BNL 876 (T-352)

320
9/10/64

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BROOKHAVEN NATIONAL LABORATORY
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BNL 876 (T-352)
(Mathematics and Computers; Instruments - TID-4500, 32nd Ed.)

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BROOKHAVEN NATIONAL LABORATORY
UPTON, NEW YORK

LEGAL NOTICE

PRINTED IN USA
PRICE 75 CENTS

Available from the
Office of Technical Services
Department of Commerce
Washington 25, D.C.

August 1964 950 copies

GPO 948-273

PURPOSE

This report was written to provide a detailed description of the preselector system associated with the spark chamber reader.

Drawing Number
IH - 326

PRESELECTOR READER

DESCRIPTION OF PRESELECTOR READER

The preselector reader is a device to read and store the data contained on punched tape (diagram A); to cause the Spark Chamber Reader to search for a particular frame and when located cause it to be digitized or indicate an error condition if the particular frame cannot be found. The reader consists of three DEC bins containing logic cards and a Rheem paper tape reader.

The following is a description of how the preselector reader accomplishes the above.

Load paper:

When loading the reader with tape this switch is closed placing an inhibit (OV) on NAND 1-18H, NAND 1-14J, 1-14P; in effect turning the machine down. Upon completion of loading, the load paper switch is opened which applies a -3V level from 1-20E to the above NAND's.

The initial start of the preselector reader must be preceded by a manual reset which originates from the reset button located on the console of the DPU. The reset pulse enters the preselector reader section of the Data Process Unit through a pulse generator 3-1S. The pulse is inverted by 3-22Z and resets the Error F/F 1-17X and the Unequal F/F 1-23X. It also goes to POR 3-16N which causes the reset of the blank tape F/F P1-23M,

and the entire frame and reel storage F/FS P1-3 to 10 and the Start/Stop F/F 1-17K. The reset now leaves the Start/Stop F/F 1-17K in the stop position; the 32 "A" F/F's 1-3 through 1-10 in the "0" state; the Sense Blank Paper F/F 1-23M in the "0" position. The "1" side 1-17Z of the Error F/F now inhibits 1-16S and through inverter 1-21K allows NAND 1-18F.

The Preselector Mode switch on the console prepares the preselector reader for operation. The "ON" position produces a -3V level, supplied by 1-20F, at NAND 1-18J and NAND 3-16E. At the same time this -3V level is inverted at 1-21N and inhibits [OV] NAND 1-16N, NAND 1-16V.

A small switch located beneath the D.E.C. bins selects the type of search. If the tape number (A) is greater than the film number (A > B) place the switch in position 2. If film number is greater than the tape number [B > A] place the switch in position 1.

Now the preselector reader has been loaded with tape, the digitizer loaded with the corresponding film and the type of search has been selected.

Next the machine is reset and the preselector "ON" "OFF" switch placed in the "ON" position. The reader is now ready to be started. The process button located at the console of the DPU is depressed placing a negative pulse on the selector request line which tests 3 NAND's. The first NAND, DPU recycle,

at P 1-16 is inhibited (OV) at terminal N via the select mode switch. The second NAND, error start, P1-16S is inhibited by the Error F/F. The third NAND, P1-18 start, is pulsed at terminal E, (f, H, and J are in the allowed condition). The output of this gate (K) operates F/F P1-17 causing the "1" side to become OV. This ground condition turns on the paper tape reader causing tape to be fed.

The tape reader will seek the start code then read the punched data into the 32 bit "A" register. After which, when sensing the stop code, the tape will be stopped and a signal sent to the DPU to move film. The film frame and reel number (B register) will be read into the comparator and compared with the frame and reel number in the A register. If the comparison is unequal, B > A or A > B, depending on the selection switch, film will continue to move until the result of the comparison is equality, A = B. At this time the DPU will digitize that particular frame and upon completion will recycle the preselector.

An error condition has been incorporated into the machine which, at the operators option, can indicate either A > B or B > A as being an error and will in turn stop film, and stop digitization.

Blank Tape Sensing: PAND P1-15 inputs are connected to the channels of the reader. When any hole is sensed on the tape the blank tape F/F is operated through NAND P1-16H placing an allow condition on strobe gate NAND P1-14 K. The strobe pulse originating from the feed hole is reduced in amplitude by divider P1-19 Y-Z and operates delay P3-17 which tests the strobe gate P1-14E and the stop code gate NAND P1-18Y. The strobe pulse, after the blank tape F/F is conditioned, fires pulse amplifier P1-13 via NAND P1-14J.

Read In of Storage F/F's: The inputs to the "A" F/F's are on-line with the data channels via eight inverters P1-21 and P3-21 through eight voltage dividers P1-19. Pulse amplifier P1-13 now pulses the shift line to all 32 F/F's, causing a "1" to be stored for each corresponding punched tape hole. The second strobe pulse will now cause the data stored in bits 21 → 28 to be shifted one file to the right 13 → 20 and the data of the second transmission stored in the left hand column 21 → 28, the third shift pulse will shift all bits one place to the right and the fourth shift will fill the "A" register with the most significant bit of the reel number in tape channel 8 in bit "1" and the least significant bit of the frame number in channel 5 in bit 28. One hole of the start code channel 4, has now set a "1" in the fourth stage of P1-3. This inhibits further shifting

of the "A" storage F/F's by grounding the strobe gate NAND P1-14F. This fourth stage also puts an allow on P1-18W and on NAND P1-16J.

The fifth and last transmission contains a stop code (1-3-4) which allows NAND P1-18X via PAND P1-15, NAND P1-14 and inverter P1-21. The pulse terminal E of P3-17 pulses NAND P1-18Y and the output of P1-18 through POR P1-18T goes to the DPU commanding film to move. It also resets the Sense Blank Tape F/F P1-23N. If the fifth transmission was not the stop code as required, the next feedhole in firing P3-17 output J will pass through P1-16 and set the "1" side of the Start/Stop F/F P1-17 thus stopping tape movement.

The preselector now awaits the arrival of a "Begin of Frame" pulse from the DPU, indicating that the film frame and reel numbers have been read and are now on the "B" inputs of the comparator. The B. of F. signal is applied to NAND P3-16F through inverter P3-5 which operates delay P3-18. The E or pulse terminal now tests the comparator for A = B, A > B or B > A at gates P3-16K, P3-23F, P1-18L, and P1-11v.

If A = B the equality line P3-22R and the sign line P1-20S are both at the -3V level. This level inhibits PAND P3-23E and NAND P1-18N via inverter P3-22V, allows NAND P3-16J and with

the test pulse of 3-18E fires delay P1-24 which operates pulse amplifiers P1-12E, N, Z, which resets the reader. In the case of A = B no reset signals are sent to the DPU from the preselector reader and the film will continue to move to the normal position to be digitized.

The following table shows the conditions produced on the sign and equal lines, by the comparator.

Sign Line	Equal Line	Meaning
-3V	-3V	A = B
-3V	OV	B > A
OV	OV	A > B
OV	-3V	Impossible

By means of a selection switch (DPDT) either unequal condition, A > B or B > A can be selected to cause the error stop. This option of error stop is provided so that film to be digitized and its associated punched paper tape may be loaded in ascending or descending sequence of frame numbering. Error stop on A > B indicates that the number read on the punched tape is larger than the film number and that the frame number is in the descending order in which case a malfunction has occurred. In like manner error stop on B > A indicates that the number read on the film is greater than the number read on the punched tape and the film numbering was loaded in an ascending order.

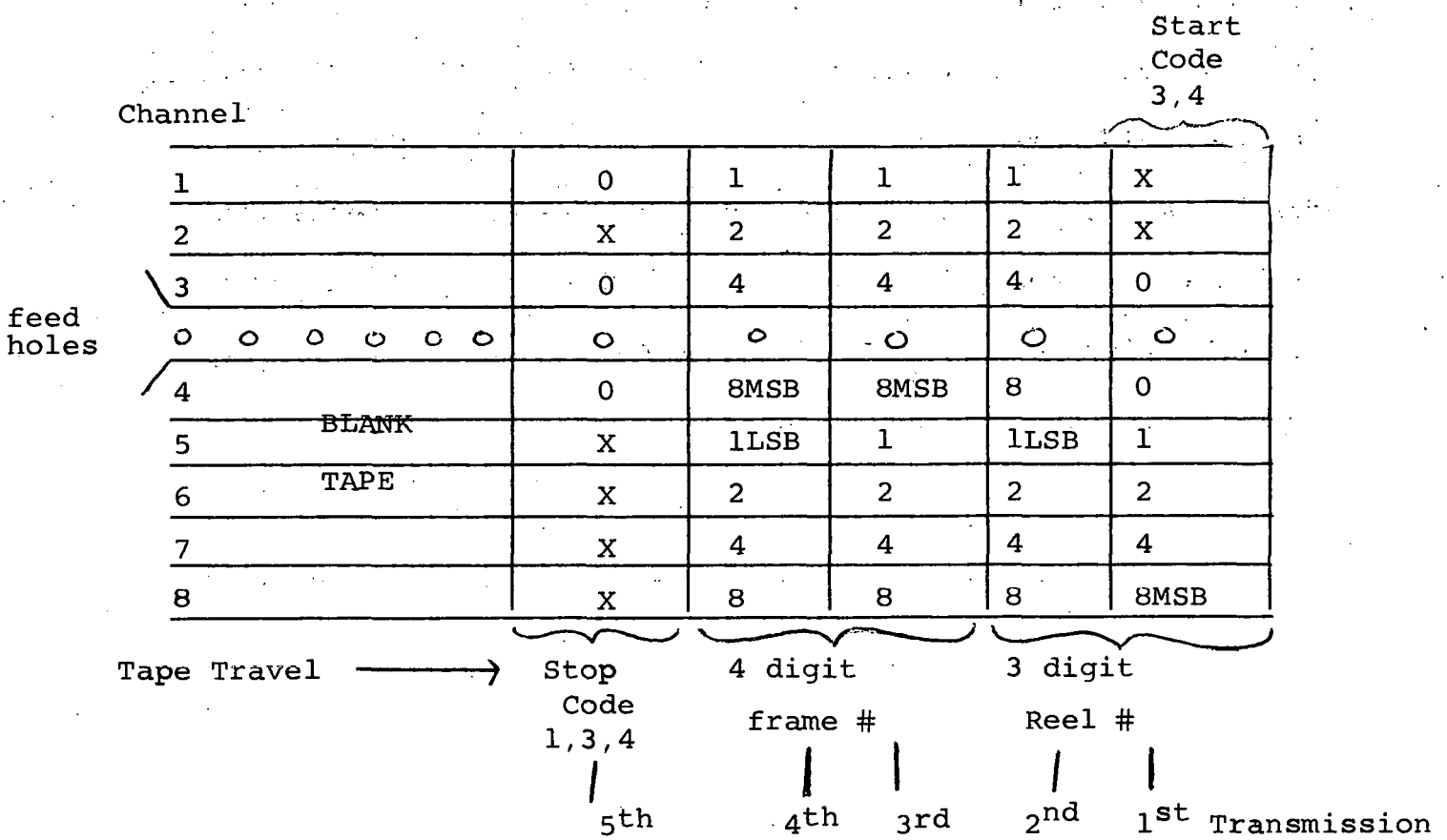
For both error and unequal conditions the equality line will remain at OV which allows PAND P3-23E and NAND P1-18N, with D.P.D.T. switch in position "2" and the sign line at -3V NAND P1-18R will pulse the error F/F which stops film and via NOR P3-23M → delay P3-24X → inverter's P3-5E and P3-5H and inhibits metering and clears encoder in the DPU. The error F/F terminal Z also places an inhibit on start gate NAND P1-18F and an allow on error start NAND P1-16S. If the process button is operated the preselector error F/F will reset allowing the start signal a second try via path P1-16R to POR P1-18S. For the condition A > B = error the DPDT switch will be placed in position "1" which breaks the path from P1-18R to P1-17W. A -3V level P1-20H is set on NAND P1-11T. The PAND P1-15W, X will sense the equality and sign line being OV and allow NAND P1-11S. The B. of F. now tests the third terminal of P1-11U to set error F/F. For all non error unequal conditions PAND P3-23H will pulse NOR P3-23N to delay P3-24X, inverters 3-5H and E and on to the stage control to inhibit metering and clear encoder counter.

In effect then, the machine does this; if the number read does not cause an error stop, was it an equal condition, it will clear the encoder of the DPU, stop metering of

film and allow additional film to be run through the machine and on the next begin-of-frame again attempt to make the comparison as outlined.

If the error F/F is set the encoder and metering will be cleared and in addition the film movement in the digitizer will also stop awaiting operator attention.

DIAGRAM A. TAPE FORMAT



The punched paper tape contains eight channels and feed holes. The holes are sensed by photo diodes and the feed holes provide strobe pulses. The signals are amplified by the tape reader and read into the "A" F/F's of the preselector. The tape word consists of five transmissions. The first transmission will always contain a start code (3 and 4 hole) and four bits of data which is the hundreds digit of the reel number. The second transmission contains the tens and units digits of the reel number. Channels 1 - 4 being the tens and 5 - 8 the units digit. The third transmission (channels 1-4) contains

the thousands and the hundreds digit (channels 5 - 8) of the frame number. The fourth transmission (channels 1 - 4) contains the tens digit and the units digit (channels 5 - 8) of the frame number. The fifth and final transmission contains the stop code (channels 1, 3 and 4). The X s in diagram A indicate those portions of the word that are not used. Blank tape is tape containing feed holes only.

PRESELECTOR PUNCH

PRESELECTOR

DESCRIPTION OF COMPONENTS (Figure 1 & 2)

Motion Analyzer: This unit purchased from the Vanguard Camera Corporation is a film transport and projection system. Film is advanced and projected on a screen enabling the operator to view and judge any particular frame of film.

Circuitry Cabinet: This cabinet contains the logical circuitry which controls the functions of the preselector. It includes: the DEC power supply, DEC bins, and a -28 VDC power supply. It also includes a potentiometer for adjusting frame registration delay time.

Punch Cabinet: This cabinet contains: The Teletype Paper Tape Punch, a -60 VDC power supply, a Vanguard control relay, paper tape take up mechanism, and a small panel containing a reset button, on/off switch for the tape take-up motor, and two counters.

On/Off Switch: This switch applies power to the take-up motor. The motor operates continuously through a slip-clutch arrangement.

Reset Button: This button located on the panel in the punch cabinet resets the flip-flops B1-3 "Yes" flip flop, B1-5 flip-flop, the up-down counter B2-4, and the decoding scaler B1-9.

Load Button: This button, located on the panel in the punch cabinet, when depressed, enables the newly loaded film to advance until the first frame is displayed and then automatically stops the film movement.

Yes Button: This button (green) is located in the center of the console. This button initiates a punch-out on paper tape of the frame and reel number of the particular frame of film being viewed. This operation can be accomplished if the film is static or moving.

No Button: This button (red) is located in the center of the console. It initiates the circuitry which advances the film to the next frame without punching the frame and reel number. This operation can also be accomplished if the film is static or moving.

Yes/No Counters: These are solenoid operated counters which give an accounting of the number of "yes" and "no" decisions made. They operate from the -60 VDC supply. They are manually resetable.

Frame Registration Marks: Two small squares are provided on each frame of film. These marks as per Figure "A" are sensed by photo diode circuits which initiate stops on the film.

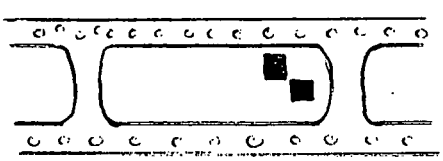
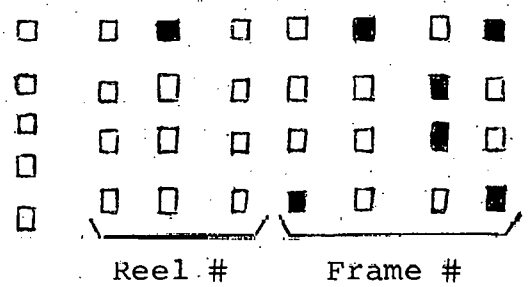


Figure "A"

Frame and Reel Number: This is a four by eight matrix of squares on the film which indicate the reel number and frame number in B.C.D. These marks as per Figure "B" are

this column not read to paper tape



Reel # 080

Frame # 1869

Figure "B"

sensed by photodiode circuits and punched on paper tape when a yes decision is made.

1. General Description of Operation

In general, film can be preselected in two modes: "Static" (film is stopped before judgement is made and "on the fly" film is moving).

In the static mode the film will be stopped and one or more frames will be displayed on the motion analyzer screen. The operator must decide whether or not that particular frame over the reading portion of the screen is to be digitized. If not, the "no" button is depressed and the film is advanced to the next frame. If the operator decides that it should be digitized, the "yes" button is depressed. The frame and reel number of that particular frame will then be punched out on paper tape by the teletype punch and the film will be advanced to the next frame.

While the film is moving the operator may make a decision. If it were "yes" then upon receipt of the frame registration marks the frame and reel number will be punched on paper tape while film continues to move. If a "no" decision is made the film just continues to move to the next frame or until another decision is made. This enables the operator to make decisions without stopping film on each frame.

2. Preselector Description

2a. Reset: Depression of the reset button originates a positive going pulse via pulse generator B2-9E and B1-10T to the POR B1-6K. It then proceeds to a pulse amplifier B1-8 Pin E. This amplifier generates a 1 μsec. positive pulse to reset B1-5V, yes F/F B1-3M, and the decoding scaler B1-9 F, L, S. The positive going pulse from B1-10T also goes to B1-8 pin N which generates a 1 μsec. pulse to reset the film drive F/F B1-3X and to reset the up-down counter B2-4 to 00.

2b. Loading: After resetting, film is automatically loaded by pressing the load button, which fires a schmidt trigger B2-2E, applying a pulse to the film drive F/F which starts to move film. This schmidt pulse is also applied to Pin N of a POR B2-5. From the POR the pulse tests the NAND B1-13. This NAND is inhibited by the fact that the up-down counter is in the -0 condition. This same pulse is also inverted by B1-10 and applied to Pin J of B2-4 to step the counter to 01. Stepping the counter to 01 puts an allow level on Pin V of B1-13 and conditions the NAND B1-13 for receipt of the next frame registration pulse. The film, during this time, is moving. When the first frame appears on the screen and the frame registration marks detected,a pulse appears on Pin U of NAND B2-5. Pins S and T are conditioned by virtue of the 01 in the counter. The pulse is allowed through and starts to down-count the counter

to 00. At the same time the frame registration pulse tests Pin U of B1-13. Because Pin V has an allow level on it, the NAND operates and the film driver F/F is set to the 0 position stopping film. Film is now stopped and ready for the operator to make a frame decision.

2c. "NO" Decision: If the no button is depressed a pulse is applied to Pin F of the NAND B2-6. Pin E has an allow level on it, because the yes F/F is in the zero position. Pin H also has an allow level on it by virtue of the 0- condition of the up-down counter. The NAND operates and the pulse is inverted and operates the film driver F/F which starts film moving. Also the pulse goes to Pin S of B1-5 and sets the F/F to the one state. This inhibits any possibility of a punch out by removing the level on Pin N of the NAND B2-6. The pulse from NAND B2-6K also steps the up-down counter to a -1. This again puts an allow on B1-13 Pin V, B2-5 Pins S and T. The next F/R pulse will stop the film and down-count the counter to a 00. At this point nothing has been punched out and the film comes to a stop again.

2d. "Yes" Decision: The yes button is depressed and the schmidt B2-1E applies a pulse on Pin E of the NAND B2-5. The up-down counter is in the 0- position putting an allow on Pin F of B2-5. The yes F/F is in the "0" position putting an allow on Pin H of B2-5. The NAND operates setting B1-3 to the "1" state

It also pulses Pin S of B2-6 through inverter B1-10Z. Since the film is stopped the pulse gets through NAND B2-6V and sets B1-5Y F/F to "0". This F/F puts an allow on NAND B2-6N. The positive pulse from B2-5K also is applied to B1-3V starting the film and is applied to POR B2-5M which steps the up-down counter to -1 again allowing NAND B2-5 S, T. When the "yes" F/F B1-3 is set to the "1" state NAND B2-6M is allowed. Input N of B2-6 is allowed as mentioned earlier. A pulse from the punch occurs every 10 milliseconds via pulse generator B1-2F. At which time NAND B2-6 operates. This pulse operates a 4MS Delay B1-7X. The 4MS level from Pin J is applied to the pins of NANDs B1-11 E, W, S, L and to B1-13K. Since the decoding scaler (down-counter) is in the 000 position B1-11K provides a positive 4MS pulse to the punch coils 1, 3, 4, via POR B2-18 F, M, T, and solenoid drivers B2-20 H, X and B2-22 H. The three corresponding holes are punched and tape is advanced by the feed solenoid via solenoid driver B2-24X. At the end of the 4MS level, delay B1-7F provides a .4us pulse to Pin E of the decoding scaler which shifts the down scaler to 111 thus putting an allow on NAND B1-13 E and F. The next sync pulse produces a 4MS level to B1-13 which then punches out the information on diodes G1 through H4 in the frame and reel matrix. On the next transmission information on diodes E1 through F4 is punched out in a similar manner. On the fourth transmission

C1 through D4 is punched out and on the final transmission B1 through B4 and the start code is punched out. This last pulse also goes from B1-12 F to Delay B2-8Y. This delay then pulses Pin F of B1-8 which in turn recycles [i.e. Resets] the decoding scaler to 000 and resets F/F B1-5V which puts an inhibit on NAND B2-6N stopping any more sync. pulses from getting through B2-6. It also resets the "yes" F/F B1-3. This operation of 5 transmissions and a recycle takes about 56 milliseconds. Film is still moving and upon receipt of F-R pulse film will be stopped.

2e. It is possible to preselect while the film is moving continuously. Suppose that film is stopped. The operator makes a "yes" decision. The frame and reel number is punched as described in section (2d). Film begins to move and the up-down counter B2-4 is set to -1 state. Before the F-R pulse of the next frame occurs should the operator make a second "yes" decision this again sets yes F/F B1-3. This sets a level on NAND B2-6S, but B2-6T is inhibited since film is moving. A -3V level is set on NAND B2-6W. The up-down counter is set to 1- which removes the level from NAND B1-13V, thus preventing film from stopping on the first F-R pulse. When the F-R pulse does come, one path is through NAND B2-6X. B2-6Z sets B1-5 F/F which puts a -3V level on NAND B2-6N. B2-6M has a level on it by virtue of yes F/F B1-3 being set in a "1" state.

This allows that particular frame and reel number to be punched out. A second path of the F-R pulse down counts the counter to a -1 via NAND B2-5 W, X, Y.

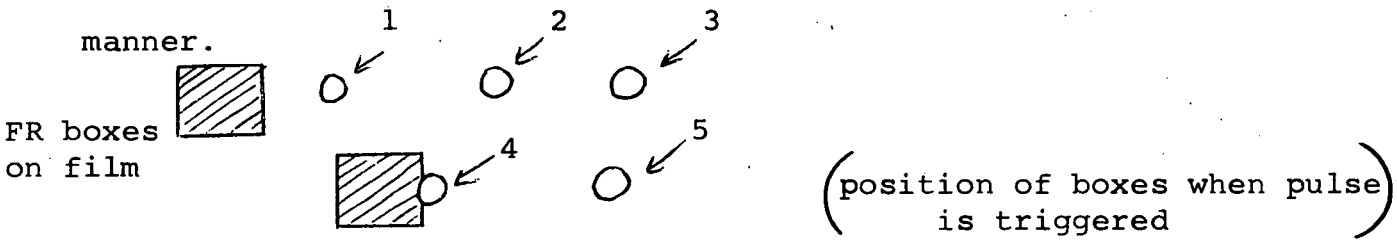
2f. Suppose now that a "no" decision is made before the next F-R pulse. The "yes" F/F B1-3 is in the "0" state putting a -3V level on NAND B2-6E. The up-down counter B2-4 reads 0- putting a -3V level on NAND B2-6H. The pulse from the schmidt trigger B2-3E gets through NAND B2-6K. This sets the up-down counter to 10 which inhibits NAND B1-13V preventing the film from stopping. The pulse from B2-6K also sets the F/F B1-5 to the "1" state via inverter B1-10F. This prevents the punch out on the next F-R pulse. The only path for the F-R pulse is to down count B2-4 to 01.

2g. Suppose two "no" decisions are made before receipt of a single F-R pulse. The first "no" starts film moving, sets the counter to -1 and puts an inhibit on B2-6N through F/F B1-5S. The second "no" merely up-counts the counter to 10. The first F-R pulse only has one path; through B2-5 W, X, Y, which down counts the counter to 01. If no other decision is made before the second F-R pulse the film will stop upon receipt of the second frame registration pulse.

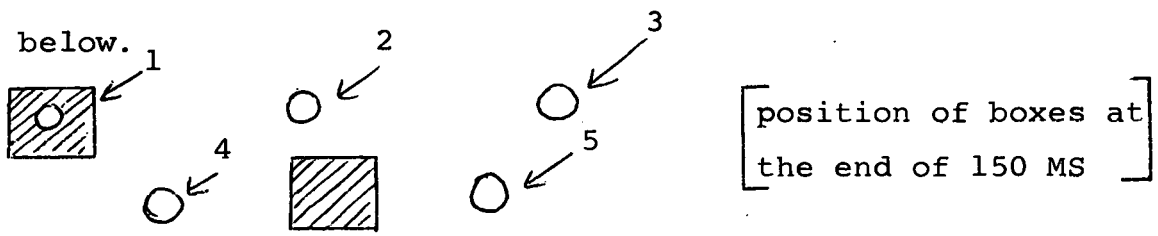
2h. Suppose a "no" and then a "yes" decision is made. The "no" decision starts film and inhibits B2-6N through F/F B1-5. It also steps the counter B2-4 to 01. The next

"yes" decision puts the counter to 1- and sets the rest of the components as described in section 2e. The F-R pulse sets F/F B1-5 through NAND B2-6Z allowing the frame and reel number to be punched and also it down counts B2-4 to -1.

2i. The frame registration pulse is originated in this manner.



The leading edge of lower F-R box triggers a pulse through inverter B1-25Y. This pulse then goes to pulse generator B2-10Z which then goes to a 150 MS delay B2-14. After the 150 MS the relative position of the boxes is as shown below.



This now gives us a "light" # 2diode and a "dark" # 1 diode condition. These conditions supply levels to H and E of PAND B2-13. This in turn allows NAND B1-6Z along with the delayed triggering pulse at Pin Y. The positive output pulse is then inverted through B2-7J and goes into the associated

circuitry, and is called frame registration pulse (F-R). The delay B2-14 is equipped with an external pot which can adjust the delay time. Since the length of delay is dependent on film speed, this delay must be adjusted when film speed is changed.