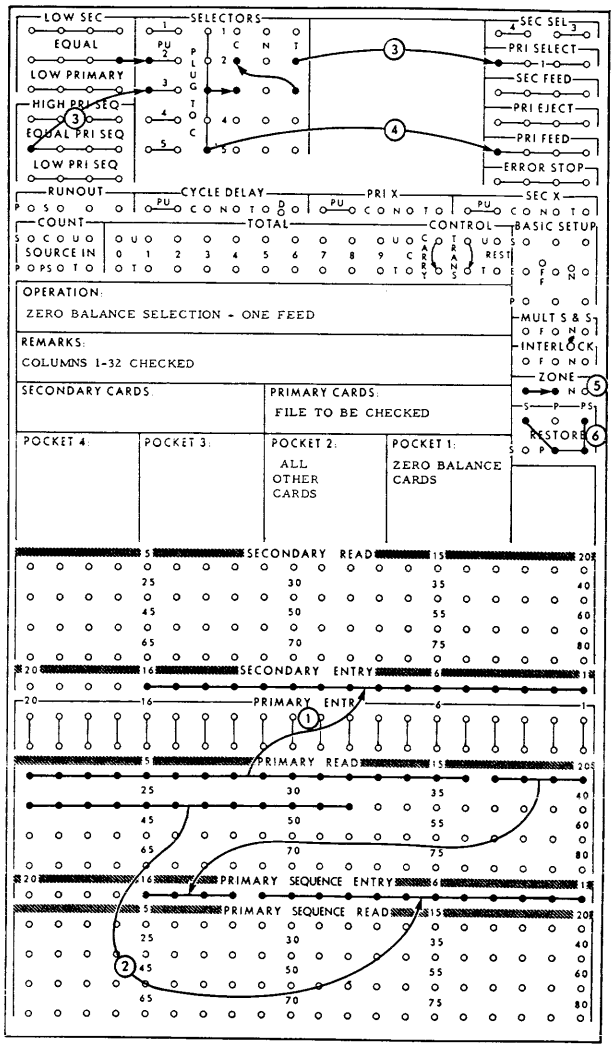


FIGURE 26

Wiring (Figure 26)

1. Sixteen of the columns to be checked are wired from primary read to the secondary entry.

2. The remaining 16 columns are wired from primary read to primary sequence entry.

3. Equal (zeros in first 16 columns) transfers selector 2 and equal primary sequence (zeros in the last 16 columns) transfers selector 3. When both selectors are transferred, all 32 columns are zeros or blanks. A plug to C can pass through the transferred side of both selectors to primary select 1.

4. A plug to C causes continuous feeding and ejection of primary cards.

5. If the zone switch is wired OFF, both zeros and blanks will be selected. If it is wired ON only blanks will be selected.

6. Since reading into the secondary and primary sequence control sections is from a primary card, both sections are restored on a primary feed.

COMPARING TWO FIELDS ON THE SAME CARD — PRIMARY FEED

TWO FIELDS on the same card may be compared, one with the other, to determine which is higher or lower, or whether they are equal to each other. The schematic diagram (Figure 27) shows a card on which field B is less than field A. It is desired to select this and all cards like it from a file. By wiring field A into primary entry and field B into primary sequence entry, a low primary sequence condition will result whenever field B is less than field A.

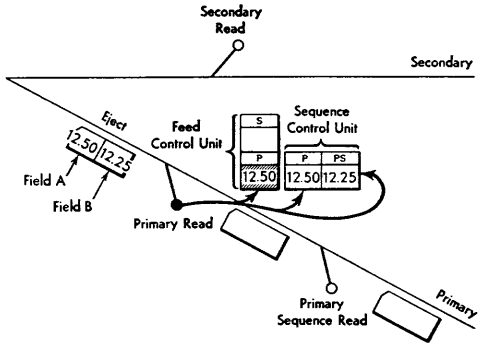


FIGURE 27. COMPARING TWO FIELDS ON THE SAME CARD—PRIMARY FEED

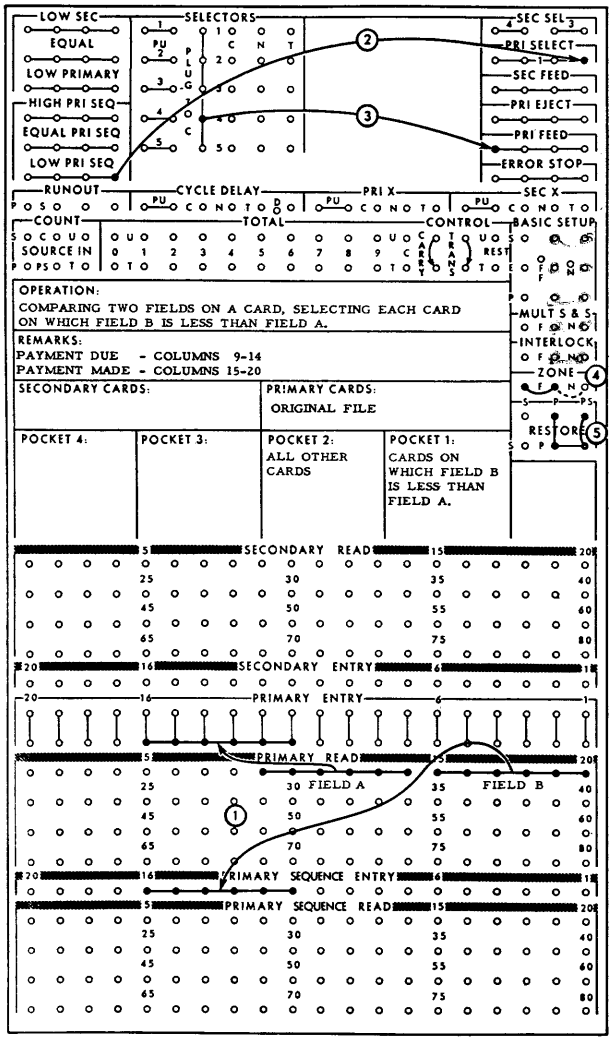


FIGURE 28

Wiring (Figure 28)

1. Field A is wired to primary entry and field B to primary sequence entry. When the primary feed is used, cards must be read from primary read.

2. When field B is less than field A, a low primary sequence condition results, which when wired to primary select, will cause the cards to stack in pocket 1.

3. A plug to C wired to primary feed causes continuous feeding and ejection of primary cards.

4. When the control field is punched with numerical information only, the zone switch is wired off.

5. The primary and primary sequence control sections are restored on a primary feed by wiring P restore to P and PS.

COMPARING TWO FIELDS ON THE SAME CARD — SECONDARY FEED

THE SECONDARY FEED may be used when comparing two fields on the same card, in which case cards with equal, high and low comparisons in the feed control unit may be selected into three separate pockets.

Control Exit. Whenever a comparison is made in the feed control unit, the results will be available from the first three rows of the control exit hubs, located in the upper left corner of the panel. Each row has four common hubs and is normally wired directly to a functional entry hub to control card selection, and to selector pickup hubs to control feeding and ejection. These hubs emit impulses under the following conditions:

1. The *low secondary* hubs emit impulses when the reading in the secondary section of the feed control unit is lower than that in the primary section.

2. The *equal* hubs emit impulses when the readings in the primary and secondary sections are equal.

3. The *low primary* hubs emit impulses when the reading in the primary section is lower than that in the secondary section.

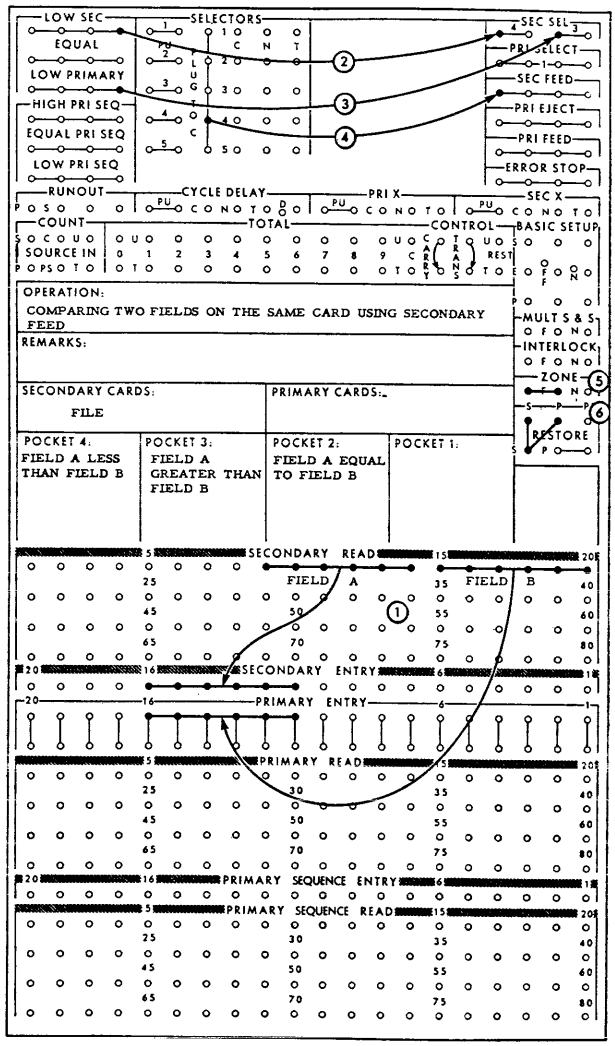


FIGURE 29

Wiring (Figure 29)

1. Field A is wired from secondary read to secondary entry and field B from secondary read to primary entry.

2. Whenever field A is lower than field B an impulse will be available from low secondary which, when wired to secondary select 4, will cause the card to stack in pocket 4.

3. Whenever field A is greater than field B an impulse will be available from low primary which, when wired to secondary select 3, will cause the card to stack in pocket 3. All equal cards will stack normally in pocket 2.

4. A plug to C to secondary feed causes continuous feeding of secondary cards.

5. The zone switch is wired OFF, since the field is punched only with numerical information.

6. Both the secondary and primary sections are restored on a secondary feed.

SELECTING CARDS BY A CONTROL NAME OR NUMBER — ONE FEED

A SPECIFIC name or number can be selected from a file of cards regardless of the sequence of that file. The name or number to be selected is punched in a finder (X punched) card which is placed ahead of the cards to be searched. The file is then run through the machine which reads and "remembers" the specific name or number from the finder card and compares it with every card that follows. In Figure 30, a file is being searched for part number A3B. The part number is read into

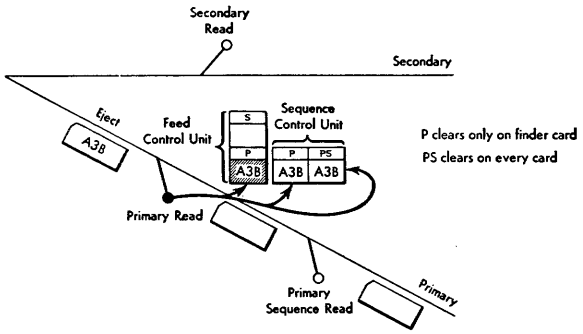


FIGURE 30. SELECTING CARDS BY A CONTROL NAME OR NUMBER—ONE FEED

the primary section from a finder card. This section is not cleared until a new finder card is read. The file cards are read into the primary sequence section which clears on every card. An equal primary sequence condition will be available whenever the part number in the file card is the same as that read from the finder card. Selection is based upon an equal primary sequence condition, and an index card may be inserted for every card selected.

Wiring (Figure 31)

1. The name or number to be selected is punched in a finder (X punched) card in the same field as the name or number in the file card. The control field is then wired from primary read to both primary and primary sequence entry.

2. Whenever the control field in the detail cards is equal to the control field in the finder card, equal primary sequence emits an impulse. It is wired to primary select to cause the equal card

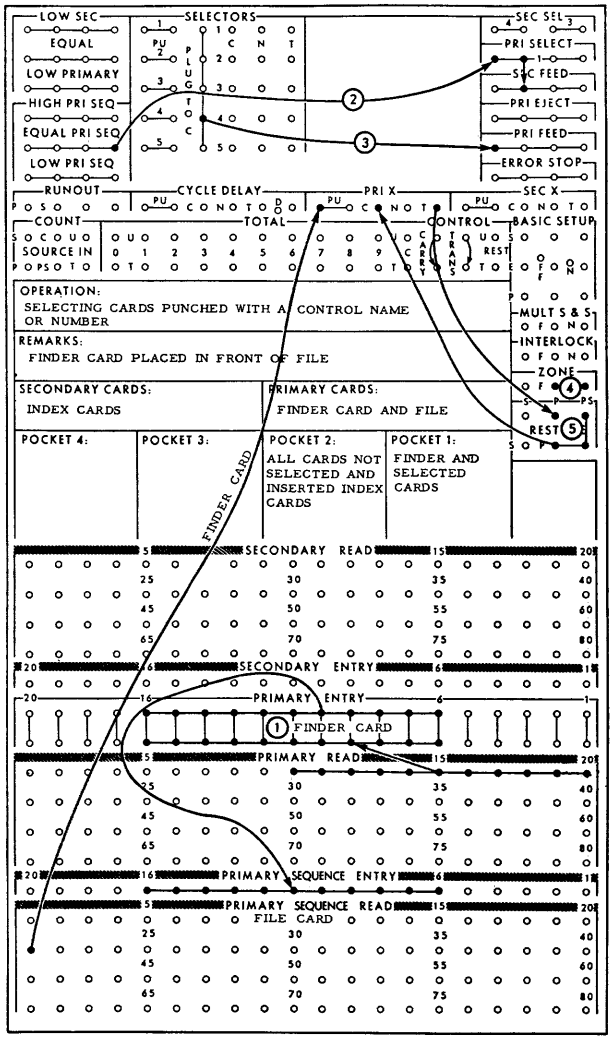


FIGURE 31

to stack in pocket 1, and to secondary feed to cause an index card to be inserted in its place.

3. A plug to C wired to primary feed causes continuous feeding and ejection of primary cards.

4. The zone switch is wired ON since the control field contains alphabetic information.

5. The primary section is cleared only from a finder card, by wiring P restore exit through the transferred side of the primary X selector to P restore entry. The primary X selector is picked up from X21, read from the primary sequence brushes. The primary section is restored when the finder card is at the primary sequence station, which is one cycle before it will be read. The primary sequence section is restored normally.

SELECTING NAMES OR NUMBERS HIGHER THAN THE CONTROL NUMBER — TWO FEEDS

IN SEARCHING a file of cards for a specific name or number, it is possible to place one-half the file in the primary and the other half in the secondary feed. Moreover, names or numbers higher or lower than that punched in the finder card may be selected, as well as those that are equal. In Figure 32, all amounts higher than $100.00 are being selected from both the primary and secondary feeds.

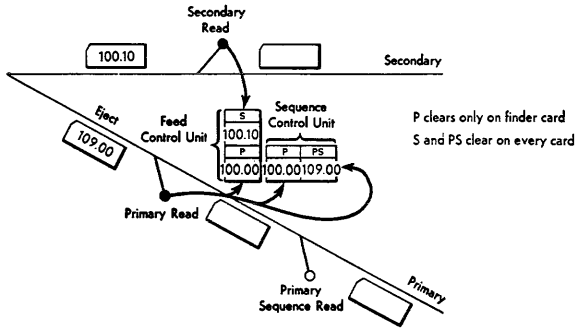


FIGURE 32. SELECTING NAMES OR NUMBERS HIGHER THAN A CONTROL NUMBER—TWO FEEDS

The amount to be selected is punched in a finder card which is placed in front of the file and is read into the primary section where it is stored. The control field from the file is read into the primary sequence control unit for primary cards and into the secondary control unit for secondary cards; both units clear on every card. Amounts higher than $100.00 create a low primary condition in the feed control unit and a high primary sequence condition in the sequence control unit.

Wiring (Figure 33)

1. The control information in the finder card and the file cards is punched in the same card columns. Primary read is wired to both primary entry and to primary sequence entry. Secondary read is wired to secondary entry.

2. When the control information punched in a secondary card is higher than that punched in the finder card, a low primary condition results. Low primary is wired to secondary select 4.

3. When the control information punched in a primary card is higher than the information punched in the finder card, a high primary sequence condition results. High primary sequence is wired to primary select.

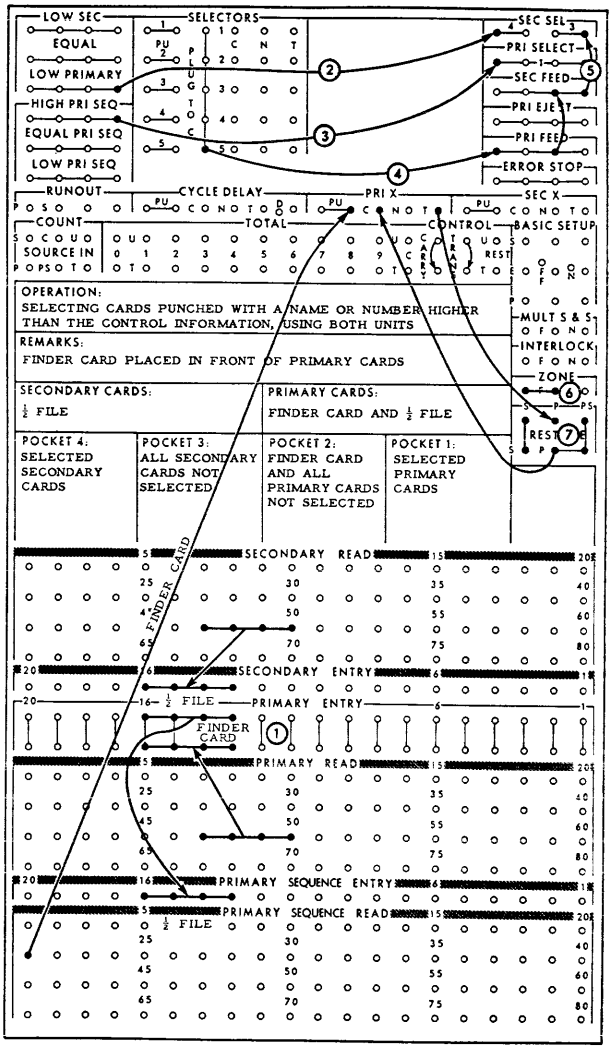


FIGURE 33

4. A plug to C is wired to primary feed and secondary feed to cause continuous feeding. If the two feeds are started simultaneously at the beginning of the run, a blank card must precede the secondary file.

5. A plug to C is wired to secondary select 3 from the common secondary feed hubs, to prevent merging of primary and secondary cards that are not selected.

6. The zone switch is wired OFF whenever the control field contains only numerical information.

7. The secondary and primary sequence units are restored normally. Primary is restored through the transferred side of the primary X selector, picked up from an X read at the primary sequence station from the finder card.

SELECTING CARDS BETWEEN TWO NAMES OR NUMBERS

CARDS with names or numbers that are higher than a minimum and lower than a maximum may be selected. The minimum and the maximum names or numbers are both punched in the same finder card. The field containing the minimum number is wired to secondary entry and the field containing the maximum number is wired to primary sequence entry.

The sections holding minimum and maximum limits must be restored for the X finder card. The field in the file cards is wired to primary entry and is compared with the minimum and maximum readings stored in the secondary and primary sequence sections. As shown in Figure 34, a card

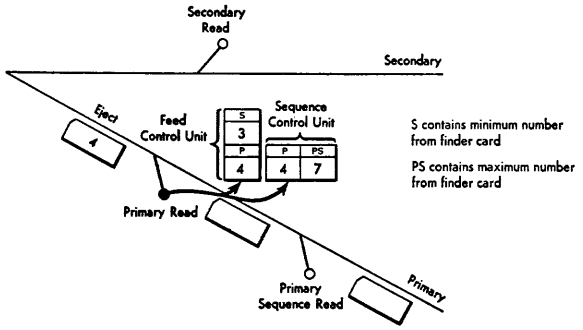


FIGURE 34. SELECTING CARDS BETWEEN TWO NAMES OR NUMBERS

will be within the minimum and the maximum limits whenever there is a low secondary condition in the feed control unit and a high primary sequence condition in the sequence control unit.

Wiring (Figure 35)

1. Columns 45-55 are punched with the minimum limit in the finder cards and the field to be searched in the file cards. They are wired to primary entry which restores on every card, and to secondary entry which restores only on the finder card.

2. The maximum limit is wired from 56-66 of primary read to primary sequence entry, which is restored only on finder cards.

3. If the name or number in the detail card is higher than the minimum, an impulse will be

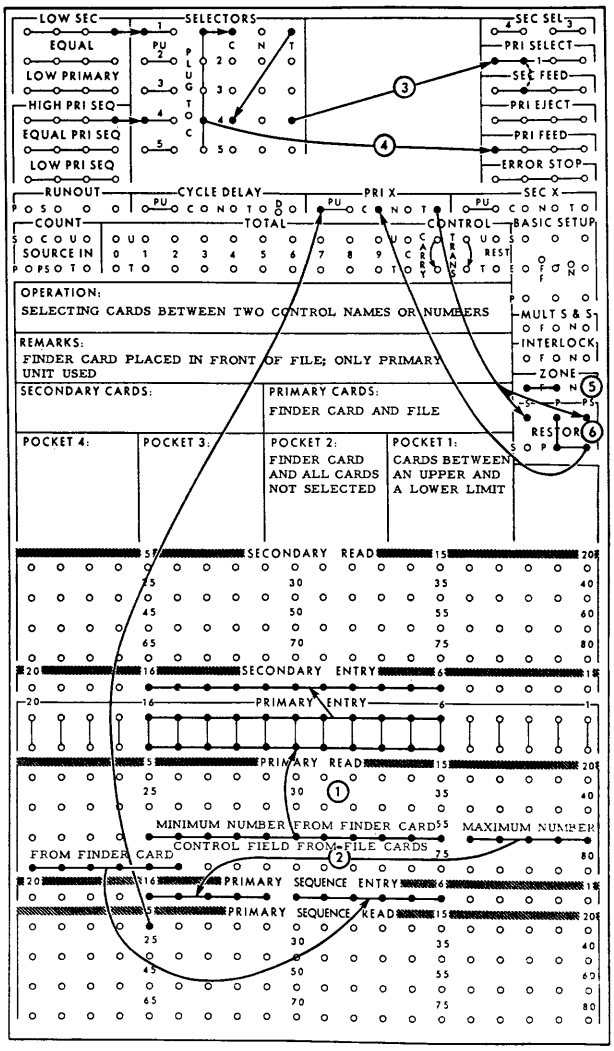


FIGURE 35

available out of low secondary. Selector 1 is picked up from this impulse.

If the name or number on the detail card is lower than the maximum, an impulse will be available out of high primary sequence. Selector 4 is picked up from this impulse. Thus, for all conditions between the two limits, selectors 1 and 4 will be transferred, establishing a path for the plug to C. A plug to C, wired through the transferred sides of these two selectors to primary select, will select all cards falling between an upper and a lower limit.

By jackplugging primary select with secondary feed as shown by the dotted wire, and placing

index cards in the secondary hopper, an index card will be filed in place of each selected card. The connection is not needed if index cards are not used.

4. Primary cards feed and eject continuously through the wiring of plug to C to primary feed.

5. The zone switch is wired OFF if the minimum and maximum fields are punched with numerical information only.

6. An X in column 5 of the finder card is wired from primary sequence read to primary X pickup. P restore exit is wired through the transferred side of the selector to S and PS restore entry. The secondary and primary sequence control sections will restore only when a finder card is read. The primary section restores normally.

SELECTING CARDS BY TWO NAMES OR NUMBERS

Two specific control names or numbers may be pulled from a file in one run of the cards through the machine. In selecting two names or numbers, three pockets are needed; two for the selected cards and one for all other cards. The secondary feed must therefore be used, making available pockets 2, 3, and 4.

Since the secondary unit contains only one set of brushes, an X finder card cannot be used, because the control information would be read before the X punch. An NX finder card must be preceded by a blank X card.

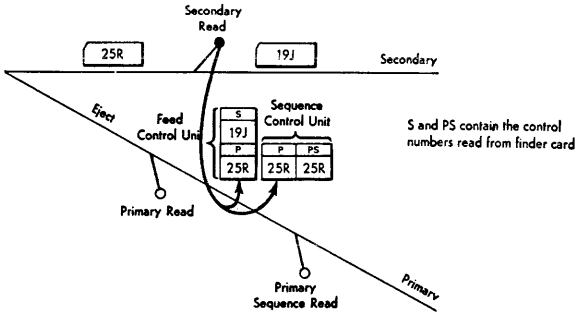


FIGURE 36. SELECTING CARDS BY TWO NAMES OR NUMBERS

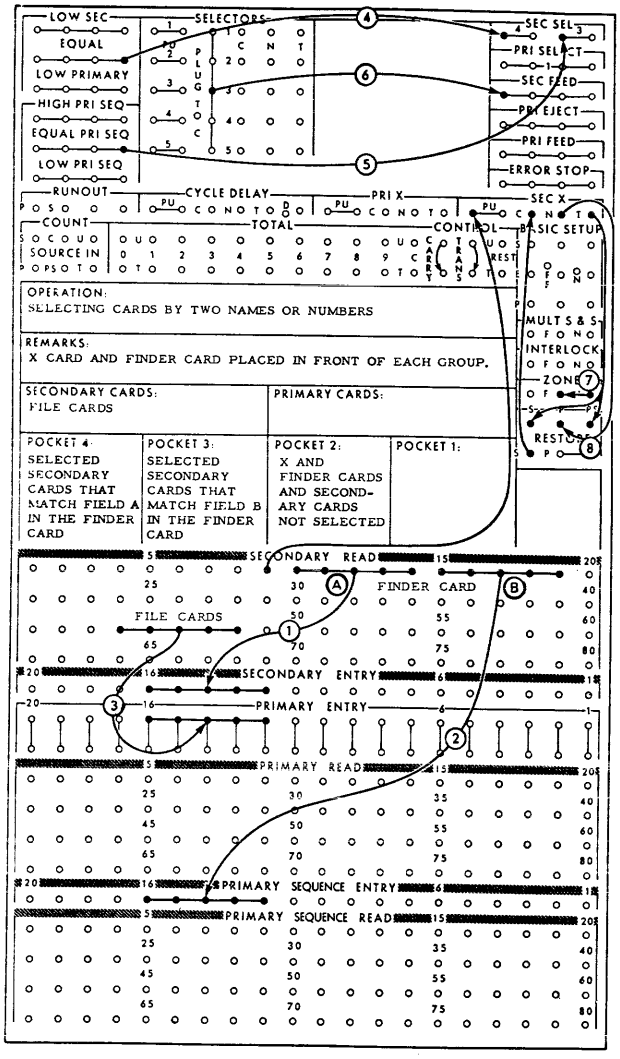


FIGURE 37

As shown in Figure 36, one number is entered into the secondary section of the feed control unit and one into the primary sequence section of the sequence control unit, from the finder card. These sections are not cleared until a new finder card is read. The primary sections read the control information from the file cards and restore every cycle. A file card is thus compared with both numbers stored from the finder card. An equal condition in the feed control unit will identify one of the control numbers, and an equal primary sequence condition in the sequence control unit will identify the other control number.

Wiring (Figure 37)

1. Field A in the finder card represents one of the control numbers and is wired from secondary read to secondary entry.

2. Field B in the finder card represents the other number and is wired from secondary read to primary sequence entry.

3. The control field in the file cards is wired to primary entry.

4. When the control field in the file cards equals field A, an equal condition occurs in the feed control unit and the file card is selected into pocket 4 by wiring equal to secondary select 4.

5. When the control field in the file cards equals field B, an equal primary sequence condition occurs in the sequence control unit and the file card is selected into pocket 3 by wiring equal primary sequence to secondary select 3. All other cards stack in pocket 2.

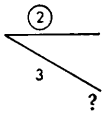
6. A plug to C wired to secondary feed causes secondary cards to feed and eject continuously.

7. The zone switch is wired ON, since the number to be selected contains alphabetic information.

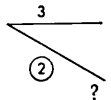
8. As the secondary feed alone is operating, the S restore exit hub must be used to restore all sections of the control units. The secondary and primary sequence control sections are restored only on a finder card by wiring S restore exit through the transferred side of the secondary X selector to S and PS restore entry hubs. The secondary X selector is picked up from an X in column 9 of the blank card, wired from secondary read. The primary section is restored on every secondary feed cycle by wiring out of the normal side of the secondary selector to P restore entry.

MERGING WITHOUT SELECTION

MERGING is the operation by which two files of cards already in order are filed together in ascending sequence. One file is placed in the secondary feed and the other in the primary feed. The secondary cards will file behind the primary cards. The operation requires the use of both the feed control and the sequence control units so that three cards may be compared simultaneously. When a primary card is compared with a secondary card and also with the following primary sequence card, one of the four following conditions is recognized:

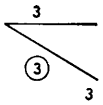


1. *Low Secondary.* The secondary card is lower than the primary card and secondary feed should be impulsed.

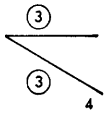


2. *Low Primary.* The primary card is lower than the secondary card and the primary feed should be impulsed.

For low secondary or low primary conditions, the primary sequence reading may be disregarded.



3. *Equal and Equal Primary Sequence.* The primary card is equal to the secondary card and to the primary sequence card. The primary feed only should be impulsed, since secondaries normally file behind primaries in a merging operation.

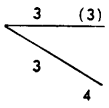


4. *Equal and High or Low Primary Sequence.* The primary card is equal to the secondary card and is different from the primary sequence card. Both the primary and secondary feeds should be impulsed. Thus, the first card of a group in the secondary file and the last card of the same group in the primary file are fed simultaneously.

Merging with Selection

Cards may be selected from a file during a merging operation. Primary cards that do not match secondary cards may be selected into pocket 1 by wiring low primary to primary select. Secondary cards that do not match primary cards may be selected by wiring low secondary to secondary select 3 or 4. The matched or equal cards would merge normally in pocket 2. The reverse of this operation would be to select matched primaries and secondaries and merge unmatched cards. This would be accomplished by wiring equal to primary select and also to secondary select 3 or 4.

When the secondary file has multiple card groups and low or equal secondaries are to be selected, condition 4 must be reconsidered:



4. *Equal and High or Low Primary Sequence.* Ordinarily, under this condition, secondary feed and primary feed would be impulsed simultaneously. If this were allowed to happen when multiple secondaries are selected, the next secondary (3) would be compared with the primary 4 on the following cycle and subsequent equal secondaries would be recognized as low secondaries. Thus, not only would low secondaries be selected but also all equal secondaries after the first. If the operation were to select equal secondaries, only the first equal secondary would be selected and the multiple equal secondaries would merge.

All that is needed to correct this condition is to eliminate primary feed under condition 4. However, if primary feed is eliminated primary eject would also be eliminated. The problem, therefore, under condition 4 is to substitute primary eject for primary feed. The last primary of a group would eject but the reading would be retained in the primary section of the feed control unit until a primary feed restored it. Thus, multiple secondaries would be compared with the last card of a primary group.

These four conditions may be recognized for merging with or without selection by use of the

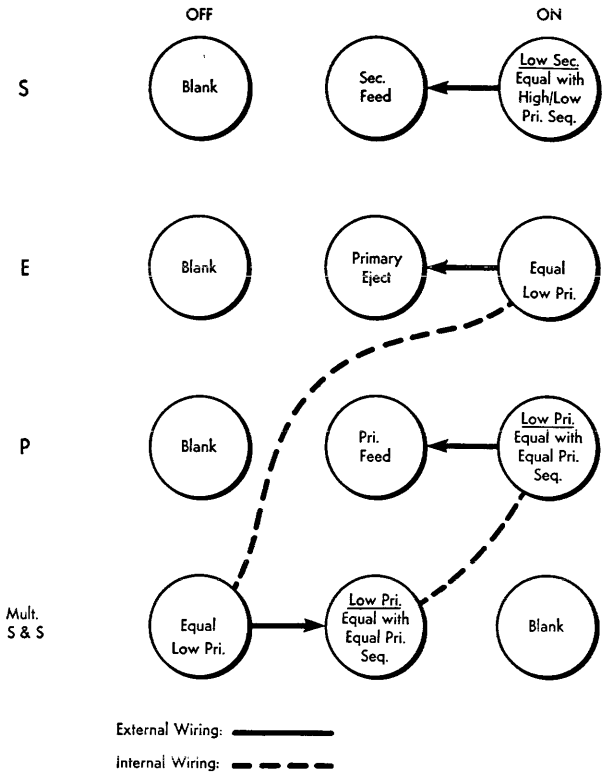


FIGURE 38. BASIC SETUP SWITCHES

basic setup switches, as shown in the schematic diagram (Figure 38). This eliminates the need for functional wiring.

S. When this switch is ON, it causes a secondary feed on a low secondary, thus satisfying condition 1. It also causes a secondary feed on an equal with a high or low primary sequence, thus satisfying the secondary feed part of condition 4.

E. Primary eject is automatic when primary feed is impulsed. This switch needs to be ON only for merging with selection of multiple secondaries, to provide a primary eject without a primary feed.

P. When this switch is ON, it causes a primary feed and eject on a low primary, thus satisfying condition 2. It also causes a primary feed and eject on equal with equal primary sequence, thus satisfying condition 3.

MS&S (Multiple secondary and selection). This switch functions only when wired to the OFF position and works in conjunction with the P

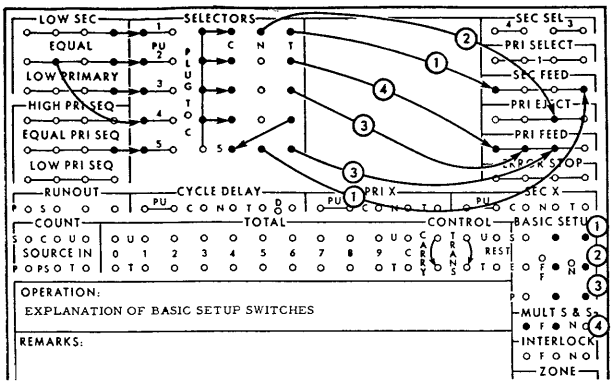


FIGURE 39. BASIC SETUP—EXTERNAL WIRING

switch. When this switch is wired OFF and the P switch is wired ON (merging without secondary selection) it causes a primary feed and eject on equal, thus satisfying the primary feed part of condition 4. When it is wired ON or disregarded (merging with multiple secondary selection), the primary feed under condition 4 is eliminated, and the primary eject is taken care of by the E switch when wired ON. Thus, one cycle is saved whenever the MS&S is wired OFF, but it cannot be wired OFF for merging with selection of multiple secondaries. The function of the basic setup switches can be better understood by comparing them with the wiring that is necessary if they are not used, as shown in Figure 39.

Primary Eject. When the primary eject hubs are impulsed, the card standing at the eject station will eject. A primary eject does not cause a primary feed.

External Basic Setup Wiring

1. The two wires to secondary feed are effective for low secondary and for equal with high or low primary sequence. The same function is performed when switch S is wired ON.
2. The wire to primary eject is effective for equal or low primary conditions. The same function is performed when switch E is wired ON.
3. The two wires to primary feed are effective for low primary and for equal with equal primary sequence. The same function is performed when switch P is wired ON.
4. The wire to primary feed is effective for equal conditions. The same function is performed when the MS&S switch is wired OFF. When this switch is wired ON or disregarded, a primary feed is eliminated for equal. This is necessary when merging with multiple secondary selection.

MATCHING WITH MULTIPLE SECONDARY SELECTION

MATCHING is the operation by which primary cards are compared with secondary cards to determine if there are cards in either group that do not match on a designated control field. Four pockets are required for a matching operation, two for the unmatched cards (normally pockets 1 and 4), and two for the matched cards (normally pockets 2 and 3).

Interlock Switch. Whenever either feed runs out of cards, automatic 9's read into the corresponding feed control unit. For example:

S (9999) Automatic 9's
P 9995 Control field in primary card when secondary ran out of cards

From this point on, all conditions in the feed control unit will be recognized as low primary, thus causing primary feed and eject when the run-out key is depressed. However, if the last primary group to go through the machine has control fields punched with 9's, the reading for that group will be recognized as equal. If low primaries (unmatched) are to be selected, unmatched primary cards punched 9's would not be selected. The same would be true if the primary feed ran out of cards and low secondaries are selected. An equal condition occurring on the run-out is changed to both low secondary and low primary by the interlock switch. This switch must be ON whenever the machine is wired to select from either or both feeds. It may be OFF or disregarded at all other times.

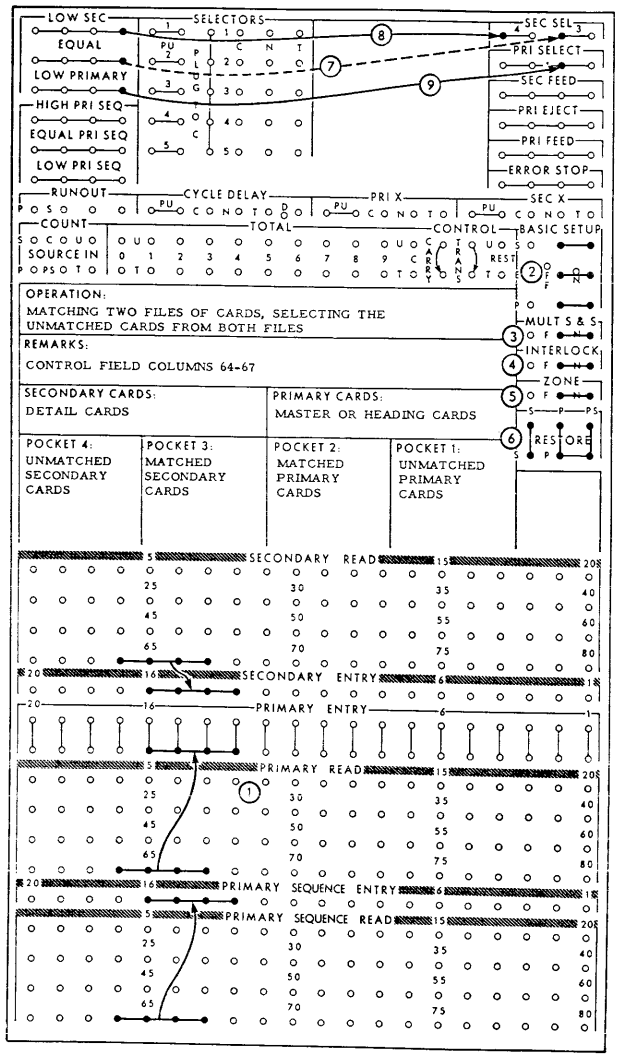


FIGURE 40

Wiring (Figure 40)

1. Secondary read is wired to secondary entry and primary read to primary entry. Whenever a normal merging or matching operation is being done and the basic setup switches are used, primary sequence read must be wired to primary sequence entry. This is because the function of the S and P switches is based not only on a comparison in the feed control unit but also on a comparison in the primary sequence control unit.

2. Basic setup switches S, E, and P are wired ON for merging or matching operations.

3. Mult S & S is wired ON or disregarded when merging or matching with multiple secondary selection. This switch cannot be wired OFF in this example since it would cause all matched multiple secondary cards after the first card to be selected.

4. The interlock switch is wired ON for selecting operations.

5. The zone switch is wired ON when the control field contains alphabetic information or special characters.

6. The restore hubs are wired normally.

7. All matched secondary cards stack in pocket 3 by wiring equal to secondary select 3. If this wire is omitted, the secondaries will merge in pocket 2 with the matched primaries.

8. Unmatched secondary cards are selected into pocket 4 by wiring low secondary to secondary select 4. If this wire is omitted, unmatched secondaries will merge in pocket 2.

9. Unmatched primary cards are selected into pocket 1 by wiring low primary to primary select. If this wire is omitted unmatched primaries will merge in pocket 2.

MATCHING CARD FOR CARD

IT IS sometimes necessary to match two files of cards, card for card. Groups in either file may be single card groups or multiple card groups. The purpose of this operation is to insure that single card groups in one file are balanced by single card groups in the other, or that multiple card groups in one file are balanced by an equal number of cards of the same group in the other file. For example, if one file has three cards of a given control number, the other file must also have three. If not, all excess cards in either file are to be selected. In addition, all unmatched cards, i. e., control numbers in one file for which there are none in the other, must also be selected.

This operation is analyzed and shown in Figure 41.

1 2 3 3 4 *4* 5 *6* 8 SECONDARY FILE

1 2 *2* 3 3 4 5 *7* 8 PRIMARY FILE

POCKET 4	POCKET 3	POCKET 2	POCKET 1
	8	8	
	5	5	
	4	4	
	3	3	
	3	3	
6	2	2	*7*
4	1	1	*2*

FIGURE 41. MATCHING CARD FOR CARD.

The italic *4* is an excess secondary; *6* is an unmatched secondary. The italic *2* is an excess primary; *7* is an unmatched primary. With excess cards selected, the cards fall in the pockets as shown.

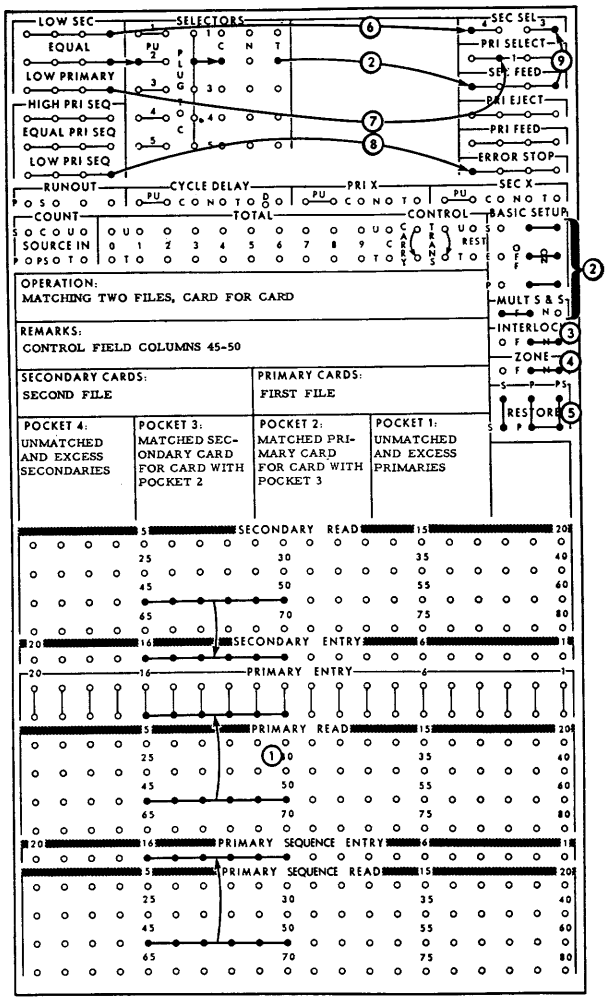


FIGURE 42

Wiring (Figure 42)

1. The control fields are wired normally.

2. Primary and secondary feeds are controlled by wiring the basic setup switches as shown. Basic setup switch 1 normally causes a secondary feed on equal with high or low primary sequence. In this problem, secondary feed must take place on an equal condition; equal is wired through selector 2 to secondary feed. The MS&S switch is wired OFF so that the primary will feed on an equal regardless of the condition in the sequence control unit, thus causing excess secondaries to be selected as low secondaries.

3. The interlock switch is ON for all selection operations.

4. The zone switch is ON when a control field contains alphabetic information or special characters.

5. The restore hubs are wired normally.

6. Unmatched and excess secondary cards are selected as low secondaries.

7. Unmatched and excess primaries are selected as low primaries.

8. An error in sequence in the primary feed causes an error stop.

9. All secondaries that match card for card with the primaries are selected into pocket 3.

MERGING PRIMARIES BEHIND SECONDARIES WITH SELECTION OF UNMATCHED CARDS

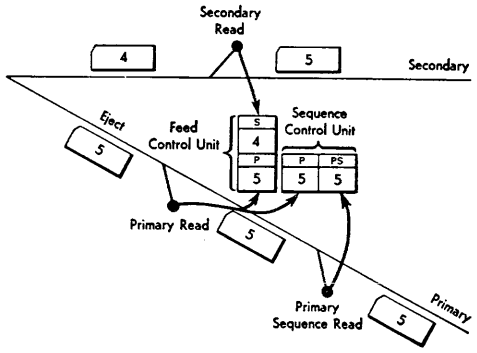
PRIMARY CARDS are normally sequence checked at the same time that they are merged ahead of secondary cards. It is possible to reverse the operation and cause primary cards to merge behind secondaries so that the file normally placed in the secondary feed may be placed in the primary.

This operation is particularly valuable when the main file is known to be in order, yet must precede the cards to be interfiled, or when the group to be interfiled is considerably larger than the main file. Since this operation is in reverse order, the basic setup switches cannot be used. Feeding and ejection is controlled by external wiring.

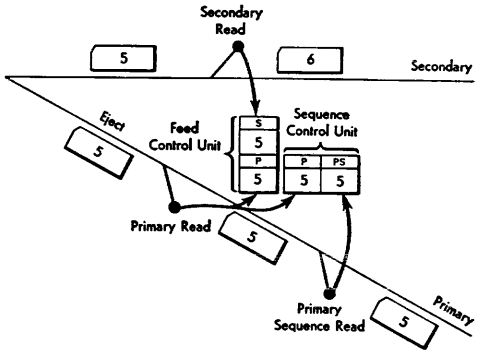
A better understanding of the operation may be obtained by following the cards shown in Figure 43 through three schematic diagrams explaining the conditions that arise in both the feed and sequence control unit as each card feeds.

Wiring (Figure 44)

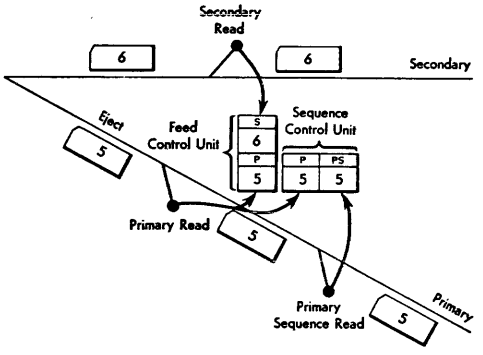
1. The control fields are wired normally.
2. The basic setup switches are wired OFF. Control of feeding and ejecting must be wired from the control exit hubs.
3. Selector 3 is picked up on low primary. A plug to C is wired through the transferred side of this selector to primary feed, causing a primary feed and eject on all low primary cards.
4. A plug to C is wired through the normal side of selector 3 to secondary feed, causing a secondary feed on equal and low secondary. It is this wiring that causes the cards in the secondary to feed and stack ahead of equal primary cards.
5. Low secondary is wired to secondary select to cause all unmatched secondary cards to stack in pocket 4.
6. Low primary sequence is wired to error stop.
7. Primary cards that do not match secondary cards must be selected. A low primary, in this example, does not always mean that the primary card is unmatched, for it could be part of a multiple group, the first card of which matched with the last secondary card of the same group. Since the secondary cards feed out on an equal, ahead of primaries, all equal primary cards of the same group will be recognized as low primaries. To pre-



A. A low secondary condition must impulse secondary feed, causing secondary card 4 to stack in pocket 2 ahead of primary card 5. If unmatched secondaries are selected card 4 will stack in pockets 3 or 4.



B. An equal condition must impulse secondary feed, causing secondary card 5 to stack ahead of primary card 5. Equal must be remembered to keep primary card 5 from being selected into pocket 1 on the following cycle.



C. A low primary condition must impulse primary feed, causing card 5 to stack in pocket 2 ahead of card 6. As may be seen from the examples above, a low primary condition preceded by an equal should not impulse primary select, since this would cause selection of all matched primaries. The low primary condition, therefore, must be controlled through the cycle delay unit.

FIGURE 43. ANALYSIS, PRIMARIES FILED BEHIND SECONDARIES

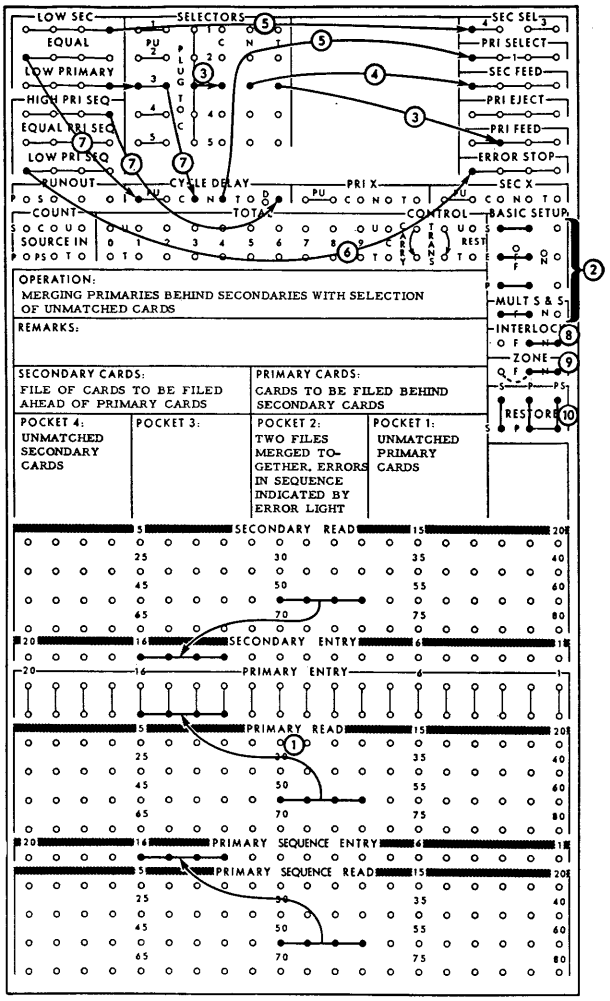


FIGURE 44

vent these cards from being selected, low primary is wired to primary select through the normal side of the cycle delay, picked up on equal. The cycle delay unit is dropped out on high primary sequence, thus preventing low primary from reaching primary select for all matched multiple primary cards. A low primary not preceded by an equal reaches primary select through the normal side of cycle delay and causes all unmatched primary cards to stack in pocket 1.

8. The interlock switch is wired ON for merging with selection.

9. The zone switch is wired ON when the control field contains alphabetic information or special characters.

10. The restore hubs are wired normally.

MERGING BALANCE CARDS WITH DETAIL CARDS, SELECTING SINGLE UNMATCHED BALANCE CARDS

WHEN detail cards are merged with balance forward cards, inactive balance forward cards may be selected at the same time. An inactive balance forward card is a single unmatched primary card. At the end of this operation the merged file can be resummarized and the new summary cards merged with the selected single balance forward cards in a subsequent operation. As shown by the schematic diagram (Figure 45), a single unmatched

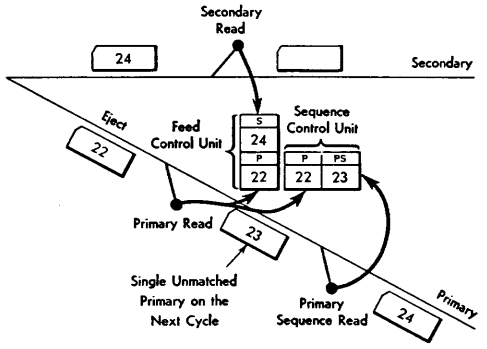


FIGURE 45. MERGING BALANCE CARDS WITH DETAIL CARDS, SELECTING SINGLE UNMATCHED BALANCE CARDS

summary (primary) card is identified by a low primary and a high or low primary sequence condition, providing the previous sequence control reading was not equal. This latter condition is established by the use of the cycle delay unit.

Wiring (Figure 46)

1. The control fields are wired normally. Balance forward cards are placed in the primary and detail cards in the secondary.

2. The S, E, P basic setup switches are wired ON. Since there is no selection of secondaries the MS&S switch is wired OFF.

3. Selector 3 is picked up by a low primary. The selector will be transferred for all unmatched balance forward cards.

4. Selector 5 is picked up by an equal primary sequence. This selector will be transferred for all multiple balance forward cards, thus preventing all but the last multiple card from being selected.

5. Equal primary sequence (multiple balance forward card), picks up the cycle delay unit, thus

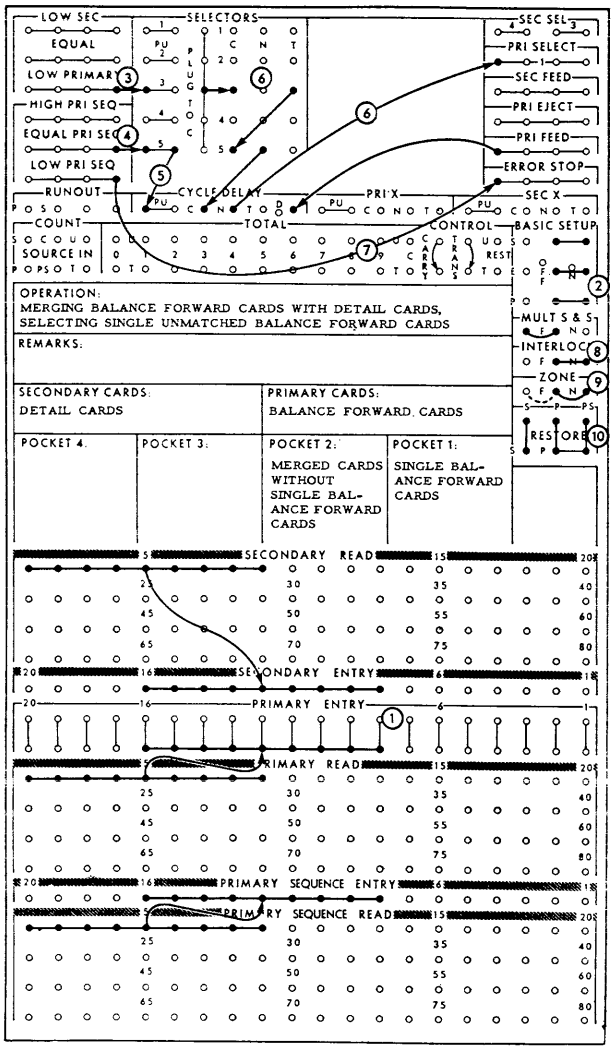


FIGURE 46

preventing selection of the last multiple primary card of each group.

6. If selector 3 is transferred and selector 5 is not transferred and the cycle delay was not picked up on the previous cycle (single balance forward card), a plug to C will reach primary select. The cycle delay unit is dropped out on a primary feed.

7. Error stop is wired from low primary sequence.

8. Interlock is wired ON for merging and selecting.

9. The zone switch is wired ON when the control field is punched with alphabetic information or special characters.

10. The restore hubs are wired normally.

ALTERNATE SELECTION — TWO FEEDS

A FILE of cards may be separated into two groups by alternate selection; that is, the first, third, and fifth cards are separated from the second, fourth, and sixth cards, etc. Two feeds may be used, so that half the file may be placed in the primary and half in the secondary. For purposes of explanation, the cycles will be designated as odd and even, the first cycle being odd, the second even, etc.

Wiring (Figure 47)

1. A plug to C is wired to primary and secondary feed to cause constant feeding and ejection of cards. It is also wired to secondary select 3 to cause every other secondary card to stack in pocket 3.

2. Odd Cycle: A plug to C passes through the normal side of the cycle delay unit to its own pickup. On this cycle the primary card falls into pocket 2 and the secondary card into pocket 3.

3. Even Cycle: The cycle delay unit transfers, causing the plug to C to reach primary select and secondary select 4. On this cycle the primary card falls into pocket 1 and the secondary card into pocket 4. Whenever pockets 4 and 3 are impulsed together, pocket 4 takes precedence.

4. The cycle delay is transferred for only one cycle at a time by wiring a plug to C to DO.

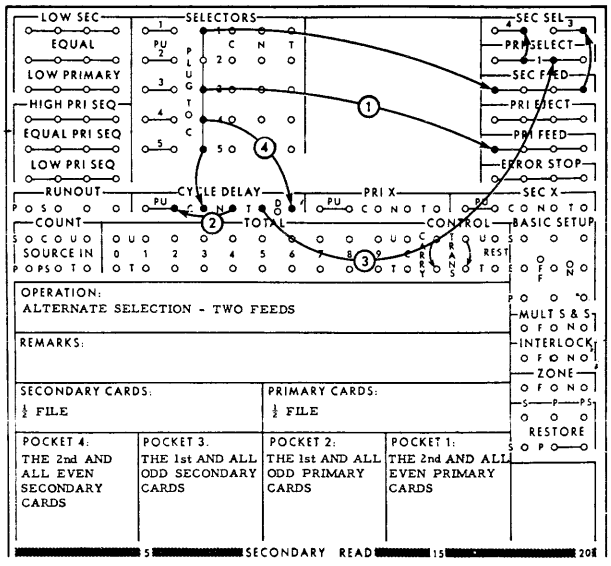


FIGURE 47

CONTROL PANEL SUMMARY

(Figure 48)

1. CONTROL EXIT HUBS — (Feed Control Unit):
   LOW SEC. Exits for impulses when the reading in the secondary section is lower than that in the primary section.
   EQUAL. Exits for impulses when the reading in the secondary section is equal to that in the primary section.
   LOW PRI. Exits for impulses when the reading in the primary section is lower than that in the secondary section.

2. CONTROL EXIT HUBS — (Sequence Control Unit):
   HIGH PRI. SEQ. Exits for impulses when the reading in the primary sequence section is higher than that in the primary section.
   EQUAL PRI. SEQ. Exits for impulses when the reading in the primary sequence section is equal to that in the primary section.
   LOW PRI. SEQ. Exits for impulses when the reading in the primary sequence section is lower than that in the primary section.

3. SELECTORS:
   PU. Entry hubs which accept control exit impulses to transfer the selectors on the same card cycle.
   C, N, AND T. When a selector is not transferred, C (common) and N (normal) are internally connected; when a selector is transferred, C and T (transferred) are internally connected.

4. PLUG TO C. Exits for an impulse every card cycle.

FUNCTIONAL ENTRY HUBS

5. SEC. SELECT. When 4 is impulsed, a secondary card is stacked in pocket 4. When 3 is impulsed, a secondary card is stacked in pocket 3.

6. PRI. SELECT. When 1 is impulsed, a primary card is stacked in pocket 1.

7. SEC. FEED. When secondary feed is impulsed, a secondary card is fed and the preceding card is ejected. These hubs are exits when secondary feed is caused by basic set up.

8. PRI. EJECT. When primary eject is impulsed, a primary card is ejected from the eject station. These hubs are exits when primary eject is caused by basic setup.

9. PRI. FEED. When primary feed is impulsed, a primary card is fed and the primary card standing at the eject station is ejected. These hubs are exits when primary feed is caused by basic setup.

10. ERROR STOP. When error stop is impulsed, the machine stops and the error light turns on.

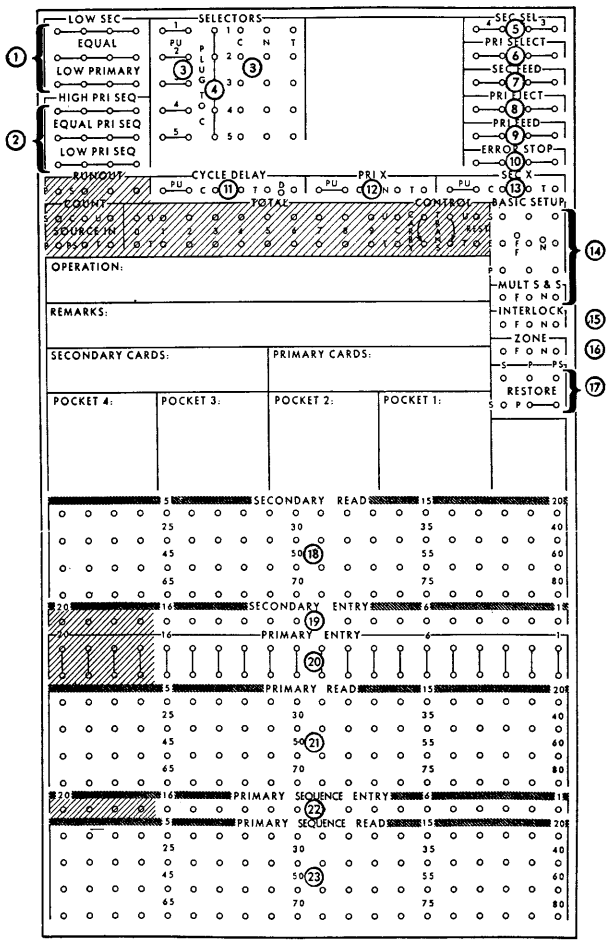


FIGURE 48. CONTROL PANEL SUMMARY

11. CYCLE DELAY SELECTOR:

    PU. Entry hubs which accept an impulse to transfer the selector on the *next* cycle. The selector remains transferred until dropped out.

    C, N, AND T. When the selector is not transferred, C (common) and N (normal) are internally connected; when the selector is transferred, C and T (transferred) are internally connected.

    DO. Entry hub for an impulse to drop out the cycle delay selector. The selector returns to normal on the cycle following the impulse to DO.

12. PRI. X SELECTOR:

    PU. Entry hubs which accept an X impulse from either primary read or primary sequence read to transfer the primary X selector on the *same* card cycle. The selector remains transferred for the duration of the cycle.

    C, N AND T. C and N are connected when the selector is not transferred; C and T are connected when the selector is transferred.

13. SEC X SELECTOR:

    PU. Entry hubs which accept an X impulse from secondary read to transfer the secondary X selector on the *same* card cycle. The selector remains transferred for the duration of the cycle.

    C, N, AND T. C and N are connected when the selector is not transferred; C and T are connected when the selector is transferred.

14. BASIC SETUP SWITCHES: See page 30 for full explanation of these switches.

15. INTERLOCK SWITCH: See page 31 for full explanation of this switch.

16. ZONE SWITCH: The zone switch is wired ON when the control field is punched with alphabetic information or special characters. It is wired OFF when the control field is punched with only numerical information.

17. RESTORE—ENTRY AND EXIT:

    S. Entry for restoration of the secondary section of the feed control unit, allowing a new read in on the following cycle.

    P. Entry for restoration of the primary section of the feed control and sequence control units, allowing a new read in on the following cycle.

    PS. Entry for restoration of the primary sequence section of the sequence control unit, allowing new read in on the following cycle.

    S. Exit for impulse each time a secondary card feeds; used normally to restore the secondary section.

    P. Exits for impulses each time a primary card feeds; used normally to restore the primary and primary sequence sections.

18. SECONDARY READ. Exits for impulses originating from the punched holes in a card passing the secondary brushes; normally wired to secondary entry.

19. SECONDARY ENTRY. Entry hubs to the secondary section of the feed control unit from any set of brushes; normally wired from secondary read. Fields wired here will compare with fields wired to primary entry.

20. PRIMARY ENTRY. Entry hubs to the primary section of the feed control and the sequence control units. Fields wired here will compare with fields wired to secondary entry and to primary sequence entry.

21. PRIMARY READ. Exits for impulses originating from the punched holes in a card passing the primary brushes; normally wired to primary entry.

22. PRIMARY SEQUENCE ENTRY. Entry hubs to the primary sequence section of the sequence control unit from any set of brushes; normally wired from primary sequence read. Fields wired here will compare with fields wired to primary entry.

23. PRIMARY SEQUENCE READ. Exits for impulses originating from the punched holes in a card passing the primary sequence brushes; normally wired to primary sequence entry.

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