

**The Polarity Switch**

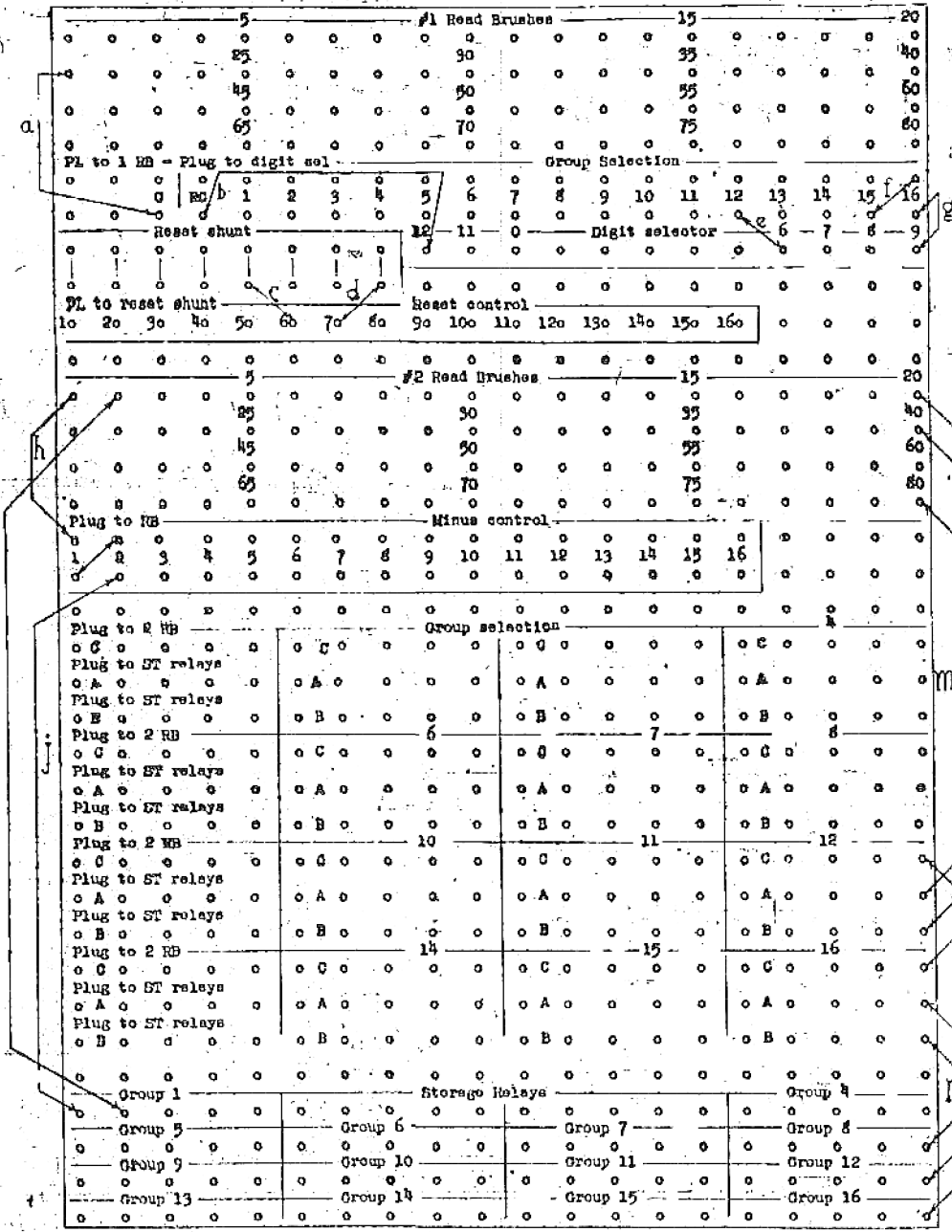
Located on the front of the IBM Reader is a double pole double throw switch which changes the polarity on the holding coils of the relays which control the group selection and the reset control. By changing this switch one can either wire these circuits on the plug board in the manner indicated there or in the reverse manner. This gives the following types of control:

- (A) With the polarity switch in normal position. The common terminal "C" is then wired to some hub of the #1 reading brushes and the group selection hubs are wired to hubs of the digit selector. Thus, all controlling is done by various punches in one column. The variety of things controlled is given by plugging to different digits (12, 11, 0,.....,9) of the digit selector.
- (B) With the polarity switch in abnormal position. In this case "C" is wired to some digit on the digit selector and the group selection hubs are wired to various columns. Here, all the control is obtained by a certain punch (for example, a 12 punch) with different things being controlled by plugging to different columns.

**Plugging Illustrations**

- (a) This shows the common hub "C" wired to column 21. The two hubs above and below C are connected so the wire could have gone to either of them. Note that besides the wire (a) one could connect this upper hub for C to some other column, say 2, getting an "or" control. That is, if a certain number (12, 11, 0,.....,9) is punched in column 21 or column 2 then whatever hub under group selection was plugged to that number of the digit selector causes the corresponding group selection relays to operate.
- (b) This wire causes the reset control to operate whenever there is a 12 punch in column 21; that is, a card with such a punch is called a master card.
- (c and d) These leads cause information in storage relay groups 6 and 7 to be held as long as cards come through without a 12 punch in column 21. Whenever a card with a 12 punch in column 21 (a master card) comes along the information in groups 6 and 7 will be dropped and new information will be put in from this master card. Immediately, the reader will go on to read the next card.
- (e) If a card has a 6 punched in column 21 this lead causes group selection relays for group 12 to be activated giving a circuit from C through B instead of A.
- (f and g) If a 9 is punched in column 21 groups 15 and 16 group selection relays will be activated. Diagonal leads such as (f) enable one to operate as many groups as desired from just one punch.
- (h, j, and k) This shows the plugging to handle ten digit negative numbers. The PM punch is in column 1 and, by the diagonal connection in the minus control, the PM relays for groups 1 and 2 are operated by this one punch. The first digit reaches the storage relays through (j). (k) illustrates the plugging for the rest of the digits.
- (l, o, and p) If there is a 6 punch in column 21 the digit from column 20 will go to the fifth digit of group 6. Otherwise, the digit from column 40 will go there.
- (m, q, and r) If there is a 9 punch in column 21 the digit in column 50 will be the fifth digit of group 12. Otherwise, it will be the fifth digit of group 16.

**NOTE:** If during the course of a computation the IBM reader should run out of cards the starting relay (see PX-11-307) will be closed so the moment new cards are dropped in, the reader will go through a cycle. To make sure that the reader does not fail to feed this first card the stop button should be held down until the cards are firmly in place.



**#1 Read Brushes**  
The #1 Read Brushes read the card before the #2 Read Brushes do. The #1 brushes are used for control purposes and the #2 brushes for reading the numbers and their PM's.

**Group Selection**  
The hubs numbered from one to sixteen control the group selection relays whose terminals are located on the lower half of the plug board. These are double hubs, that is, the hub above and below the number are common. The single hub located to the left of these and labeled RG controls the reset control. The features of group selection and reset control are described below. For details see the IBM Reader wiring diagram PX-11-119.

**Reset Control and Reset Shunt**  
Certain groups of relays (depending upon plug board arrangements) may be caused to hold their information while a sequence of "detail" cards are read. This is accomplished by connecting the corresponding terminals under Reset Control to any of the Reset Shunt terminals. To change the information which is being held in these relays a "master" card is inserted in the sequence of cards. A particular punch on this master card can cause the held information to drop out and as the master card passes the #2 Reading Brushes new information can be stored in these relays until the next master card comes along. Whenever such a master card is read the Reader will immediately read the next detail card before it gives out a computing signal to the ENIAC.  
**WARNING:** The detail cards either must not contain information in the fields corresponding to the relays that are holding master card information or else group selection must be used to prevent such information from disturbing the held relays.

**Group Selection Relays**  
There are sixteen five pole double throw relay switches, called the group selection relays. The common terminals are labeled "C" and normally the circuit is through the terminals labeled "A". When activated (picked up) the circuit is through "B". These circuits are isolated (internally) from the other circuits of the reader so there are many other possible plugging arrangements other than those indicated on the plug board.

**Minus Control**  
By means of cams in the Reader these terminals connect to the PM relays of the Constant Transmitter only when the IBM card is in positions 11 and 12, that is, when the PM punches would be under the #2 Read Brushes. The two hubs, above and below the group number, are common. Usually, the punch for minus indication will occur in the same column that a digit punch appears. Thus, the same reading brush will indicate the PM of the number and later as the positions zero to nine pass under the brush indicate the digit punched. Other cams (called coding cams) energize the numerical circuits only during the zero to nine part of the cycle enabling the digit punch in that column to cause the proper relays to be set up in the Constant Transmitter. The coding cams consist of two groups, one group is used for positive numbers and the other group causes complements (with respect to 10<sup>-1</sup>) to be set up by storage relays. The PM relays determine which set of coding cams are used.

**Storage Relays**  
The storage relays are located in the Constant Transmitter. There are essentially four relays associated with each digit. That is, four relays representing respectively 1, 2, 2', and 4 can, in various combinations, represent any digit from zero to nine. These four relays are indirectly (through vacuum tube circuits) associated with the 1, 2, 2', and 4 pulses sent out by the cycling unit. That is, each relay opens a gate tube which through an inverter opens a second gate tube. This second gate tube passes the 1, 2, 2', or 4 pulses.  
For positive numbers the hubs of the #2 reading brushes can be wired directly to the hubs of the storage relays in any order whatsoever. Negative numbers must be handled in groups which are multiples of five. To indicate the negative number there will be an 11 or 12 punch in some column. The wire from the hub representing this column must go to the minus control hubs of all the storage relay groups used for this negative number. There must also be a connection to the hub corresponding to this digit in the storage relays. See the examples shown to the left.

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**IBM READER PLUG BOARD**

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PX-11-305