IBM

Field Engineering Education

Student Self-Study Course

7330 Magnetic Tape Unit

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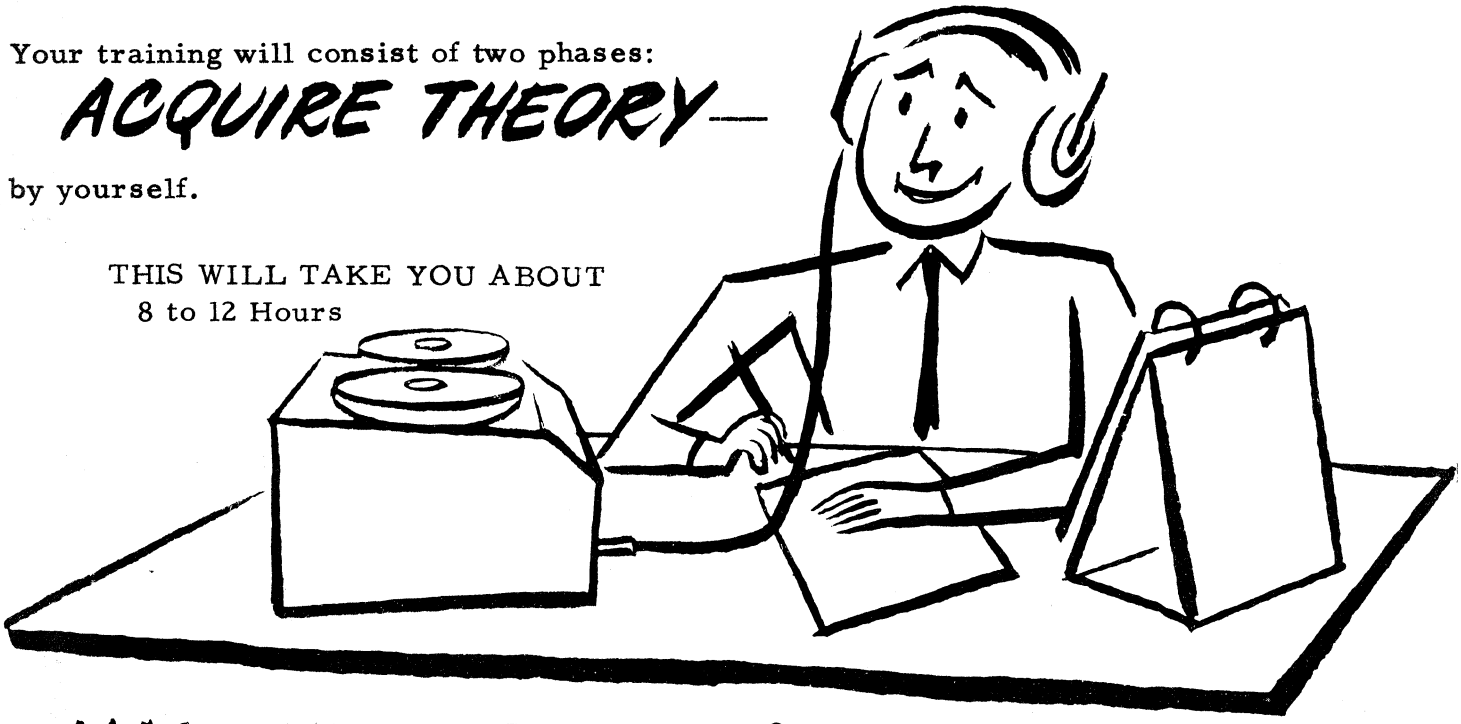
INTRODUCTION

This course, on the 7330 Magnetic Tape Drive, has been designed to allow you to effectively learn the machine when and where it is convenient for you, without the need of formal classroom training. You will set your own pace, as you will be the judge of your progress.

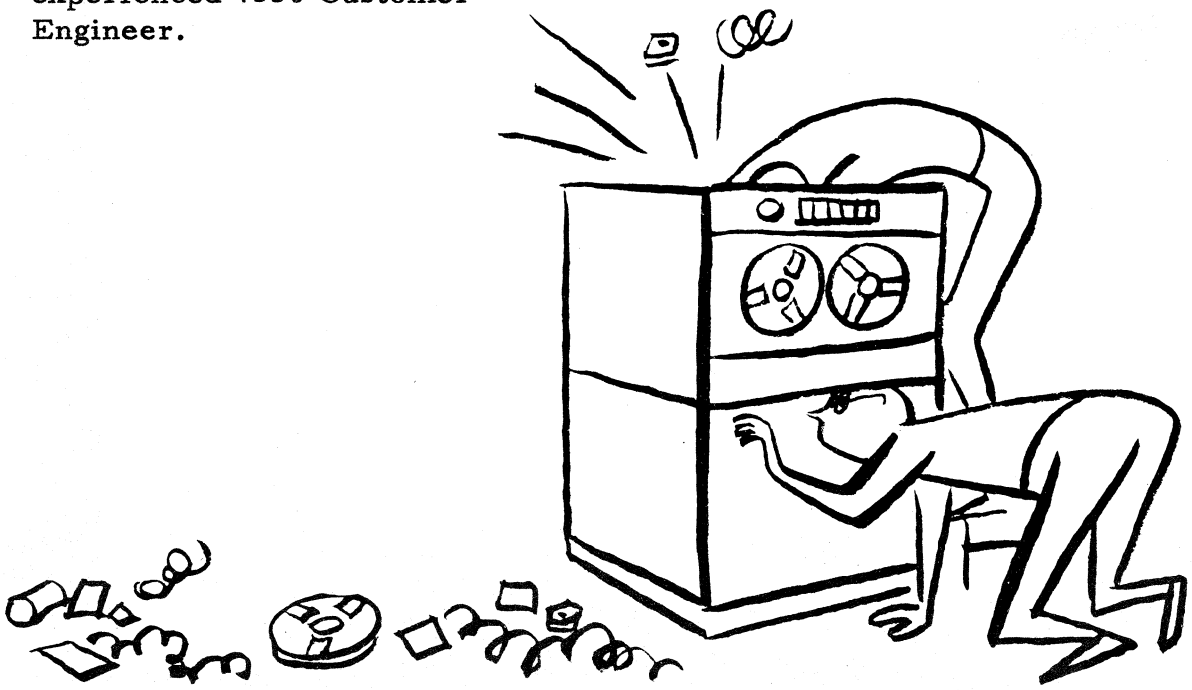
Your training will consist of two phases:

ACQUIRE THEORY— by yourself.

THIS WILL TAKE YOU ABOUT
8 to 12 Hours



MACHINE EXPERIENCE —— while working with an experienced 7330 Customer Engineer.



Then.....

COMPREHENSIVE QUIZ

COURSE PREREQUISITES

*1. OSCILLOSCOPE

A thorough understanding of oscilloscope operation and practice in using any of the following Tektronix models is necessary: (531, 535, 545, 551 or 561A)
When told to compensate a probe, or sync on point so-and-so, or scope a particular output, you should be able to do so without undo hesitation and with the understanding of what the instrument will show you.

*2. SMS, TRANSISTOR THEORY AND ALD READING

A knowledge of basic Standard Modular System packaging (card location, pin layout and soforth) is necessary.
Also necessary is the ability to read Automatic Logic Diagrams so that you follow through circuits made up of And circuits, Or circuits, converters, triggers and so forth.

3. SYSTEMS CONCEPT

So that you have a feeling for the use of the tape drive with a system, you should have either prior tape system experience or:

* "Fundamentals of Data Processing Systems"
  (Prerequisite for 1410 or 7000 series training)
* 1401 Pre-School Training Course
  (Prerequisite for 1401 training)

* The courses are available in self-teaching form as outlined in the Manager's Field Training Guide (Form No. R23-9591).
Look under 7330 Tape Drive Course (Self-Teaching)

COURSE MATERIAL

7330 Audio Training Tapes	
Reel 1	223-2689
Reel 2	223-2690
7330 Audio Visual Instruction Guide	223-2688
7330 Reference Manual	223-6967
7330 Instruction Manual	223-6943
7330 Instructional System Diagrams	223-6930

HOW TO TAKE THIS COURSE

THEORY PORTION

Once you start listening to the audio tapes, you will receive all the necessary instructions to complete the course.

- There are 2 reels of tape - recorded at 3 3/4 inches per second.
- Be careful not to damage or erase tape.
- This Instruction Guide is yours to keep so feel free to make notations.
- Take your time and be thorough.

MACHINE EXPERIENCE

The tape will introduce you to a Machine Experience Guide that you and the experienced 7330 Customer Engineer will use.

- Make it your responsibility to see that you do get adequate machine experience.
- Work closely with the experienced 7330 Customer Engineer while getting experience in adjusting and troubleshooting the drive.

Put reel one on the tape recorder and begin.

CONTENTS

SECTION		PAGE
1	The Physical Layout of The 7330 Magnetic Tape Drive	1
2	7330 Operations or Functions	5
3	Basic Components of The Tape Transport Area	11
4	The Movement of Tape Forward and Backward	22
5	Tape Transport Idlers, Guides and Tape Paths	30
6	Reel Drive and Brake Mechanisms	42
7	Left and Right Rewind Arm Operating Mechanisms (Transport Rear)	50
8	Rocker Arm Centering Device and Moving Coil Assembly	55
9	Theory of Magnetic Writing Using the Binary Coded Decimal System of Coding	60
10	Reading Tape, and The Mechanisms Used for Reading and Writing	68
11	Select and Ready	75
	Introduction to The 7330 ISD's	83
12	Read Circuits	88
13	File Protect	96
14	Write Circuits	104
15	Character Density and Recognizing the Beginning and End of Tape	114
16	Basic Tape Movement Control Circuits, Reel Drive Motors, Reel Brakes, Capstan Drive Motor, and Moving Coil	
	Part I	123
	Part II	133
17	Low Speed Rewind	139
18	High Speed Rewind	151
19	Lines Connecting the 7330 to a Computer System	163
20	Power Supply	173
21	Picture Review	179
22	CE Tester	199
ADJUSTMENT CONCEPTS		208
	Tracking	208
	Tape Tracking Concepts	216
	Start/Stop Time	232
	Skew	238
MACHINE EXPERIENCE GUIDE		0-1
	Machine Project I	1-1
	Machine Project II	2-1
	Machine Project III	3-1
	Machine Project IV	4-1
	Machine Project V	5-1

SECTION 1

THE PHYSICAL LAYOUT OF THE 7330 MAGNETIC TAPE DRIVE

OBJECTIVE: Be able to locate and name the major components of the 7330 tape drive.

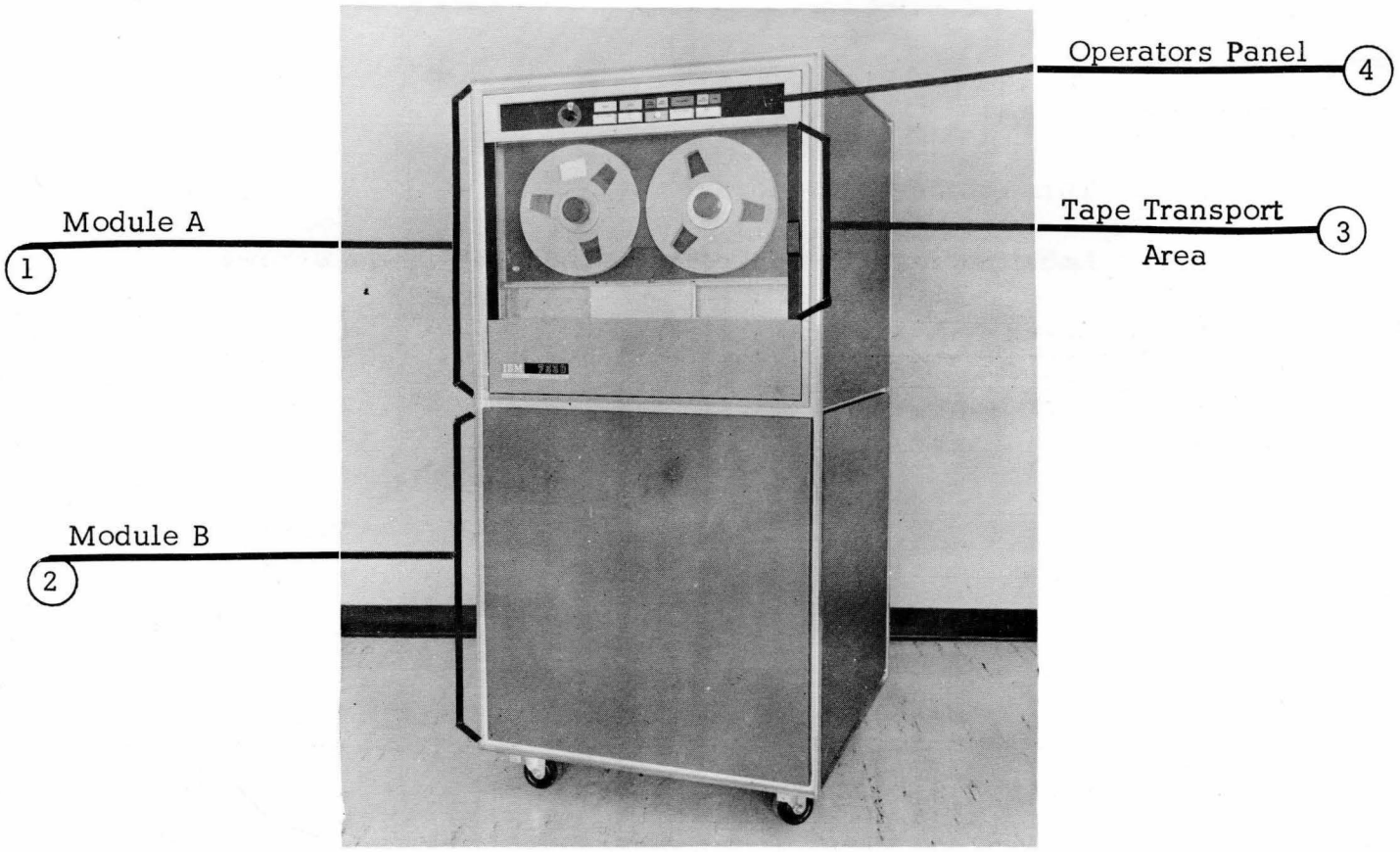


Figure 1 Front View

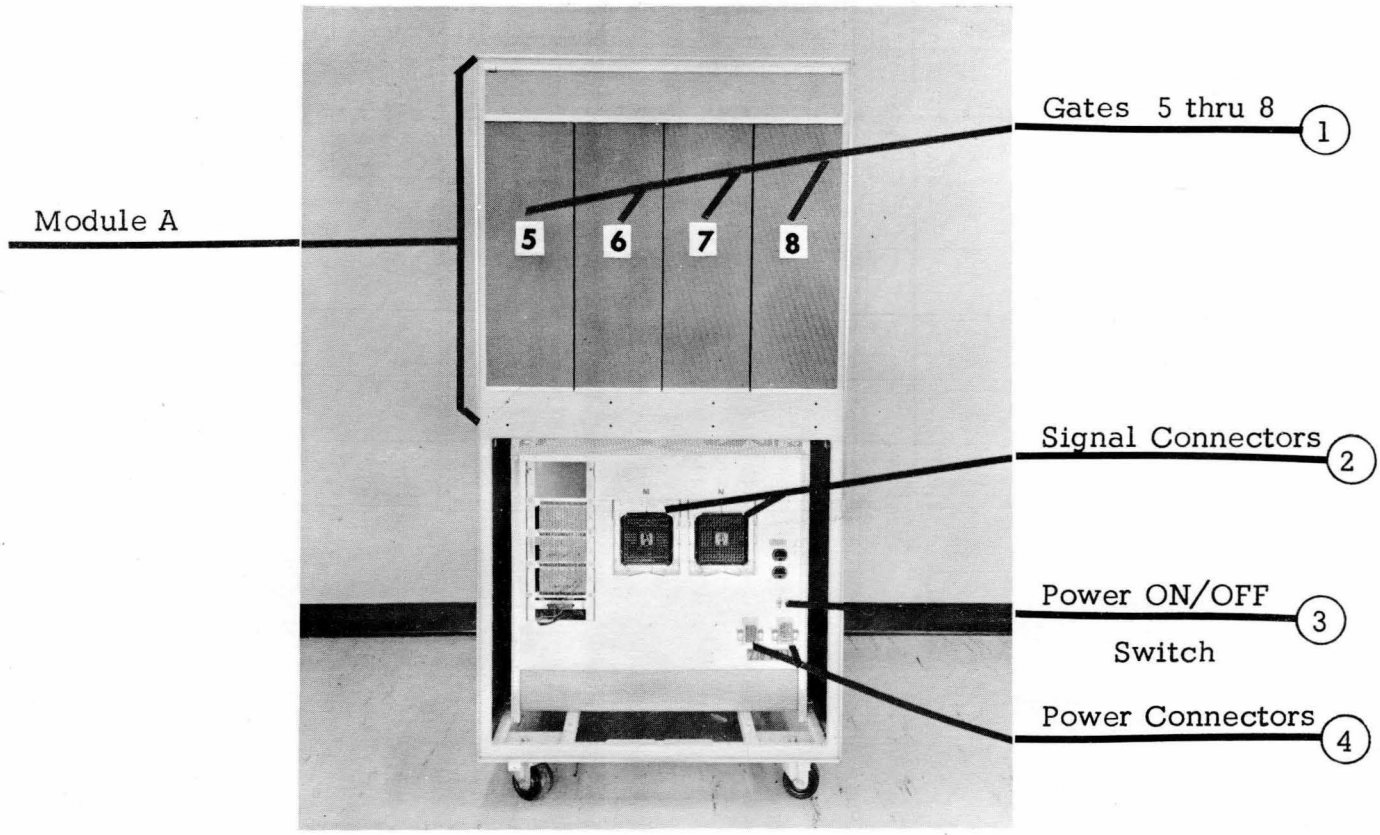
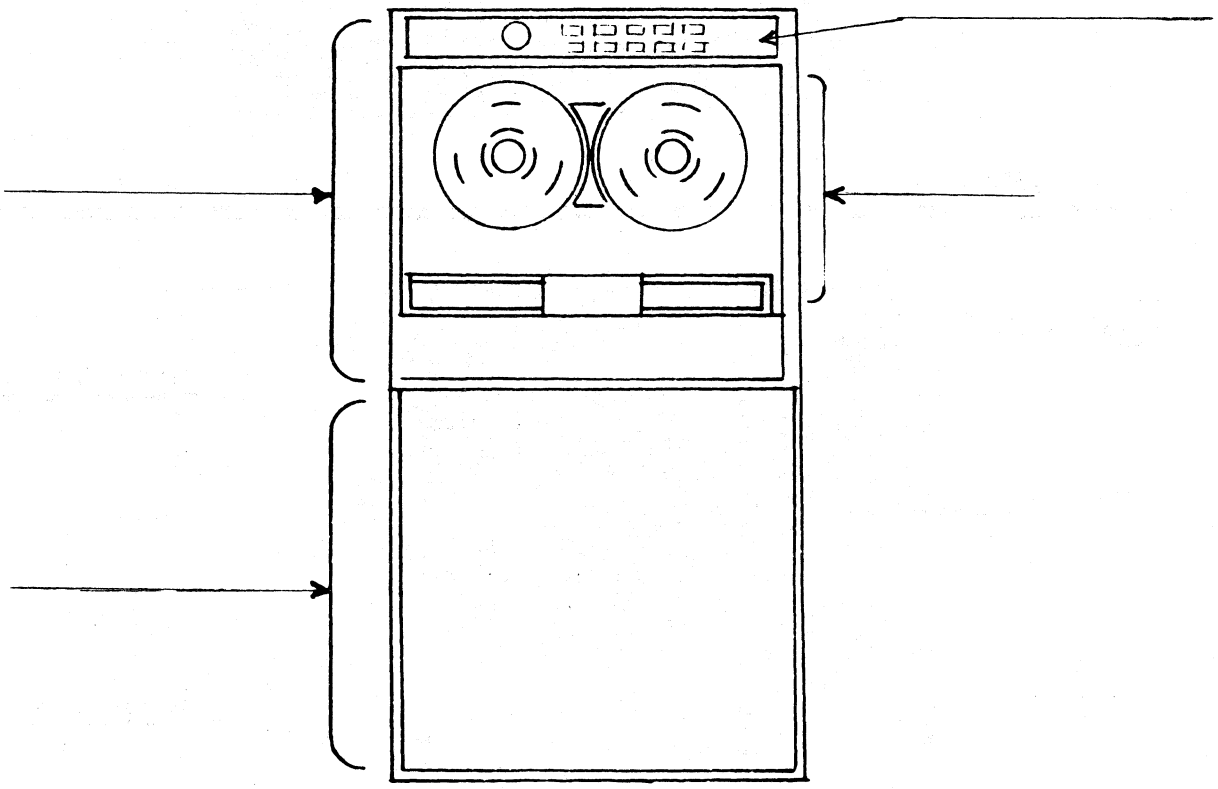


Figure 2 Rear View

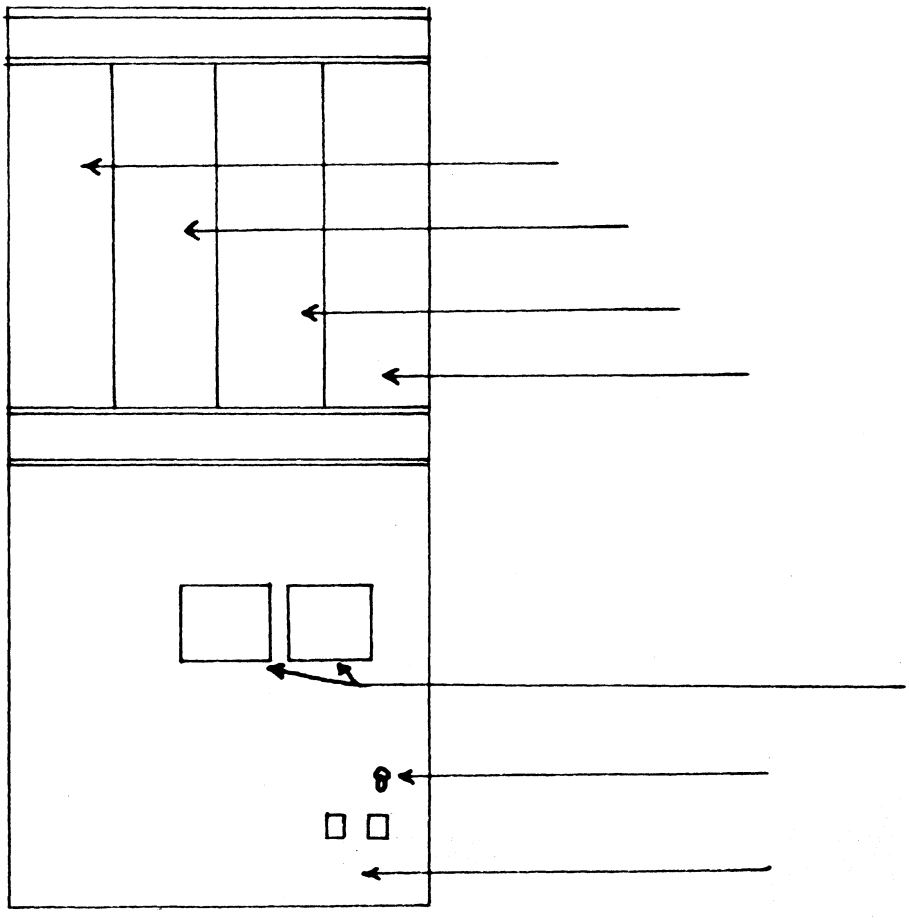
DIRECTIONS

1. Turn off the tape recorder
2. Label the major components as indicated by the arrows
3. Check your answers against page 2
4. Turn to page 4



DIRECTIONS

1. Label the major components as indicated by the arrows.
2. When you have finished, check your answers against page 2
3. Turn on the tape recorder.



SECTION 2

7330 OPERATIONS OR FUNCTIONS

OBJECTIVE: Be able to list the basic operations or functions that the 7330 performs.

Basic operations or functions of the 7330

1. _____

2. _____

3. _____

   a. _____

   b. _____

4. _____

5. _____

6. _____

DIRECTIONS:

1. Turn off the tape recorder

2. Answer the following questions.

1. When the tape drive is putting information onto tape, the operation is called a _____ operation.

2. To send information that has been written on magnetic tape to a computer, the tape drive must perform a _____ operation.

3. The loadpoint marker indicates the _____ of tape.

4. When tape is rewound faster than 36 inches per second, the operation is called a _____ _____ _____.

5. Sensing the loadpoint marker terminates a _____ operation.

6. In order to position tape to re-read a record, a _____ operation is performed.

7. The End of Reel marker indicates the _____ of tape.

Turn to Page 8 and check your answers.

ANSWERS TO PAGE 7

1. write operation

2. read operation

3. beginning

4. high speed rewind operation

5. rewind operation

6. backspace operation

7. End

Now turn to Page 9

List the basic operations or functions of the 7330.

When you have finished, turn to Page 10

ANSWERS TO PAGE 9

The basic operations or functions that a 7330 can perform are: recognize the beginning of tape, recognize the end of tape, write, read, backspace, and rewind (low speed and high speed).

Turn on the Recorder

SECTION 3

BASIC COMPONENTS OF THE TAPE TRANSPORT AREA

OBJECTIVE: Be able to name, locate, and state the functions of the basic tape transport components.

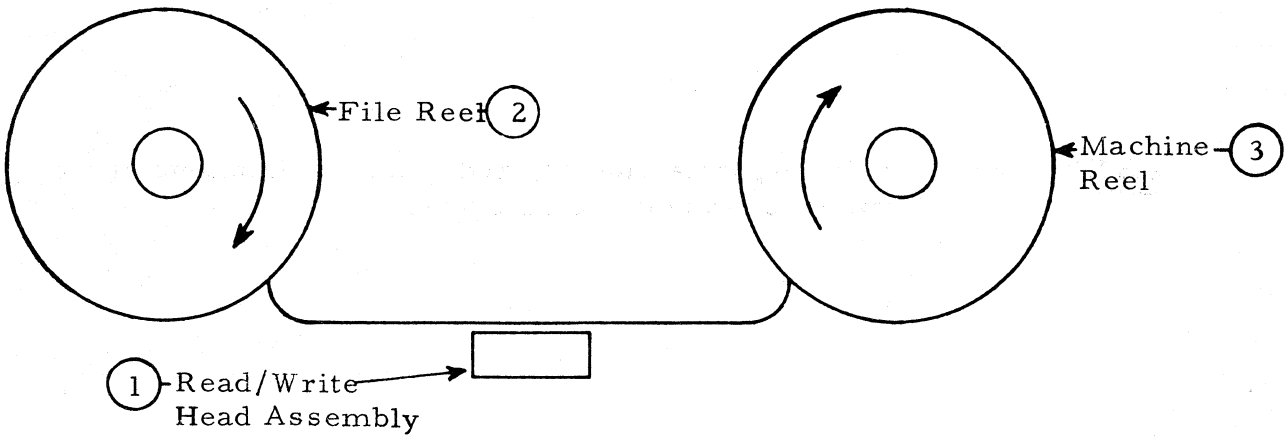


Figure 1

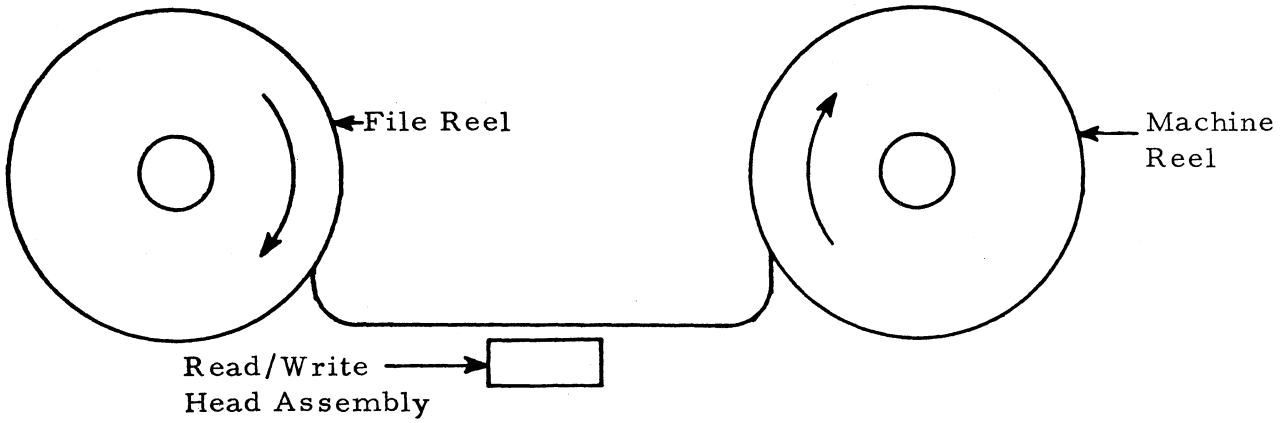


Figure 1

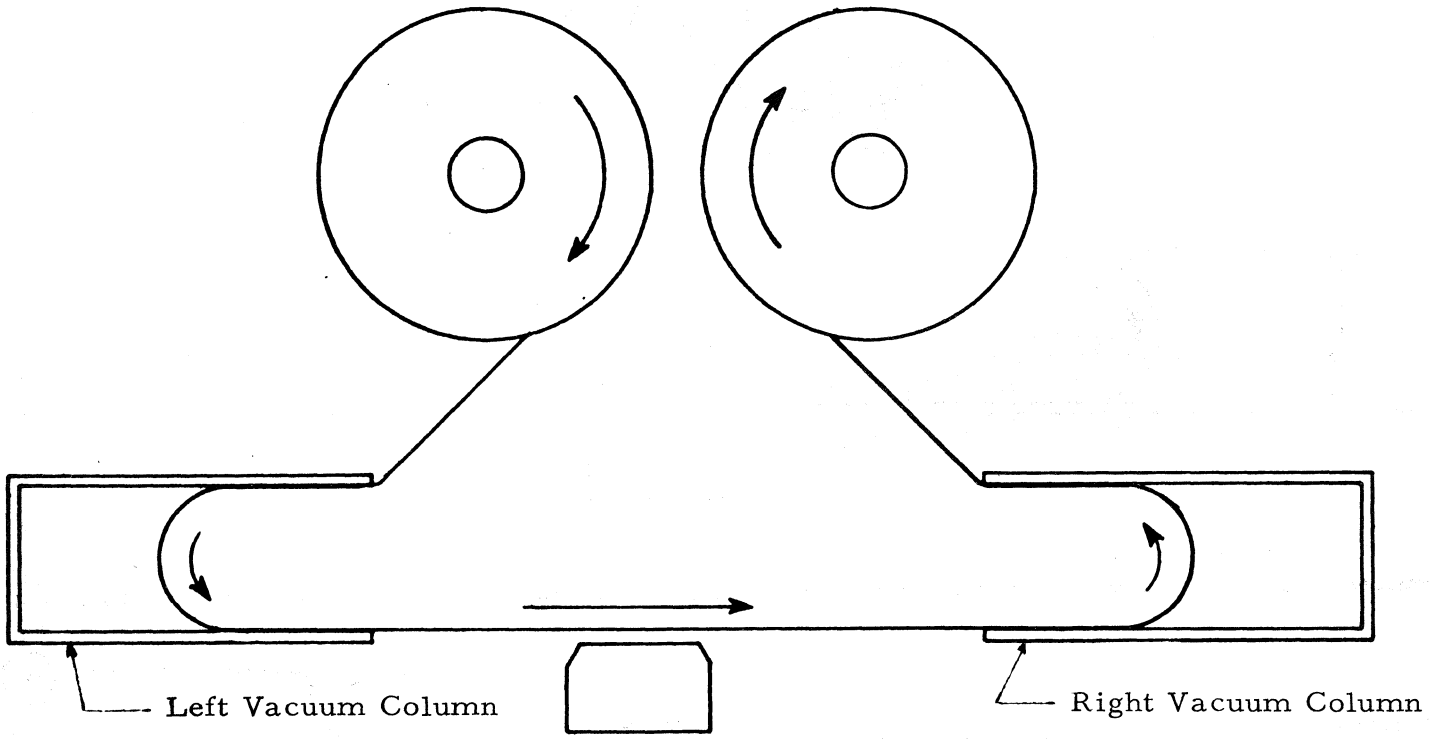


Figure 2

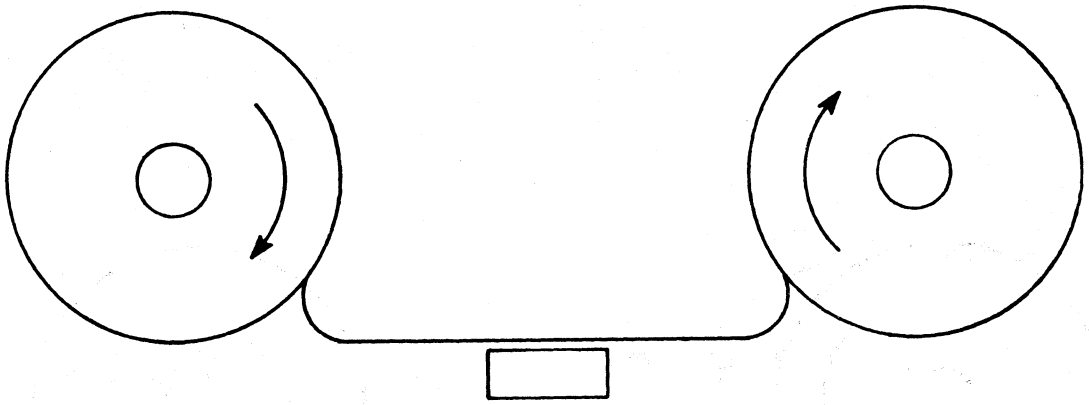


Figure 1

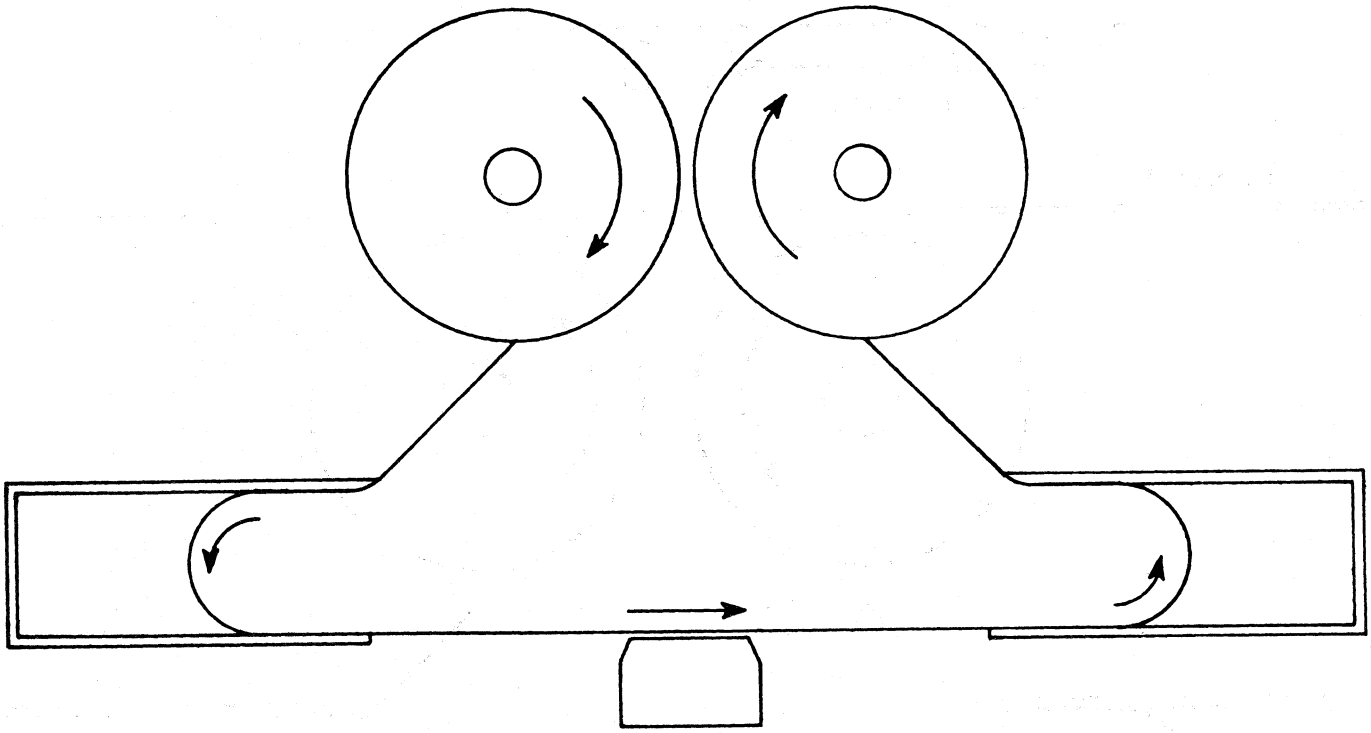


Figure 2

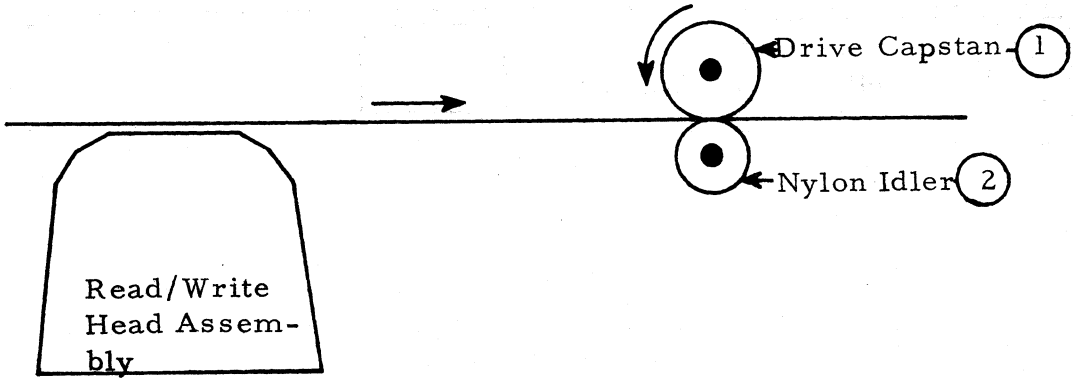


Figure 3

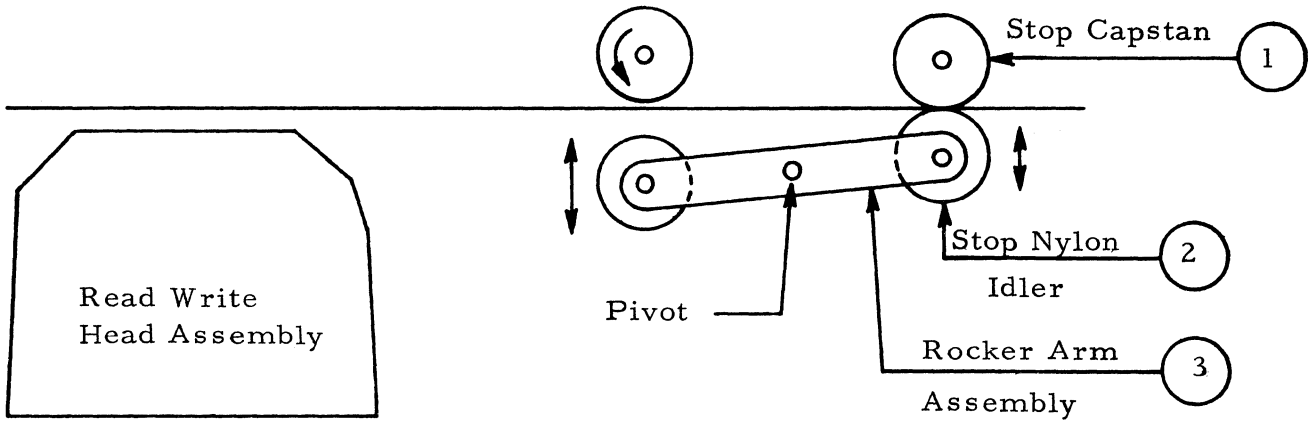


Figure 4

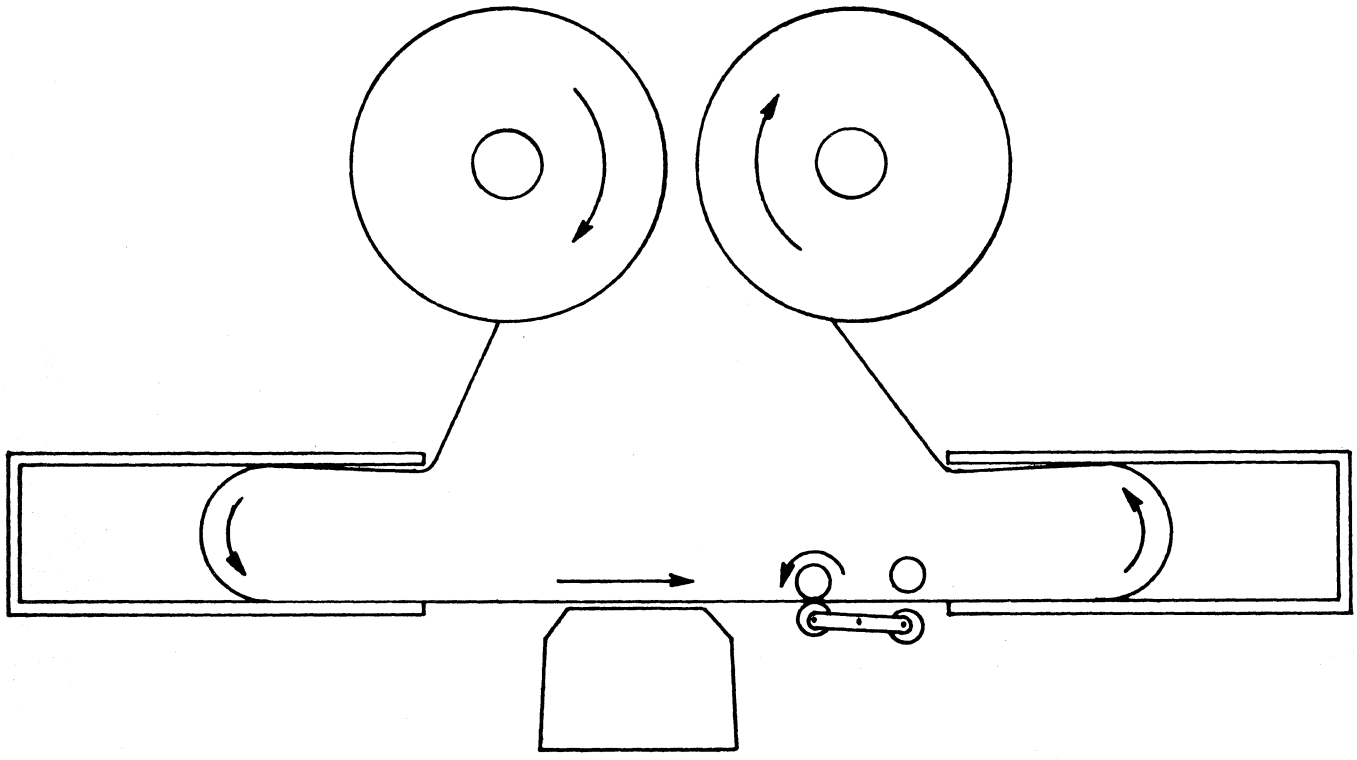


Figure 5

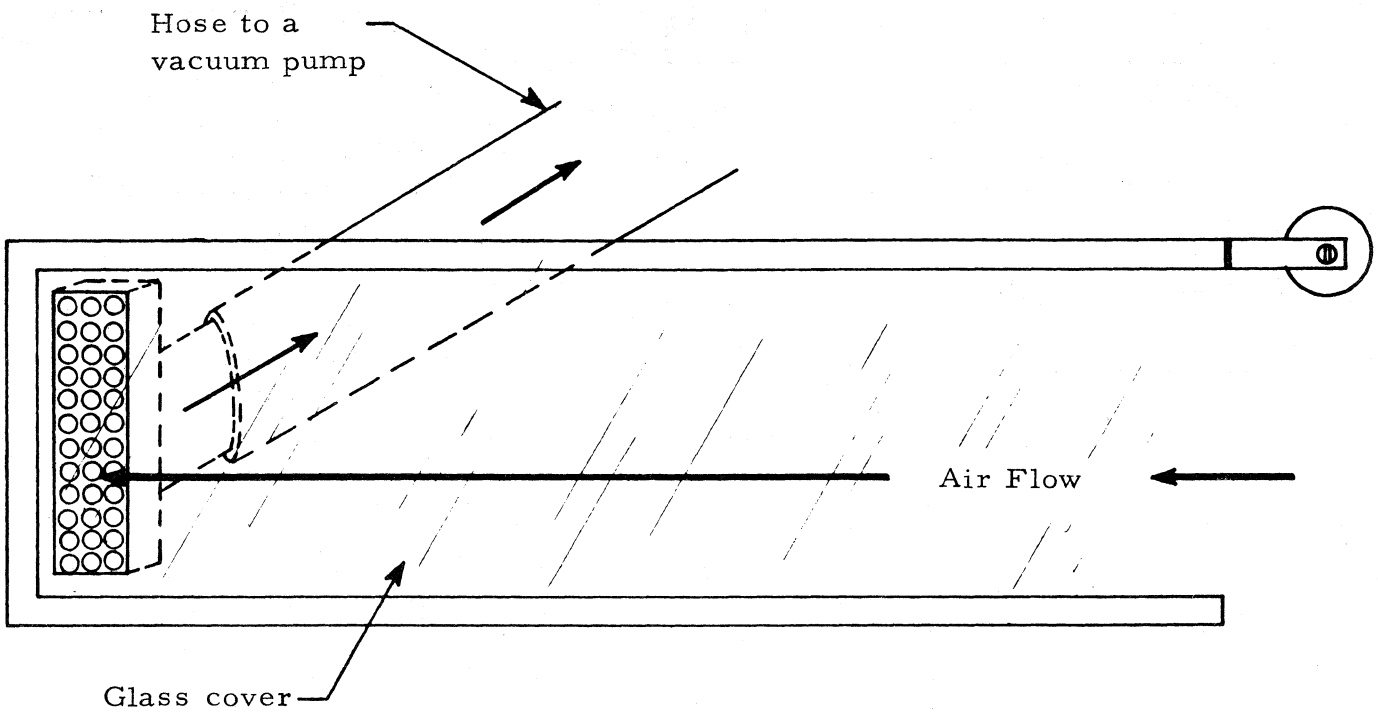


Figure 6a Left Vacuum Column (front view)

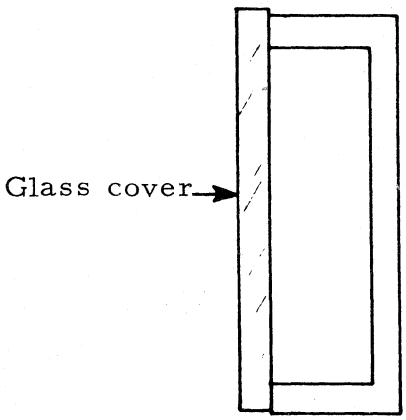


Figure 6b Left Vacuum Column (end view)

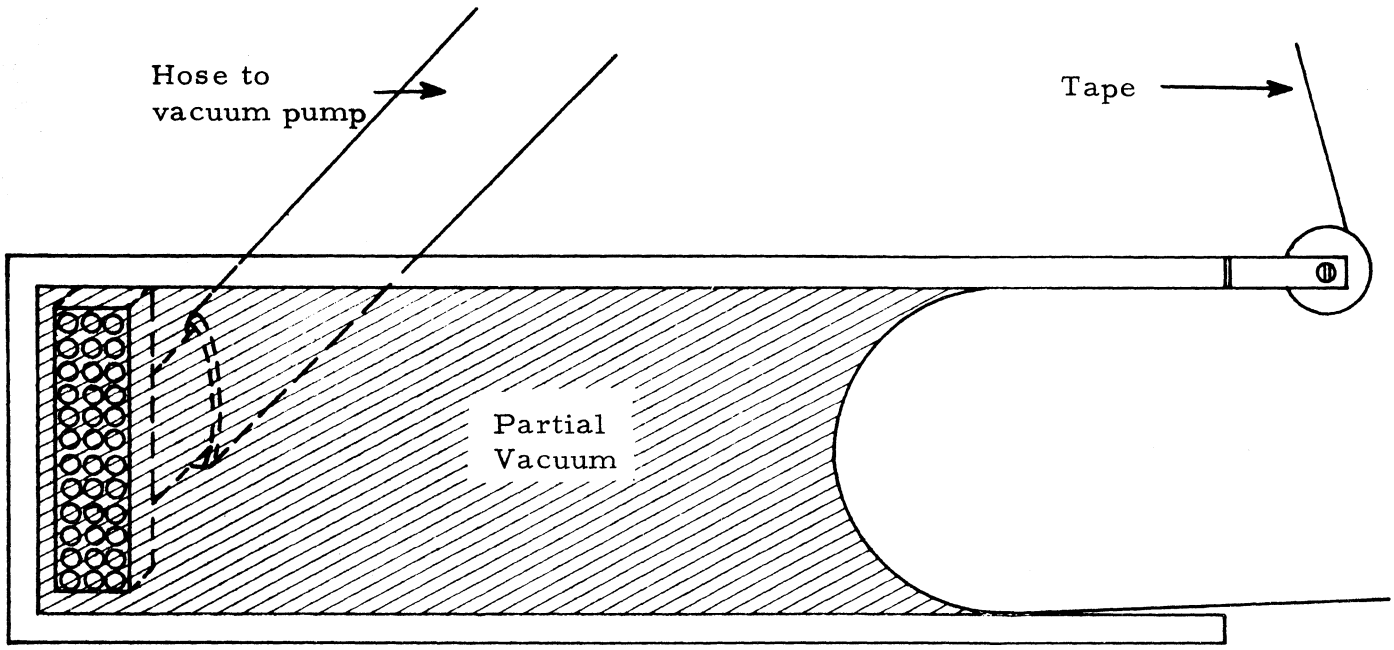


Figure 7 Left Vacuum Column

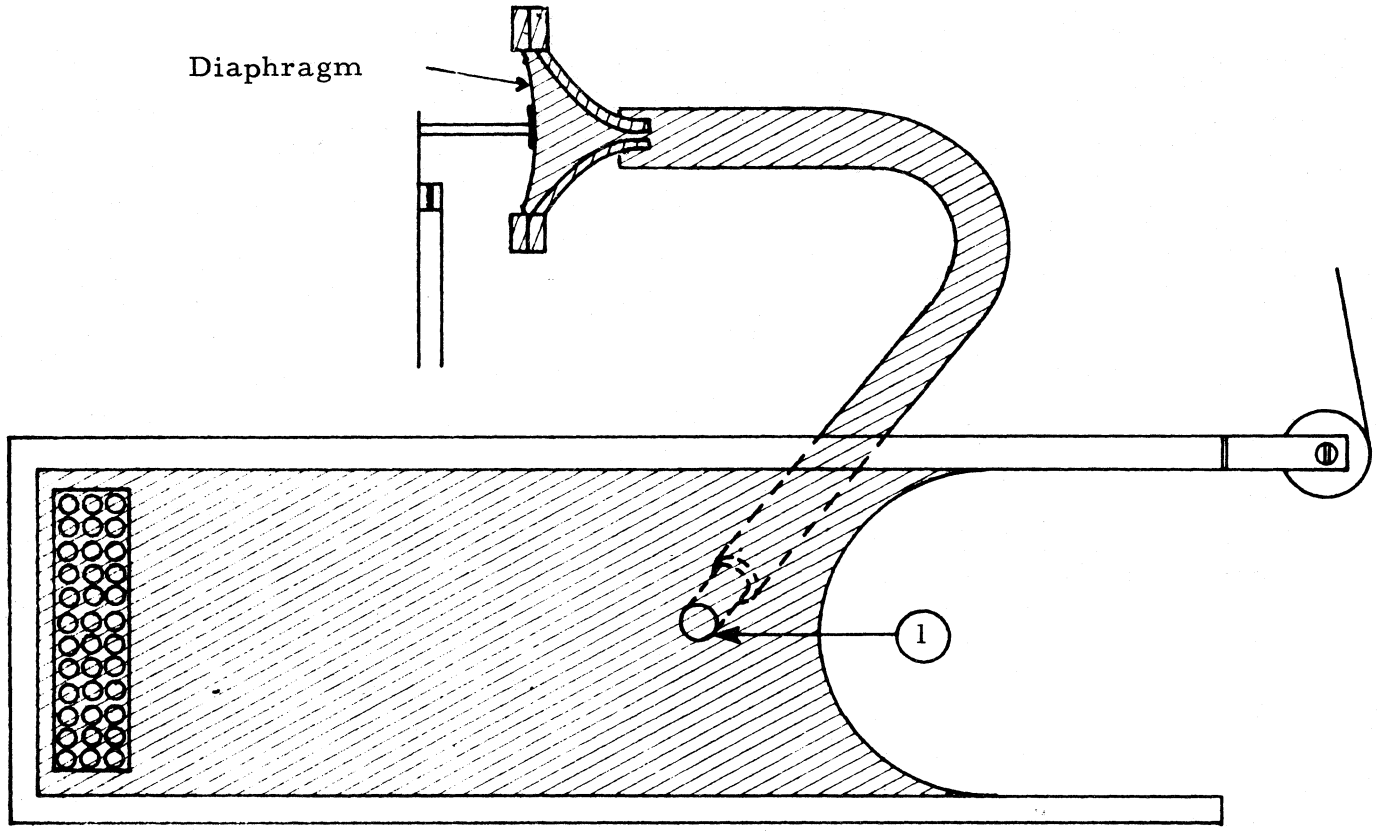


Figure 8 Left Vacuum Column

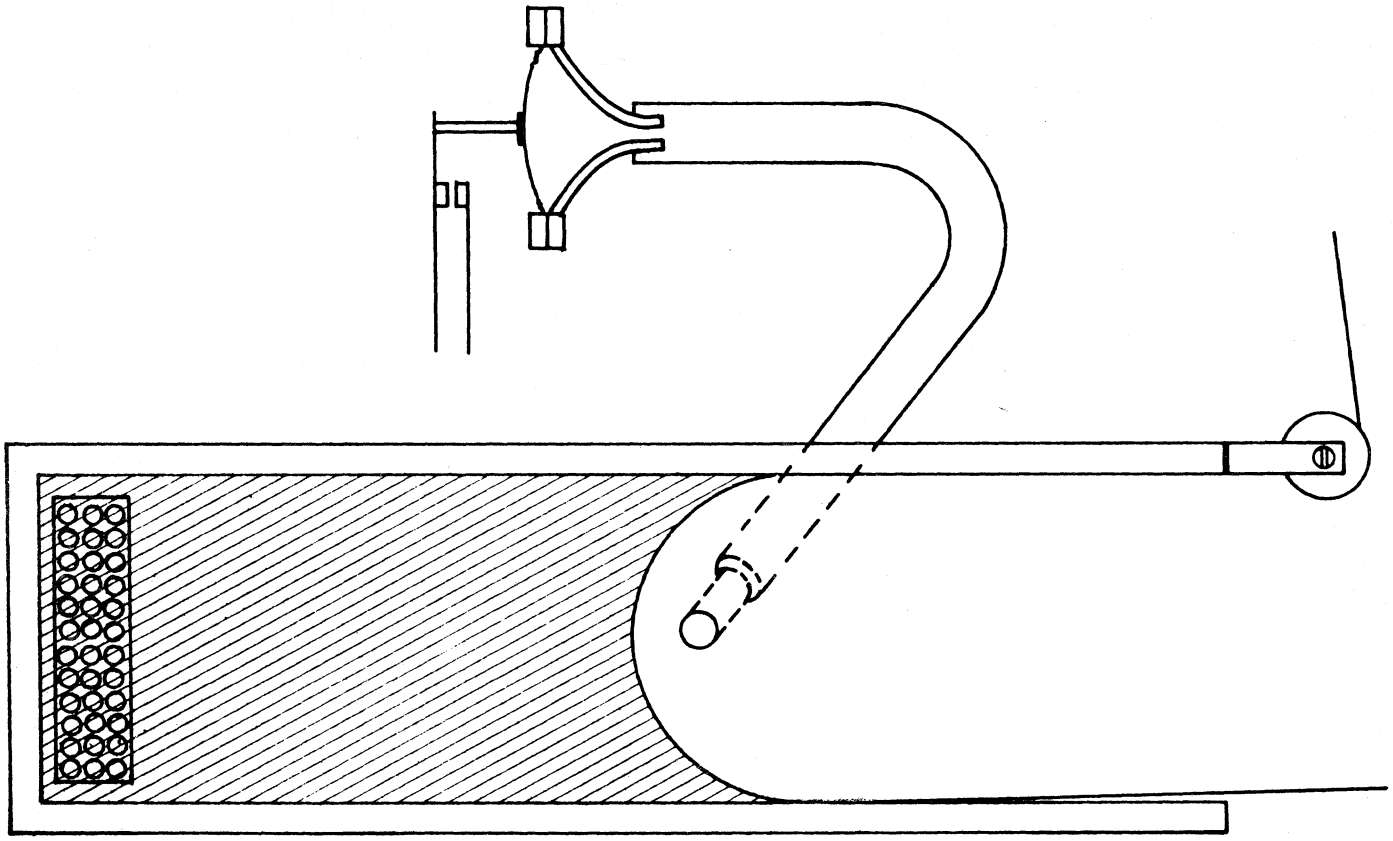


Figure 9

Turn off recorder

1. Tape is driven by the _____ capstan.

2. The stop nylon idler operates against the _____ capstan.

3. The drive nylon idler and the stop nylon idler are mounted on the _____ _____ assembly.

4. When tape is moving forward, it moves from (left to right) (right to left) over the Read/Write head.

5. The right reel is called the _____ reel.

6. The left reel is called the _____ reel.

7. Because vacuum columns are used, the drive capstan can move tape continuously while the _____ _____ are being started and stopped.

8. The vacuum column switches sense the _____ of tape in the columns and therefore can control the tape reels.

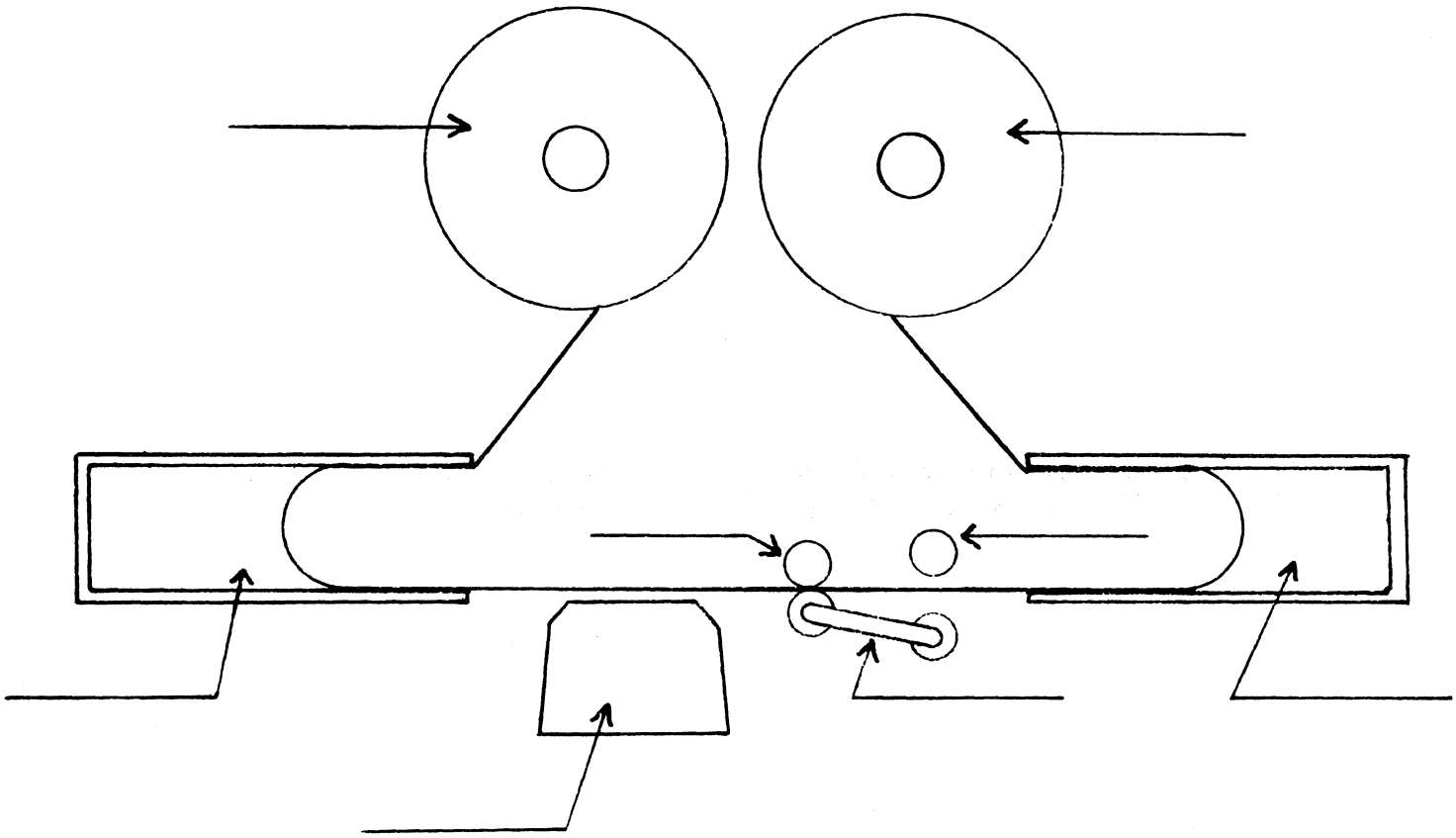
Check your answers on the next page.

ANSWERS TO PAGE 19

1. Drive
2. Stop
3. Rocker arm
4. left to right
5. machine reel
6. file reel
7. tape reels
8. position, amount

Turn to Page 21

1. Label the drawing as indicated by the arrows.



2. Check your answers against pages 13 through 15.

3. Turn on the Recorder

SECTION 4

THE MOVEMENT OF TAPE FORWARD AND BACKWARD

OBJECTIVE: Be able to state the relationship of the tape transport components to the movement of tape.

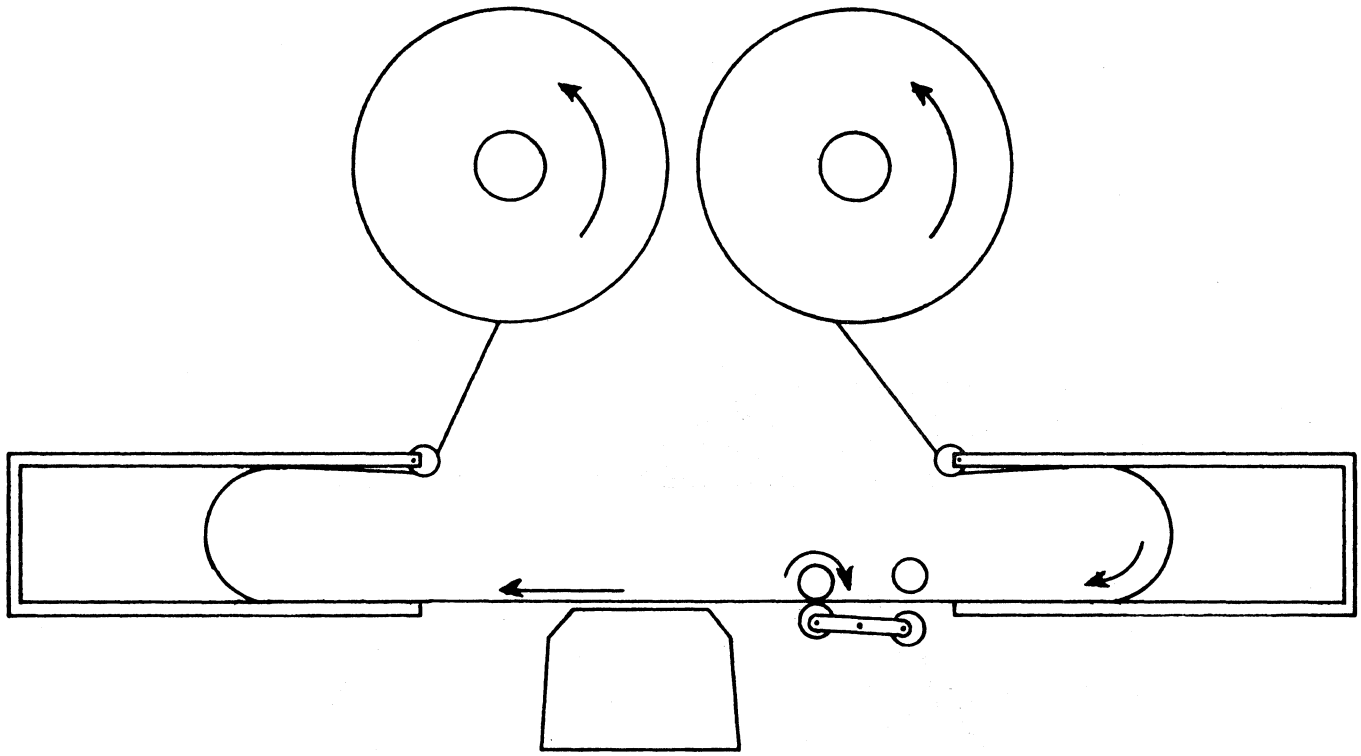


Figure 1 Backward Motion

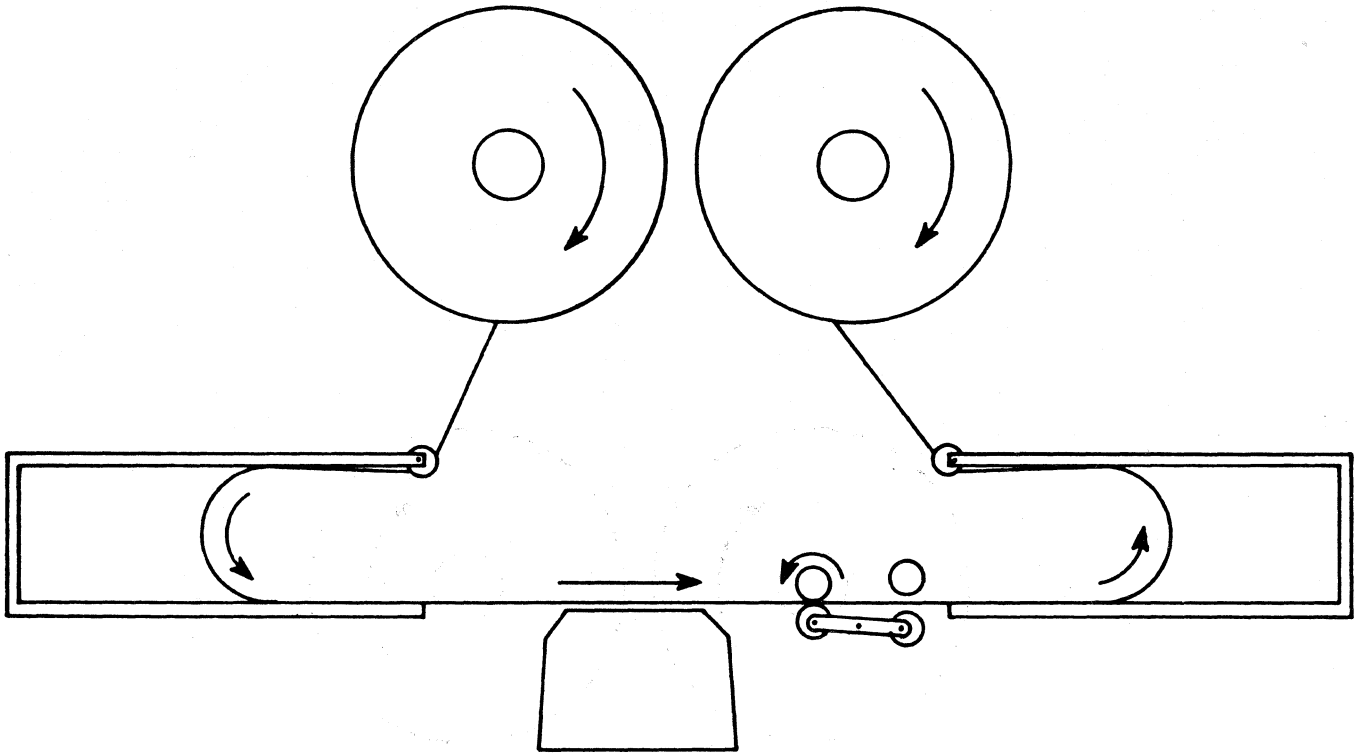


Figure 2 Forward Motion

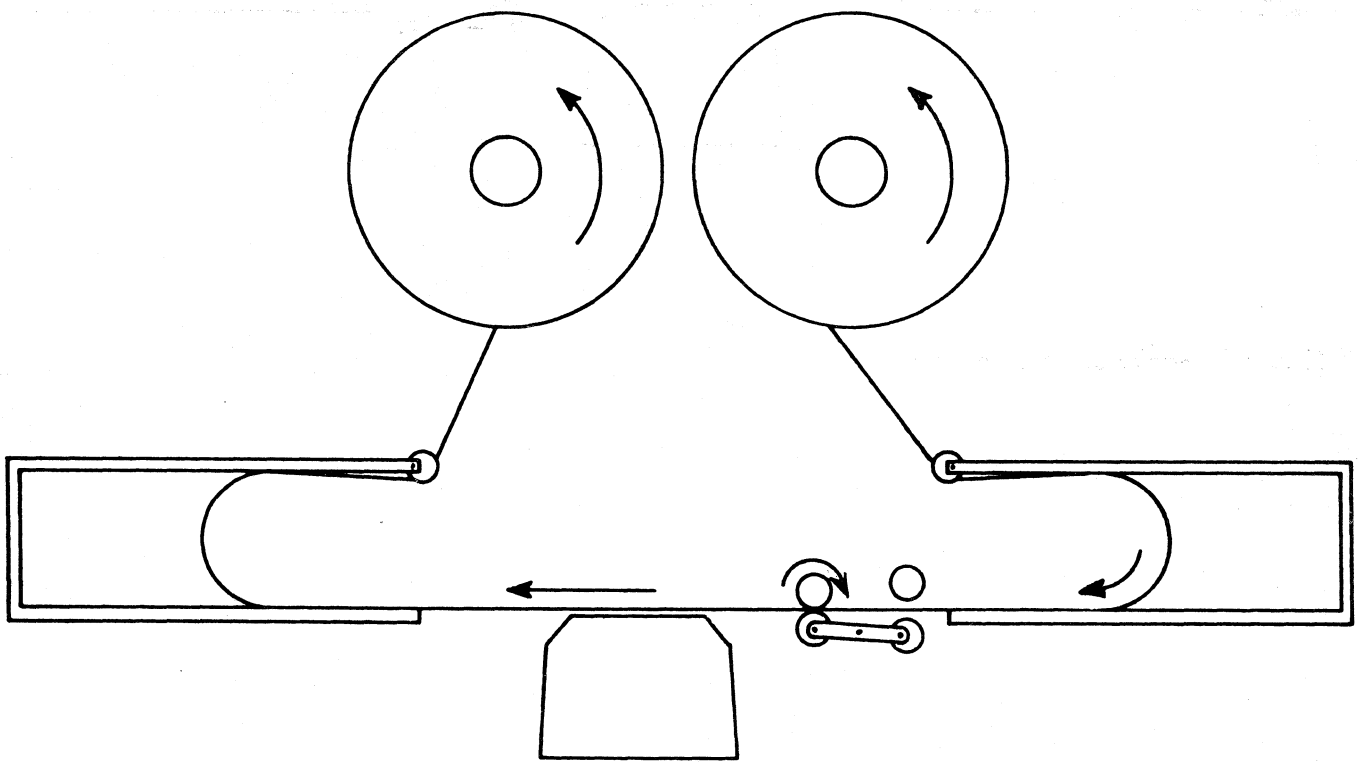


Figure 3 Backward Motion

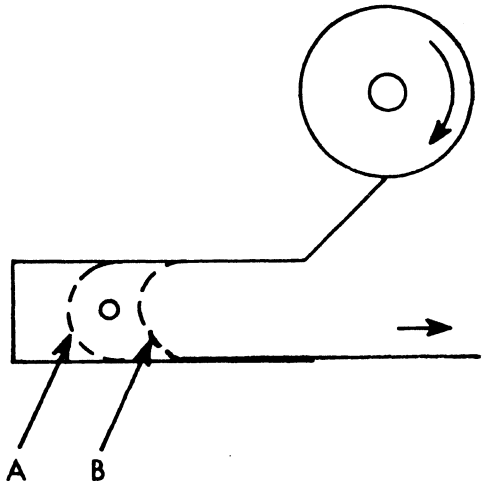


Figure 4 Forward

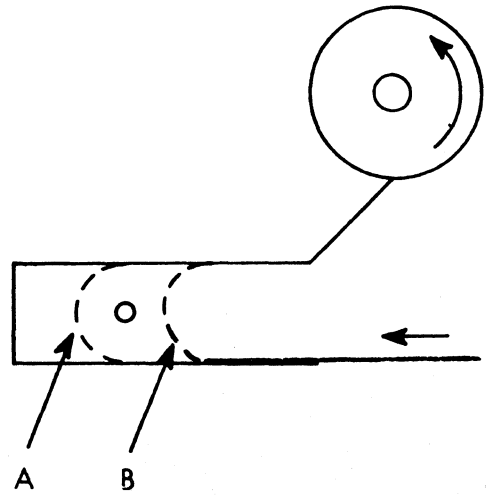


Figure 5 Backward

1. When moving tape backward,tape moves from (left to right) (right to left).

2. To move tape backward the drive capstan must turn (clockwise) (counterclockwise)

3. When moving tape backward, tape will be taken from the _____ column by the drive capstan.

4. When moving tape backward, the machine reel will (put tape into) (take tape out of) the right vacuum column.

5. The file and machine reels will turn (clockwise) (counter-clockwise) during backward tape motion.

6. The right vacuum column switch controls the _____ reel.

7. The file reel is controlled by the _____ _____ _____ switch.

8. When moving tape forward the file reel brake is applied when (tape is to the left) (tape is to the right) of the vacuum sensing switch in the left column.

9. Is it possible to have brake on both reels at the same time?

10. Is it possible for both reels to be driven at the same time?

Turn to Page 27 to check your answers.

ANSWERS TO PAGE 26

1. right to left

2. clockwise

3. right vacuum column

4. put tape into

5. counter-clockwise

6. machine

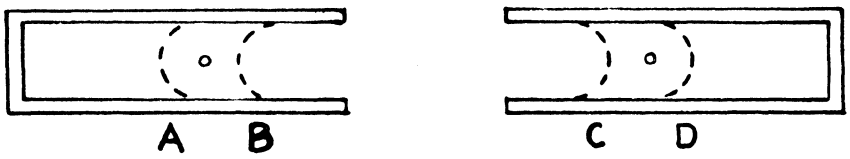
7. left vacuum column

8. tape is to the left

9. yes (remember the reels are controlled completely independent of each other)

10 yes (same as above)

Turn to Page 28



1. When moving tape backward and tape is at :

   Point A, the file reel will (have brake applied) (turn counter-clock-wise)
   Point B, the file reel will (") (")
   Point C, the machine reel will (have brake applied) (turn counter-clock-wise)
   Point D, the machine reel will (") (")

2. When moving forward and tape is at :

   Point A, the file reel will (have brake applied) (turn clock-wise)
   Point B, the file reel will (") (")
   Point C, the machine reel will (have brake applied)(turn clock-wise)
   Point D, the machine reel will (") (")

Turn to Page 29 to check your answers.

ANSWERS TO PAGE 28

1. A. counter-clockwise (taking tape out of the left column)
   B. have brake applied
   C. counter-clockwise (putting tape into the right column)
   D. have brake applied

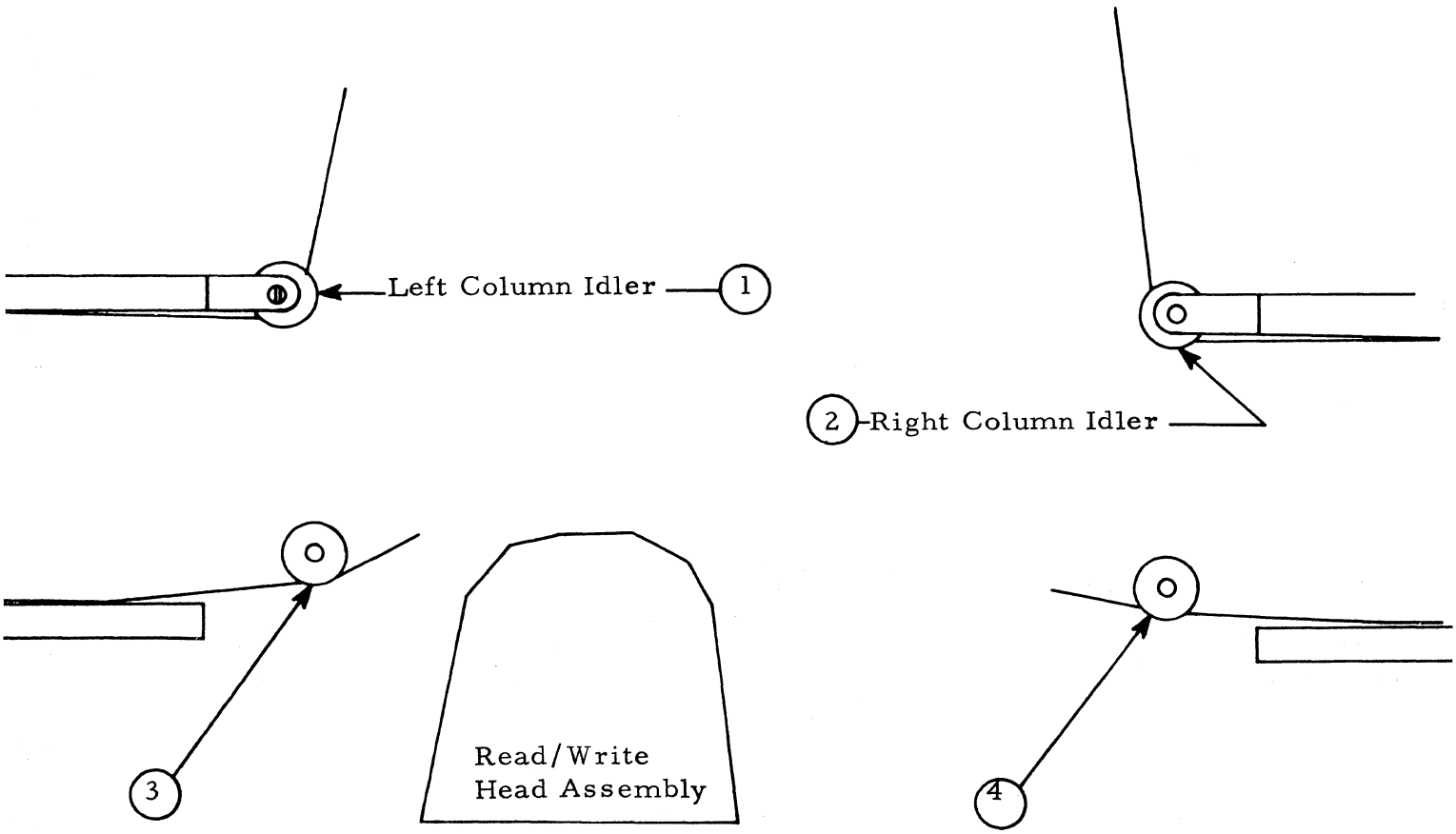
2. A. have brake applied
   B. clockwise (putting tape into the left column)
   C. have brake applied
   D. clockwise (taking tape out of the right column)

Turn on the tape recorder

SECTION 5

TAPE TRANSPORT IDLERS, GUIDES AND TAPE PATHS.

OBJECTIVE: Be able to name and locate the tape transport idlers and guides. Also be able to draw the tape paths through the transport.


Left Column Idler
1
2
Right Column Idler
3
Read/Write
Head Assembly
4

'igure 1

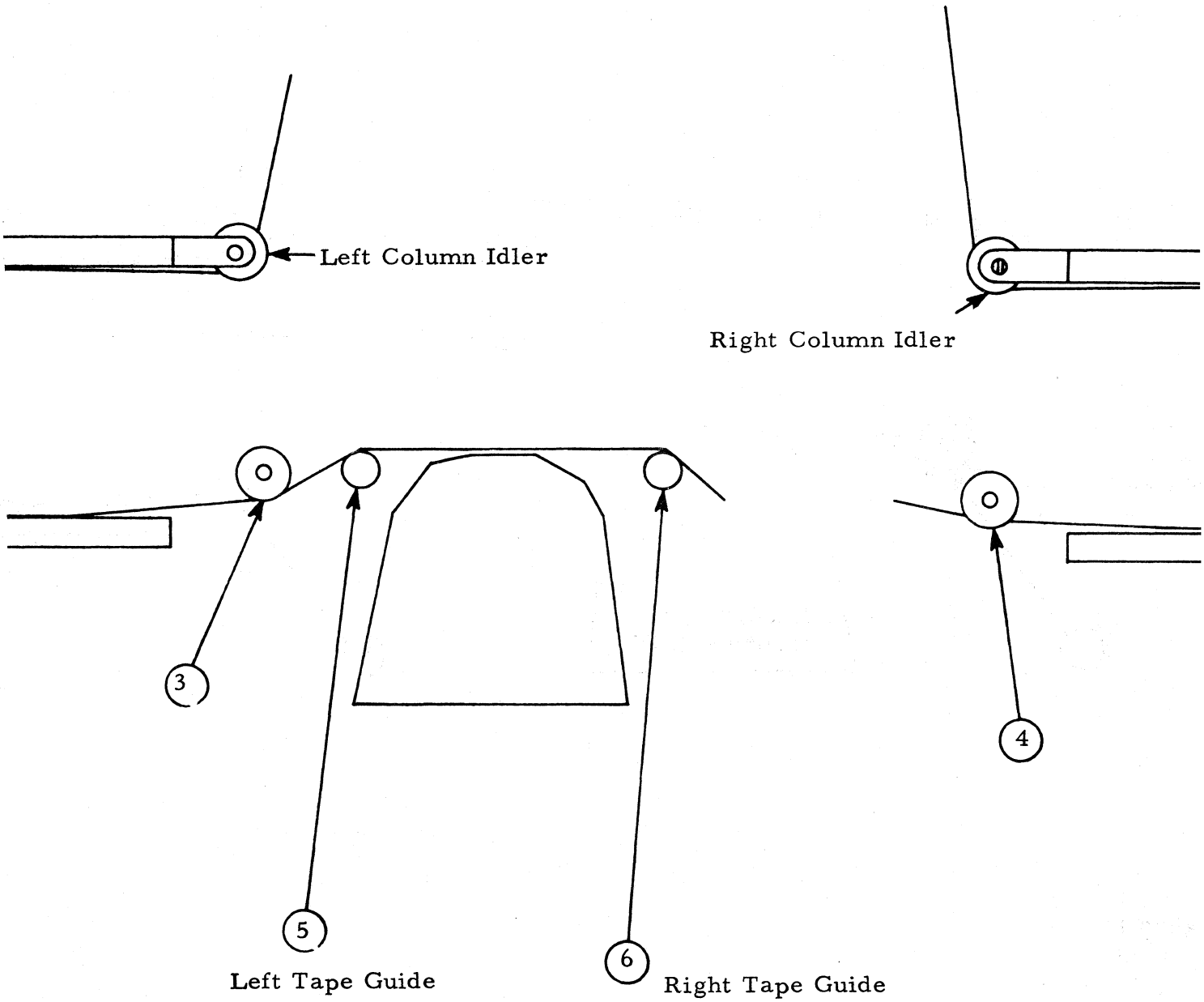

Left Column Idler
Right Column Idler
3
4
5
6
Left Tape Guide
Right Tape Guide

Figure 2

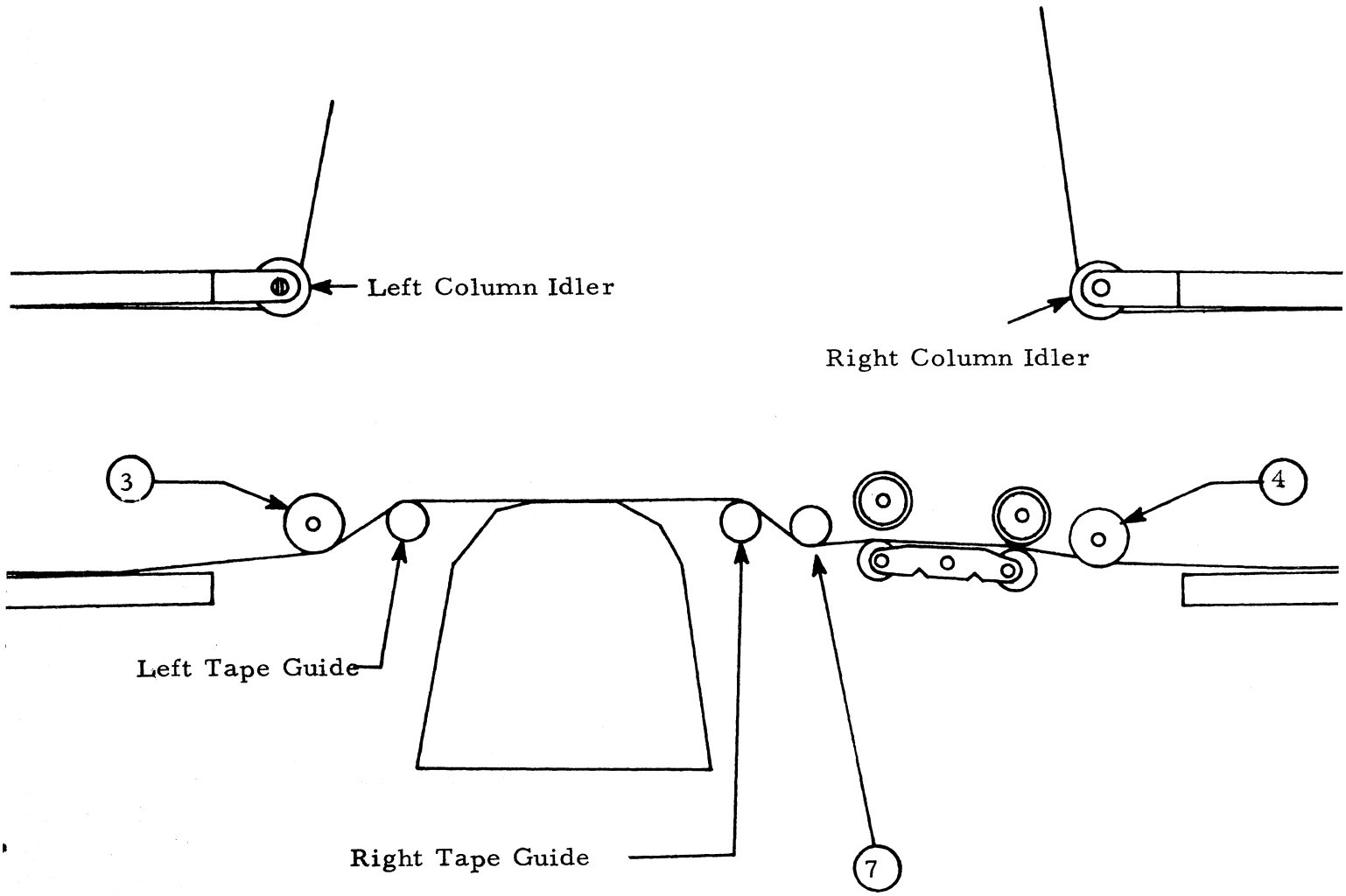

Left Column Idler
Right Column Idler
3
4
Left Tape Guide
Right Tape Guide
7

Figure 3

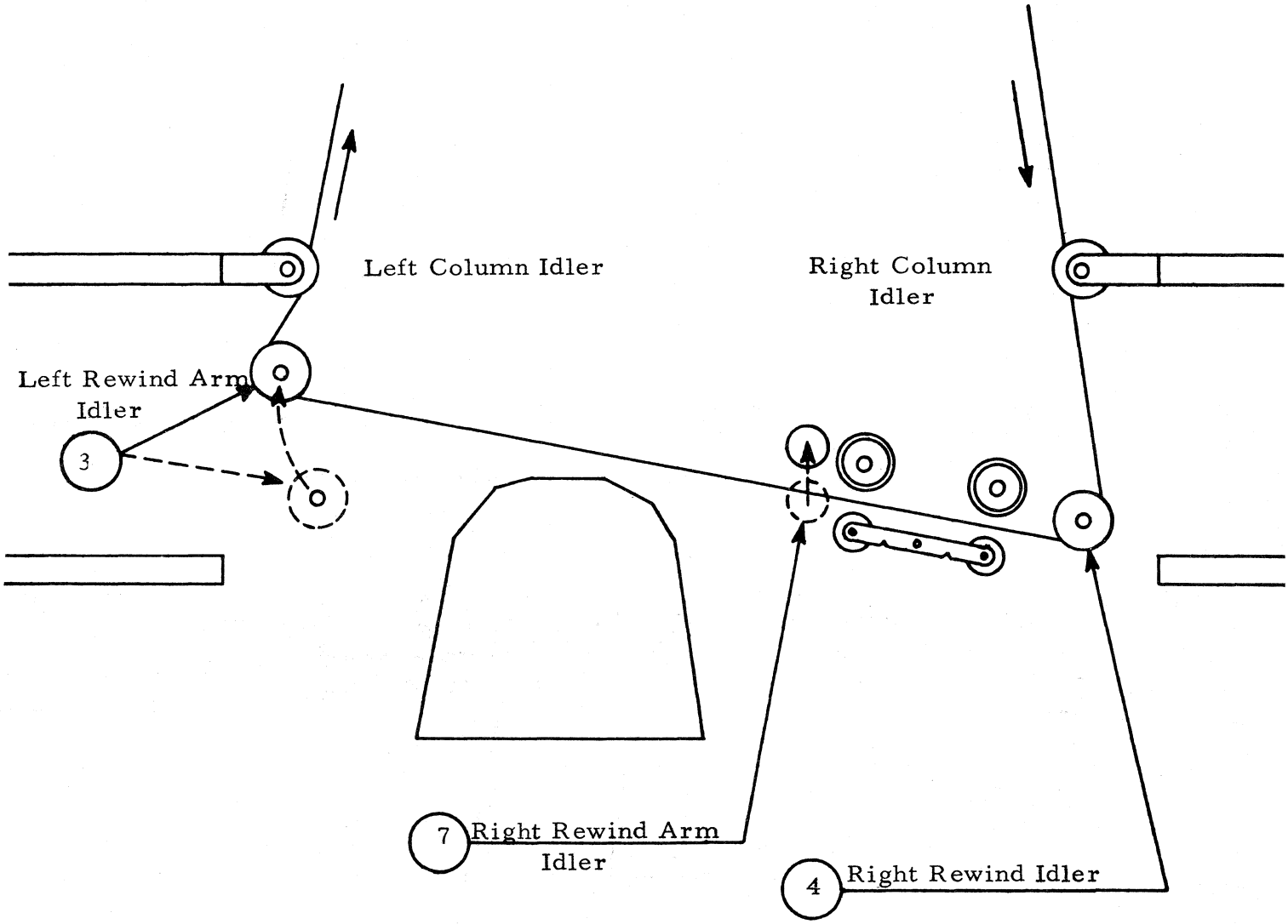

Left Column Idler
Right Column Idler
Left Rewind Arm Idler
3
7
Right Rewind Arm Idler
4
Right Rewind Idler

Figure 4

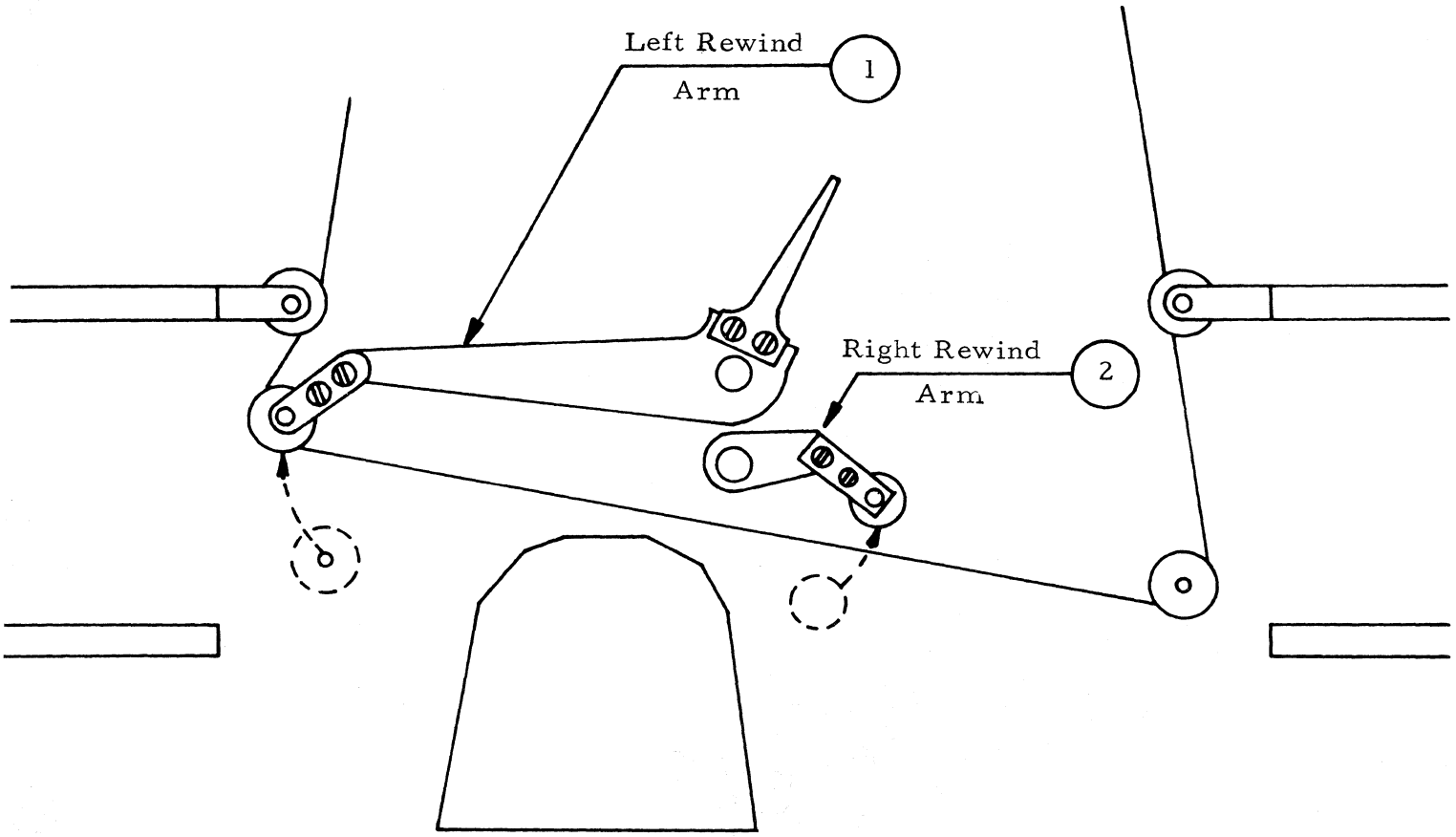


Figure 5

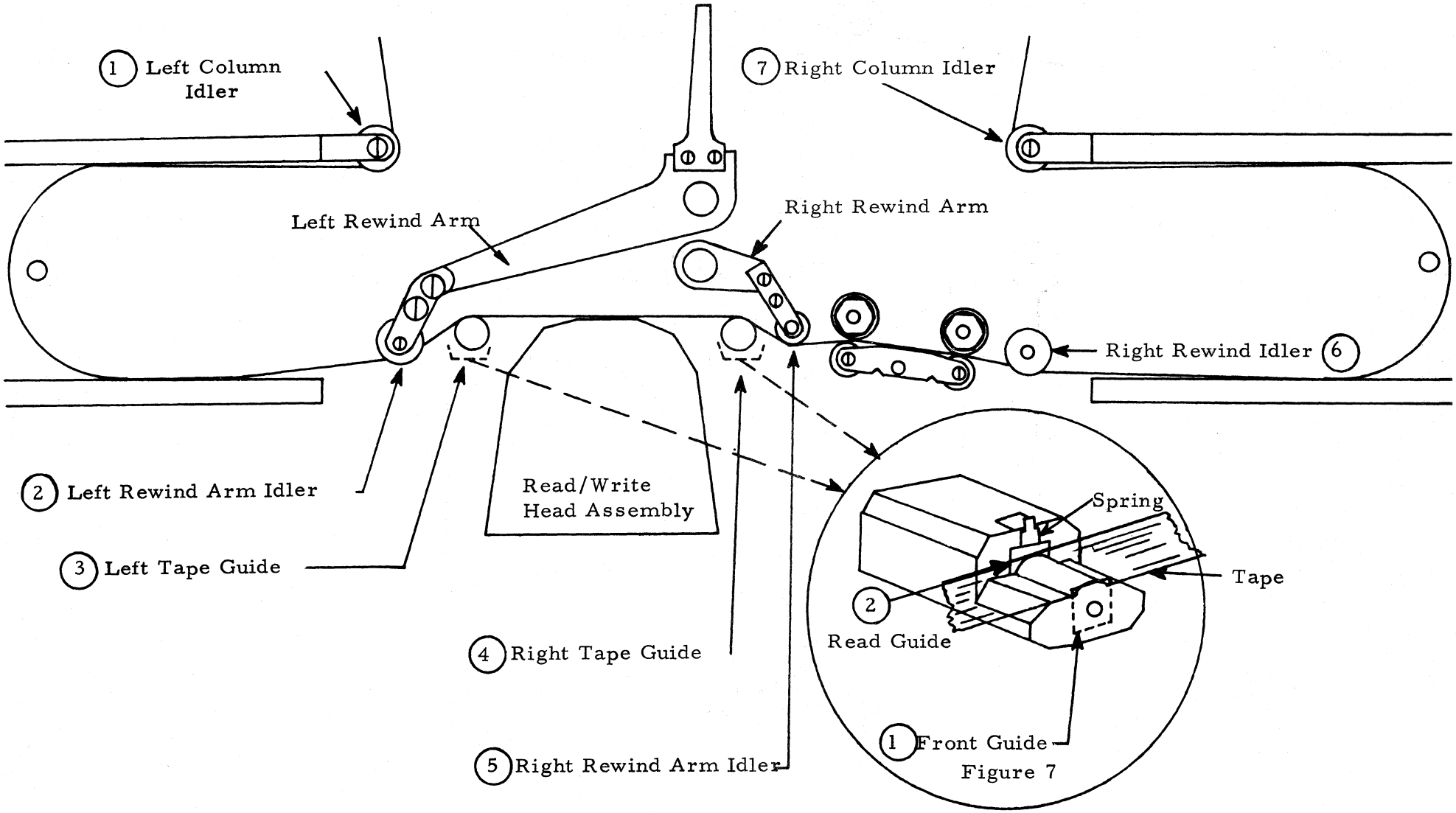


Figure 7

Figure 6

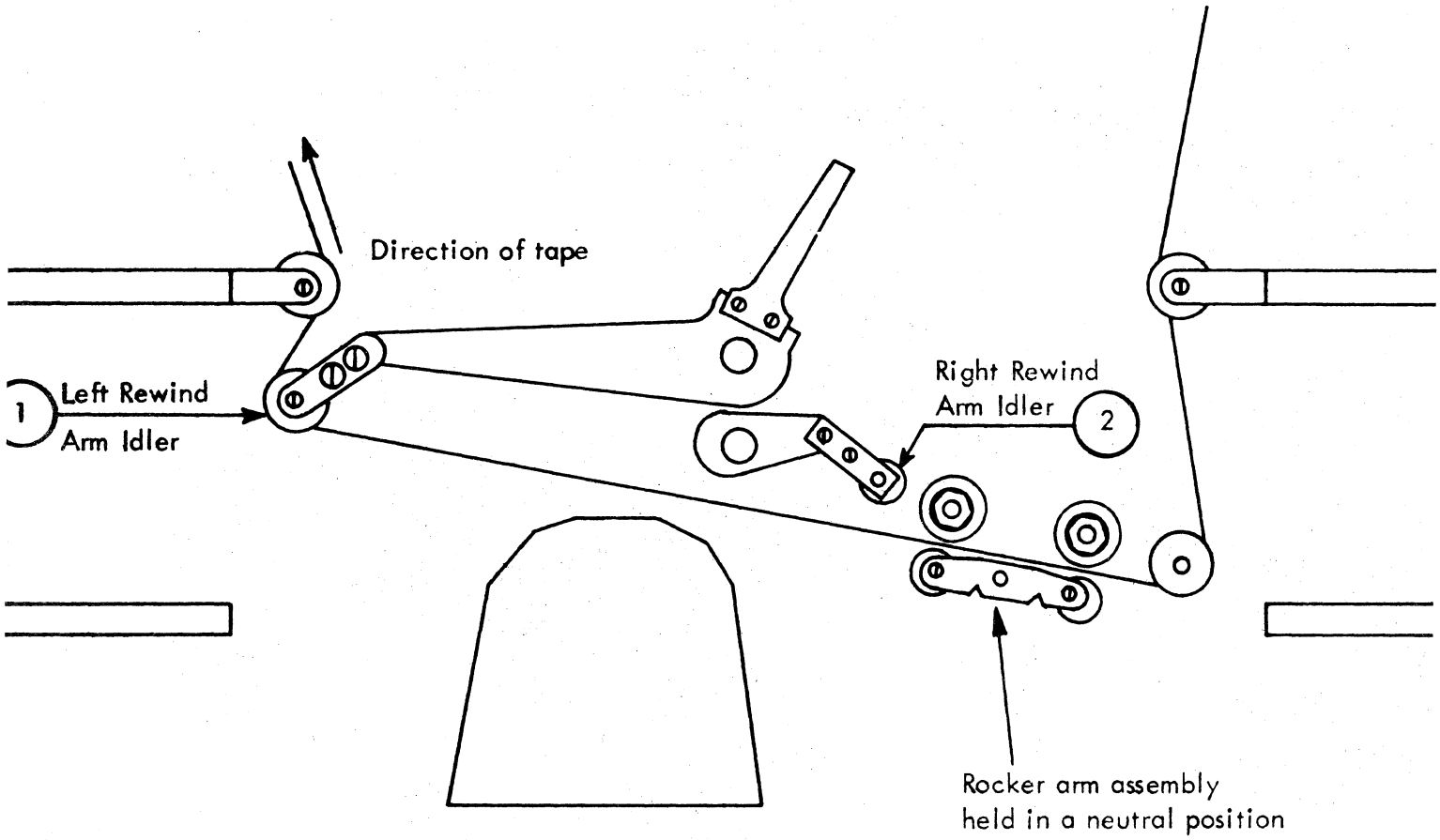
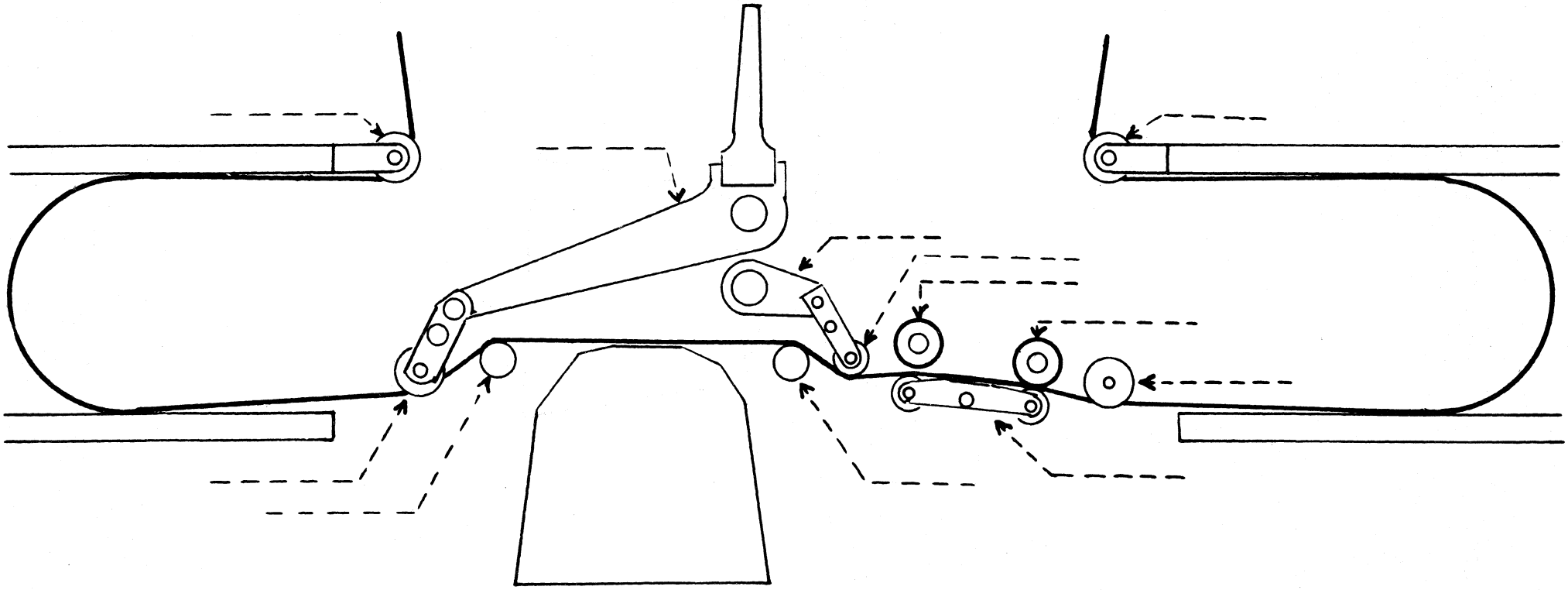

Direction of tape
1
Left Rewind
Arm Idler
Right Rewind
Arm Idler
2
Rocker arm assembly
held in a neutral position

Figure 8

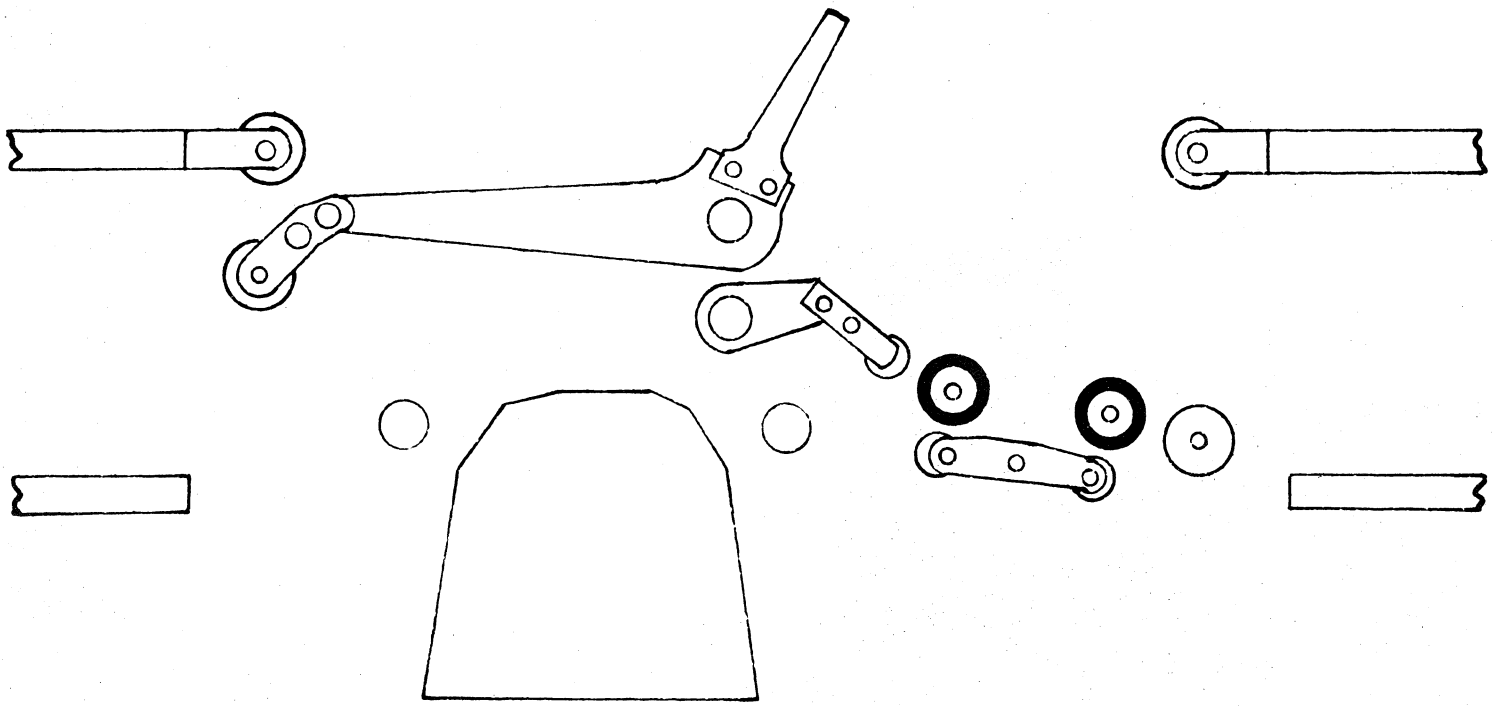
1. Label the drawing as indicated by the arrows.

2. Check your answers against page 36

3. Turn to page 39



1. Draw the tape path for high speed **rewind** on the diagram below.



2. Check answer with page 37

3. Turn to Page 40 when finished.

1. During high speed rewind the left rewind arm and the right rewind arm are in a _____position.

2. During high speed rewind the rocker arm is held in a _____ position.

3. Tape is rewound at high speed by driving the _____ reel.

4. Brake and drive are both removed from the _____reel while high speed rewinding.

5. Because the vacuum columns are not used for high speed rewind, the control of the tape reels must be removed from the _____ _____switches.

Turn to Page 41 to check your answers.

ANSWER TO PAGE 40

1. raised
2. neutral
3. file reel
4. machine reel
5. vacuum column

Turn on the tape recorder.

SECTION 6

REEL DRIVE AND BRAKE MECHANISMS

OBJECTIVE: Be able to state the names of the parts of the reel drive and brake assembly and how they operate.

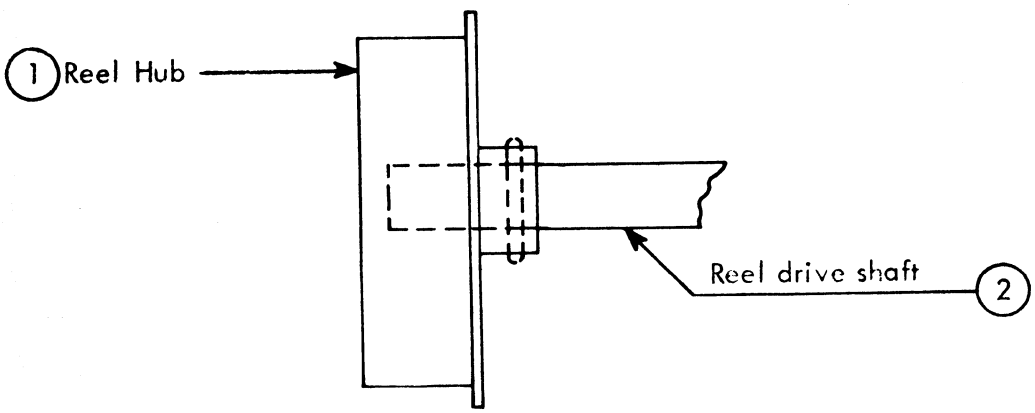


Figure 1a Reel Hub

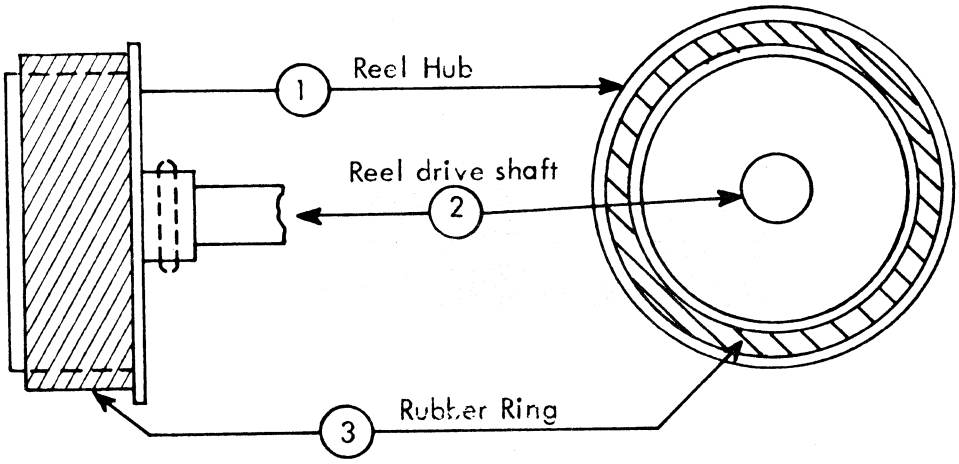


Figure 1b

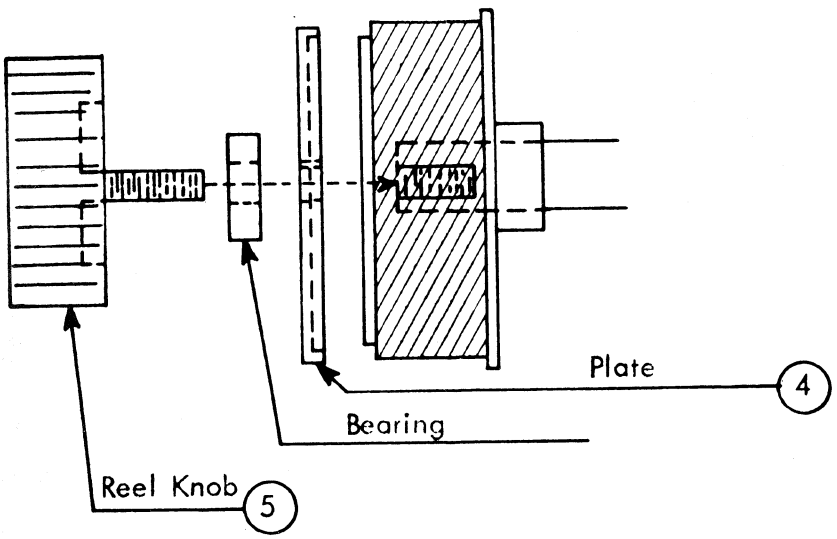


Figure 1c

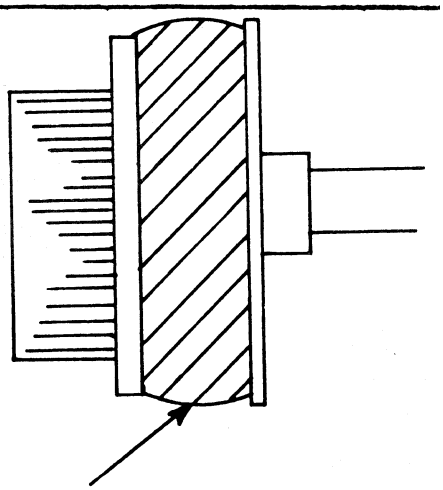


Figure 1d

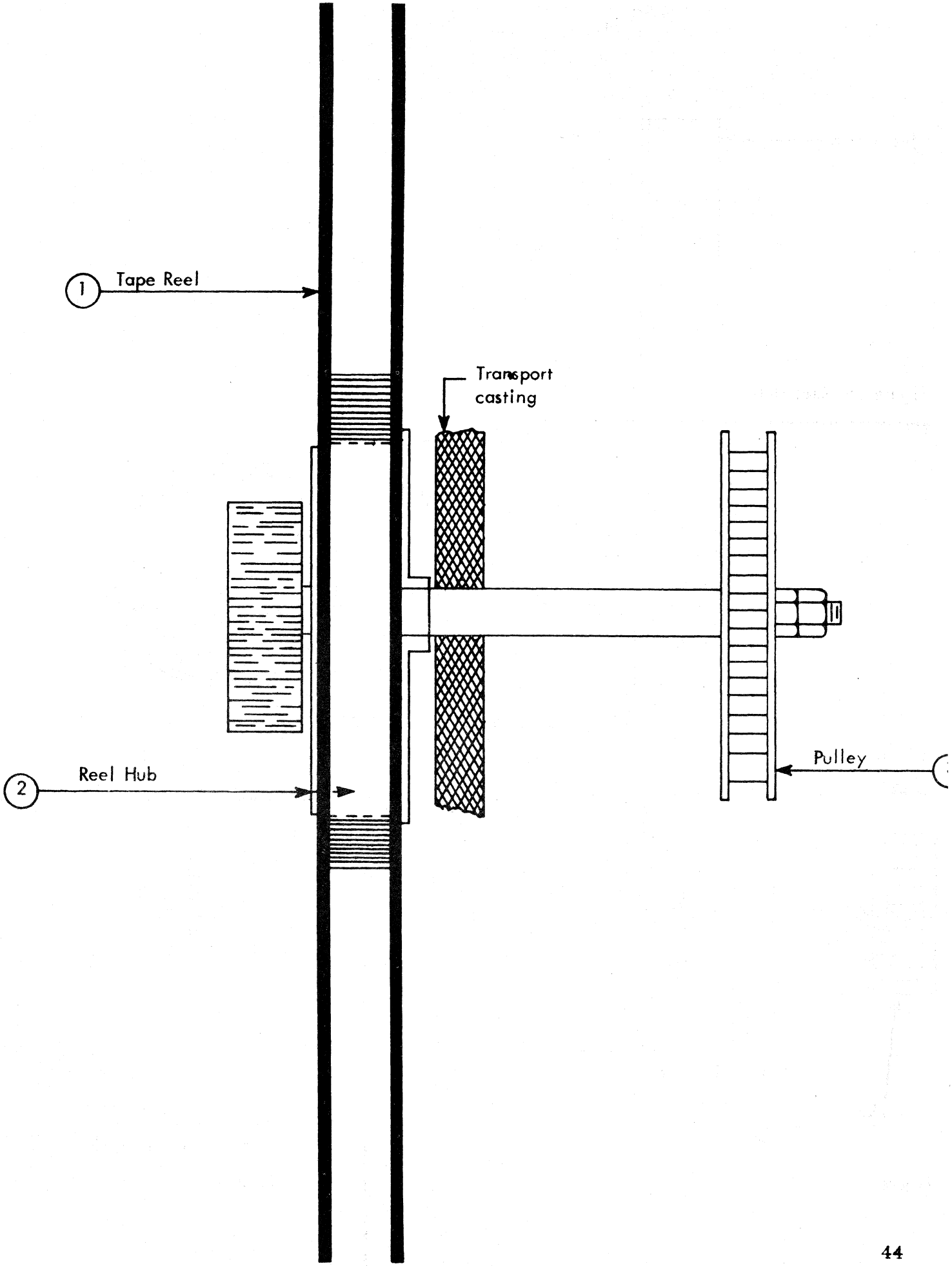


Figure 2

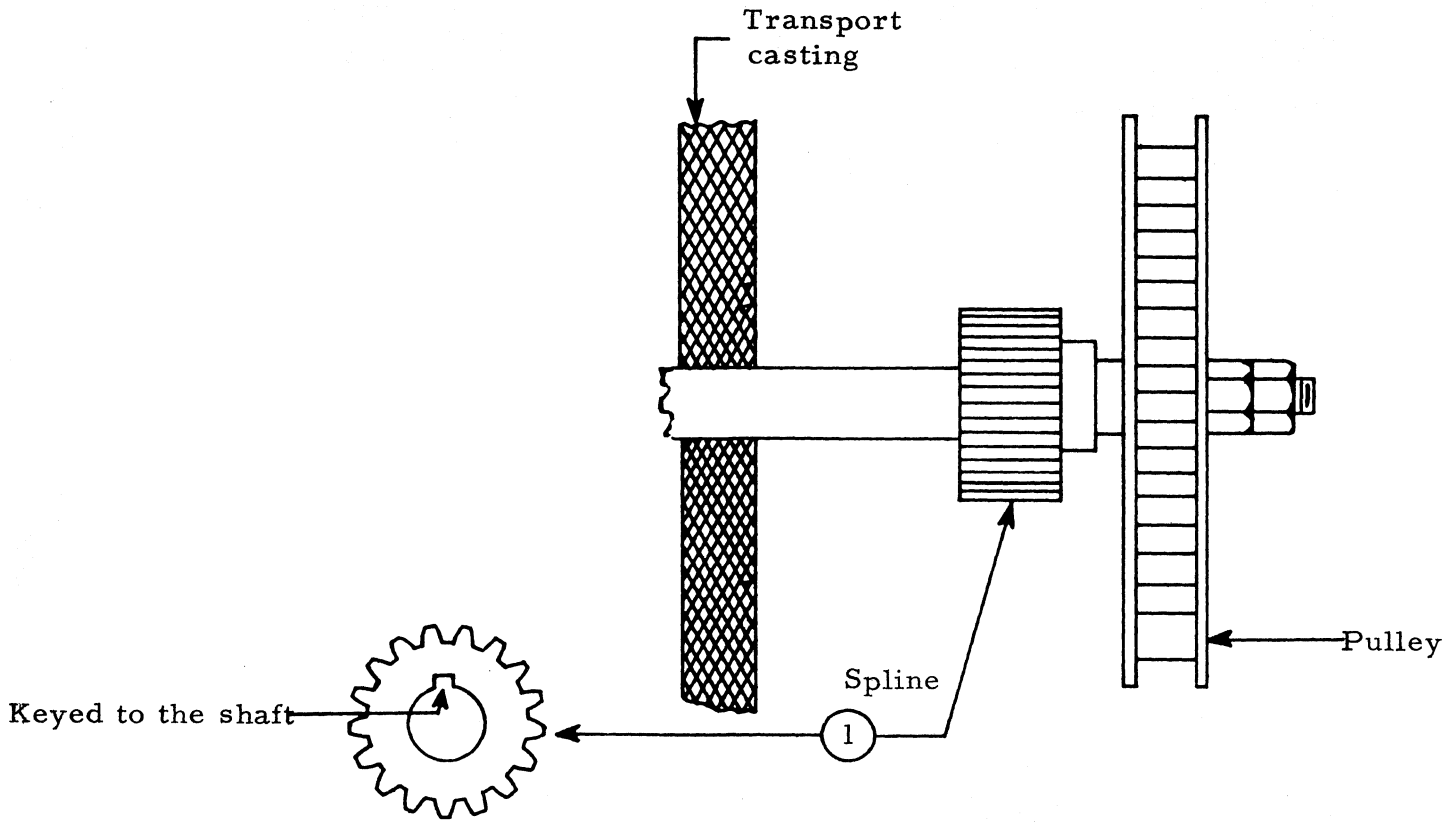


Figure 3a

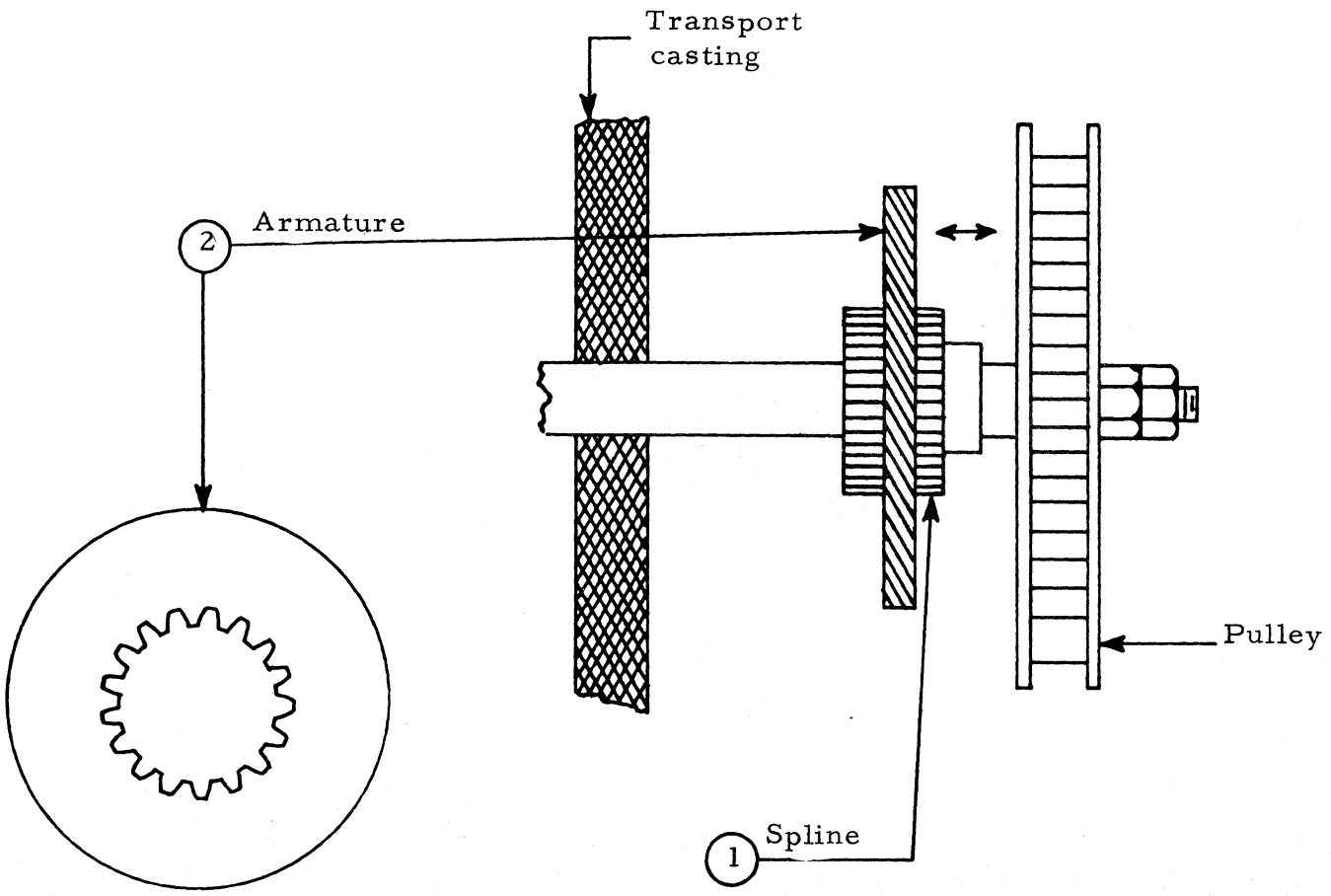


Figure 3b

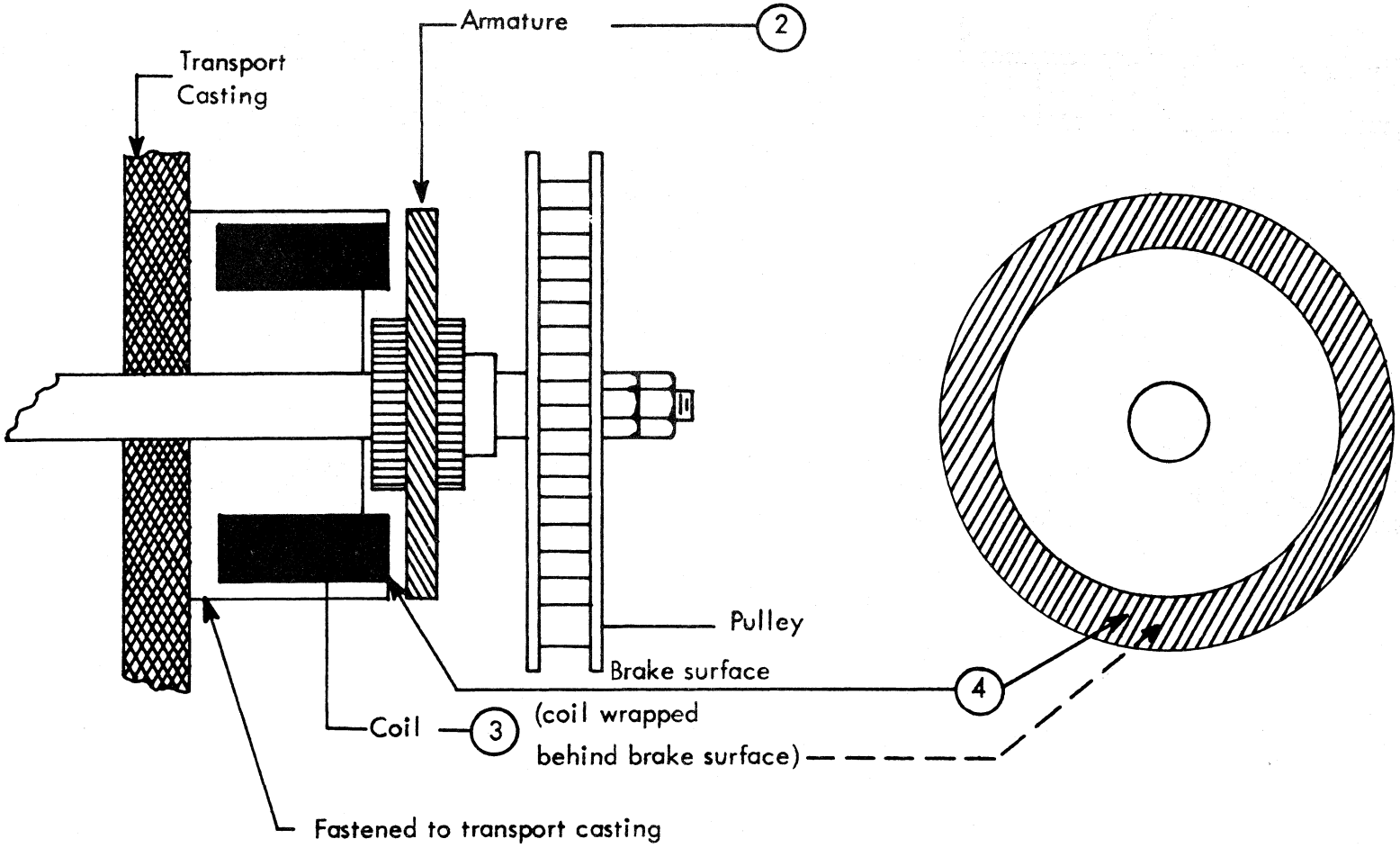


Figure 4 No Brake Applied

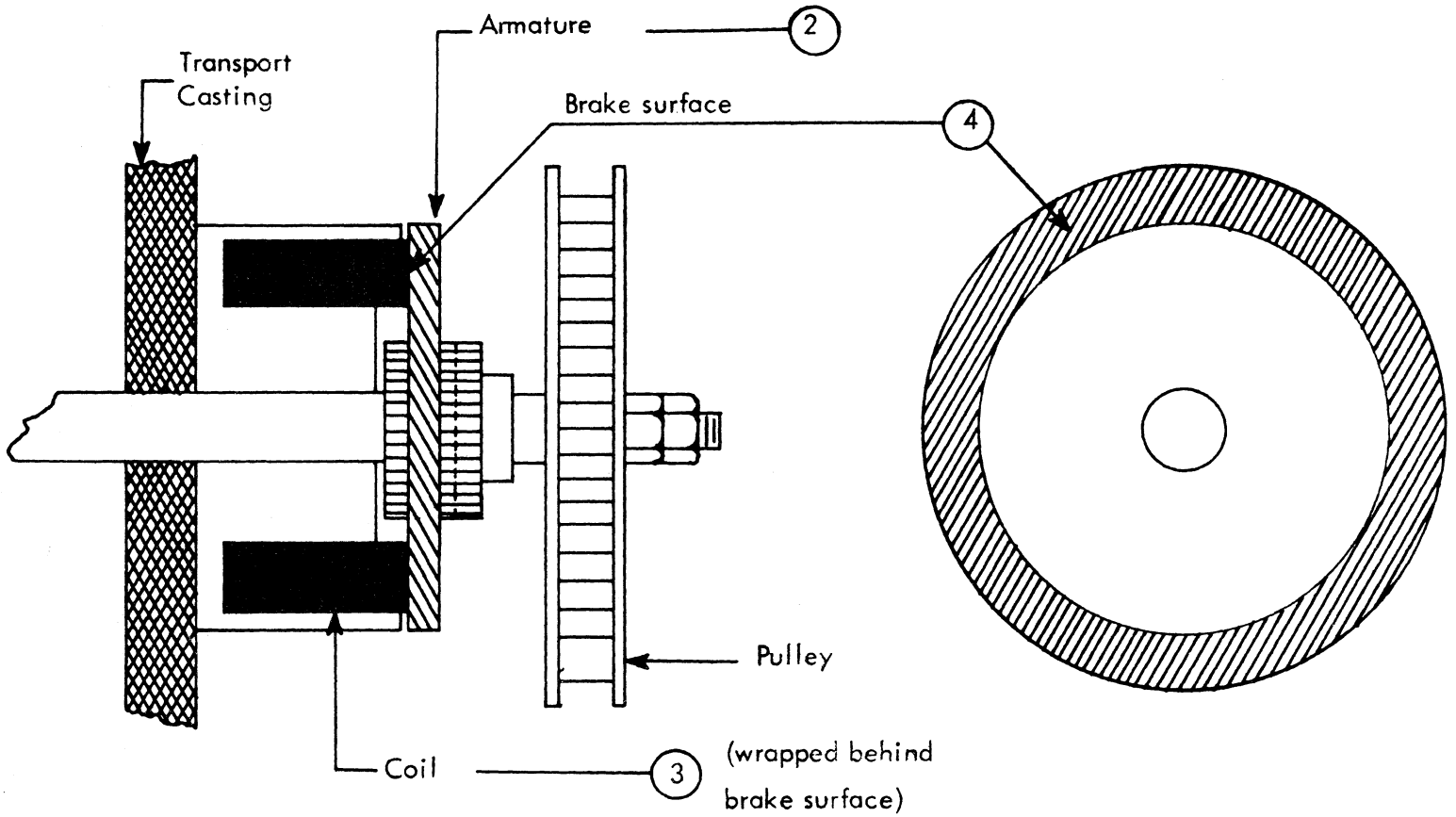


Figure 5 Brake applied

1. Is it necessary to remove the reel knob to mount a reel of tape?

2. The brake coil attracts the _____ to the braking surface.

3. The braking action is transferred to the reel drive shaft because the armature is meshed with the _____ keyed to the shaft.

4. Whenever the reel drive motor is energized, the brake coil is _____.

5. The 7330 has _____ (how many) reel drive motors and _____ brake assemblies.

Turn to Page 49 to check your answers.

ANSWERS TO PAGE 47

1. No (it is only necessary to loosen the knob enough to allow the tape reel to fit over the rubber expansion ring).

2. armature

3. spline

4. de-energized

5. 2, 2

Turn ON the recorder when you have finished this review.

SECTION 7

LEFT AND RIGHT REWIND ARM OPERATING MECHANISMS (REAR OF TRANSPORT)

OBJECTIVE: Be able to name, locate, and state the function of the left and right rewind arm mechanisms.

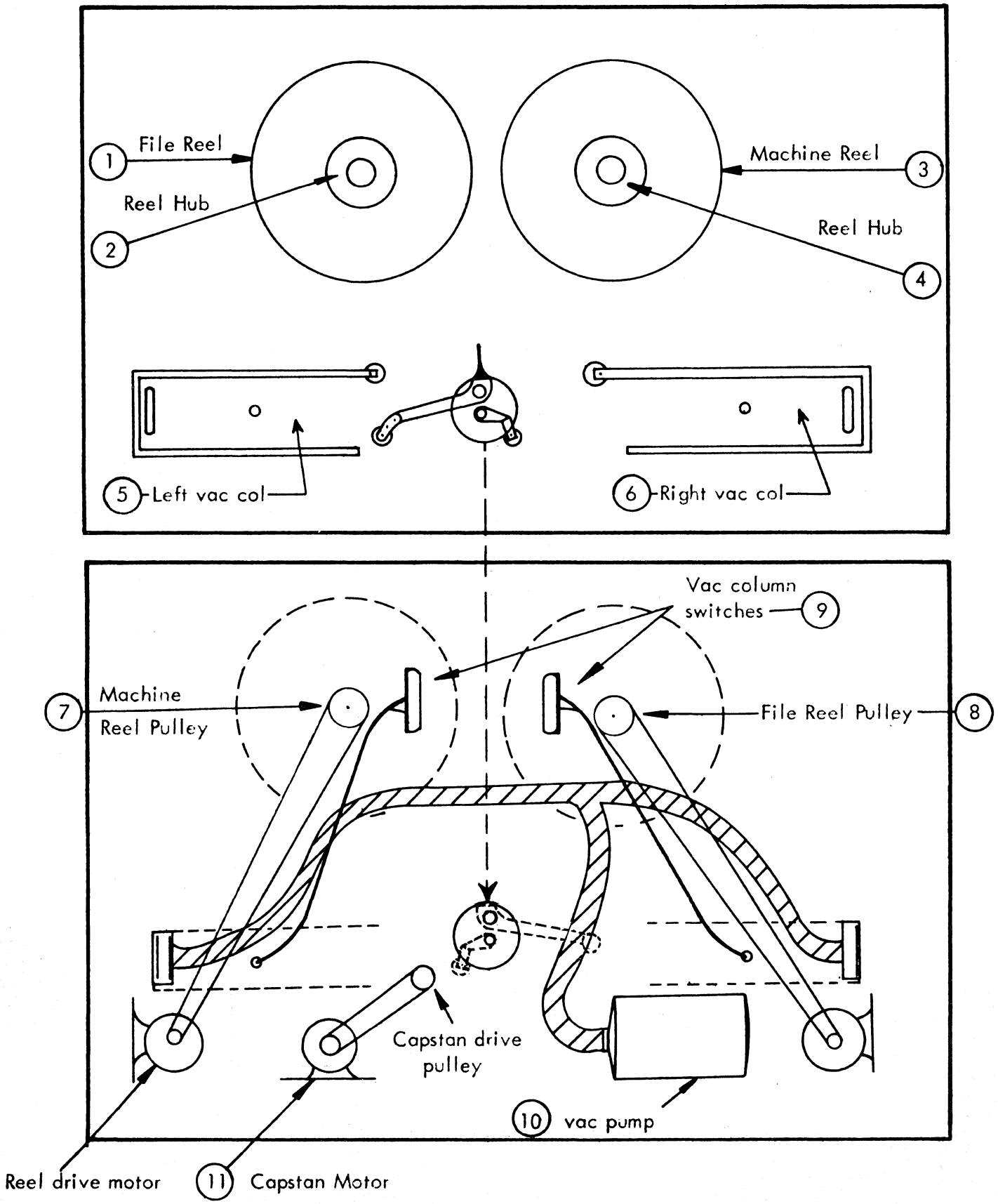

1 File Reel
2 Reel Hub
3 Machine Reel
4 Reel Hub
5 Left vac col
6 Right vac col
7 Machine Reel Pulley
8 File Reel Pulley
9 Vac column switches
10 vac pump
11 Capstan Motor
Capstan drive pulley
Reel drive motor

Figure 1

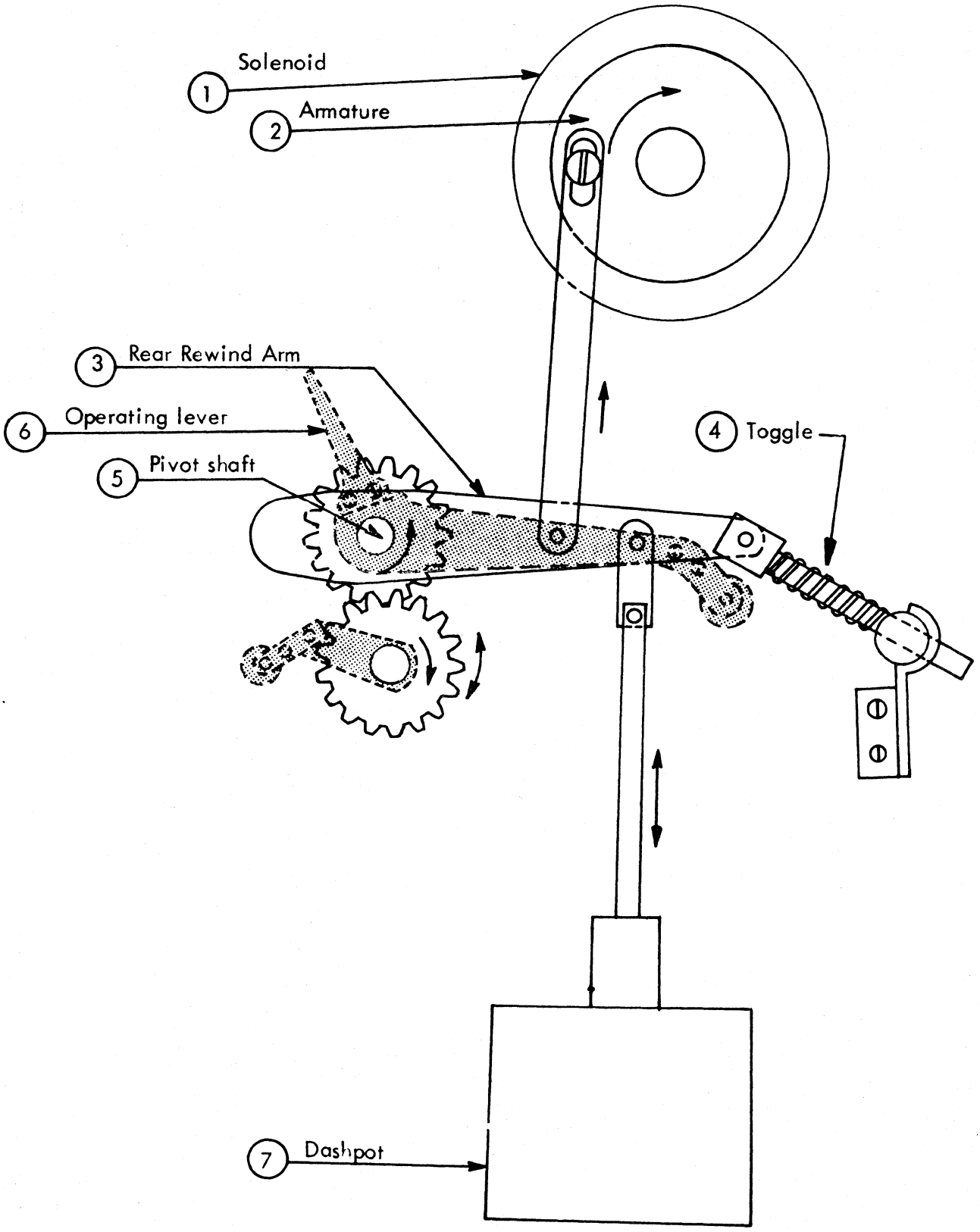


Figure 2 Left and Right Rewind Arms Operating Mechanism

1. The solenoid can (raise) (lower) the rewind arms.

2. The dashpot is effective when the rewind arms are being (raised) (lowered).

3. What holds the rewind arms in the up or down position.

4. The rewind arms can be raised or lowered manually by the _____ lever.

5. The rewind arms are <u>always</u> lowered manually by the operating lever. True or False

6. State whether the following components are located on the front or rear of the transport.

   a. operating lever_____
   b. left rewind arm_____
   c. toggle_____
   d. solenoid_____
   e. right rewind arm_____
   f. spur gears_____
   g. right rewind arm idler_____
   h. rear rewind arm_____

Turn to Page 54 to check your answers.

ANSWERS TO PAGE 53

1. raise

2. lowered

3. the toggle

4. operating

5. true

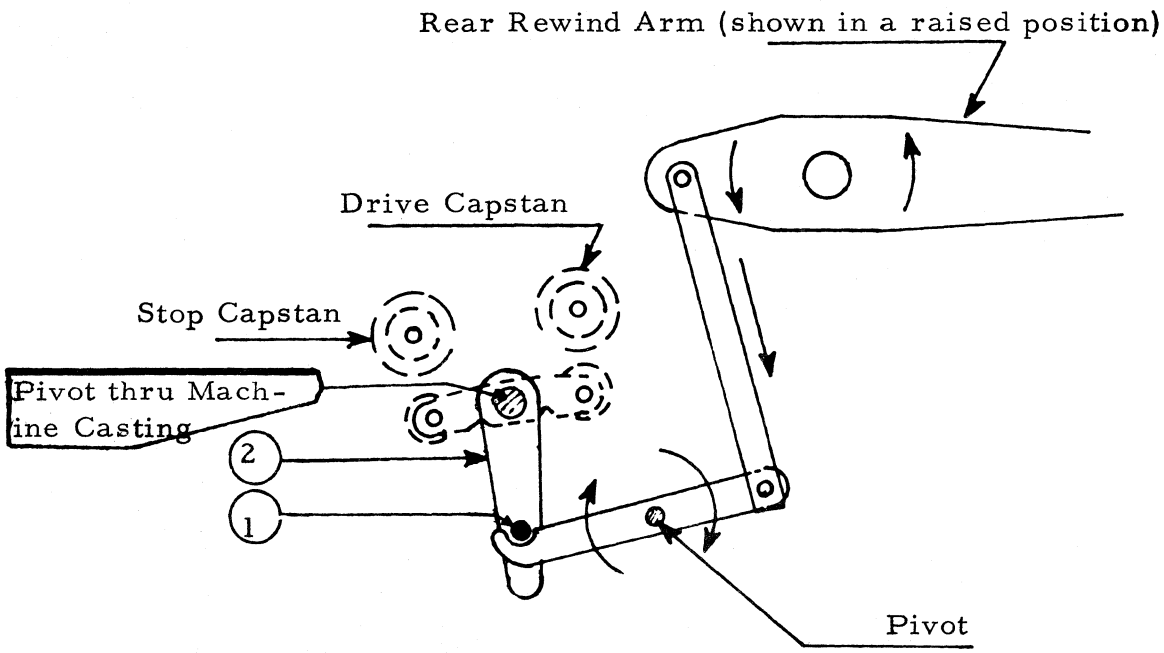
6.
   a. front
   b. front
   c. rear
   d. rear
   e. front
   f. rear
   g. front
   h. rear

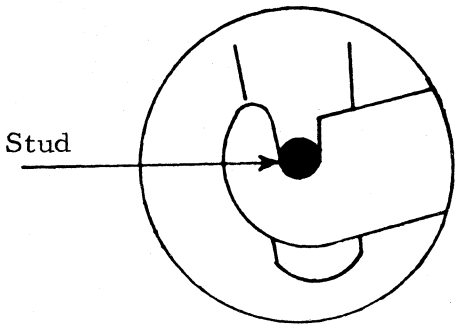
Turn ON the recorder when you have finished.

SECTION 8

ROCKER ARM CENTERING DEVICE AND MOVING COIL ASSEMBLY.

OBJECTIVE: To be able to state the operation of the rocker-arm centering device and the moving coil assembly.





Enlarged view of rocker-arm centering device

Figure 1 Rocker Arm Centering Device

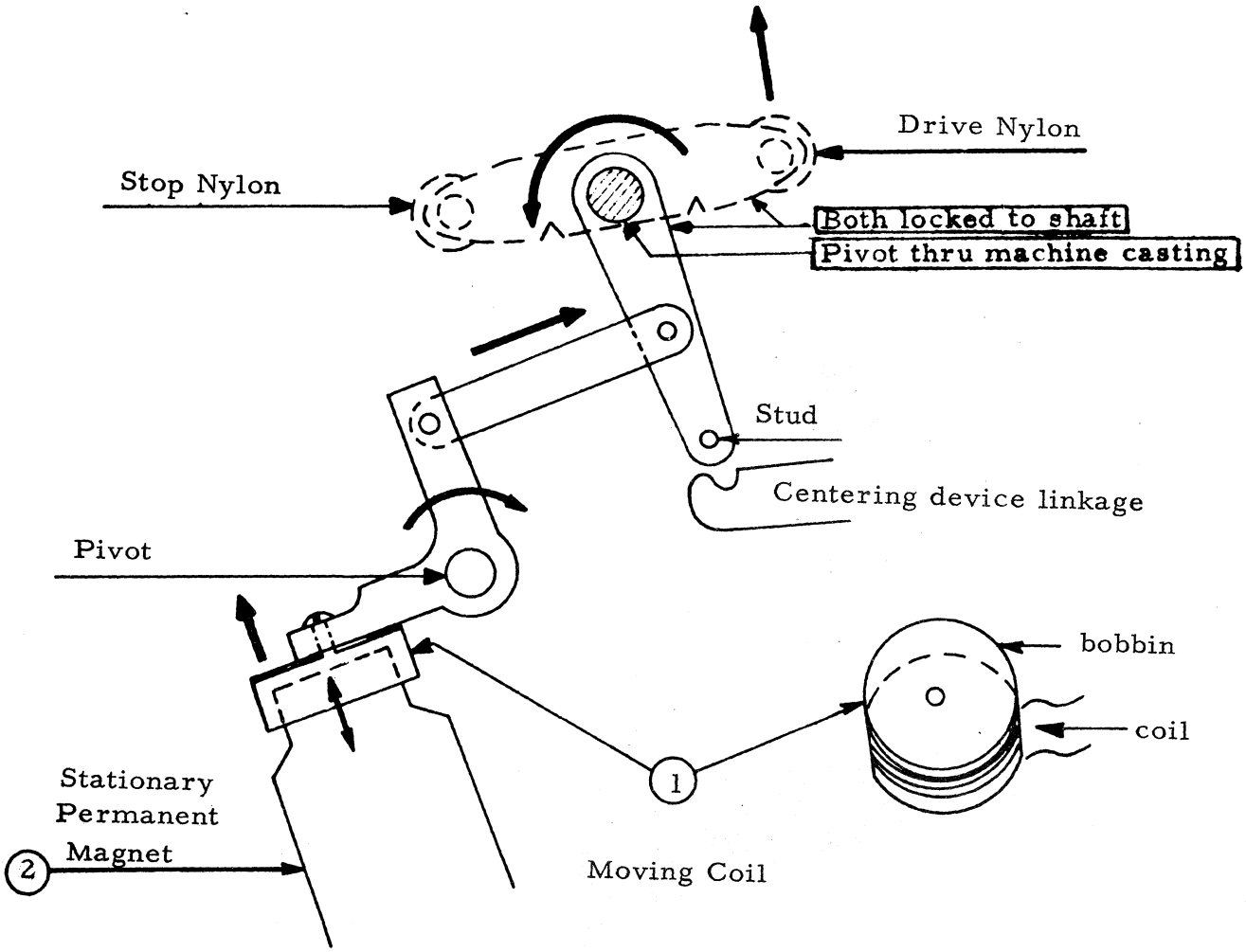
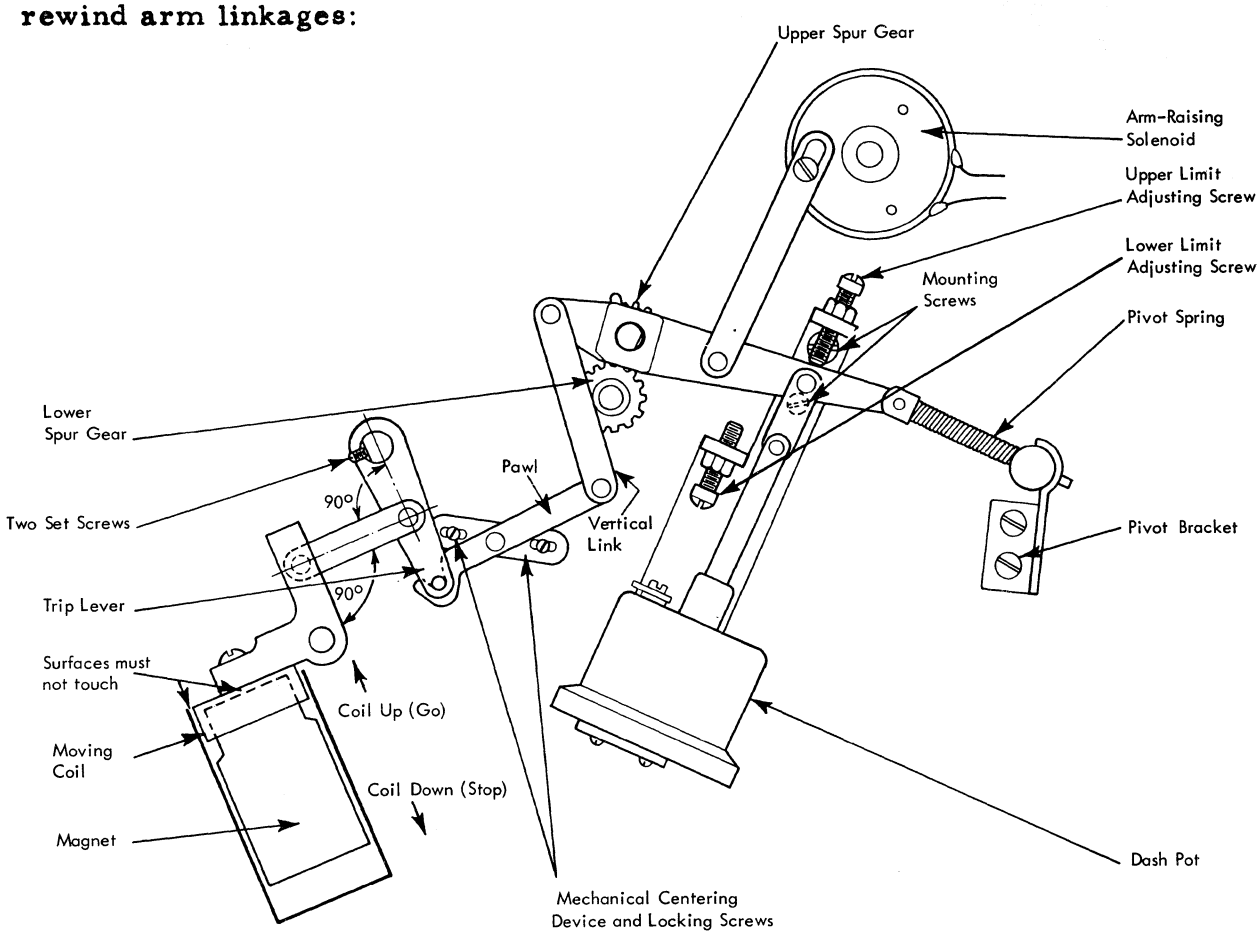


Figure 2 Moving Coil Assembly

Here, for your reference, is a figure showing the moving coil and rear rewind arm linkages:



1. **The rocker arm centering device holds the rocker arm in a _____position.**

2. **The rewind arms must be (up)(down) to cause the rocker arm assembly to be held in a neutral position.**

3. **The rocker arm assembly must be in a neutral position to thread tape through the transport, to remove tape from the transport, or during _____ _____ _____.**

4. **To drive tape, the moving coil (moves toward)(moves away from) the magnet.**

5. **To operate the rocker arm with the moving coil, the rocker arm centering device must be (engaged)(disengaged).**

Turn to Page 59 to check your answers.

ANSWERS TO PAGE 58

1. neutral

2. up

3. high speed rewind

4. moves away from

5. disengaged

Turn ON the recorder when you have finished this review.

SECTION 9

THEORY OF MAGNETIC WRITING USING THE BINARY CODED DECIMAL SYSTEM OF CODING.

OBJECTIVE: At the end of this section you should be able to state:

1. How the 7330 magnetizes tape and stores information.
2. What comprises the complete tape record.
3. What the Inter Record Gap is in terms of magnetic theory.

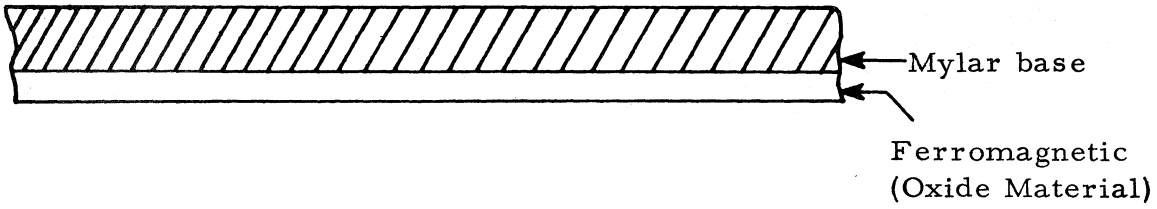


Figure 1 Magnetic Tape - side view - enlarged

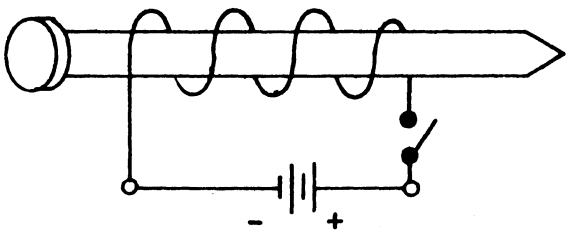


Figure 2

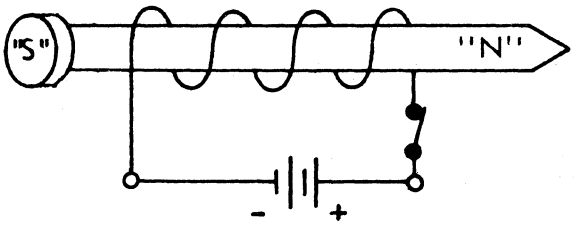


Figure 3

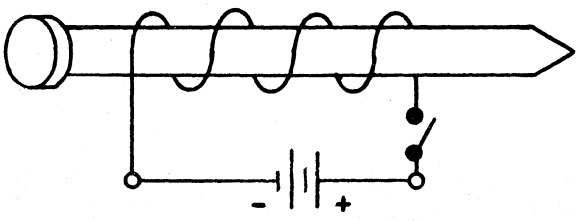


Figure 4

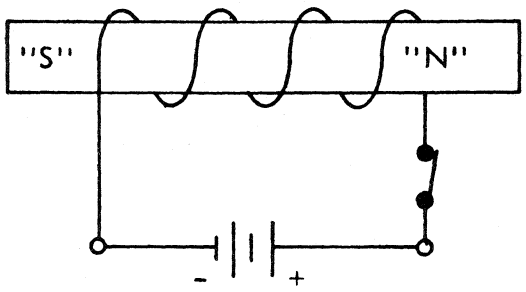


Figure 5

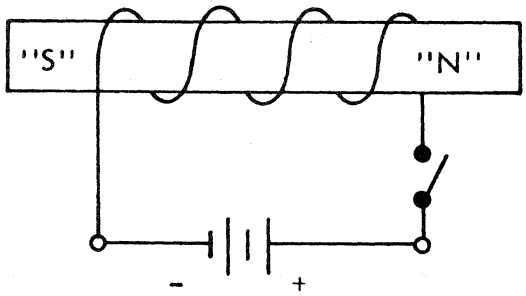


Figure 6

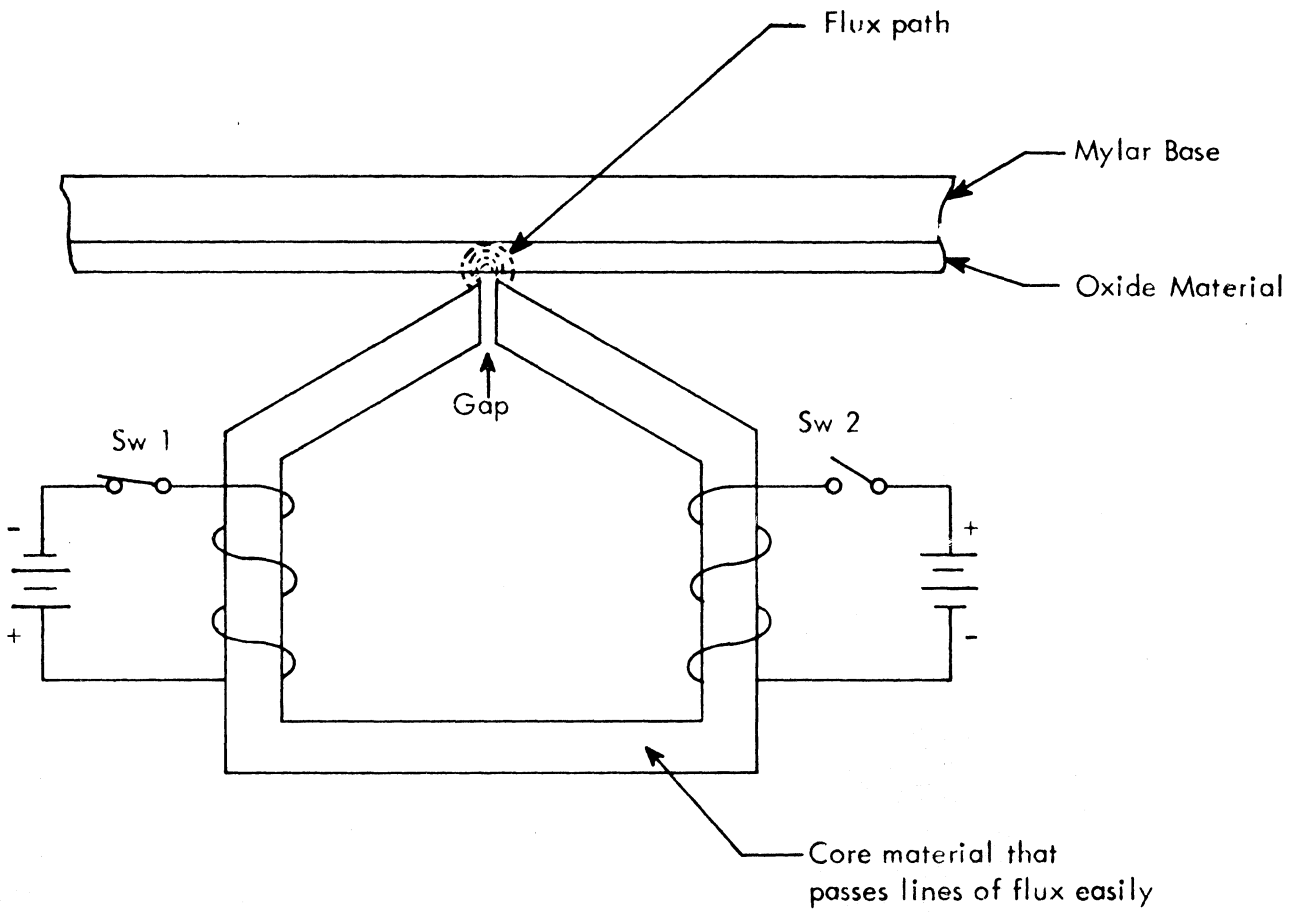

Flux path
Mylar Base
Oxide Material
Gap
Sw 1
Sw 2
-
+
+
-
Core material that
passes lines of flux easily

Figure 7

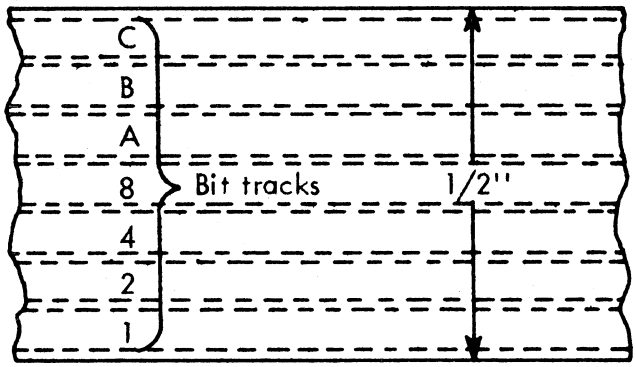


Figure 8

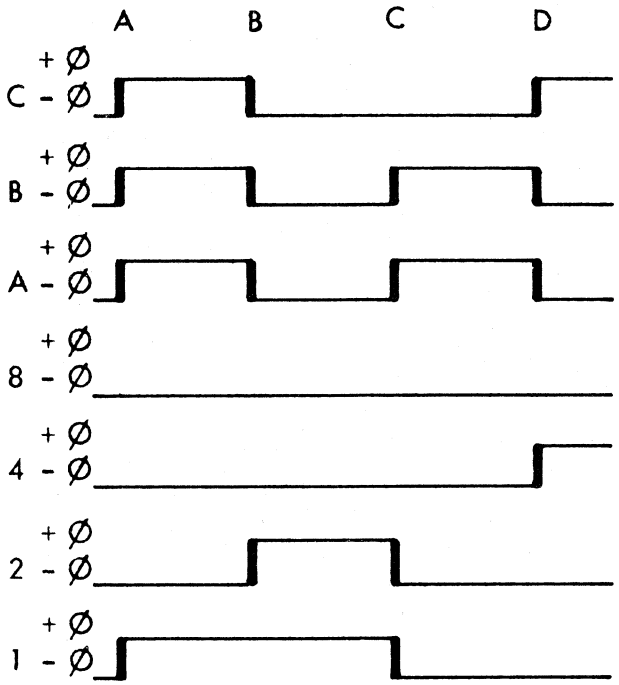
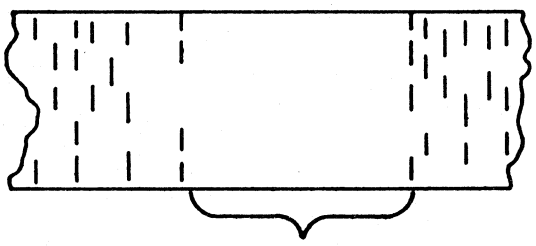


Figure 9



Inter Record Gap - approximately 3/4" of erased tape

Figure 10

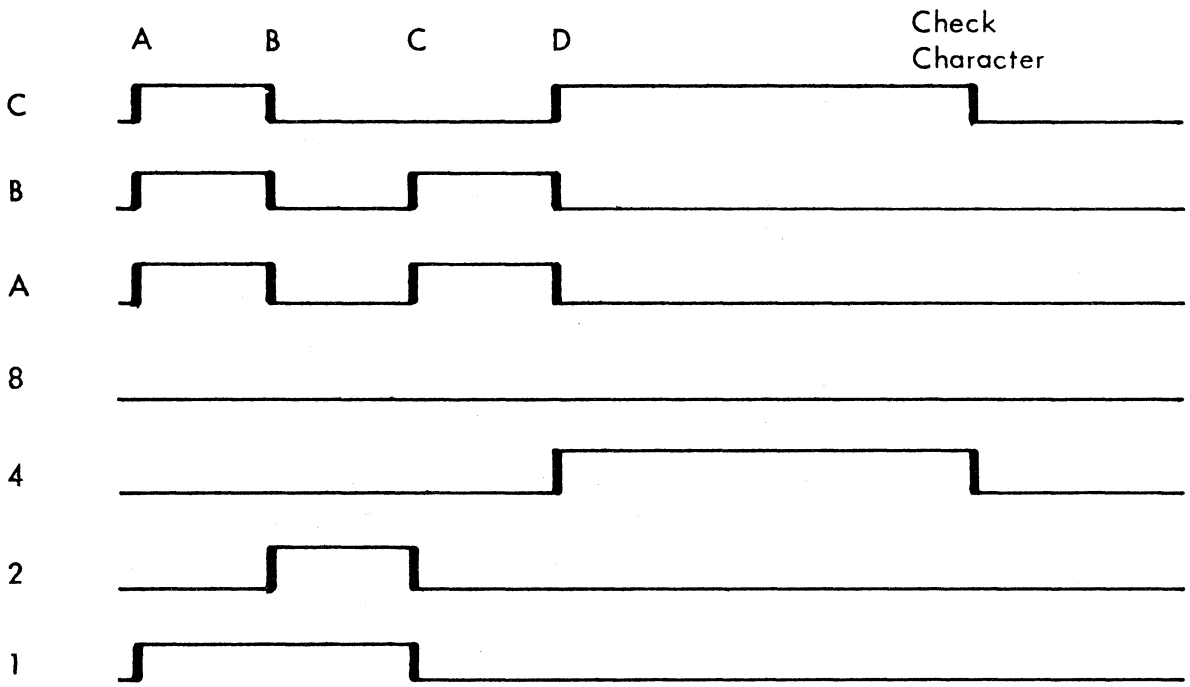


Figure 11

ANSWER THE FOLLOWING QUESTIONS:

1. When a magnetic material has the ability to retain a state of magnetism it is said to have high retentivity. The oxide coating on magnetic tape has (high, low) retentivity.

2. The method used to write a bit on tape with a 7330 is:
   a. To change the flux pattern from zero to the plus direction.
   b. To change the flux pattern from zero to the minus direction.
   c. To change the direction of flux pattern from minus to plus or from plus to minus.
   d. To record a plus pulse for a "1" bit and a minus pulse for a "0" bit.

3. There are _____(how many?) write heads in the 7330.

4. To erase tape the 7330:
   a. De-magnetizes all tracks.
   b. Magnetizes all tracks in the same direction.
   c. Writes continuous bits to distinguish the erased portion from the record.

5. An Inter Record Gap is approximately 3/4" of _____ed tape separating two records.

6. Before the characters of a record begin to be written, all tracks are magnetizing tape in:
   a. The same direction
   b. Random fashion
   c. The opposite direction

7. After the record has been written, about four character spaces are left and then the _____ _____is written by resetting all tracks to the starting condition.

8. Draw the flux pattern for the record ABCDE and include the check character. (for reference, your format should be similar to Fig. 11 on Page 65).

9. During the time that the 7330 is being used for a write operation, the tape is always being magnetized in either one direction or the other, and a bit is written by just reversing the direction of magnetization (T or F).

Turn to Page 67 to check your answers

ANSWERS TO PAGE 66

1. High

2. c. (to change the flux pattern from minus to plus or from plus to minus).

3. 7

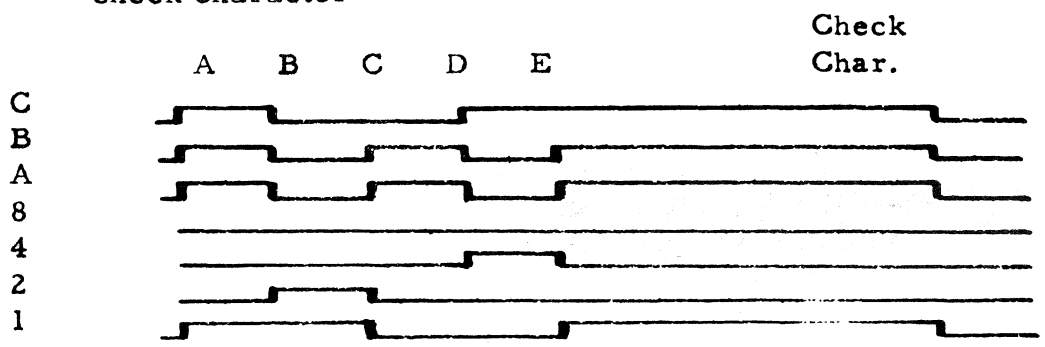
4. b. (magnetizes all tracks in the same direction)

5. erased

6. a. (the same direction)

7. check character

8.



9. true

Turn ON the tape recorder.

SECTION 10

READING TAPE, AND THE MECHANISIMS USED FOR READING AND WRITING.

OBJECTIVE:

At the end of this section you should be able to state:

1. How tape is read

2. The location, details and function of the mechanisims associated with reading and writing.

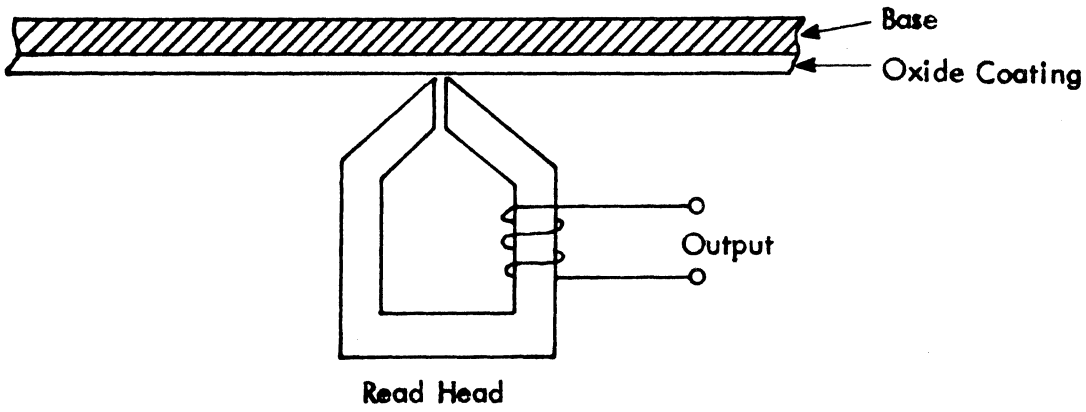


Figure 1

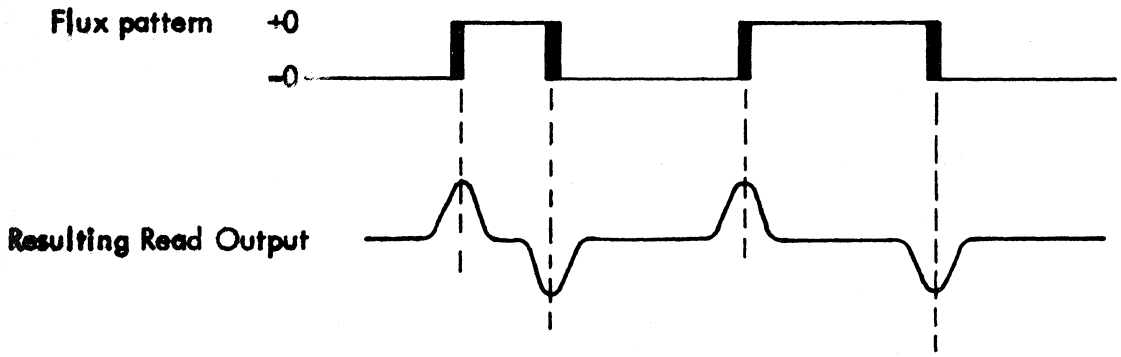


Figure 2

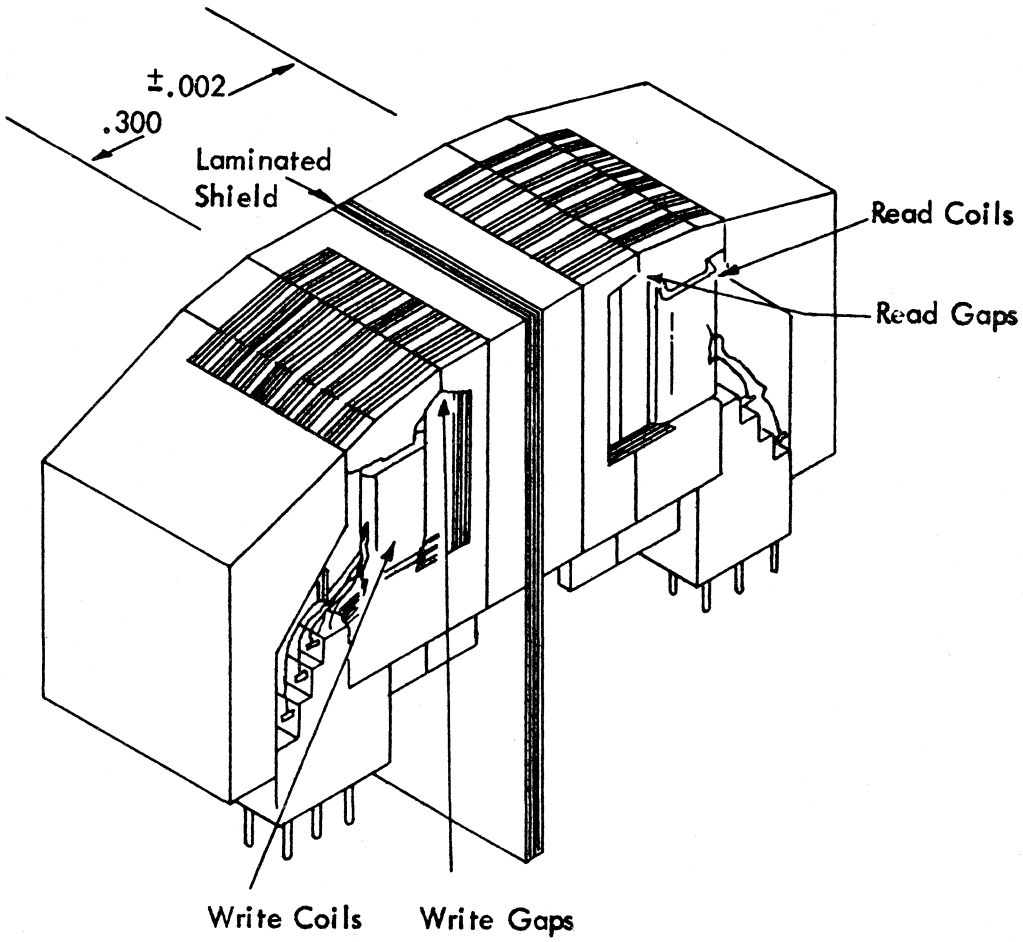


Figure 3 Two-Gap Read-Write Head

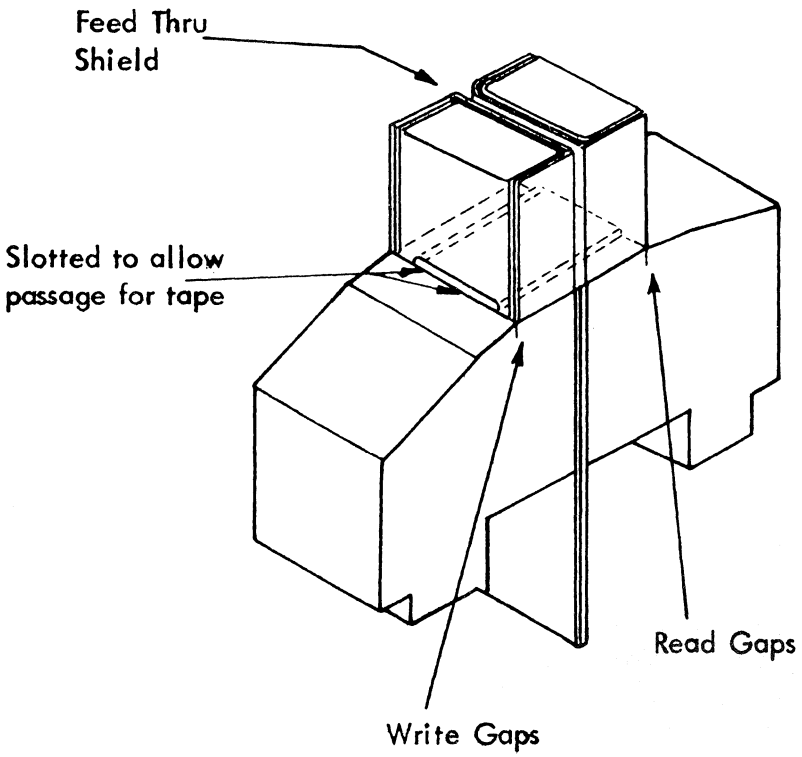


Figure 4. Read/Write Head Assembly & feed thru shield

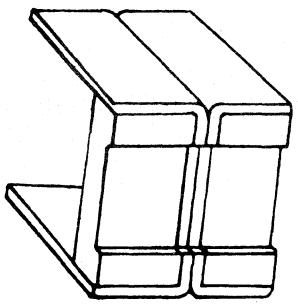


Figure 5. Feed Thru Shield (bottom view)

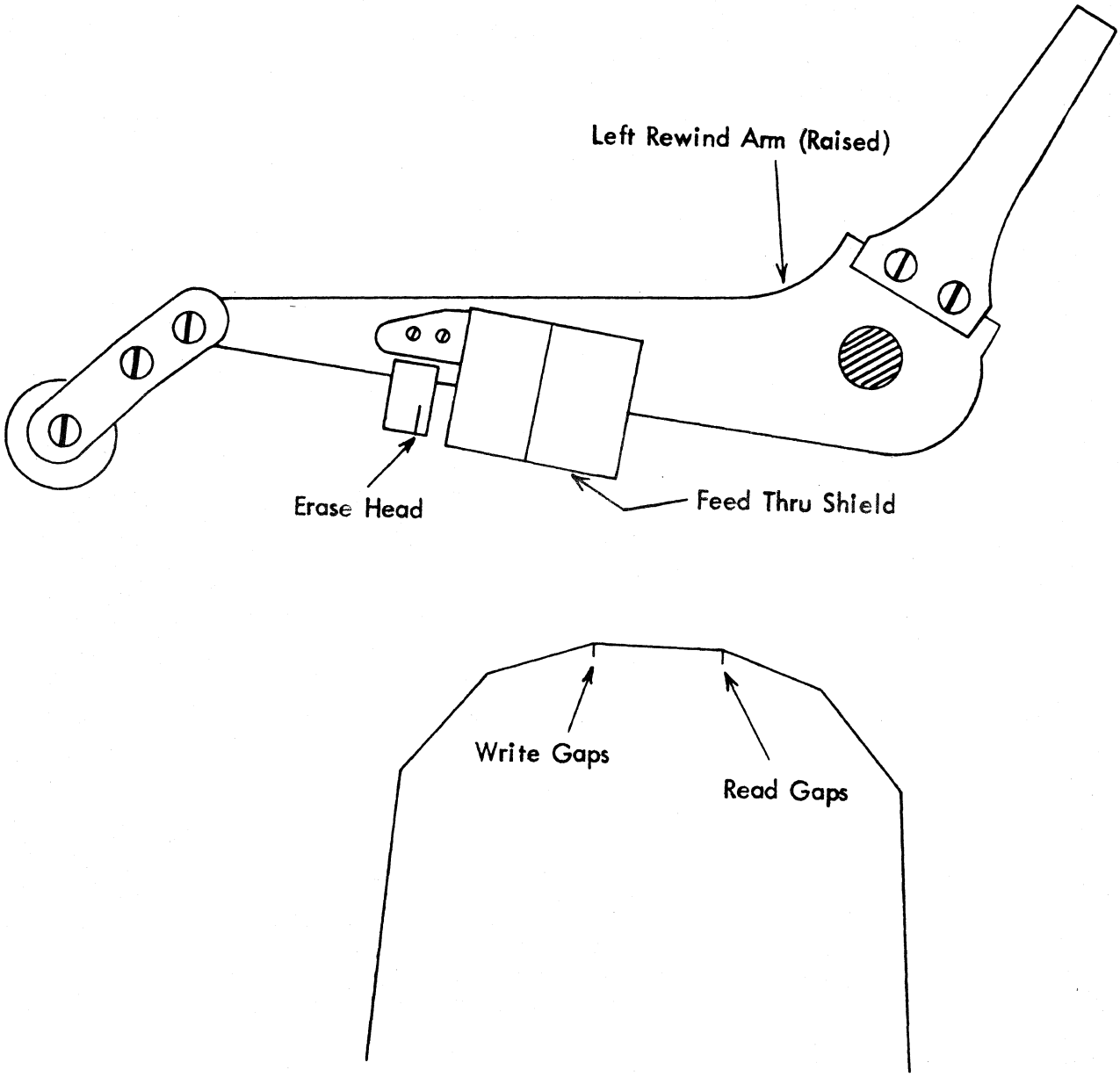


Figure 6 Left Rewind Arm Raised

1. Given a single track with a flux pattern as shown, draw in the voltage waveform that would result from reading this track.

2. There are _____(how many?) write heads and _____ read heads.

3. When tape is moving forward it will pass first over the _____ heads and then over the _____heads.

4. During a write operation, characters are written at the write heads and then as tape continues and passes over the _____heads it is _____and the characters are sent back to checking circuits in the computer.

5. Because the write operation uses the write and the read heads, it is necessary to shield the read heads from the lines of flux generated by the write heads. The _____ _____ shield blocks the lines of flux from the write gaps from reaching the read gaps.

6. To insure that tape is completely erased prior to writing, a separate _____head is activated during a write operation.

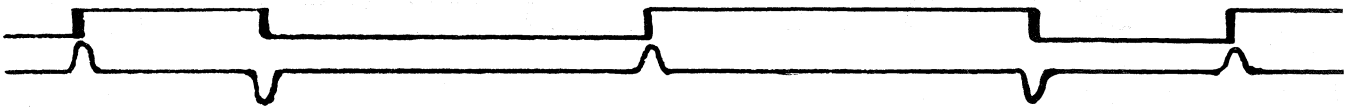
7. The _____ _____shield and the _____head are mounted on the _____ _____arm.

8. It is essential that during a read operation, the _____heads and the _____head are completely de-activated.

Check your answers on Page 74

Answers to Page 73

1.



2. 7, 7

3. write - read

4. read - read

5. feed thru

6. erase

7. feed thru - erase - left rewind

8. write - erase

Turn ON the recorder.

SECTION 11

SELECT AND READY

OBJECTIVE:

At the end of this section you should be able to define the terms Select and Ready and be able to follow the circuits that cause the 7330 to be selected and ready.

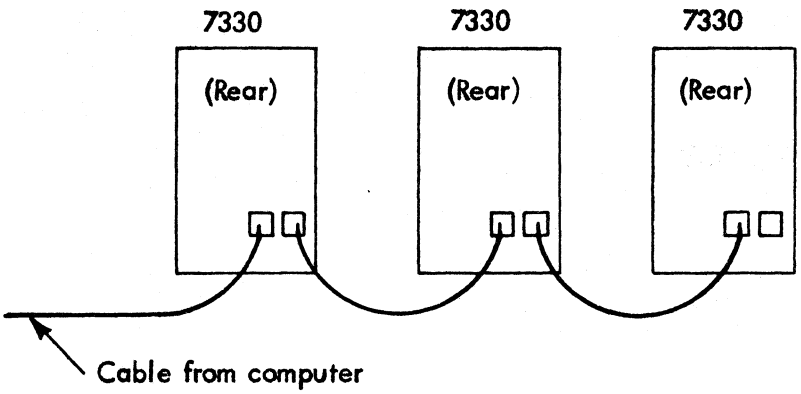


Figure 1

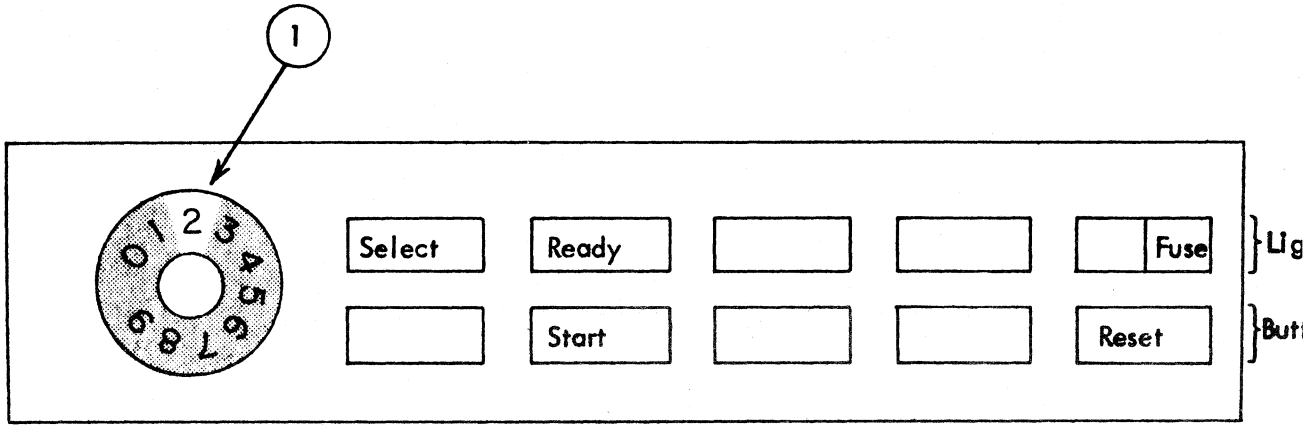
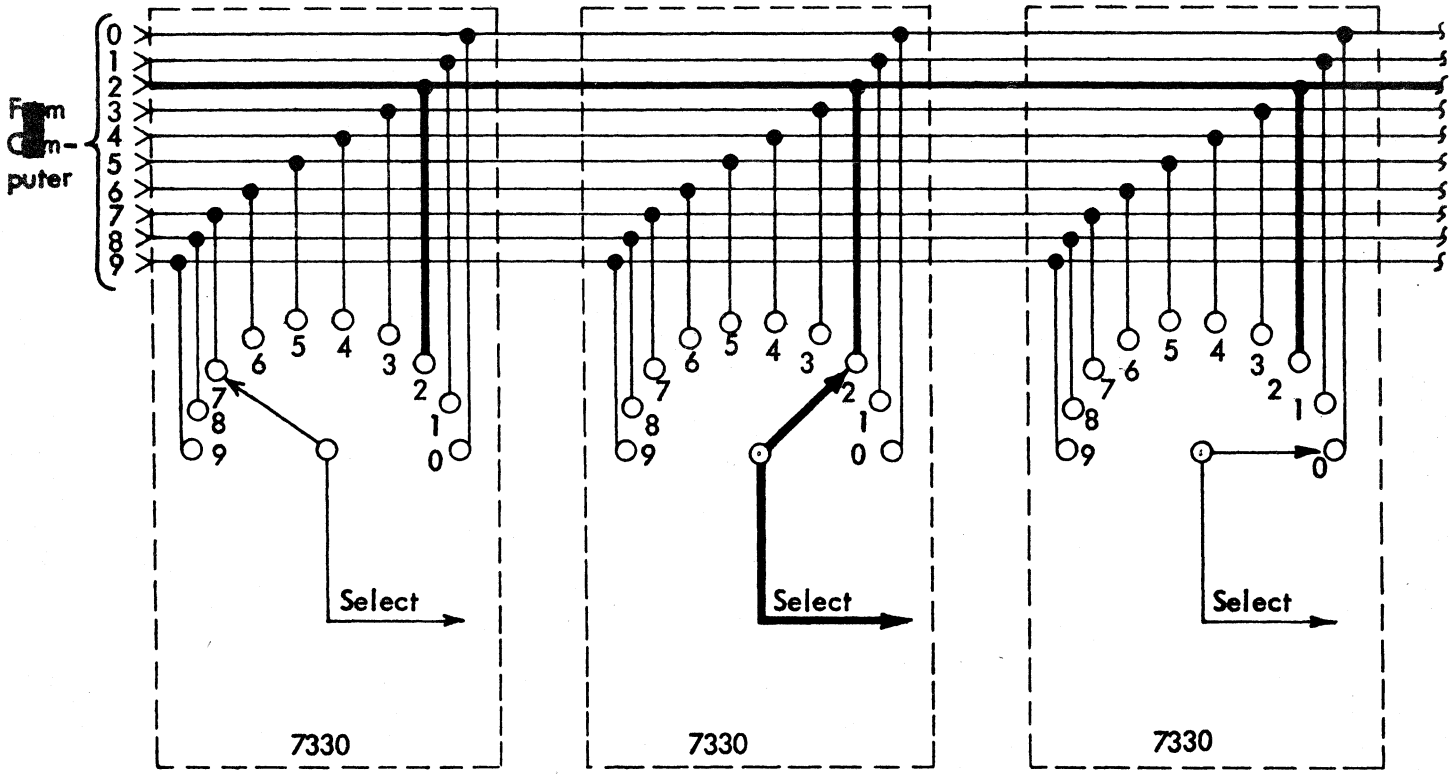


Figure 2



Ready: -

1. Vacuum up and tape in both columns
2. Rewind arms down
3. Lamps On
4. No blown fuses
5. Door interlock closed
6. Tape had been initially rewound
7. Start Key

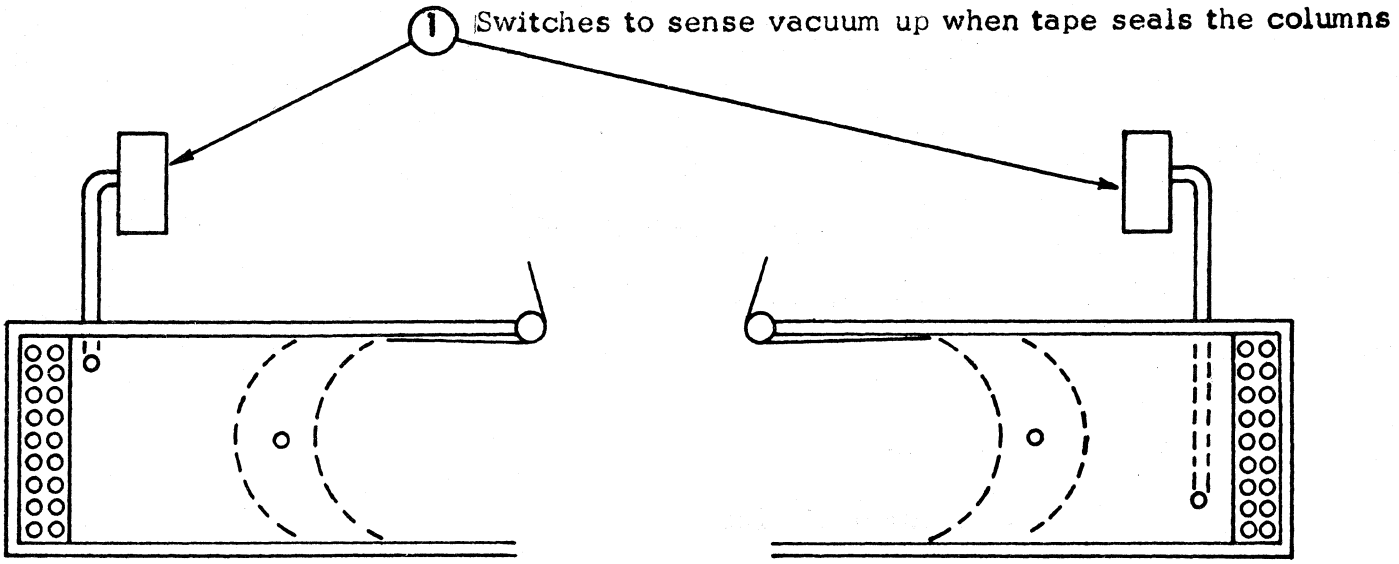


Figure 4

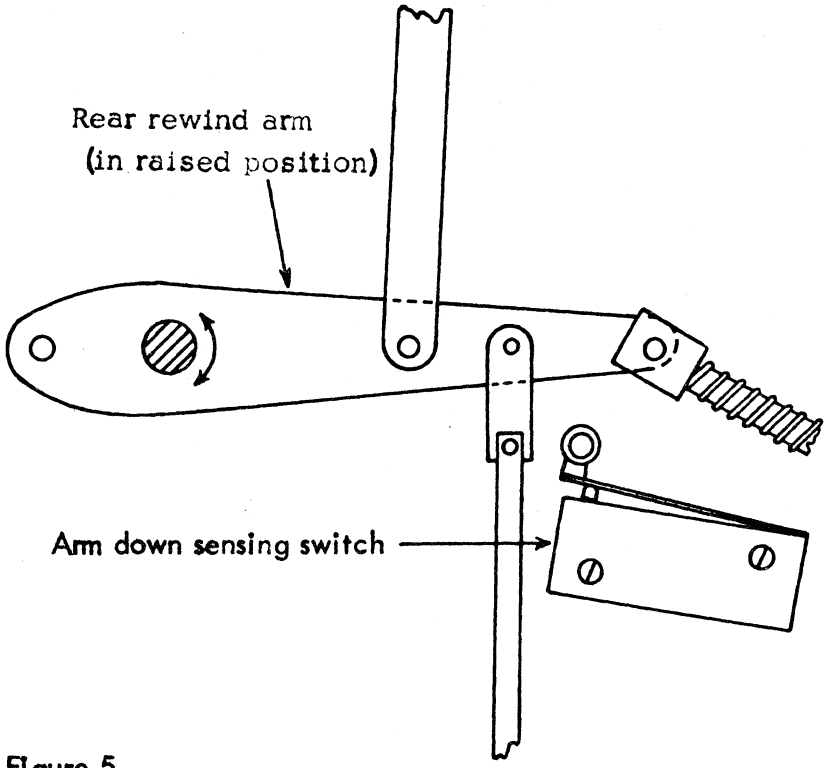


Figure 5

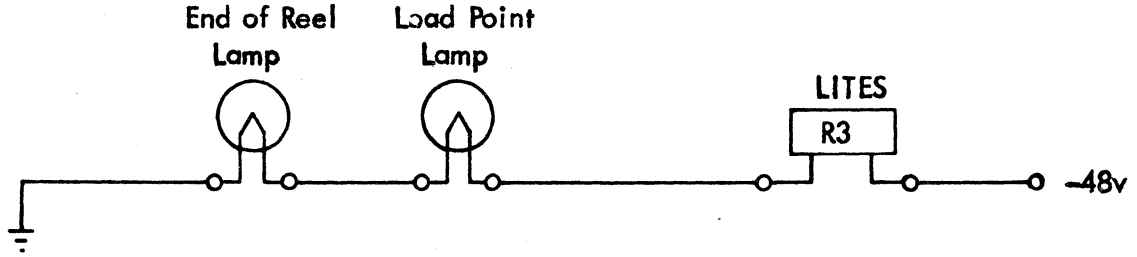


Figure 6

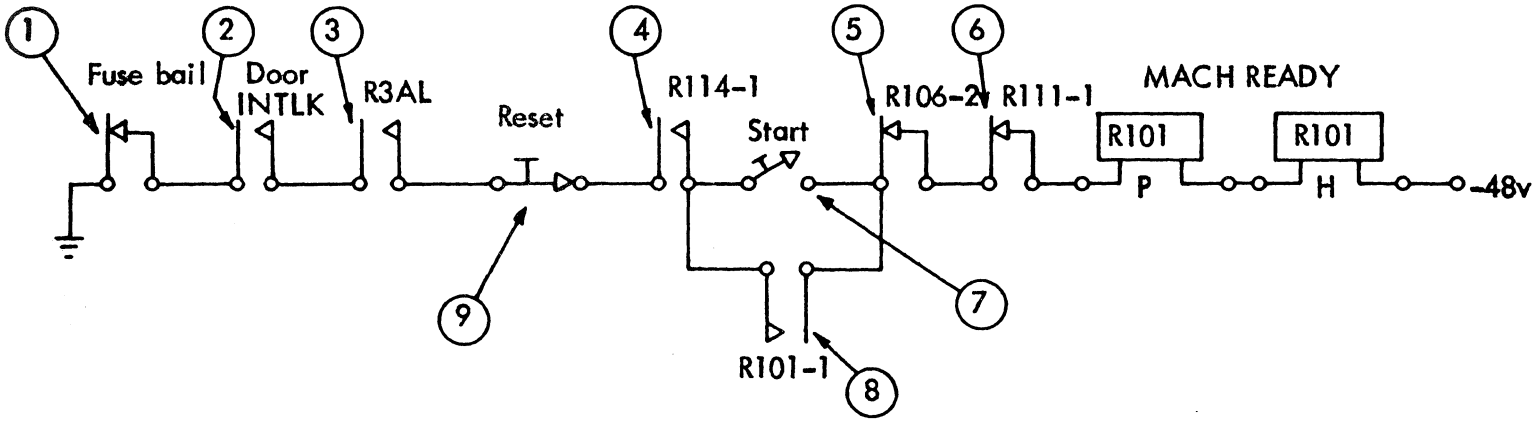


Figure 7

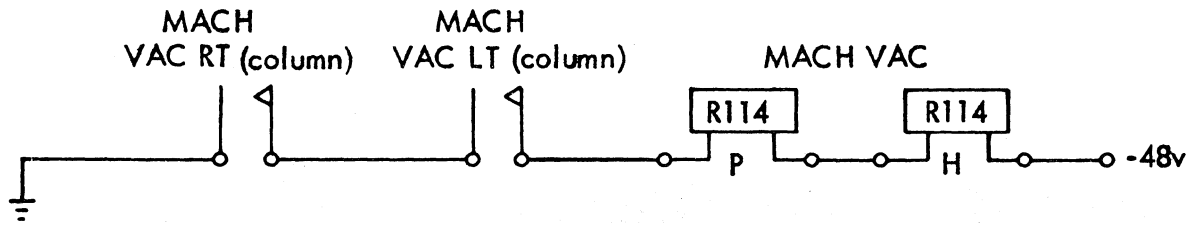


Figure 8

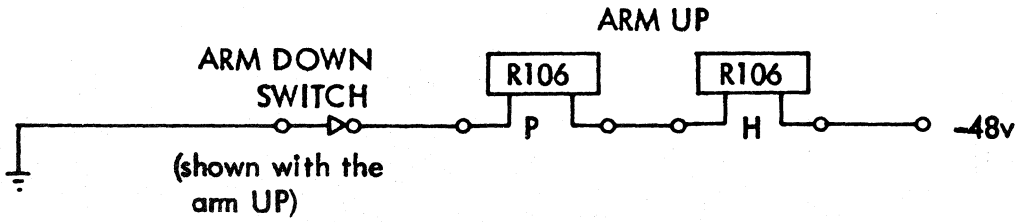


Figure 9

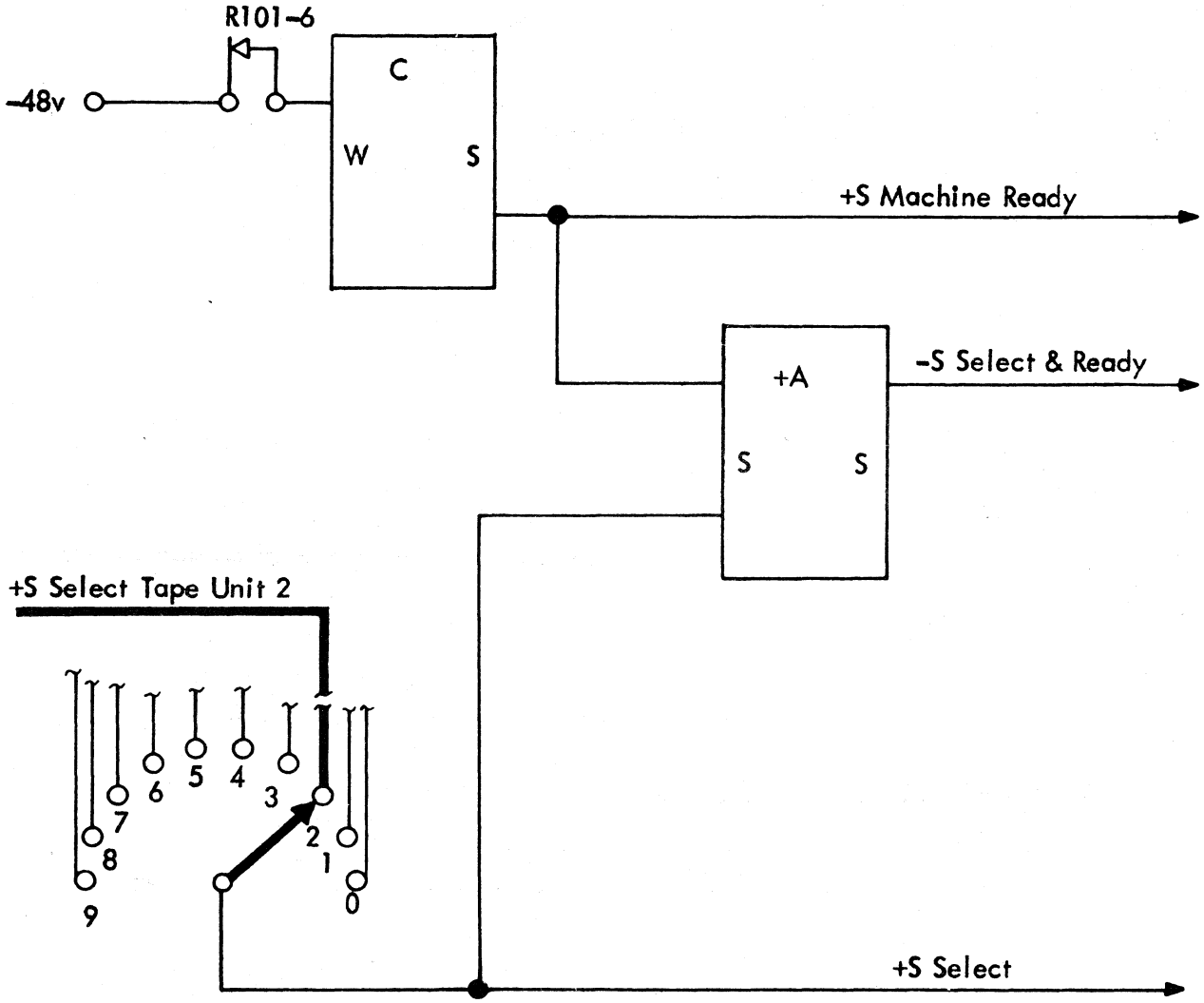

R101-6
-48v
C
W
S
+S Machine Ready
+A
S
S
-S Select & Ready
+S Select Tape Unit 2
9
8
7
6
5
4
3
2
1
0
+S Select

Figure 10

1. Before the computer can use a 7330, it must first _____ which drive it want s to use.

2. Then, before the 7330 can carry out any instructions from the computer, it must be mechanically and electrically _____.

3. Say the computer wishes to select tape unit four (4), what must the operator do to a 7330 so that it will be selected?

4. In this section we introduced two new vacuum switches. Their purpose is to:

5. Before the 7330 can be Ready, the rewind arms must be in the (raised, lowered) position.

6. What relay will be energized if both the load point and end-of-reel sensing lamps are On.

7. In Fig. 7, on Page 79 , what relay point would prevent the pick of R101 if tape was not in the left vacuum column.

8. Referring to the same Figure, what is the purpose of the R101-1 point?

9. Again referring to the same Figure, what relay point would prevent the pick of R101 if the rewind arms were in the raised position?

Turn to Page 82 to check your answers.

Answers to Page 81

1. Select

2. Ready

3. The select dial on the 7330 must be set to 4.

4. Sense that vacuum is up and tape is in the vacuum columns.

5. Lowered

6. Relay 3

7. R114-1

8. To provide a hold for R101 after the start key has been pressed and then released.

9. R106-2

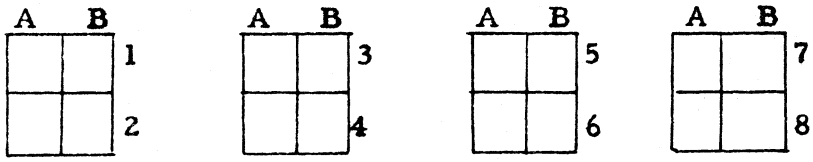
Turn to Page 83

You are now ready to begin using actual machine diagrams. Before you turn on the tape recorder, make sure that you have a copy of the book entitled, INSTRUCTIONAL SYSTEMS DIAGRAMS--7330 MAGNETIC TAPE UNIT (Form No. 223-6930).

You will now be using both the Instruction Guide and the Instructional Systems Diagrams (ISD's).

When you have this material, turn on the tape recorder.

To aid you in locating the circuit components in the 7330 system diagrams, several methods have been used. Some of the pages are divided into four sections as shown below:

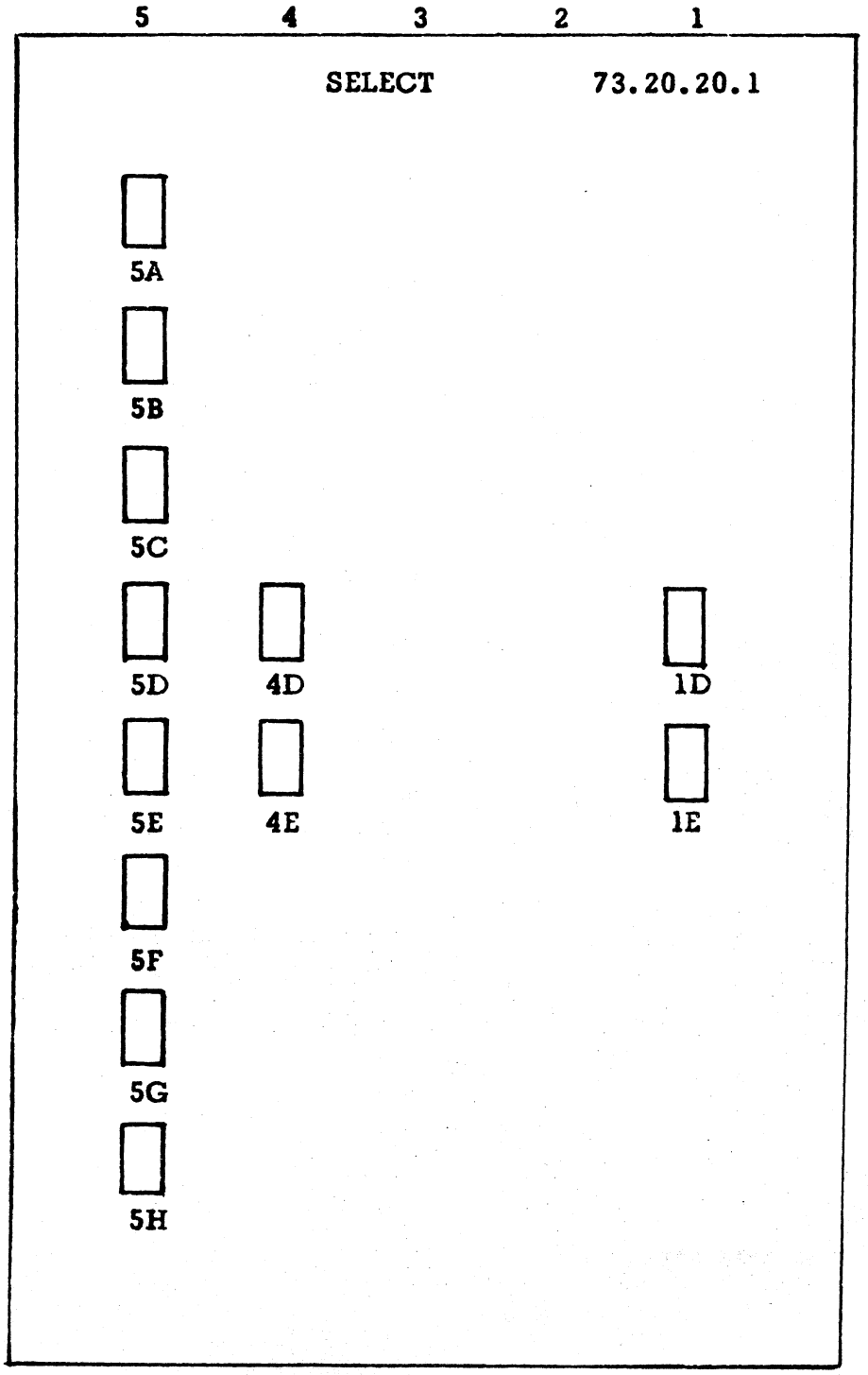


If you will turn to page 73.04.01.0, you will see a location chart in the top left corner of this page. This location chart indicates that sections 1 and 2 can be found on Page 73.50.01.0. Likewise, this location chart shows that Sections 3 and 4 are on Page 73.50.05.0. Now, below this location chart, there is a location chart for wire contact relays. Notice the first relay listed, Relay 101. Its pick and hold coil show the location B1. Using the above chart, Relay 101 could be found on Page 73.50.01.0. The points for this relay as well as the location can be found by using the location charts. Other components listed on this page can be found in the same manner.

Continue on Page 85

The transistor circuit pages are layed out using a system of co-ordinates so that reference can be made to the location of any circuit on the page.

Look at the example drawn below. This is the layout of Page 73.20.20.1. Notice the co-ordinate numbers 1 through 5 along the top of the page and the letters A through I down the side. Every circuit will be designated by the co-ordinates. For example, two blocks are used to represent the Select Switch. These two blocks are located at 1D and 1E.



Continue on the next page

This is a review exercise of Select and Ready to enable you to start gaining experience using the systems diagrams.

Line levels; +w = O volts +S = O volts
-w =-48 volts -S =-12 volts

In case you run across any circuit blocks that are unfamiliar to you, there is a section entitled "SMS Component Circuit Cards" in your 7330 Reference Manual (Form No. 223-6967).

Compare the following figures in the Instruction Guide to the ISD's.

Figure 3, Page 76 with Page 73.20.20.1.
Notice the Select Switch located at co-ordinates 1D and 1E. The ten select lines coming into the left side of the page would come from the external system.

Figure 6, Page 78 with Page 73.50.01.
Relay 3 is located at B2. Notice, what we have called the End-of-Reel lamp is labeled TI (Tape Indicate). This terminology is interchangeable, tape indicate will mean more to you later. Notice that there is a potentiometer in series with the LP and TI lamps. This will be used to adjust the lamp voltage.

Figure 7, Page 79 with Page 73.50.01.0
Relay 101 is located at B1. The only thing different shown here is the fuse bail contact N/O points. If it were transferred, you can see the circuit that would light the fuse lamp on the operator's panel.

Figure 8, Page 79 with Page 73.50.05.0
Relay 114 is located at B4.

Figure 9, Page 79 with Page 73.50.01.0
Relay 106 is located at the top of Section B2. Remember the Arm Down Switch is drawn in the closed position as it would be if the Arm were raised.

Continue on the next page.

Figure 10, Page 80 with Page 73.50.10.0.
Find the Relay 101-6 N/C point in location A5. Also, while you are here, notice the Ready light at the top of the page.

Follow the Plus W Machine Ready line to Page 73.20.01.1.

The And Circuit at 4A is where the Select line and the Ready line combine to form the interlock line, Select and Ready. As you can see, pin K must also be plus. This will be plus except when the machine is rewinding. You will see the purpose of this input when we cover Rewind. There will be many cases like this where you must accept certain line levels or conditions until they are covered.

To enable you to gain experience in using the 7330 machine diagrams, ISD Reviews like this one will be provided. The idea of comparing simplified diagrams to the actual machine circuits is to help you readily determine how the circuit operates. During future reviews, if you find that you do not need to make this comparison, then feel free to work through the review following all other instructions given.

Turn ON the recorder.

SECTION 12

READ CIRCUITS

OBJECTIVE:

By the end of this section, you should be able to follow through the circuits used to read and control the reading of tape.

Read Operation

1. Drive must be selected and ready.

2. The read head outputs must be amplified and sent to the computer.

3. Tape moves forward.

4. Write and erase head currents must be blocked.

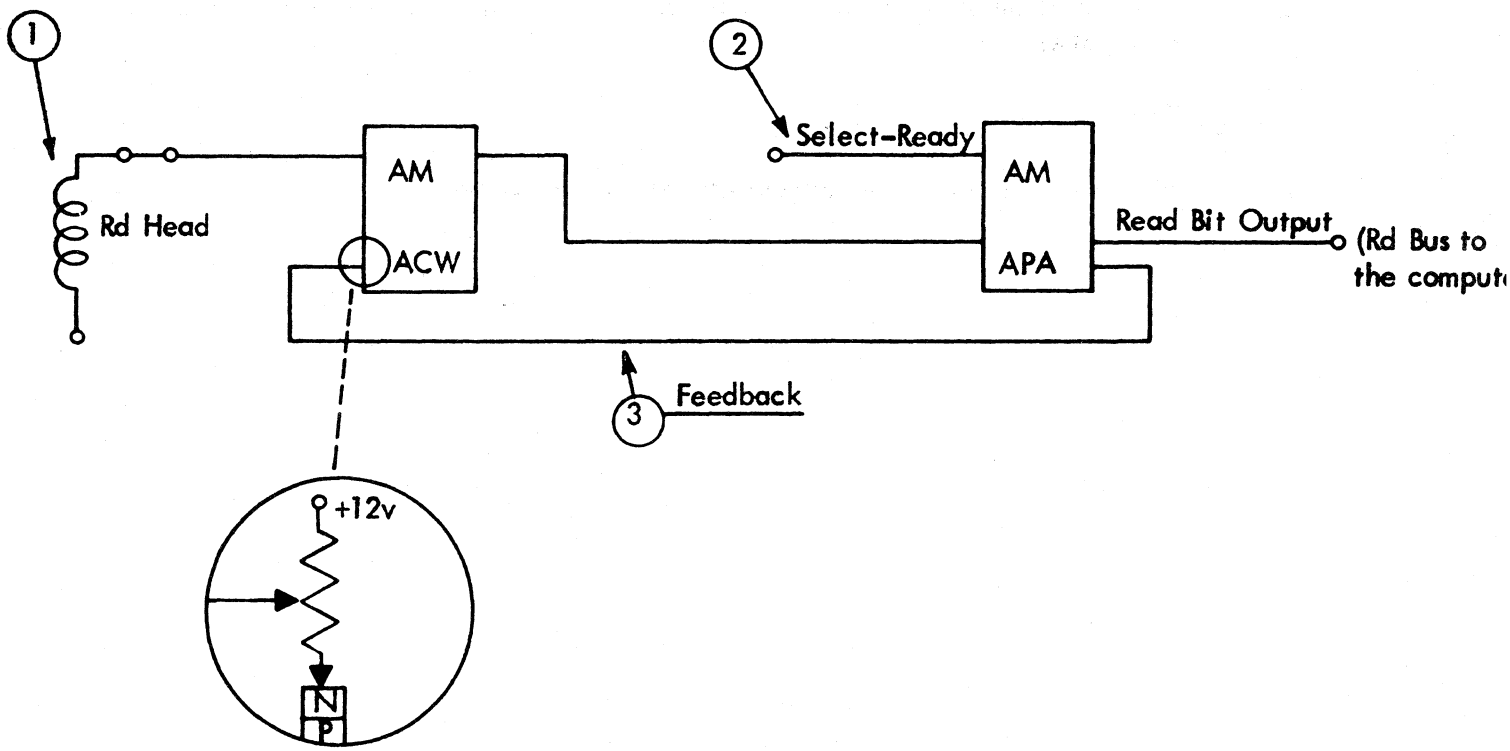


Figure 1 Read Preamplifier

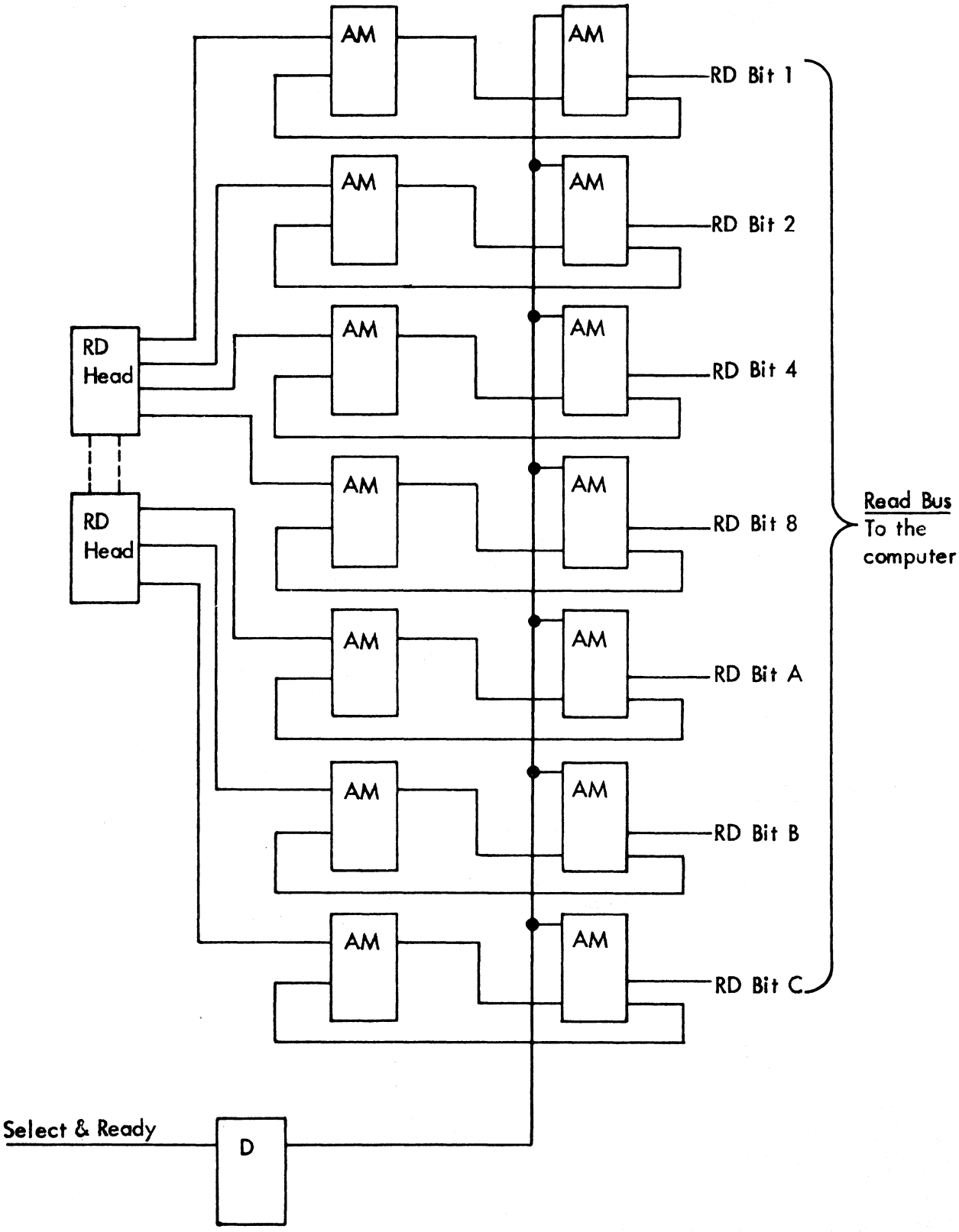


Figure 2 Read Preamps

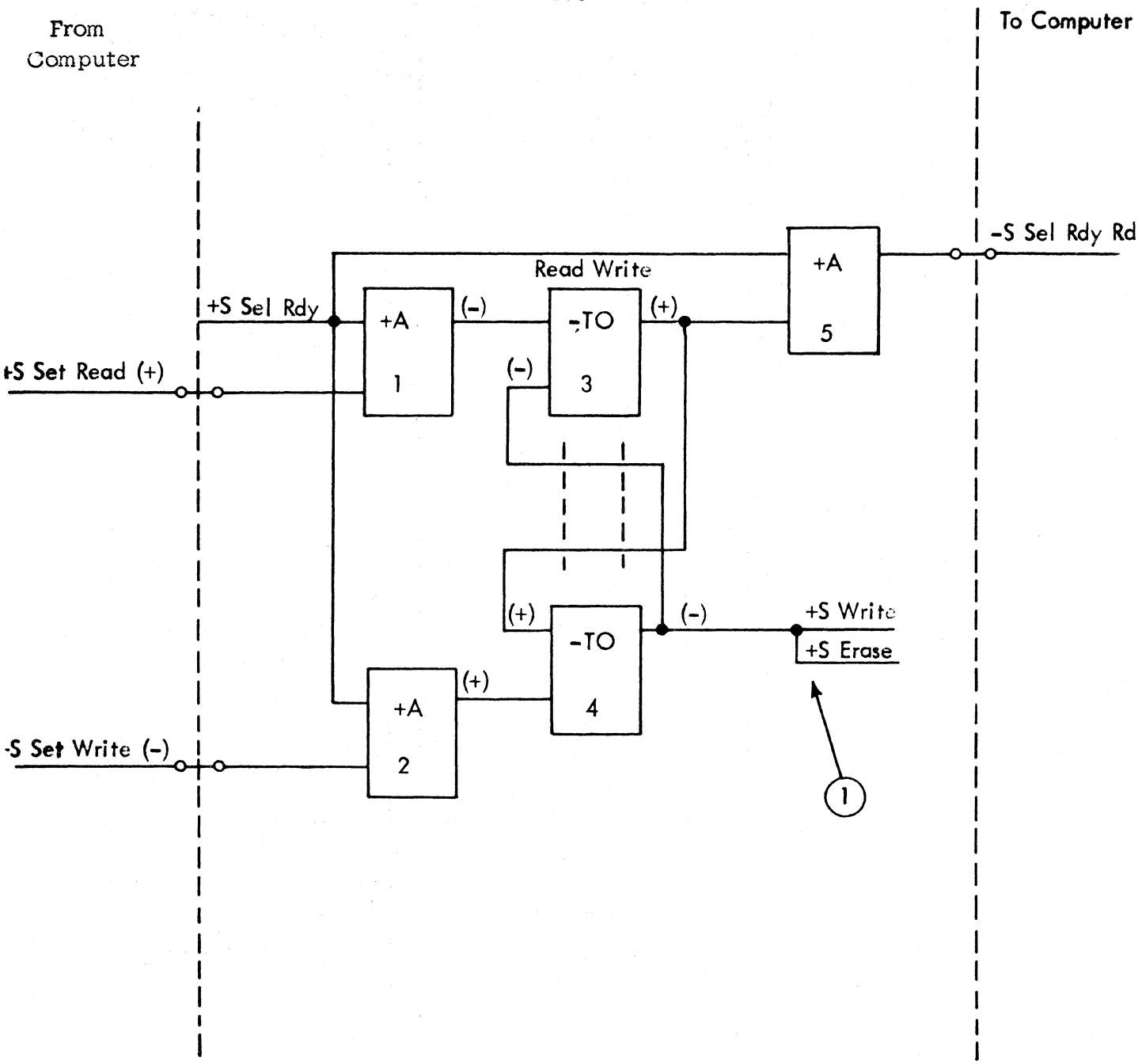


Figure 3 Read/Write Status Trigger

1. What interlock line is used to gate the amplified read signals onto the read bus?

2. In the pre-amplifier circuits, a feedback circuit is connected to a potentiometer. Adjusting the potentiometer will adjust the _____ of the preamps.

3. We discussed a Read/Write status trigger, what line from the computer turned this trigger to Read Status?

4. Turning the Read/Write status trigger to Read will block current from passing through the _____ and _____ heads.

The following questions refer to Figure 3

5. For a Read Operation, the Set Read line would be (plus, minus) and the Set Write line would be (plus, minus).

6. To satisfy And circuit 1, the _____ line is Anded with _____.

7. When And circuit 1 is satisfied, its output is (plus, minus).

8. Since the plus Set Write line is minus, And circuit 2 is (satisfied, not satisfied). Its out-of-phase output is therefore, _____.

9. For a Read Operation, which of the minus TO's will be satisfied.

10. The output of the minus T0 number 4 is _____. This will block _____ and _____ currents.

11. The output of the And circuit 5 is labeled Select, Ready and Read. This type of line is known as a _____ line.

Turn to Page 94 and check your answers.

Answers to Page 93

1. Select and Ready
2. gain, or amplification, or output
3. Set Read
4. write and erase
5. plus, minus
6. plus S Set Read, plus S Select and Ready
7. minus
8. not satisfied, plus
9. minus TO number 3
10. minus, write and erase
11. response

Turn to Page 95

ISD REVIEW OF THE READ OPERATION

Compare the following figures in the Instruction Guide to the ISD's.

Figure 2 Page 91 with Page 73.40.01.1

Notice the seven read heads are shown in the two blocks at 5D and 5E. Select and Ready is jumpered to Pin F of all the second stage preamplifier cards. This will gate the output of the preamps to the read bus.

The potentiometers to adjust preamp gain are located on each of the first stage preamp cards. For instance, to locate the potentiometer for the C bit track, you would find the location of the card shown at 3H. The card is located in Module A, Gate 6, Row A, and Column 24.

Follow the bit lines leaving this page going to 73.30.05.1. Notice they go into blocks labeled "No operation". The No Operation block is a visual means of showing that no operation is performed on the bit lines on this page. However, on this page, point to point wiring can be found. For example, follow the line for the C bit track. Just before the No Operation block at 2H find the notation (*Q). Find *Q down at the bottom of the page. Following *Q will be labeling such as: 00B5B08Q, and other notations.

The diagram below will show how these notations refer to the physical wiring of the C bit line from the preamp to the signal connectors.

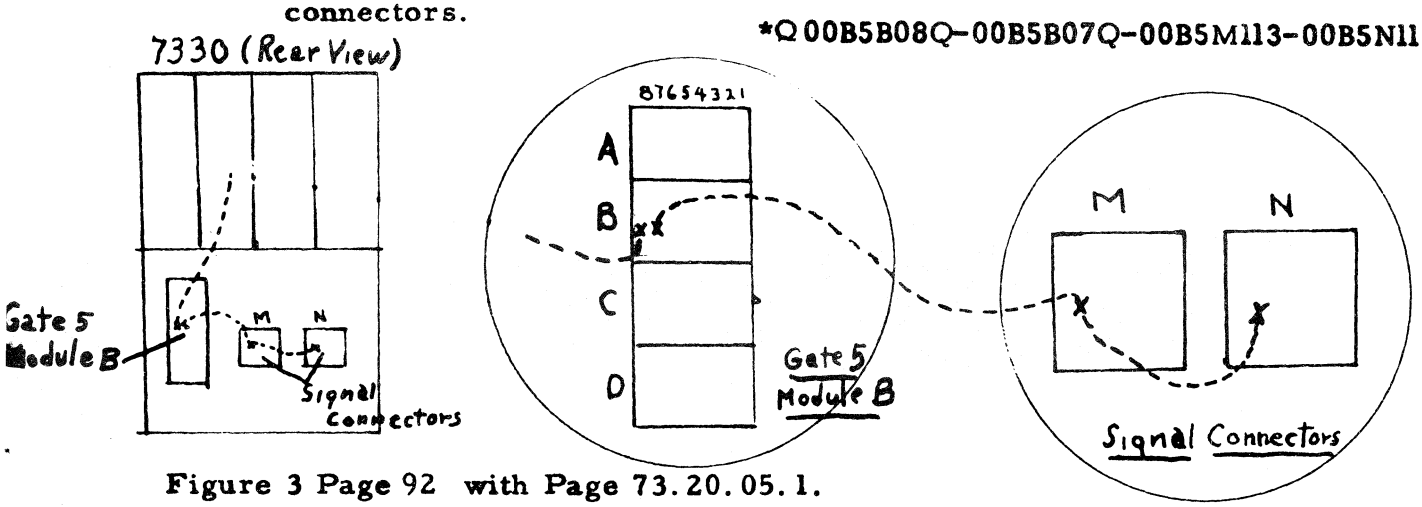


Figure 3 Page 92 with Page 73.20.05.1.

Notice on Fig. 3 And circuit 1 is located in the ISD's at 4A. And circuit 2 is at 4B. (Don't concern yourself with the third input to this And circuit, it will be covered later). The Read/Write status trigger is shown at 3A and 3B. And circuit number 5 is shown at 2A. In Fig. 3, Circle 1 pointed the plus S Write and plus S Erase lines used to gate or de-gate write and erase currents. The DE at 4C and the DFC at 1B were not shown in Fig. 3 as they do not change the logic of these lines.

Turn ON the Tape Recorder ..

SECTION 13

FILE PROTECT - THIS SECTION WILL COVER THE FILE PROTECTION FEATURE USED TO PREVENT ACCIDENTAL WRITING ON TAPE.

OBJECTIVE:

You should be able to state how file protection is accomplished and be able to follow through the associated circuits.

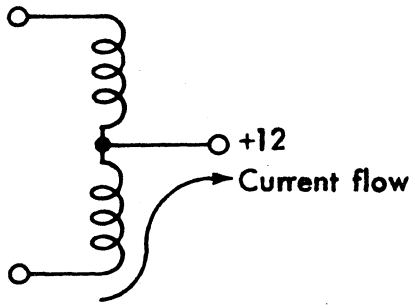


Figure 1A

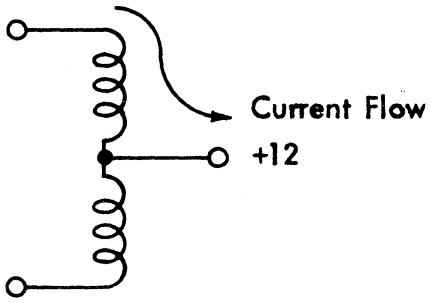


Figure 1B

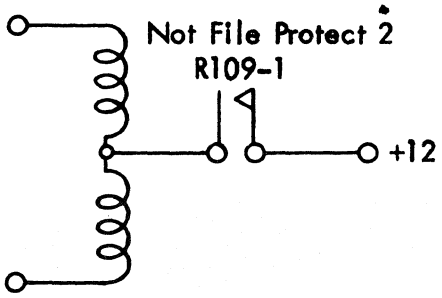


Figure 2

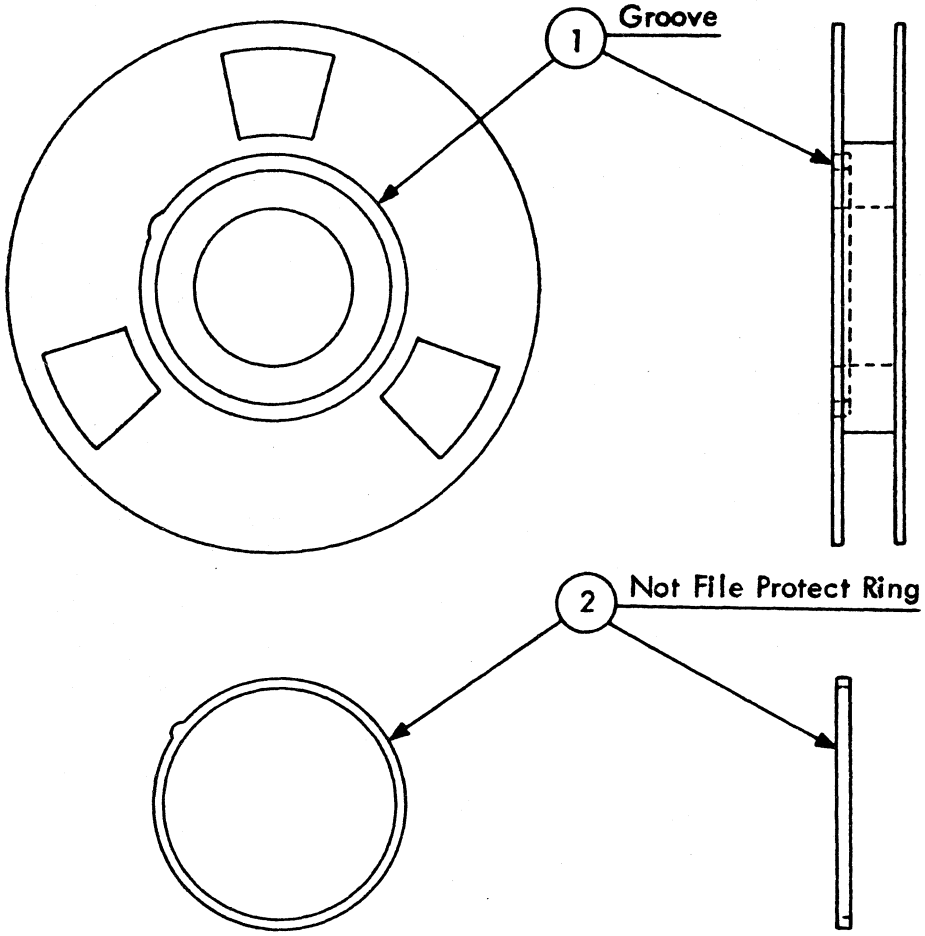


Figure 3

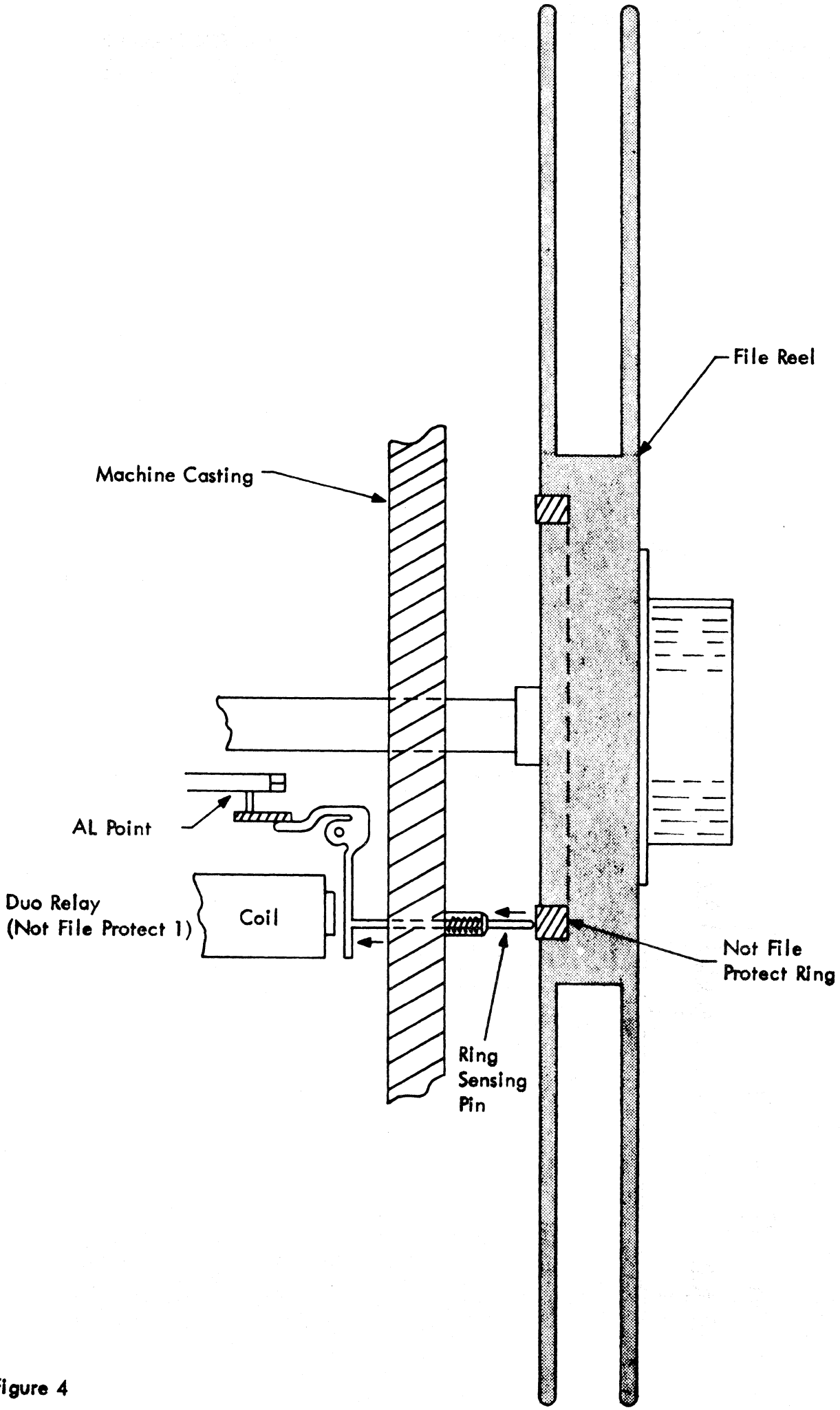

File Reel
Machine Casting
AL Point
Duo Relay
(Not File Protect 1)
Coil
Not File
Protect Ring
Ring
Sensing
Pin

Figure 4

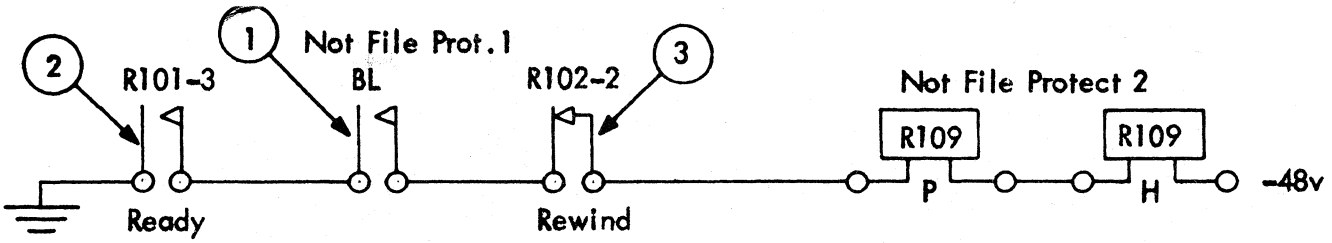


Figure 5

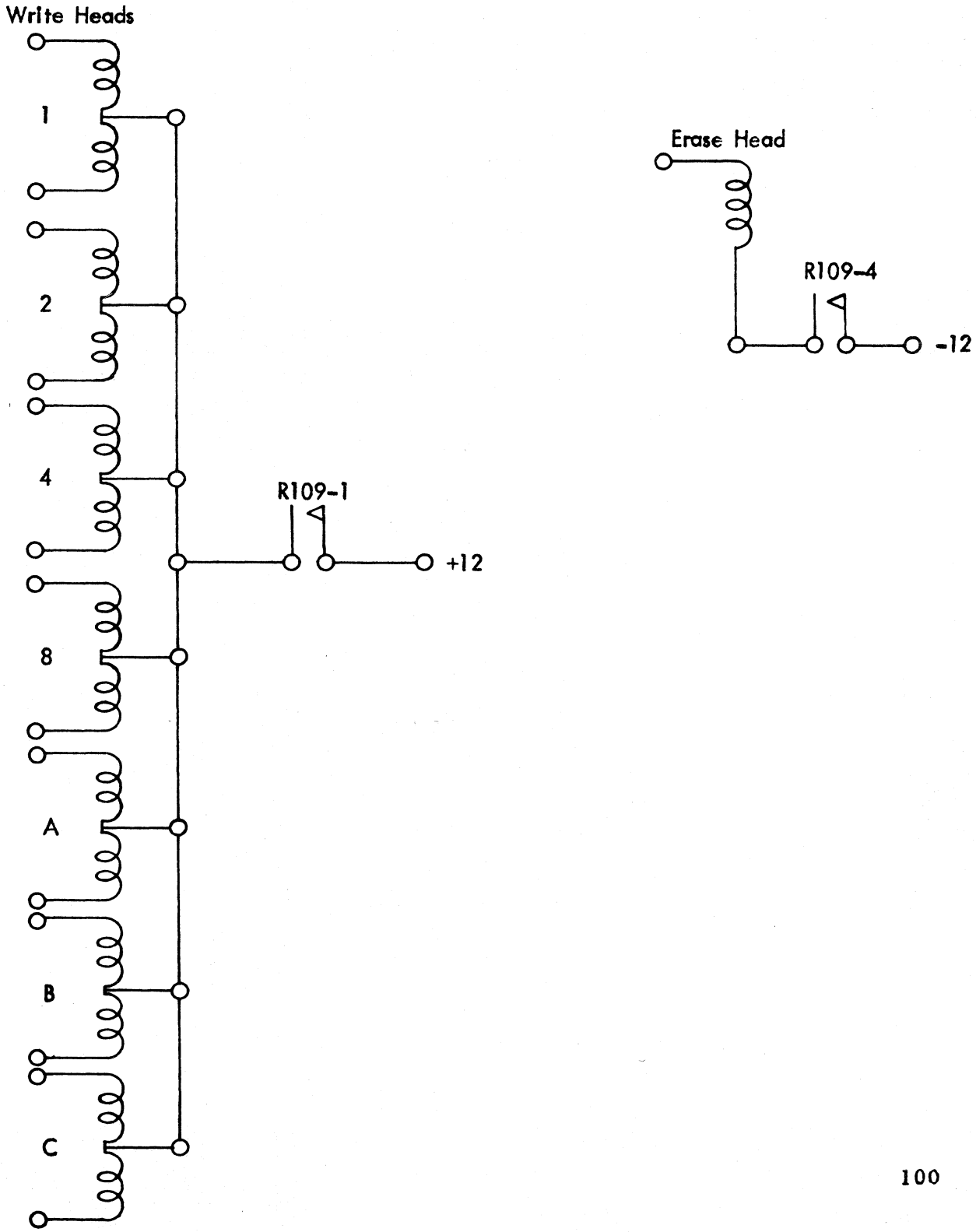


Figure 6

1. When a 7330 is File Protected current cannot flow through either the _____ or _____ heads.

2. The not file protect ring must be in place in the file reel in order that a _____ operation can be performed.

3. The ring sensing pin connected to the relay armature will cause the relay to pick when the ring is (in, out of) the _____ reel.

4. If the 7330 were not ready, current (could, could not) flow through the write or erase heads.

5. When rewinding, the circuit to relay _____ is opened so that write and erase head currents are blocked.

6. The sensing pin will sense the presence or absence of the ring in the tape reel mounted on the _____ _____ hub.

7. The Not File Protect 1 relay is a specially adjusted duo relay in that only the _____ point is closed by the _____ pushing the armature.

8. Energizing the Not File Protect 1 relay will further attract the armature and close the other points. The sensing pin will be _____ away from the _____ so that it will not rub when the reel is turning.

Turn to Page 102 to check your answers.

Answers to Page 101

1. Write - erase
2. Write
3. In - file
4. could not
5. 109
6. file reel
7. AL, sensing pin
8. pulled, ring (Not File Protect Ring)

Continue the review on the next page.

ISD REVIEW OF THE FILE PROTECT CIRCUITS

Compare the following figures in the Instruction Guide to the ISD's.

Fig. 5 Page 100 with Page 73.50.05.0
Relay 109 is located at the top of Section B3.

The Not File Protect 1 relay is located just under Relay 109 in section B3. Notice, to energize this relay, the sensing pin must close the AL point. Assume that Relay 111 is down.

Fig. 6 Page 100 with Page 73.50.10.0
Locate the Erase head coil section A6. Notice the Relay 109-4 point in series with the -12 volt power supply terminal and the Erase head coil. To allow current to flow through the Erase head coil, R109 must be up and the line labeled Plus W ERASE must be plus. Follow this line to Page 73.20.05.1. It comes from the DFC (driver functional coil) at 1B. This line is plus when the read/write status trigger is set to write status.

Now turn back to Page 73.50.10.0. Compare the write head center taps circuit, as shown in Fig. 6, with the ISD circuit. In section A6, find the line labeled "GATE A5 PLUS 12 VOLT TERMINAL BOARD". This plus 12 volt line is connected to Relay 109-1 and Relay 109-2. These are points of the Not File Protect 2 relay. The line leaves this page and goes to 73.20.01.1. On page 73.20.01.1, the Not File Protect line is shown at the No Operation block at 3H. No logic is changed on this line, but D does indicate the pin connection to show how this line enters Gate 6.

Now follow the Not File Protect line back to Page 73.50.10.0 as indicated. This line enters 73.50.10.0 as the bottom line on this page in section A6. Continue across the page and notice the notation "WRITE HEAD CENTER TAPS". Follow on to 73.04.08.0 as is indicated.

On 73.04.08.0 there is a note concerning this Plus 12 volt Not File Protect line in the center of the page indicating that this line goes to the common or center taps of all 7 write heads.

Turn ON the Tape Recorder.

SECTION 14

WRITE CIRCUITS

OBJECTIVE:

At the end of this section you should be able to follow through the circuits used to write on tape.

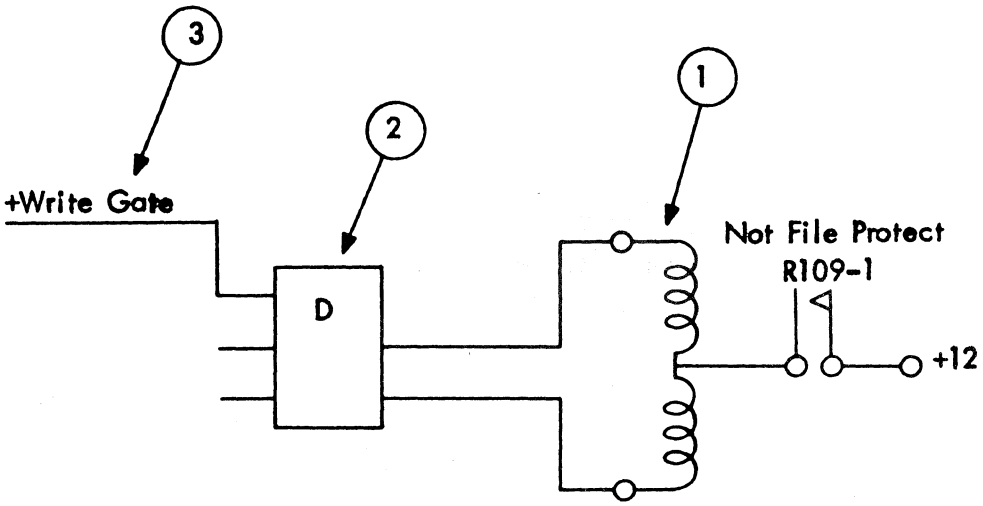


Figure 1

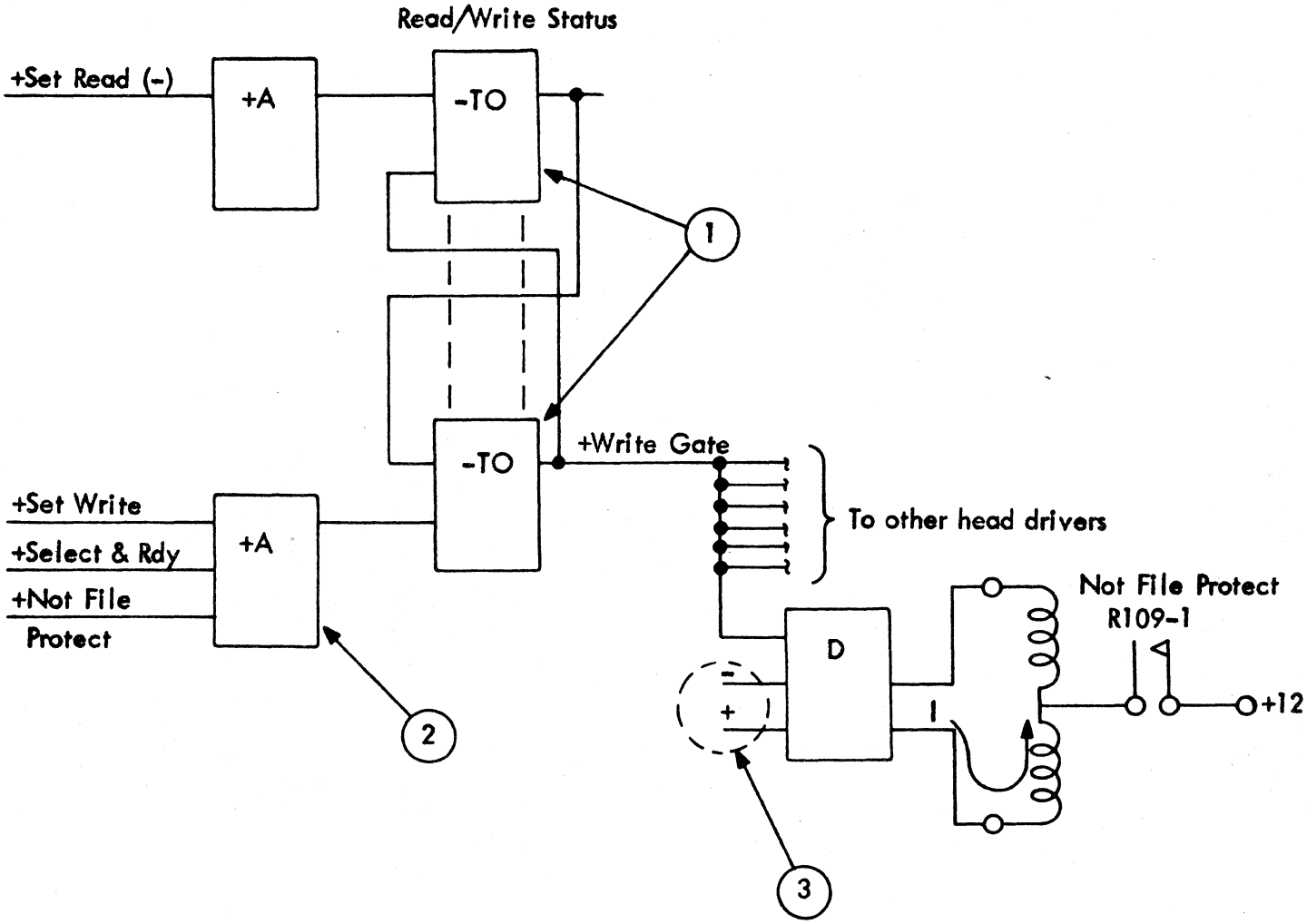

Read/Write Status
+Set Read (-)
+A
-TO
1
-TO
+Write Gate
+Set Write
+Select & Rdy
+Not File
Protect
+A
To other head drivers
Not File Protect
R109-1
D
+12
2
3

Figure 2

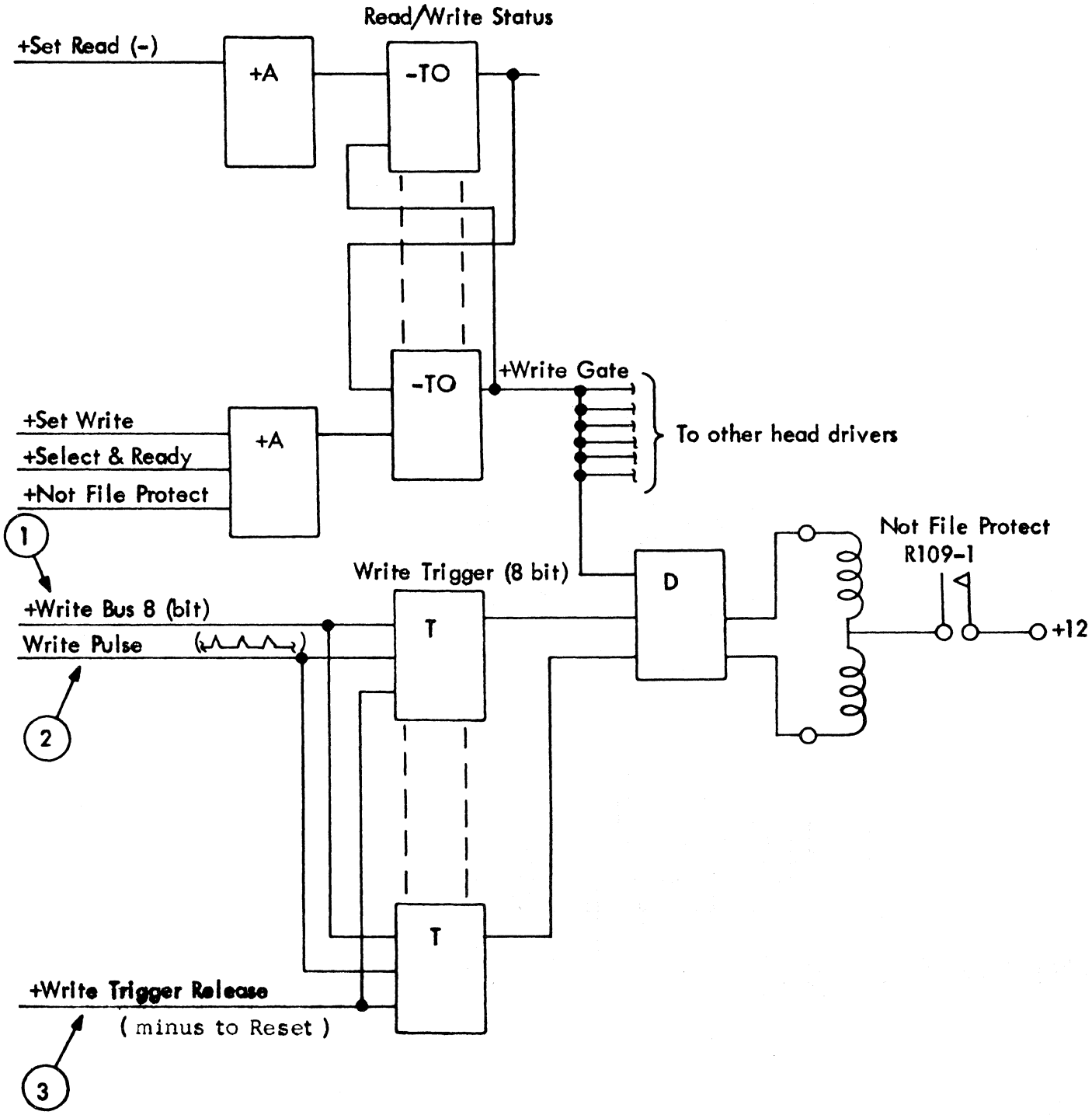

Read/Write Status
+Set Read (-)
+A
-TO
-TO
+Write Gate
+Set Write
+Select & Ready
+Not File Protect
+A
To other head drivers
1
Not File Protect
R109-1
Write Trigger (8 bit)
D
+Write Bus 8 (bit)
Write Pulse
T
+12
2
T
+Write Trigger Release
(minus to Reset)
3

Figure 3

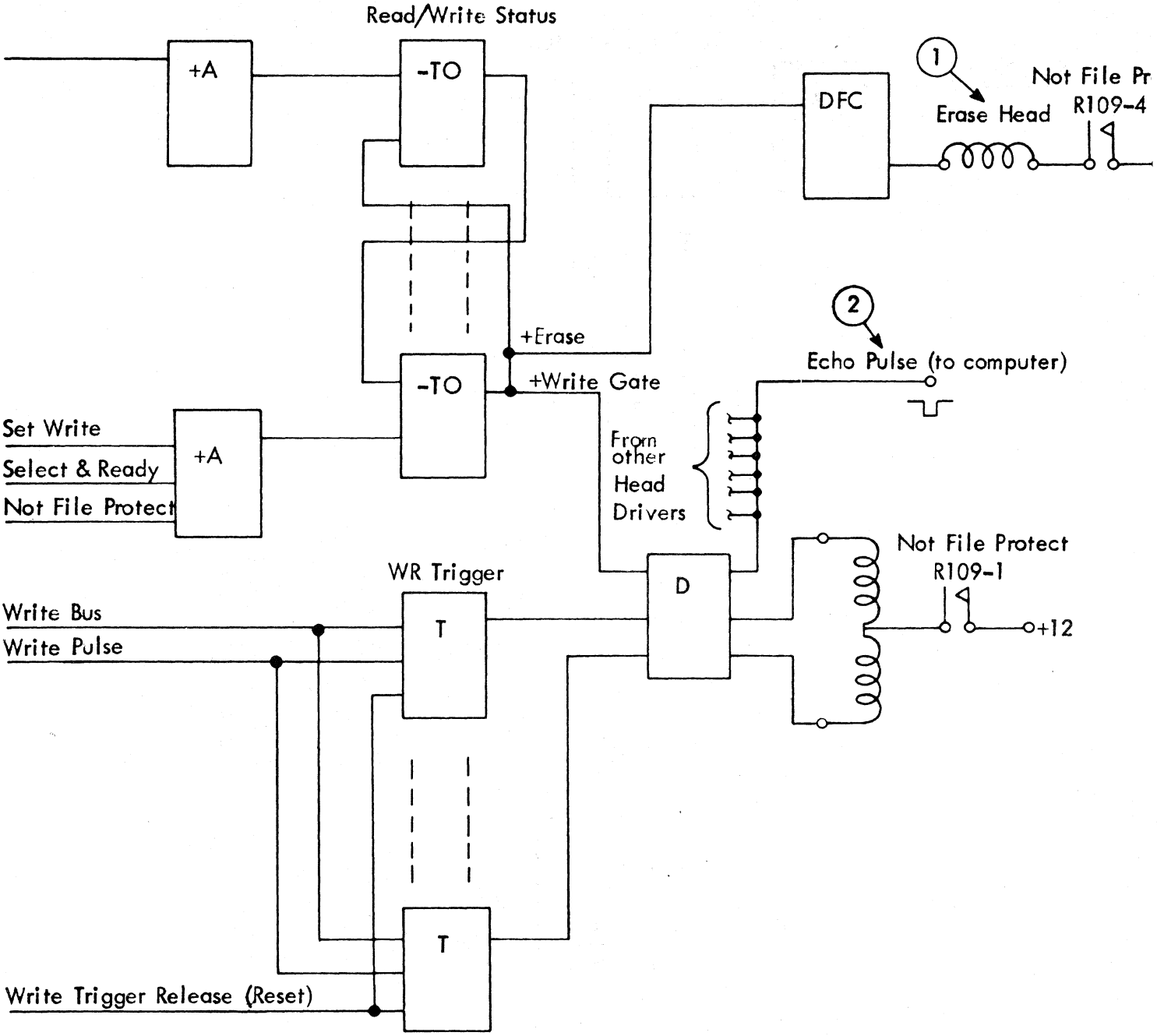

Read/Write Status
+A
-TO
DFC
1
Not File Pr
Erase Head
R109-4
2
Echo Pulse (to computer)
+Erase
-TO
+Write Gate
Set Write
Select & Ready
Not File Protect
+A
From other Head Drivers
Not File Protect
R109-1
+12
WR Trigger
D
Write Bus
Write Pulse
T
T
Write Trigger Release (Reset)

Figure 4

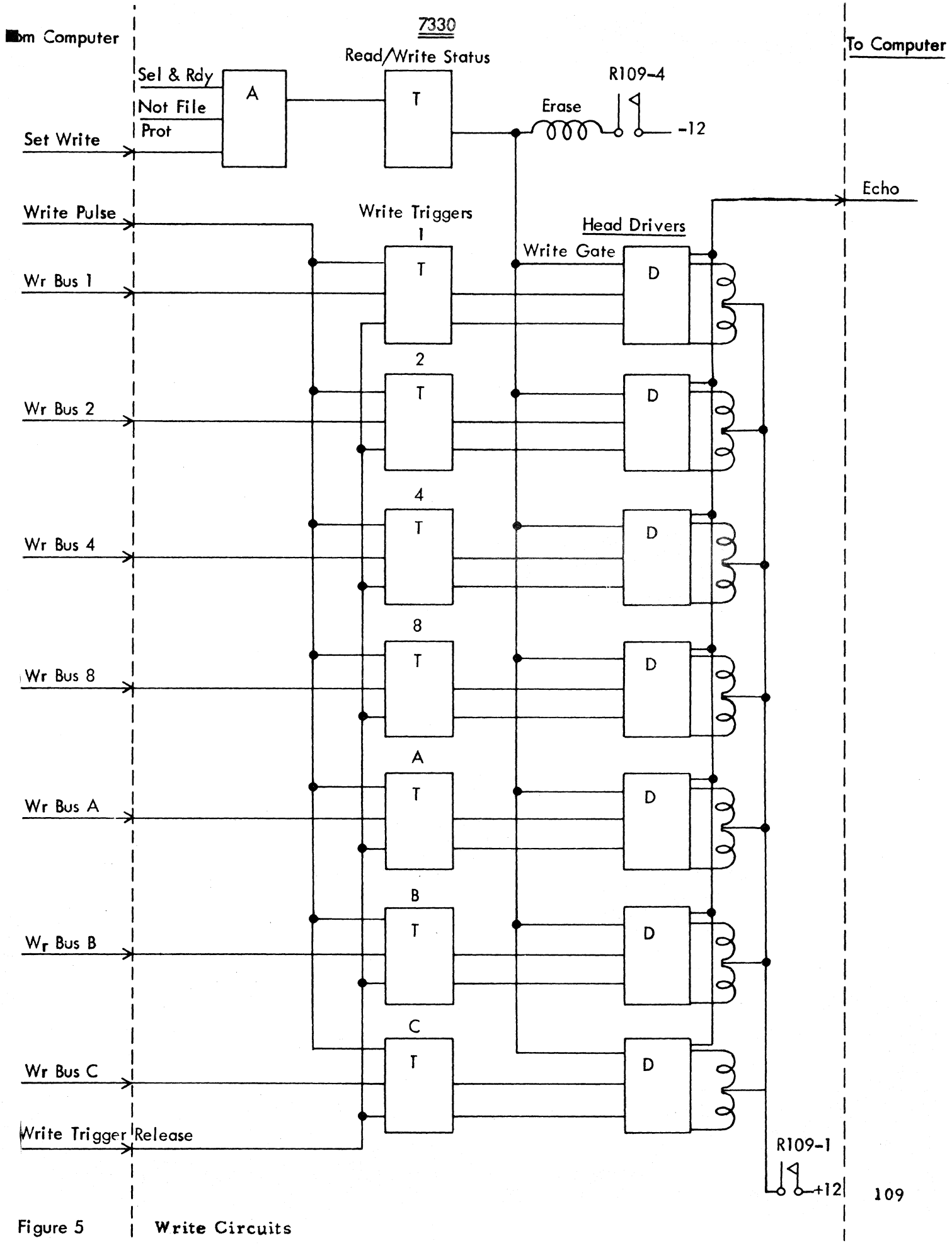


Figure 5 Write Circuits

1. There are _____ write head drivers and _____ write triggers in the 7330.

2. There are three inputs to each head driver. Two of these come from the write trigger and the third input is the _____ _____.

3. What are the three inputs to each write trigger?

4. Referring to question 3, which of these inputs controls the spacing of characters on tape?

5. Again, referring to question 3, which of these lines causes the check character to be written?

6. When any of the write triggers flip to write a bit, the _____ pulse is developed and sent to the computer.

7. Write and erase head current is controlled by the Read/Write status trigger being in _____ status.

Turn to Page 111 to check your answers.

Answers to Page 110

1. 7 - 7

2. Write gate

3. a. Write bus
   b. Write pulse
   c. Write trigger release (reset)

4. Write pulse

5. Write trigger release (reset)

6. echo

7. Write

Continue on Page 112

ISD REVIEW OF THE WRITE CIRCUITS

Compare the following figures in the Instruction Guide to the ISD's.

Figure 5 on Page 109 with Page 73.30.01.1 and 73.30.01.2
On 73.30.01.1 the head drivers for the 1 track, 2, 4, and 8 tracks are shown at 1A, 1C, 1E, and 1G. On 73.30.01.2 the head drivers for the A, B, and C tracks are shown at 1A, 1C, and 1E.

The write head windings are connected between pins B and D of each head driver. The write head windings are not shown on this page, but look at "NOTE X" down at the bottom of the page. "NOTE X" refers you to Page 73.04.08.0 to the write head wiring chart.

Notice from pin F of each head driver the Echo line is commoned together and goes to 73.30.05.1. On 73.30.05.1, the Echo pulse goes through the No Op block at 1A and on to the computer.

73.30.01.1 the Write Gate connects to pin A of all the head drivers. The Write Gate comes from 73.20.05.1. On this page the line comes from the Read/Write status trigger at 3B and through the DE at 4C.

The Read/Write status trigger is set to Write Status by the And circuit at 4B. Pin K of 4B insures that the drive is not file protected before setting Write Status. If you will follow the -W FILE PROTECT line back to 73.50.10.0 you will find that the line will only be at the PLUS W level when Relay 109 is up.

73.30.01.1: The write triggers are shown at 3A, 3B, 3C and 3D, etc. Notice the WRITE BUS inputs come from 73.30.05.1. Follow them back through the DT's (driver Terminators) to the lines coming from the external system.

73.30.01.1, the reset line WRITE TRIGGER RELEASE is developed at the And circuit 3I. Pin R of 3I comes from the computer. Pin Q of 3I insures that the 7330 is selected, ready, and in write status. (SELECT and READY Anded with WRITE STATUS at 3C on 73.20.05.1).

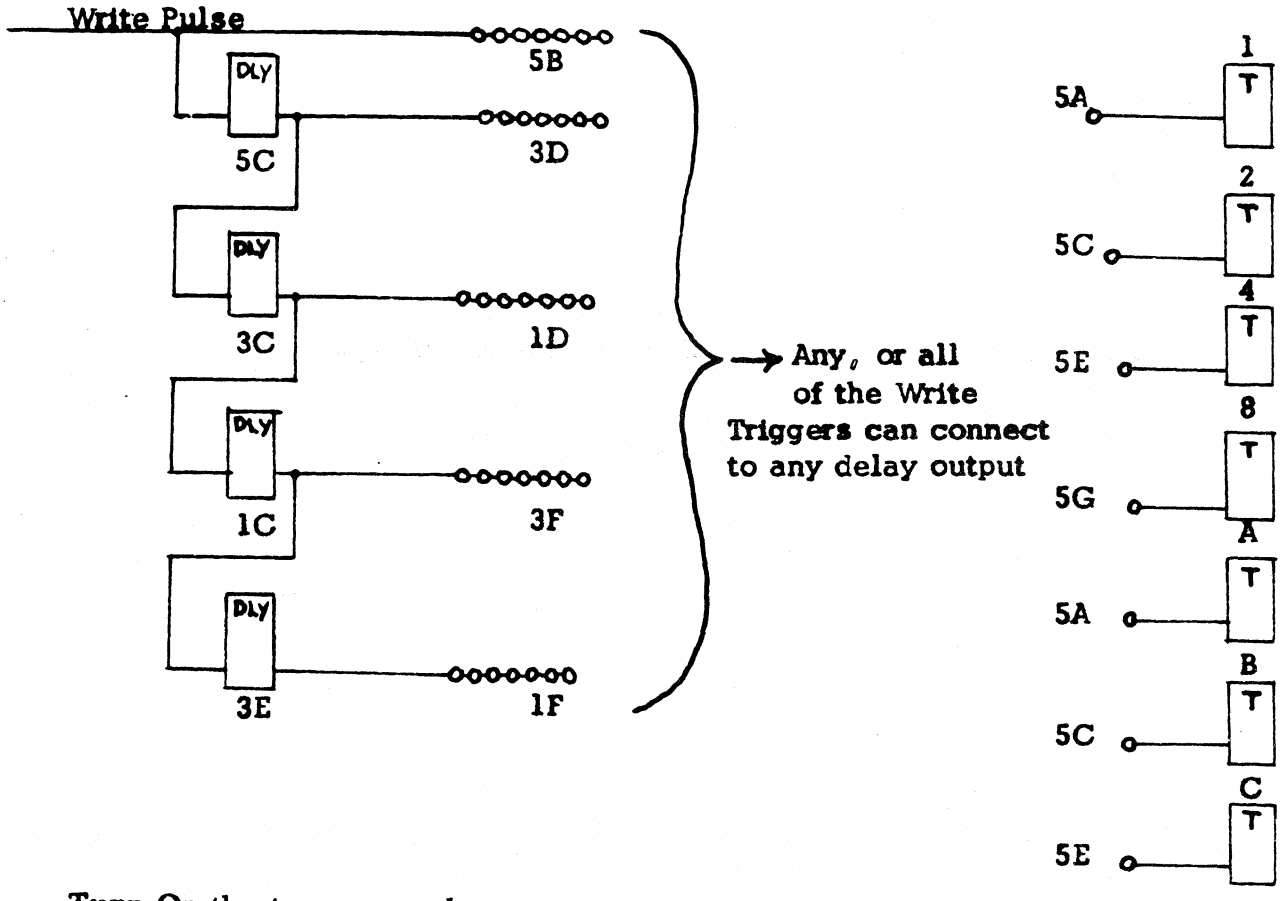
Continue on the next page.

The Write Pulse connects to the Write triggers through pins C and N. The No Operation blocks simply show the other end of these wires not connected to anything. You know that the write pulse is what determines the exact time that a write trigger can be flipped. Later in adjustments, you are going to find that it is necessary to be able to vary or change slightly the time that individual write triggers can be flipped.

There is only one Write Pulse line from the computer which eventually comes into 73.30.01.3 at And circuit 5A. This Write Pulse line is further gated at the DSP at 4A. The output of 4A feeds into a series of delay cards. By connecting the other ends of the wires that were indicated by the No Operation blocks that feed the write triggers to the pins noted by the No Operation blocks on this page (73.30.01.3) the Write Pulse is connected to the write triggers.

The simplified diagram below shows how the time that each of the 7 write triggers will flip can be adjusted individually by selecting the desired amount of delay. Each delay card will delay the write pulse approximately 1.25 microseconds.

73.30.01.3 73.30.01.1-2



Turn On the tape recorder.

SECTION 15

CHARACTER DENSITY AND RECOGNIZING THE BEGINNING AND END-OF-TAPE.

OBJECTIVE:

You should be able to state what two character densities are used and follow through the circuits that control the density.

In addition, you should be able to follow through the circuits used to recognize the beginning and the end of tape.

LOW DENSITY

200 Characters per inch

139 microseconds between characters

HIGH DENSITY

556 Characters per inch

50 microseconds between characters

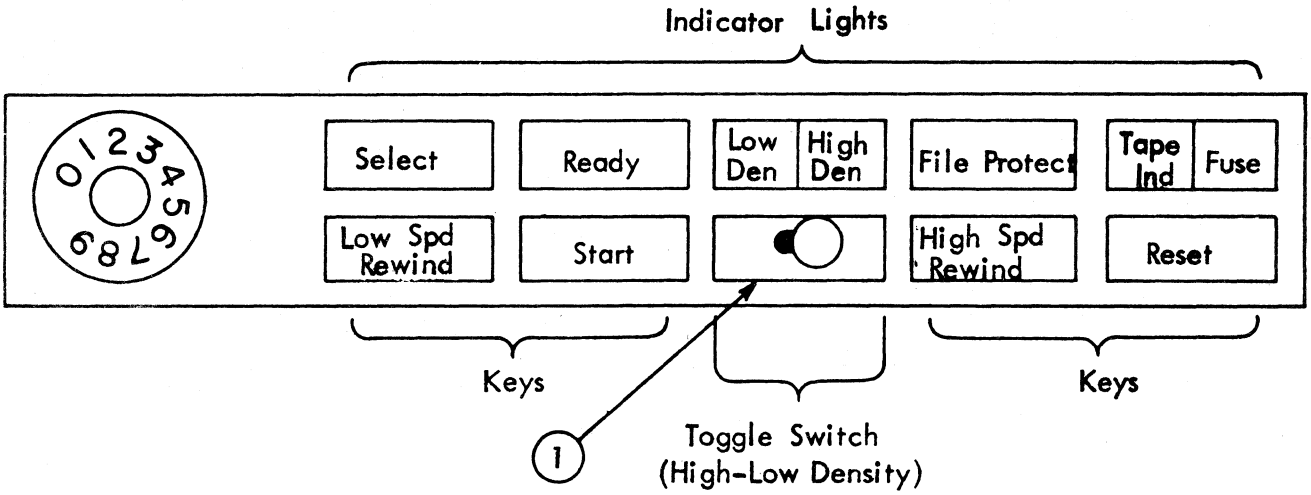


Figure 1

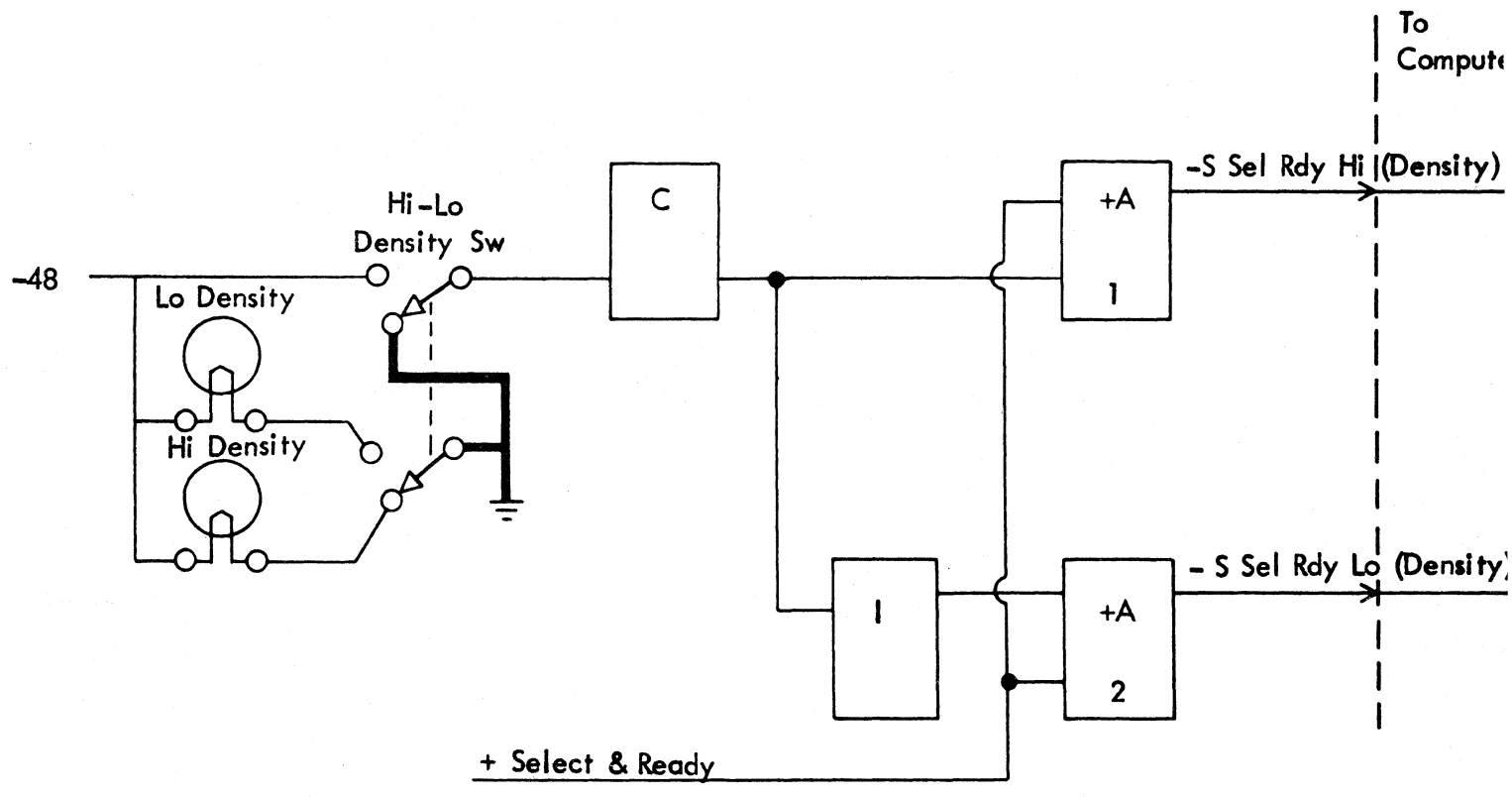


Figure 2

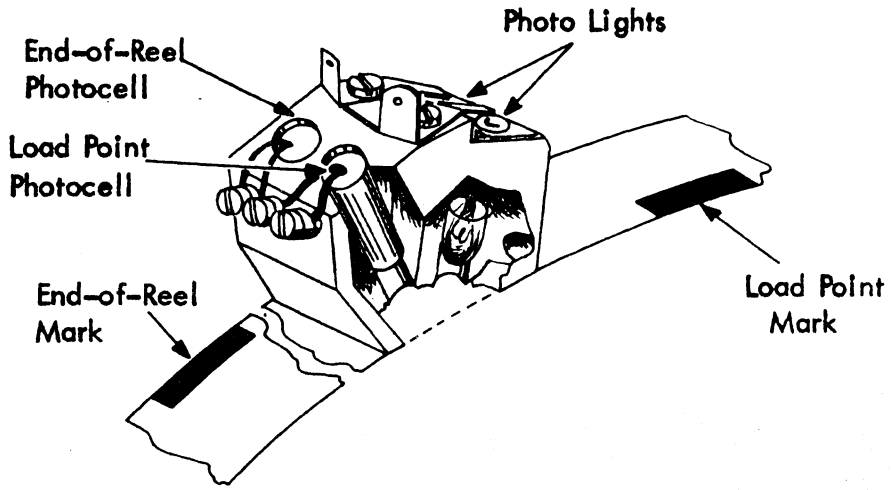


Figure 3

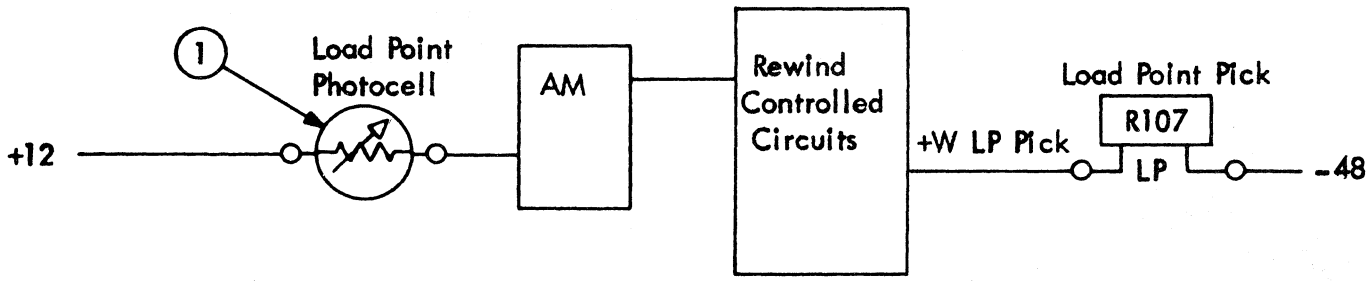


Figure 4

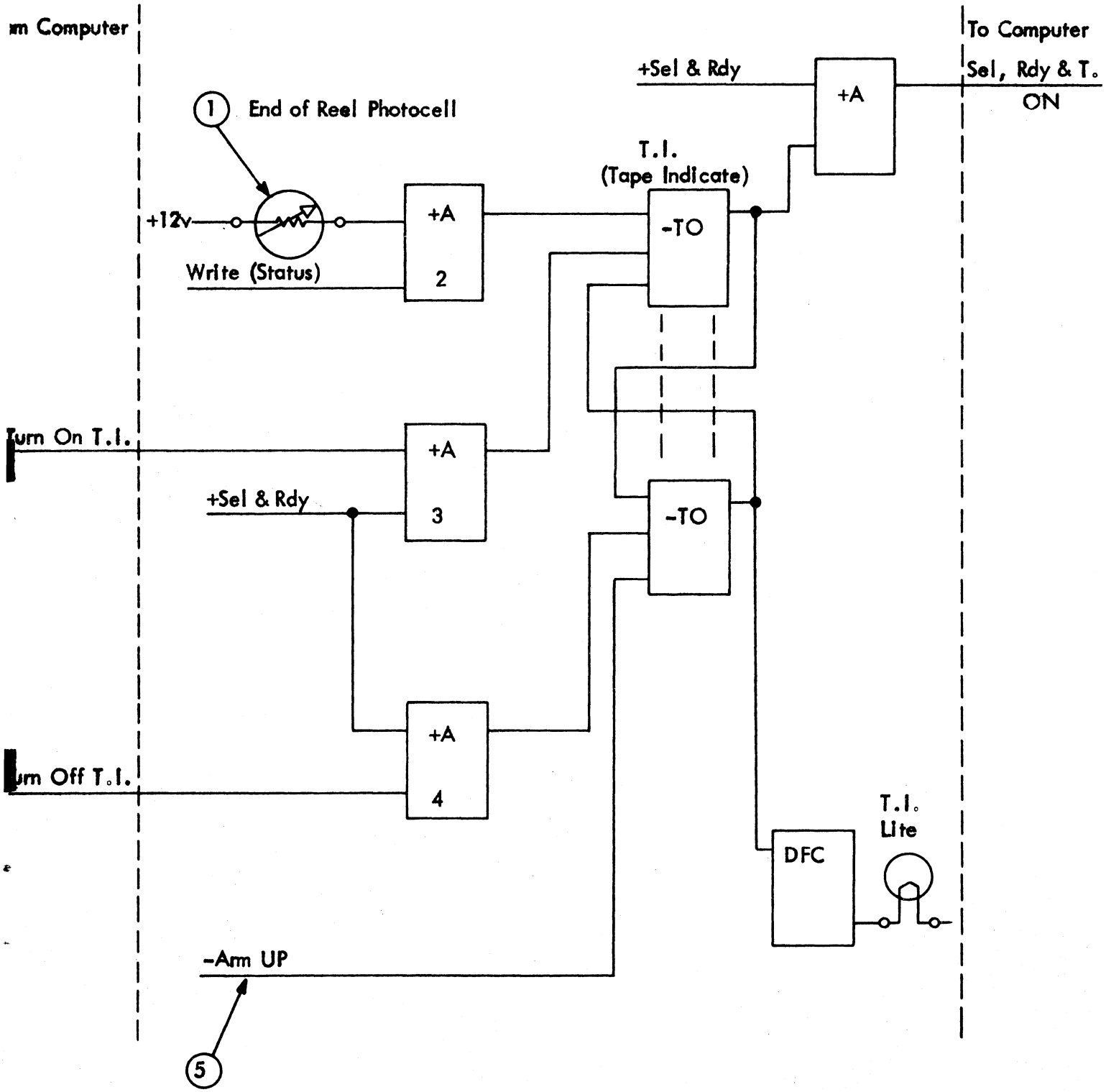
Sensing the End of Reel

1. Sensing the End of Reel reflective mark is only used when the 7330 is in write status.

2. It is only a warning that the End of Tape is near.

3. Turn on the Tape Indicate trigger.

4. The computer would stop sending information to be written.


m Computer
To Computer
Sel, Rdy & T.
ON
+Sel & Rdy
+A
1
End of Reel Photocell
T.I.
(Tape Indicate)
+12v
+A
-TO
Write (Status)
2
Turn On T.I.
+A
+Sel & Rdy
3
-TO
+A
urn Off T.I.
4
T.I.
Lite
DFC
-Arm UP
5

gure 5

1. Low density is _____ characters per inch, high density is _____ characters per inch.

2. The operator selects the density by setting the _____ _____ on the operator's panel.

3. The computer must be informed which density has been chosen (T or F)

4. Tape should always be read at the same density it was written. (T or F)

5. Relay 107 is latch picked when the _____ _____ reflective mark is sensed.

6. The load point marker is put on tape toward the (front, rear) edge.

7. The End of Reel marker is put on tape toward the (front, rear) edge.

8. Sensing the End of Reel reflective spot during a _____ operation will turn on the _____ _____ trigger.

9. There are two ways to reset the tape indicate trigger, one way is by command from the computer and the other is by _____ ing the tape drive.

Turn to Page 121 to check your answers.

Answers to Page 120

1. (Low) 200, (High)556
2. (Toggle switch) or (Hi-Lo Density Switch)
3. True
4. True
5. Load point
6. Front
7. Rear
8. write, tape indicate
9. unloading (raising the rewind arm)

Turn to Page 122

ISD Review of the Density, Load Point, and Tape Indicate circuits.

Compare the following figures in the Instruction Guide to the ISD's.

Figure 2 on Page 116 with 73.50.10.0
The High-Low density switch and lights are located in section B5. Follow the line labeled PLUS W HI DENSITY to 73.20.01.1. On Page 73.20.01.1, the PLUS HI DENSITY line feeds the convert block at 4C.

And circuit #1 in Fig. 2 is located in the ISD's at 2B (73.20.01.1). The inverter is at 3D and And circuit #2 is located at 2D.

Figure 3 on Page 117 with 73.50.01.0
The Load Point and Tape Indicate photo lights are shown in section B2. These are the lights in series with R3 that were referred to in the section in which we discussed Select and Ready. The photo cells are shown on 73.50.10.0 in section A6.

Figure 4 on Page 117 with 73.50.01.0
The output of the L. P. photo cell goes to 73.20.10.1. The amplifier is located at 5C. After going through some rewind circuitry, that will be covered later, the line PLUS W L. P. PICK will eventually be developed at the DFC at 1A.

On Page 73.50.01.0 the line PLUS W L. P. PICK will latch pick Relay 107. R 107 is located in section B2.

Figure 5 on Page 119 with 73.50.10.0
Follow the output of the T. I. photocell to 73.20.10.1. Its output is amplified at 5E. And circuit #2 of figure 5 is located at 3E.
The T. I. trigger is located at 3F and 3G
And circuit 3 is at 4G
And circuit 4 is at 4H
The DFC is at 2I and feeds the Operator's Panel T. I. lamp on Page 73.50.01.0

Turn on the tape recorder.

SECTION: 16

BASIC TAPE MOVEMENT CONTROL CIRCUITS, REEL DRIVE MOTORS, REEL BRAKES, CAPSTAN DRIVE MOTOR, AND MOVING COIL.

OBJECTIVE:

Be able to identify the function performed by the logic blocks used to control the reel drive motors, reel brakes, capstan drive motor, and moving coil.

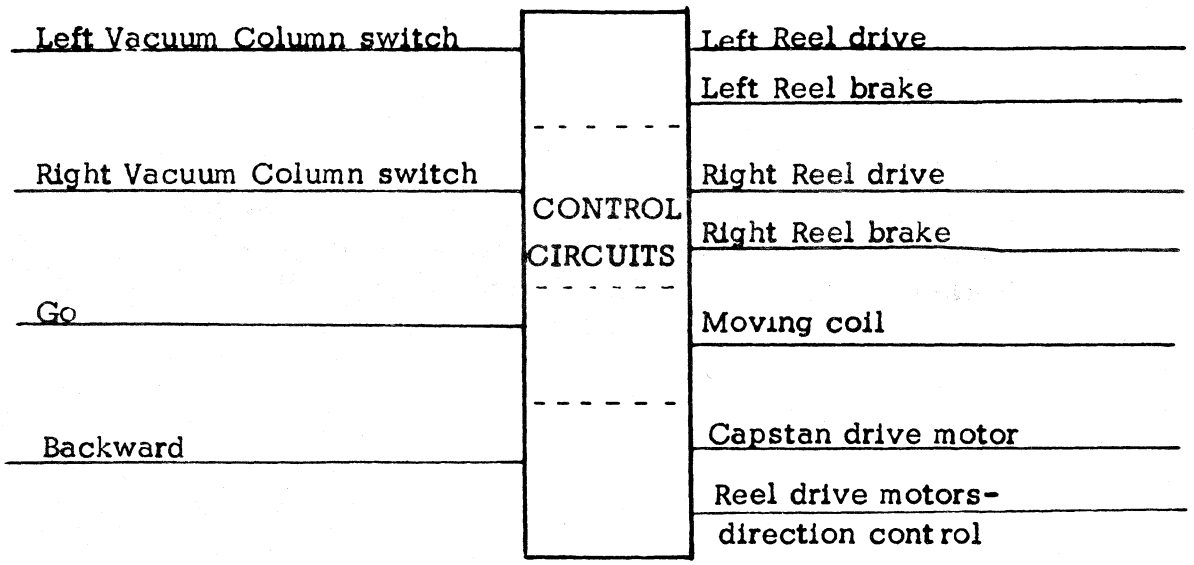

Left Vacuum Column switch
Right Vacuum Column switch
Go
Backward
CONTROL CIRCUITS
Left Reel drive
Left Reel brake
Right Reel drive
Right Reel brake
Moving coil
Capstan drive motor
Reel drive motors-direction control

Figure 1

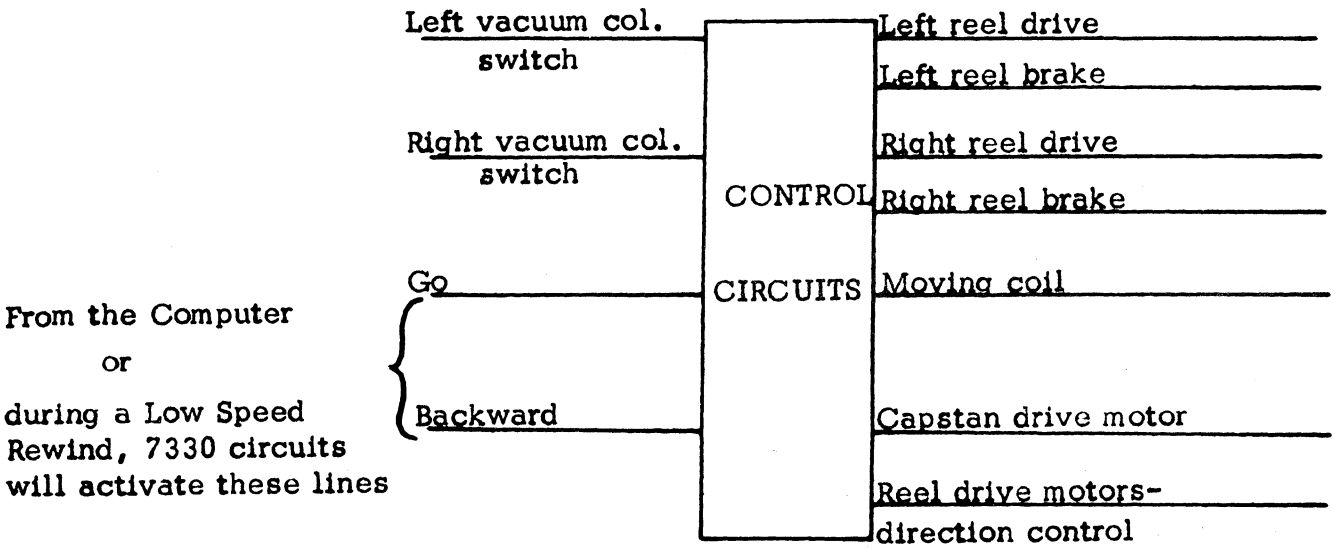
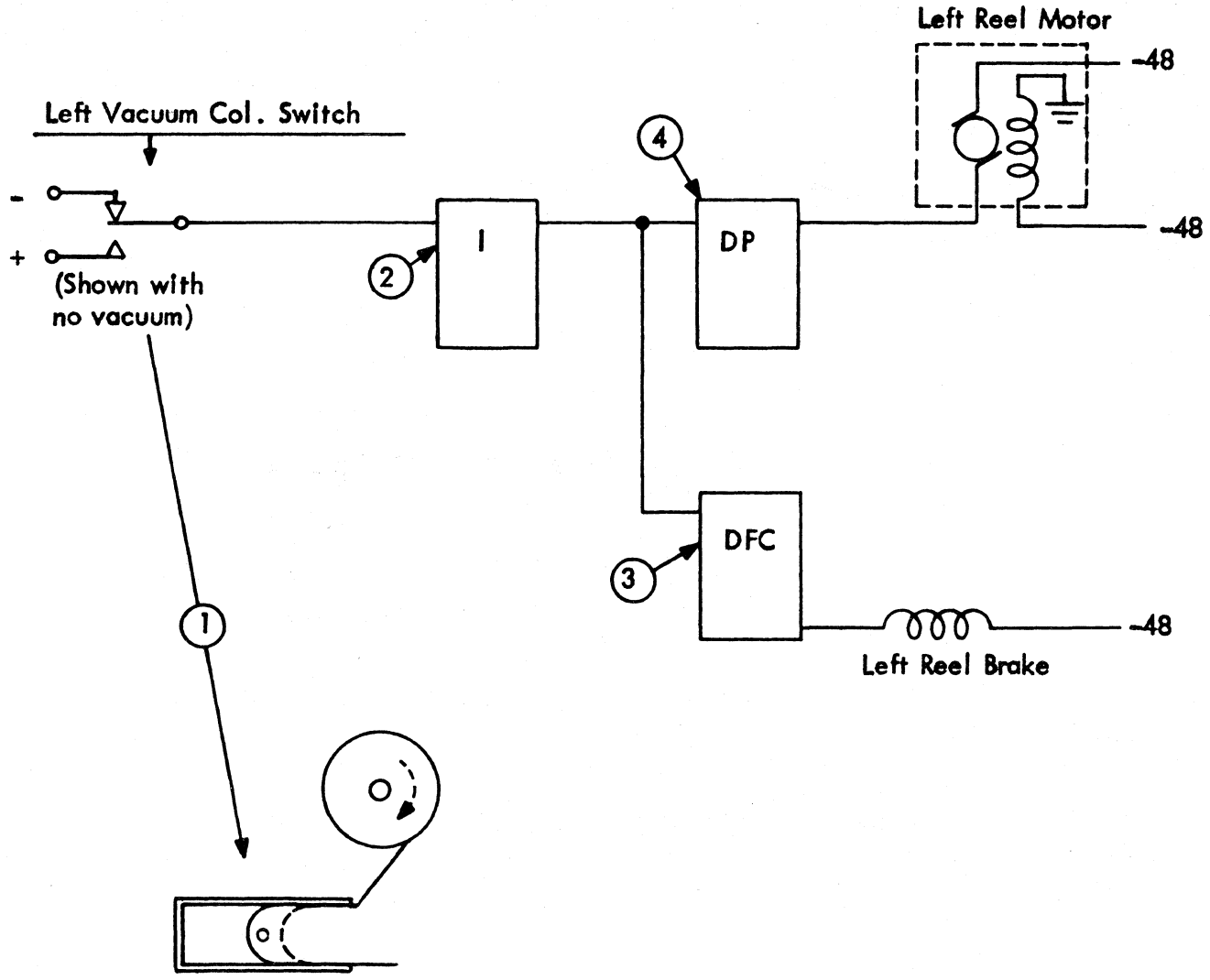

Left vacuum col. switch
Right vacuum col. switch
Go
Backward
From the Computer
or
during a Low Speed Rewind, 7330 circuits will activate these lines
CONTROL CIRCUITS
Left reel drive
Left reel brake
Right reel drive
Right reel brake
Moving coil
Capstan drive motor
Reel drive motors-direction control

Figure 2



Simplified Diagram of the Left Reel Controls-- Forward Motion

Figure 3

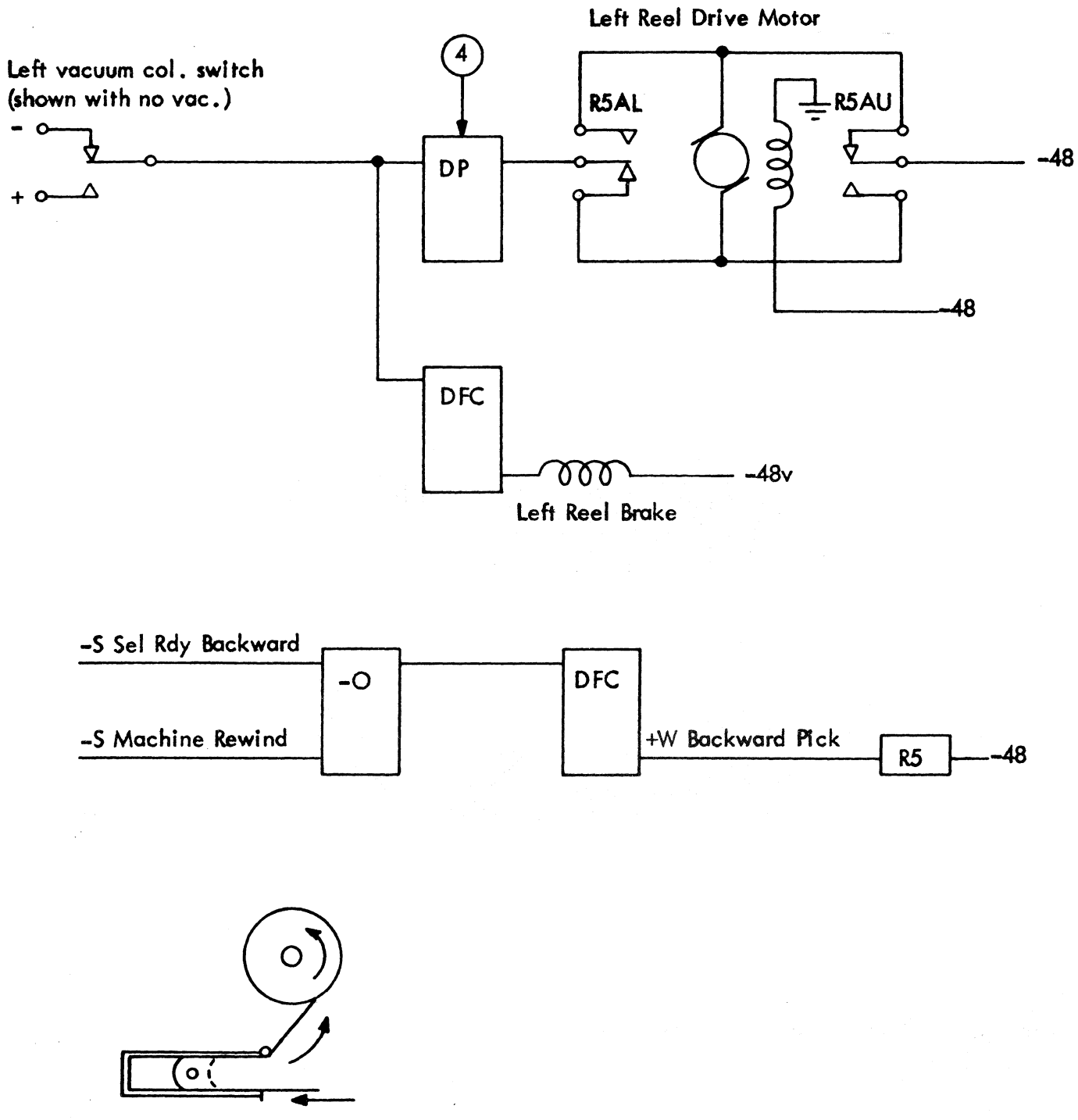


Figure 4. Left Reel Controls for Backward

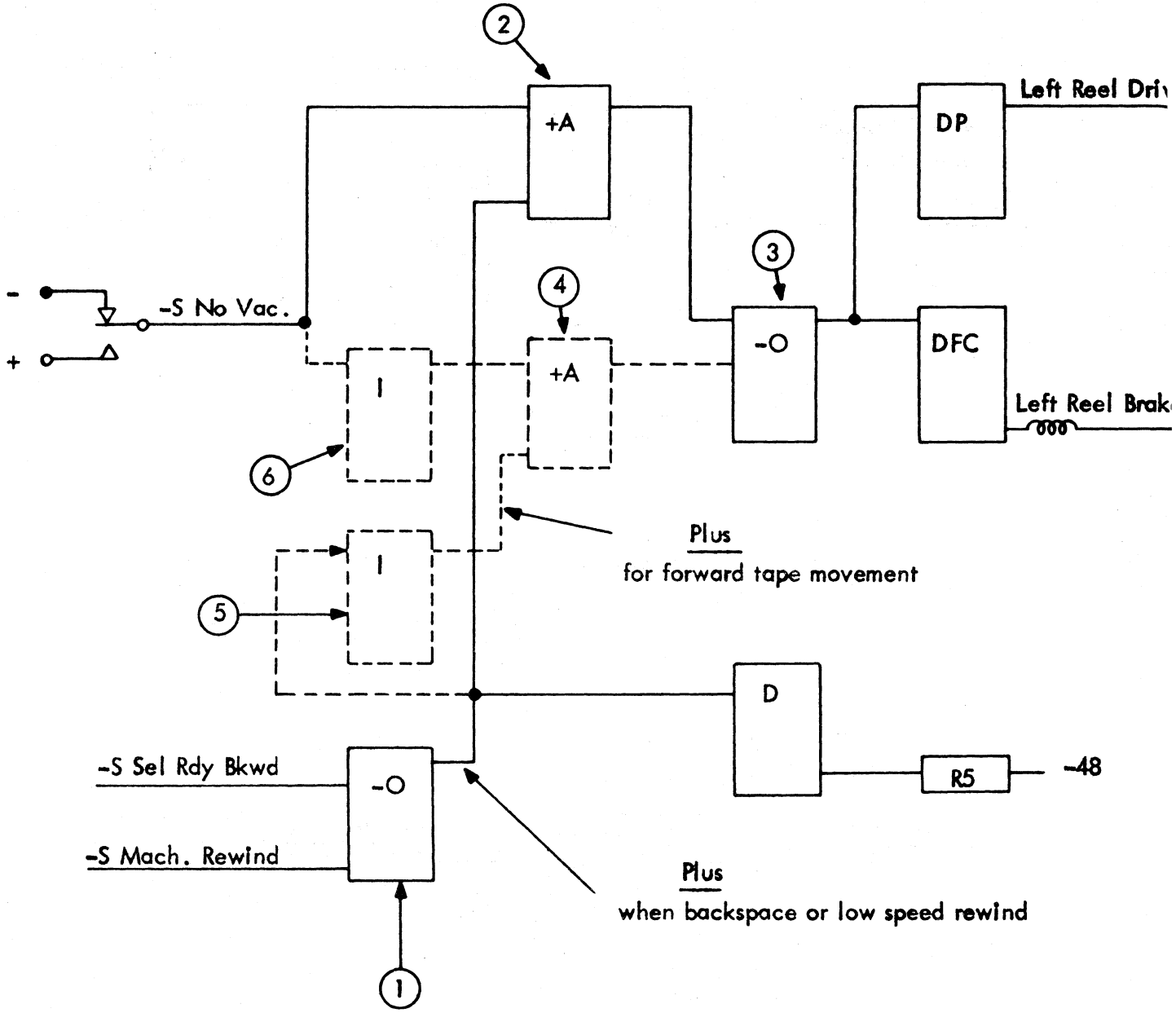


Figure 5. Left Reel Controls for Forward and Backward

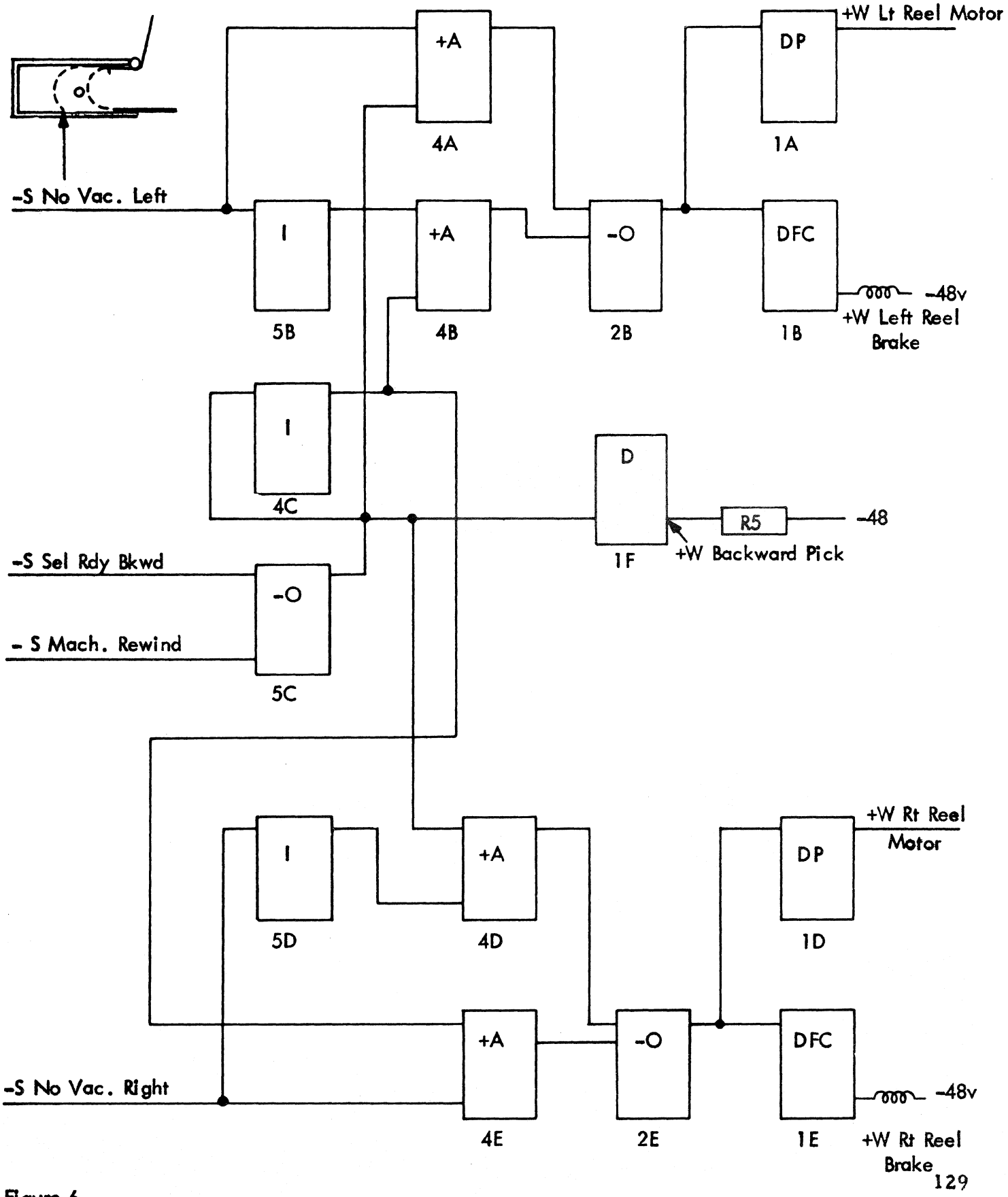

+W Lt Reel Motor
+A
DP
4A
1A
-S No Vac. Left
I
+A
-O
DFC
-48v
+W Left Reel Brake
5B
4B
2B
1B
I
D
4C
R5
-48
1F
+W Backward Pick
-S Sel Rdy Bkwd
-O
- S Mach. Rewind
5C
+W Rt Reel Motor
I
+A
DP
5D
4D
1D
+A
-O
DFC
-S No Vac. Right
-48v
4E
2E
1E
+W Rt Reel Brake

Figure 6

Review Questions to Section 16, Part I

All questions refer to Figure 6, Page 129

1. When Relay 5 is normal the reel drive motors are conditioned for (forward) (backward) motion.

2. a. To pick Relay 5, the OR circuit at _____ must be conditioned.
   b. This OR circuit will only be conditioned for a _____ or a _____ operation.

3. For forward motion, the AND circuit at _____ will be conditioned to control the left reel drive or brake.

4. For forward motion, the AND circuit at _____ will be conditioned to control the right reel drive or brake.

5. For backward motion, the AND circuit at _____ will be conditioned to control the left reel drive or brake.

6. For backward motion, the AND circuit at _____ will be conditioned to control the right reel drive or brake.

7. When the OR circuit at 2B has a minus input, there will be (drive) (brake) applied to the left reel.

8. When the OR circuit at 2E is <u>not</u> satisfied, there will be (drive) (brake) applied to the right reel.

Check your answers on the next page.

Answers to Page 130

1. forward

2. a. 5C
   b. backspace or rewind (low speed)

3. 4B

4. 4E

5. 4A

6. 4D

7. brake

8. drive

Continue on the next page.

ISD REVIEW

Compare Figure 6 on Page 129 with ISD Page 73.20.15.1

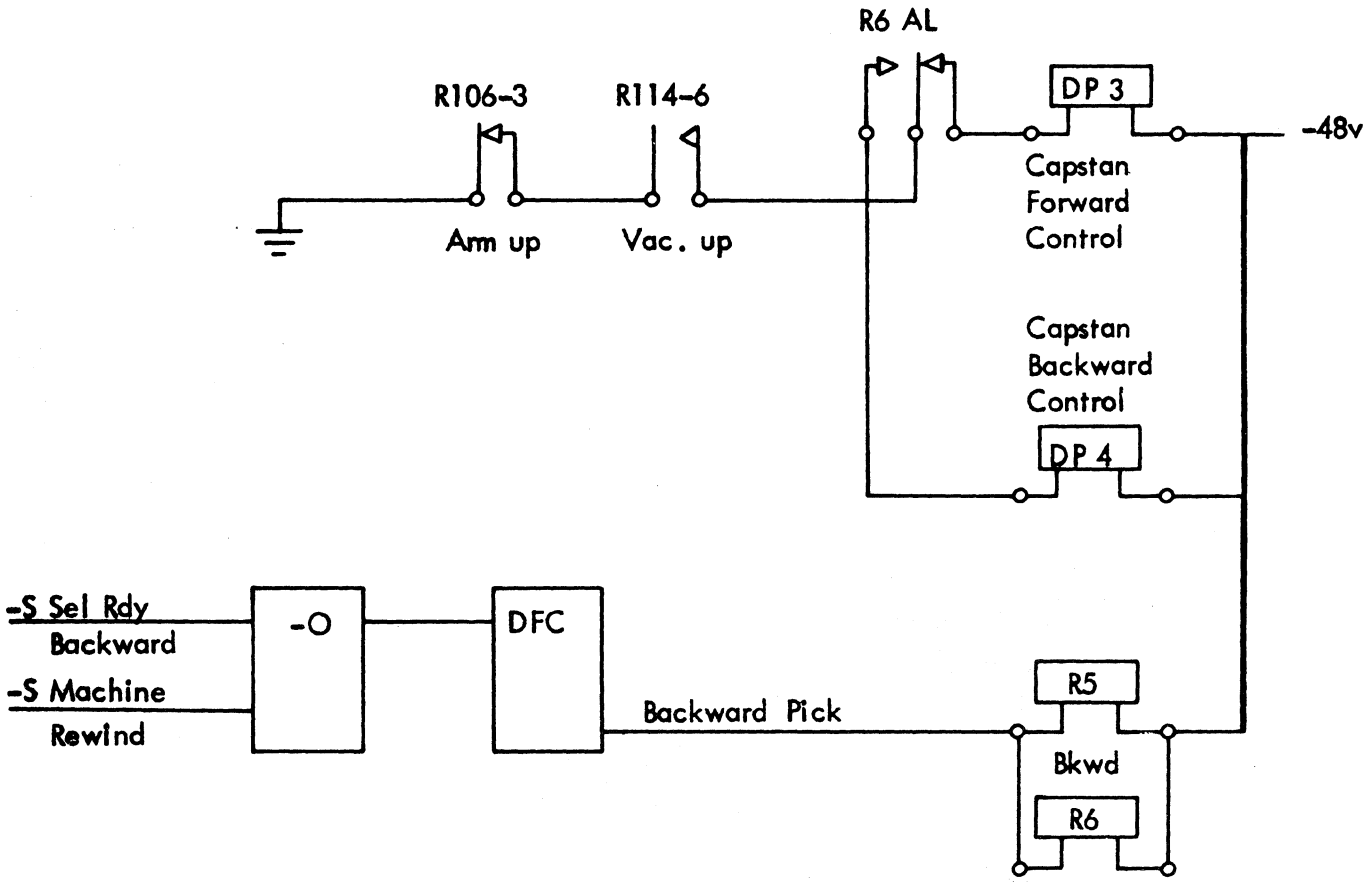
1. Notice that the labeling on the blocks in Figure 6 correspond to their location on ISD Page 73.20.15.1

2. Locate each block on the ISD page. (Don't worry about the circuits located at 4G, 3G, 3H, and 5H)

3. CORRECT YOUR ISD'S SO THAT THE DFC'S AT 1B, 1E, and 1F HAVE IN PHASE OUTPUTS.

4. Follow the line labeled PLUS W BACKWARD PICK from 1F to pick Relay 5 on Page 73.50.05.0. Notice a Relay 6 in parallel with Relay 5. We will use this Relay to reverse the capstan motor rotation in part 2 of this Section.

Turn ON the tape recorder


R6 AL
R106-3
R114-6
DP 3
-48v
Arm up
Vac. up
Capstan
Forward
Control
Capstan
Backward
Control
DP 4
-S Sel Rdy
Backward
-S Machine
Rewind
-O
DFC
R5
Backward Pick
Bkwd
R6

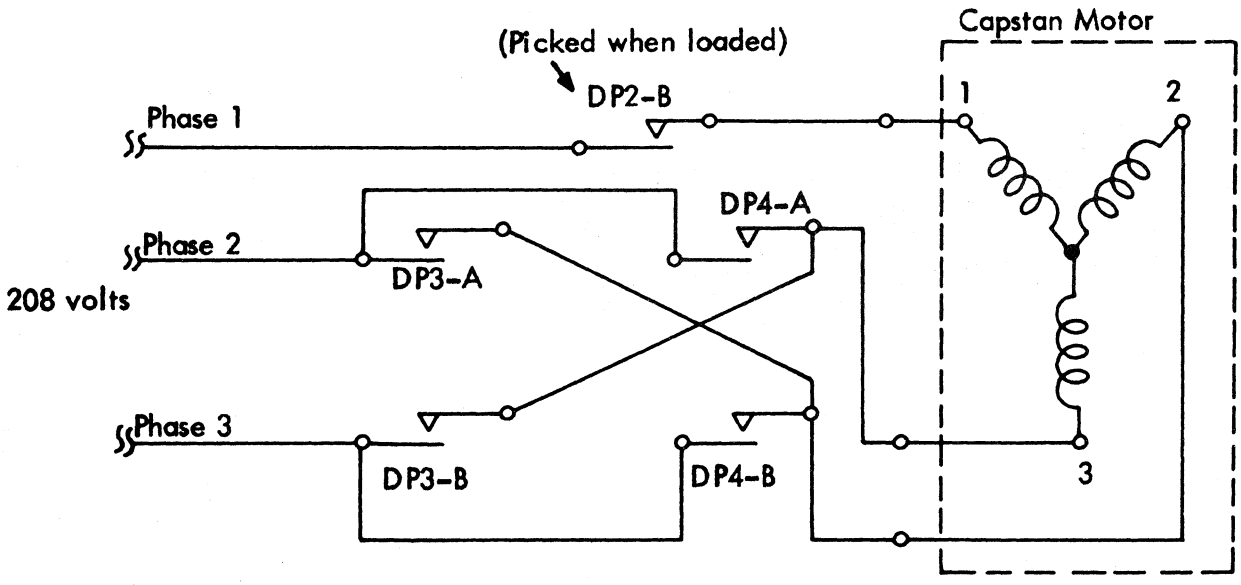
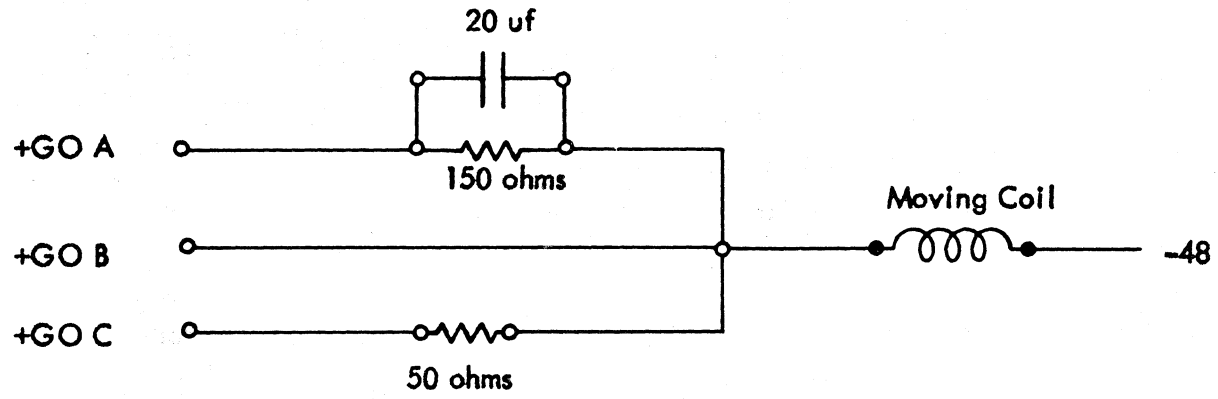

Capstan Motor
(Picked when loaded)
DP2-B
Phase 1
1
2
DP4-A
Phase 2
208 volts
DP3-A
Phase 3
DP3-B
DP4-B
3

Figure 7


20 uf
+GO A
150 ohms
Moving Coil
+GO B
-48
+GO C
50 ohms

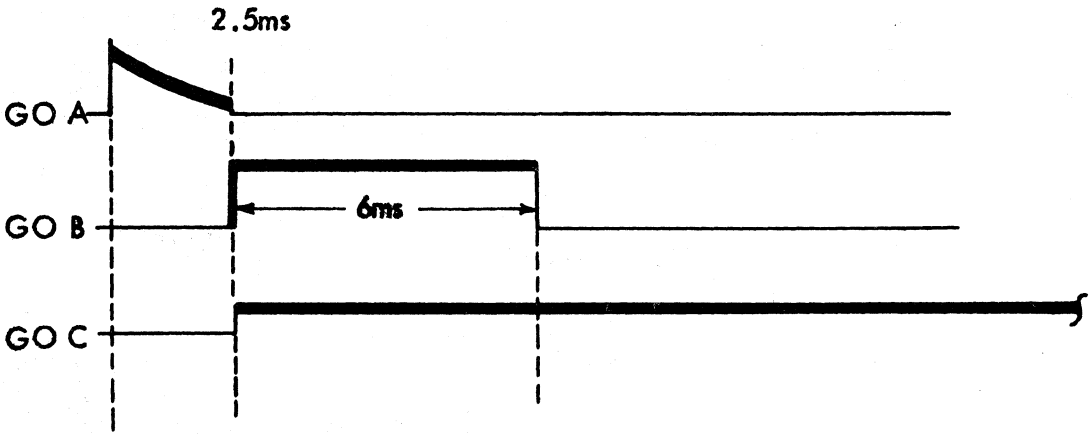

2.5ms
GO A
6ms
GO B
GO C

Figure 8

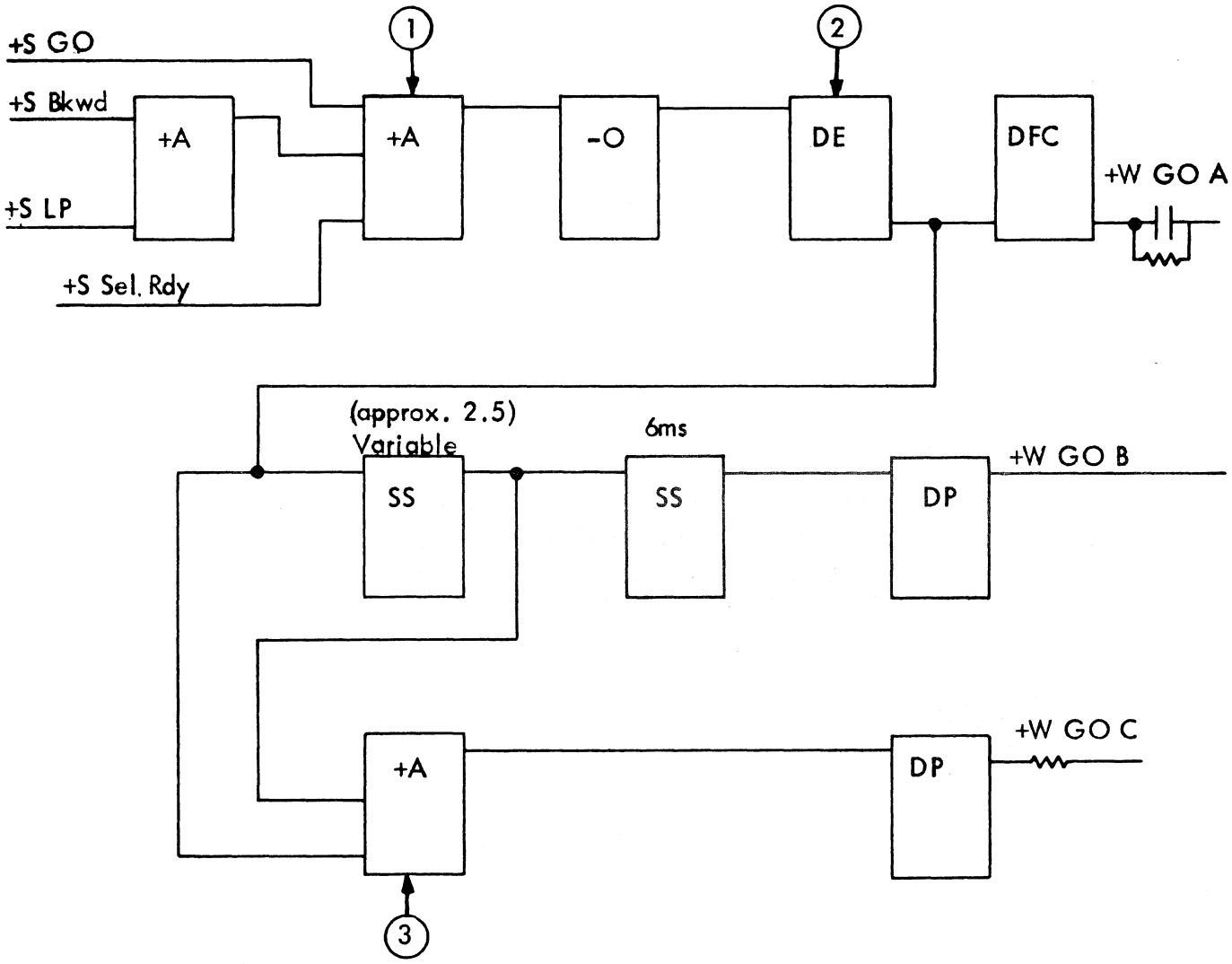

+S GO
+S Bkwd
+S LP
+S Sel. Rdy
+A
1
+A
-O
2
DE
DFC
+W GO A
(approx. 2.5)
Variable
SS
6ms
SS
DP
+W GO B
+A
DP
+W GO C
3

Figure 9

REVIEW QUESTIONS

1. A 3 phase motor can be reversed by reversing the connections to any _____ phases.

2. The capstan will turn in a forward direction when DP 3 is _____ and DP 4 is _____.

3. Relay 6 will control the direction of rotation of the _____ motor.

4. The initial surge current to the Go coil, to transfer the rocker arm quickly is provided by the _____ current line.

5. To prevent the rocker arm from bouncing, the Go coil is held energized for 6 milliseconds by the _____ line.

6. Sufficient current to hold the rocker arm in the Go or drive position is supplied by the _____ line.

Turn to Page 139 to check your answers.

Answers to Page 136

1. Two
2. DP 3 picked, DP 4 is down
3. Capstan
4. Go A
5. Go B
6. Go C

Continue on the next page.

ISD REVIEW

Compare Figure 7 on Page 133 with 73.50.01.0

DP 3 and DP 4 are in Section B2

Compare Figure 7 on Page 133 with 73.50.20.0 - Sheet 2 of 2

DP 2 in phase 1 will be picked when the drive is loaded.

Compare Figure 8 on Page 134 with 73.50.15.0

The moving coil is located in Section B8. Notice, to complete the circuit to -48 volts, you must go through a DP1A N/O which is closed when the arms are down. The Go A, Go B, and Go C lines come from 73.20.05.1

Compare Figure 9 on Page 135 with 73.20.05.1

The AND circuit at Circle 1 is located at 4D.
The DE at Circle 2 is located at 2D.
The variable S.S. - 4F and 4G
The 6 Ms S.S. - 3F and 3G
AND circuit, Circle 3, is a 2G

Turn on the recorder

SECTION 17:

LOW SPEED REWIND

OBJECTIVE:

Be able to state the mechanical and electrical sequence of a low speed rewind and be able to identify the function performed by the logic blocks used to control low speed rewind.

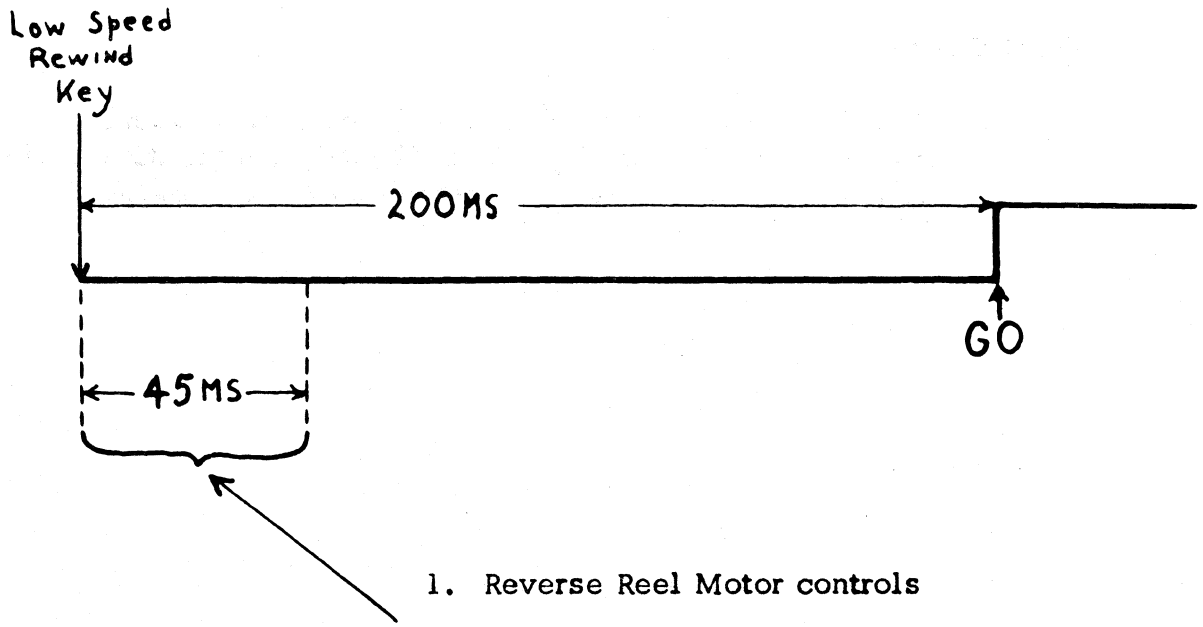
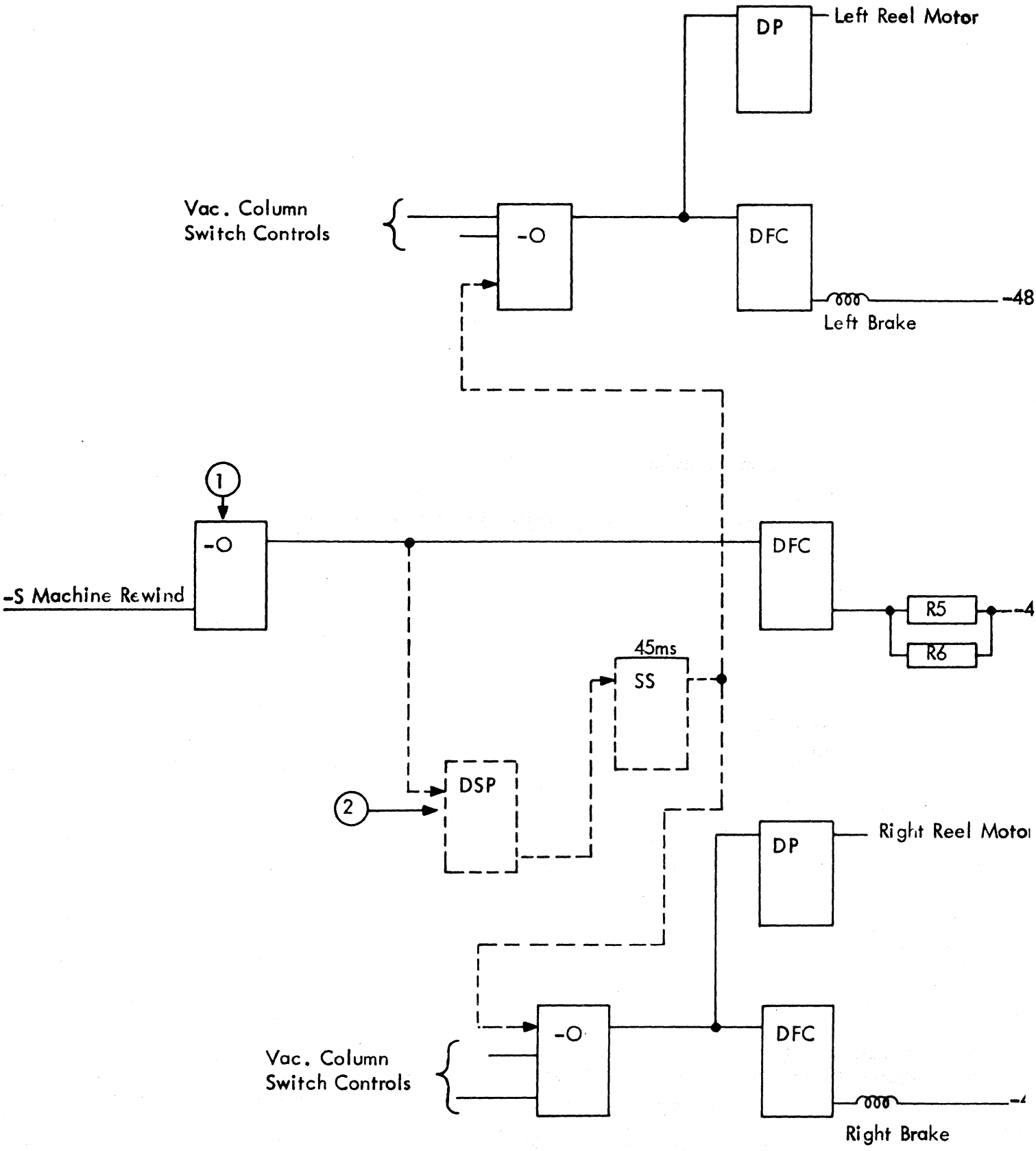

Low Speed
Rewind
Key
200MS
GO
45MS
1. Reverse Reel Motor controls
2. Reverse Capstan Motor
3. Apply brake to both reels

Figure 1


DP
Left Reel Motor
Vac. Column
Switch Controls
-O
DFC
-48
Left Brake
1
-O
-S Machine Rewind
DFC
R5
R6
-4
45ms
SS
DSP
2
DP
Right Reel Motor
-O
Vac. Column
Switch Controls
DFC
Right Brake

141

igure 2

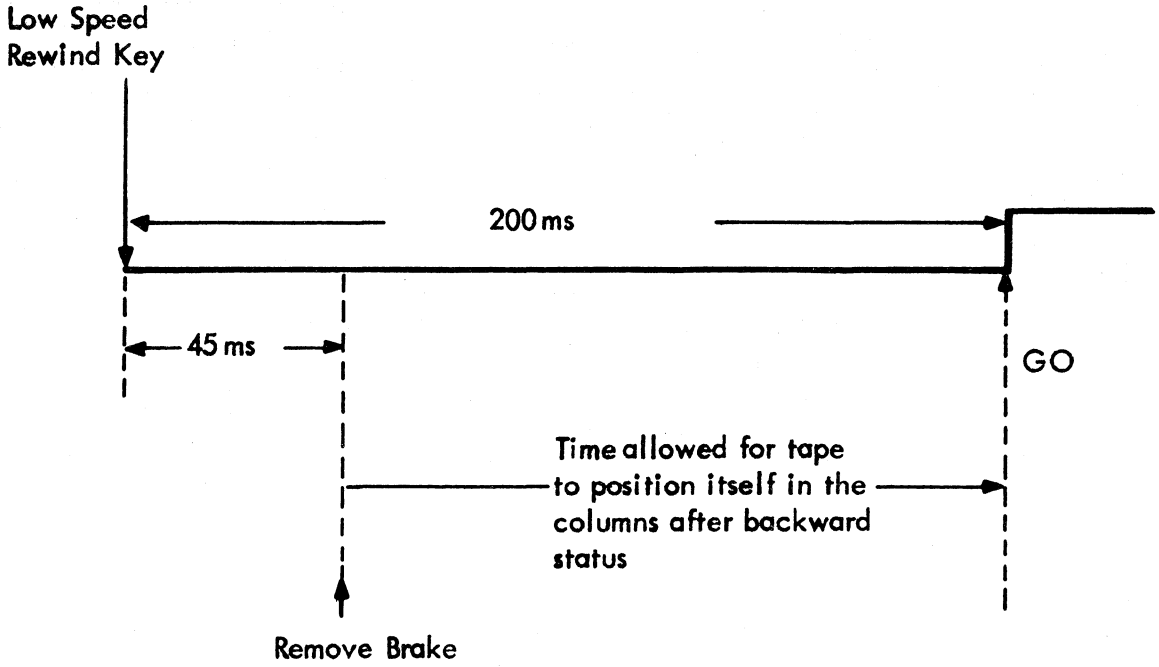


Figure 3

Tape position before low speed rewind key is depressed

Figure 4A

Tape position after it is adjusted to move tape backward

Figure 4B

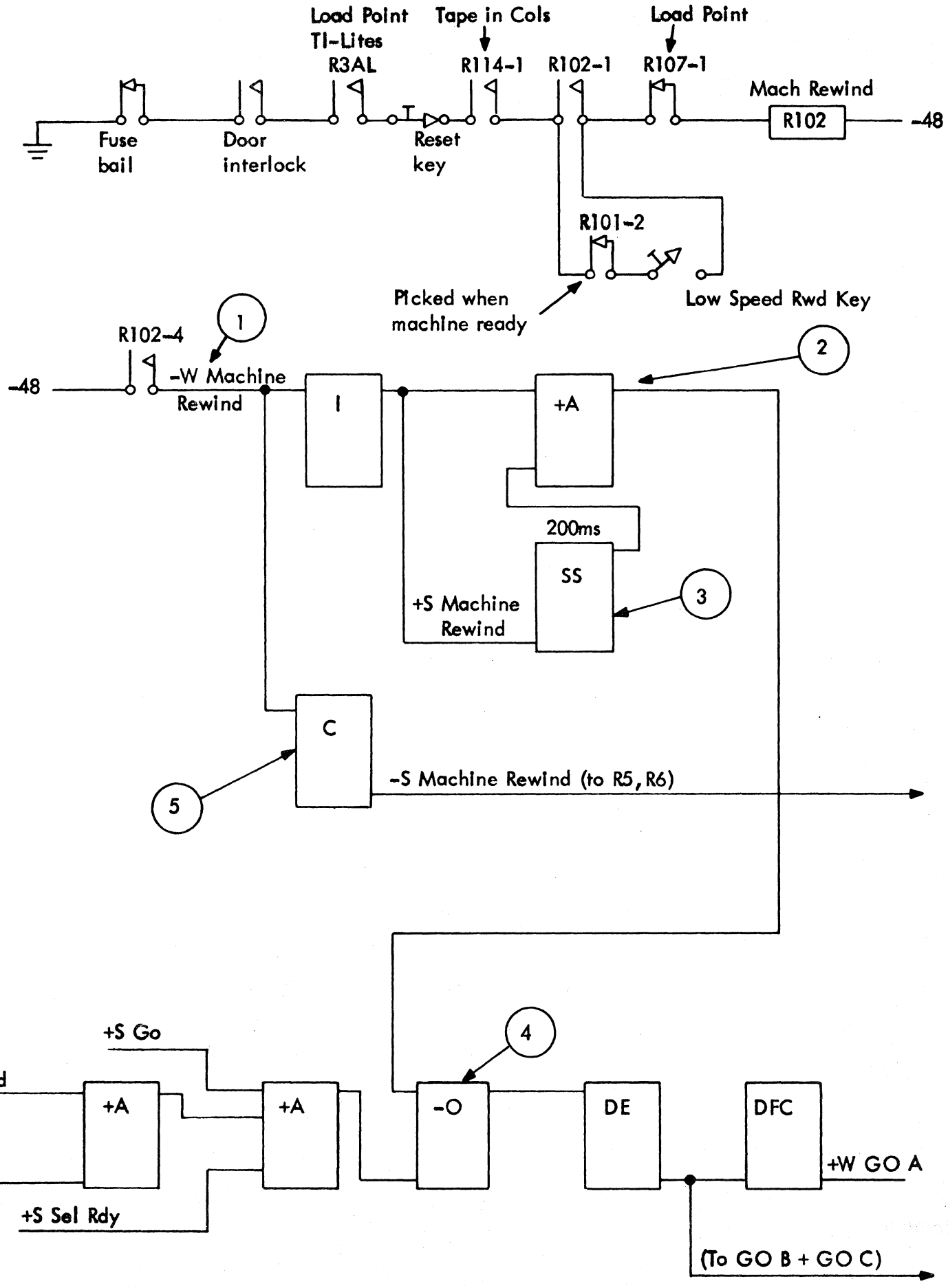
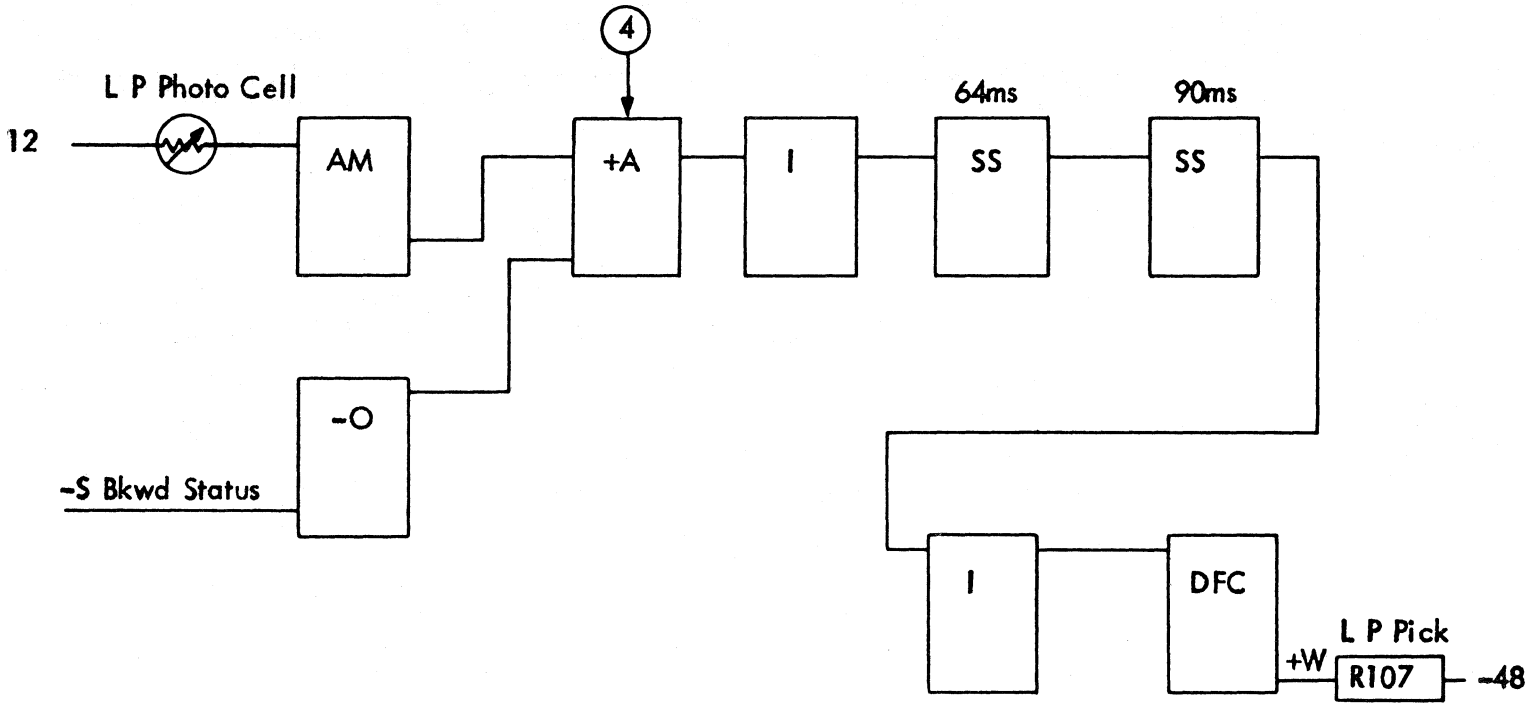

Load Point
TI-Lites
R3AL
Tape in Cols
R114-1
R102-1
Load Point
R107-1
Mach Rewind
R102
-48
Fuse
bail
Door
interlock
Reset
key
R101-2
Picked when
machine ready
Low Speed Rwd Key
R102-4
1
-W Machine
Rewind
-48
I
+A
2
200ms
SS
3
+S Machine
Rewind
C
5
-S Machine Rewind (to R5, R6)
+S Go
4
+S Bkwd
+A
+A
-O
DE
DFC
+W GO A
+S Lp
+S Sel Rdy
(To GO B + GO C)

Figure 5


4
L P Photo Cell
12
AM
+A
I
64ms
SS
90ms
SS
-O
-S Bkwd Status
I
DFC
L P Pick
+W
R107
-48

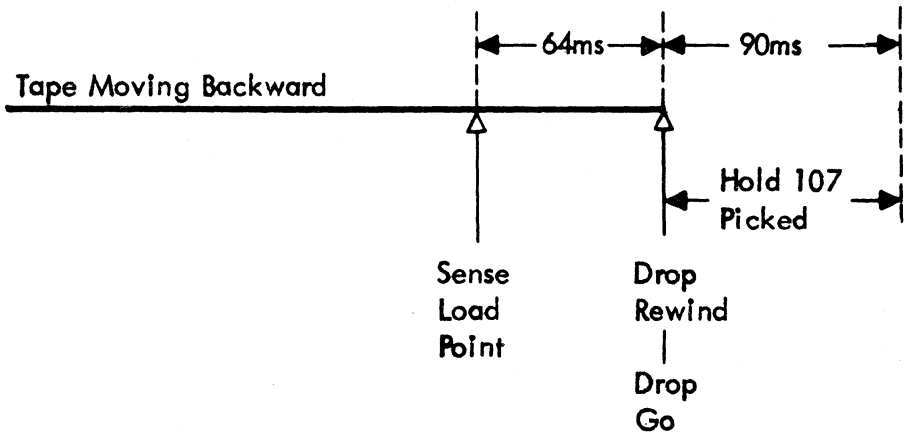

64ms
90ms
Tape Moving Backward
Hold 107
Picked
Sense
Load
Point
Drop
Rewind
Drop
Go

Figure 6

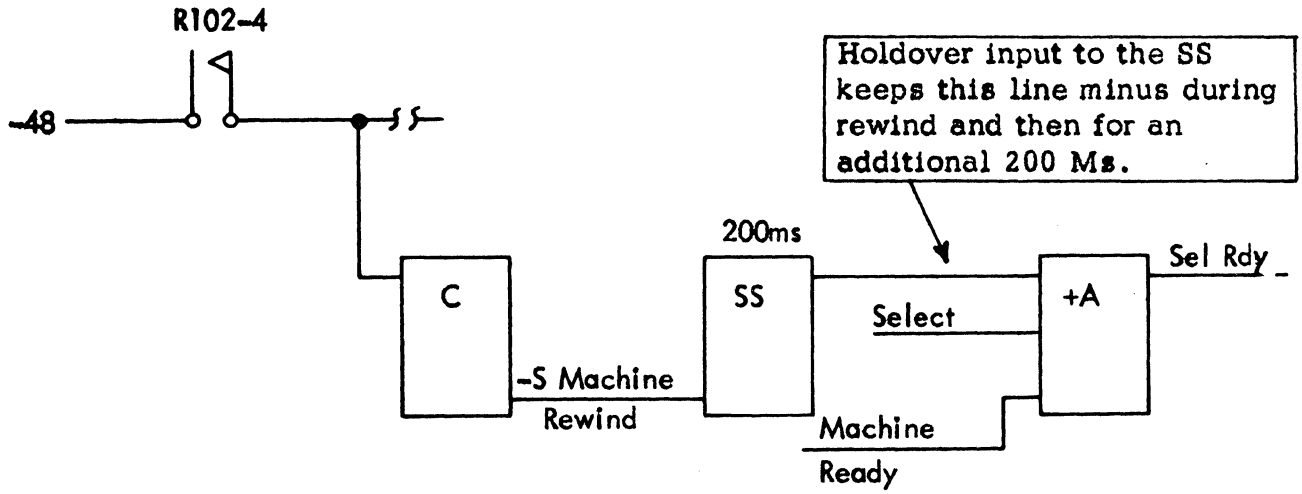

R102-4
-48
Holdover input to the SS keeps this line minus during rewind and then for an additional 200 Ms.
200ms
C
SS
+A
Sel Rdy
Select
-S Machine
Rewind
Machine
Ready

Figure 7

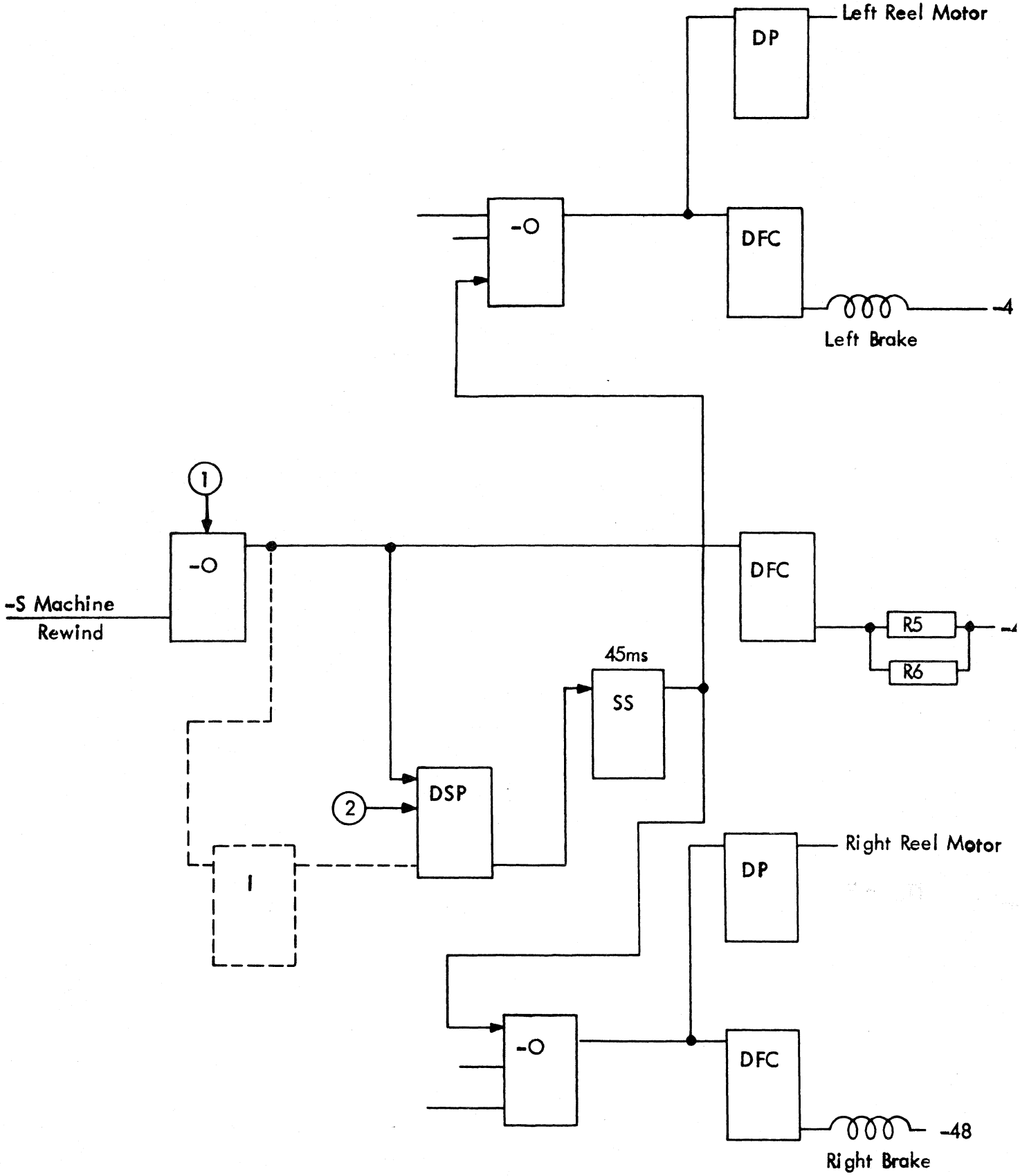

Left Reel Motor
DP
-O
DFC
-4
Left Brake
1
-O
-S Machine
Rewind
DFC
R5
R6
45ms
SS
2
DSP
I
Right Reel Motor
DP
-O
DFC
-48
Right Brake

Figure 8

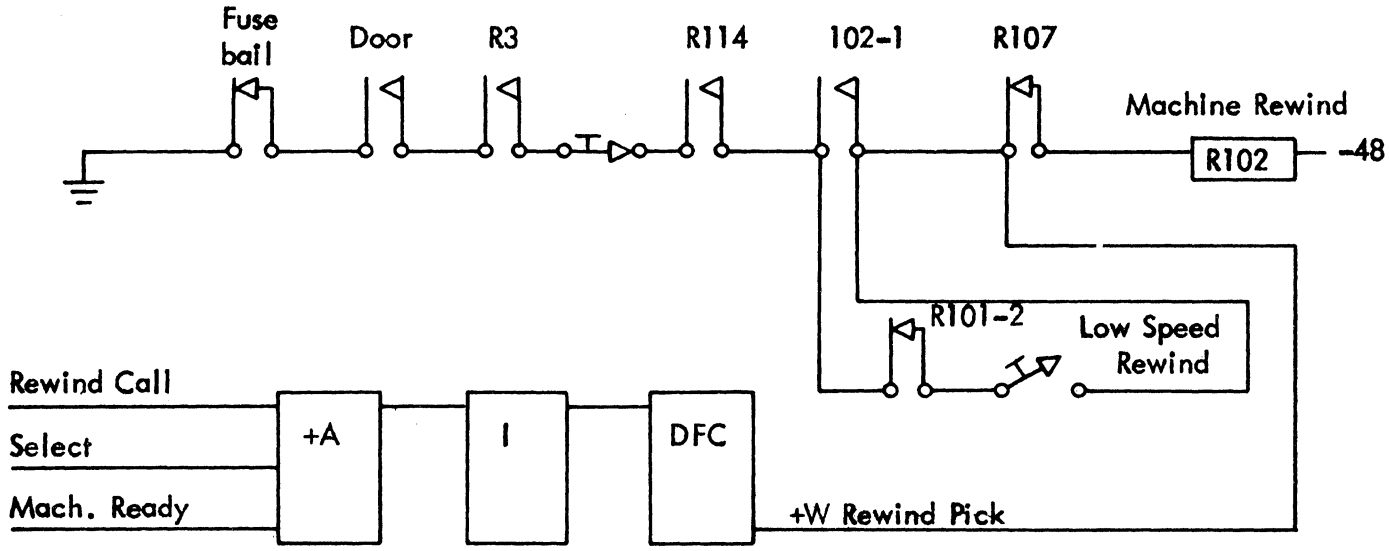

Fuse
bail
Door
R3
R114
102-1
R107
Machine Rewind
R102
-48
R101-2
Low Speed
Rewind
Rewind Call
Select
Mach. Ready
+A
I
DFC
+W Rewind Pick

Figure 9

1. Compare Figure 8 on Page 146 with 73.20.15.1
   a. The OR circuit at Circle 1 is at 5C DSP, Circle 2, - 4G The output of 5C going to pin B of 4G goes through three inverters; 4C, 3C, and 2C. The logic affect then is one inversion as shown in Figure 8.
   b. The output of 5C going to pin D of 4G is inverted twice; 4C and 3C. The logic affect with two inversions is the same as no inversion as shown in Figure 8.
   c. The 45 millisecond S.S. is at 3G and 3H.

2. Compare Figure 5 on Page 143 with 73.50.01.0
   a. The machine rewind relay circuit is in Section B1.
   b. The 200 millisecond S.S. used at the beginning of the rewind operation is located 3E. The AND circuit, Circle 2, is at 4E.
   c. Follow the Plus S machine rewind line feeding the S.S. and the And circuit at 4E, back to 73.20.01.1. On 73.20.01.1, the inverter is at 3C. The converter at Circle 5 represents the two converters at 5B and 5C, and the two inverters at 3C and 1C.

3. Compare Figure 7 on Page 145 with 73.20.01.1
   a. The 200 millisecond S.S. used at the end of the rewind opeza-tion is located at 3E. The AND circuit is located at 4A.

4. Compare Figure 6 on Page 144 with 73.20.10.1
   a. As a point to begin, AND circuit, Circle 4, is located at 3C.

5. Return to Loadpoint Relay, R111. 73.50.05.0
   a. With the drive unloaded Relay 111 is picked two ways:
      (1) Thru R114-2 N/C (vacuum is down)
      (2) Thru R106-1 N/O (the rewind arms are up) and R 110-3 N/C.
   b. Relay 111 then holds thru the R 111-3 N/O and R 102-5 N/C points.
   c. The two pick circuits to R 111 are removed when:
      (1) The rewind arms are lowered, dropping R 106,
      (2) and, R 114 is picked with tape in the columns and vacuum up.
   d. Relay 111 will drop when the low speed rewind key is depressed (R102 picks) to rewind to loadpoint.
   e. The machine ready relay, R101 section B1, can now be picked by depressing the Start Key.
   f. The Plus W machine Ready logic line (73.50.10.0, B5) can now be developed.
      (1) As long as R 102-4 is picked, the Plus W machine ready line is being held minus thru diode D 18.
      (2) Sensing loadpoint drops out the machine rewind relay, R 102.

REVIEW QUESTIONS

1. A low speed rewind can be initiated two ways, by the computer instruction or by depressing the _____ _____ _____key.

2. What relay initiates the low speed rewind operation?

3. After low speed rewind is initiated, Go is not brought up until 200 milliseconds.
   Pick the actions that take place during this 200 millisecond delay from the following list:
   - Brake is applied for 45 ms
   - Loadpoint is sensed
   - Tape positions itself in the columns for forward motion
   - Tape positions itself in the columns for backward motion
   - Capstan motor is reversed
   - Tape moves forward
   - Reel drive motors controls reversed
   - Tape moves backward

4. On Page 144, is the latch pick for R107. When R107 is picked the rewind operation terminates by dropping Relay _____.

5. At the end of the low speed rewind, the 7330 will change back to _____status. Therefore, a 200 millisecond delay is again used while this change in status takes place.

6. The low speed rewind key is depressed and tape positions itself in the columns to move backward. However, the tape does not rewind. The trouble was found to be:
   a. 73.20.05.1, 4D, pin F was always minus.
   b. 73.20.05.1, 3D, pin R was always plus.
   c. 73.50.01.0, (B1) Relay 107-1 failed to make.
   d. 73.50.01.0 (B2) loadpoint lamp burned out.

7. While low speed rewinding the tape was pulled completely out of the right vacuum column. The trouble was found to be:
   a. 73.50.15.0 (A7) R5BL N/C failing to make.
   b. 73.20.15.1, 4E, pin K was always plus.
   c. 73.20.15.1, 2E, pin D is always minus.
   d. 73.20.15.1, 1D, pin C is always minus.

Turn to Page 150 and check your answers.

Answers to questions on Page 149

1. low speed rewind key

2. Relay 102

3. brake applied for 45 milliseconds
capstan motor reversed
reel drive motors controls reversed
tape position in the columns adjusted for backward motion

4. R102

5. forward

6. a. No, this pin will be minus during a low speed rewind.
b. Yes, pin R must go minus to bring up GO.
c. No, the rewind would not have been initiated. R102 would not pick.
d. No, R3 would be down and this would prevent R102 from picking.

7. a. No, R5 is transferred.
b. No, pin K should be plus during rewind. This And circuit is not used while moving tape backward.
c. No, this would cause the right reel motor to be energized all the time.
d. Yes, the right reel motor would not be energized to supply tape to the right column.

SECTION: 18

HIGH SPEED REWIND

OBJECTIVE:

1. Given a list of the steps that make up the high speed rewind operation, you should be able to arrange them in the proper sequence.
   And also
2. be able to identify the purpose of the circuits used to control a high speed rewind.

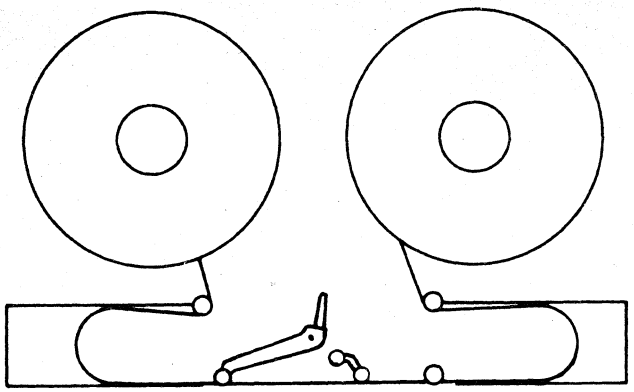


Figure 1A

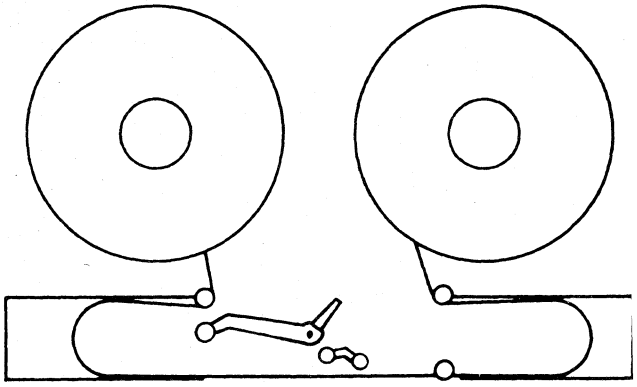


Figure 1B

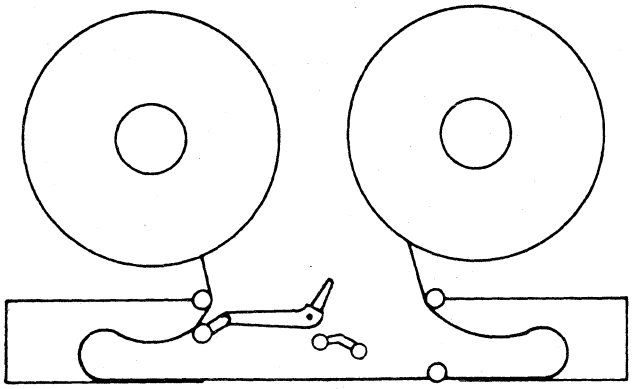


Figure 1C

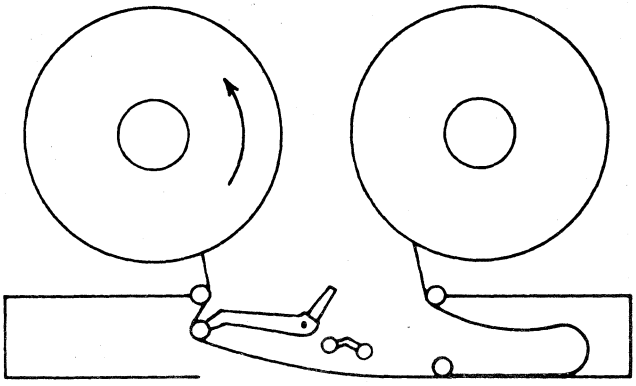


Figure 1D

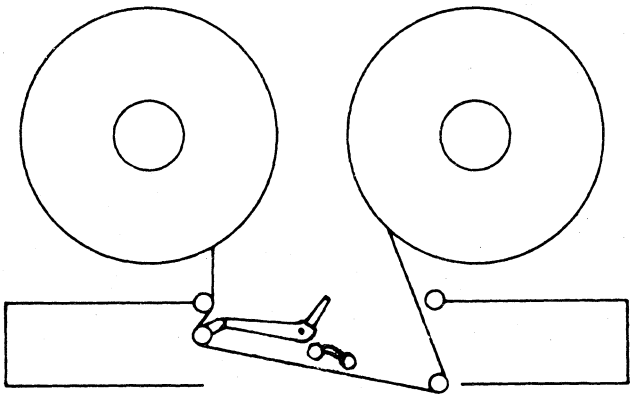


Figure 1E

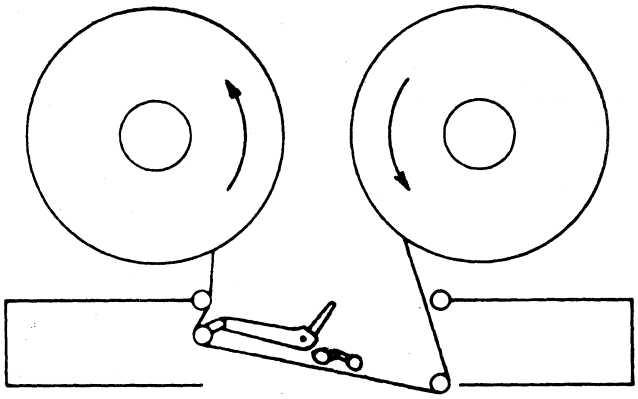


Figure 1F

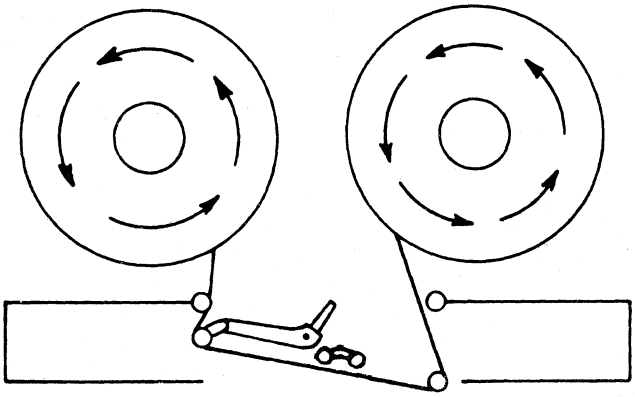


Figure 1G

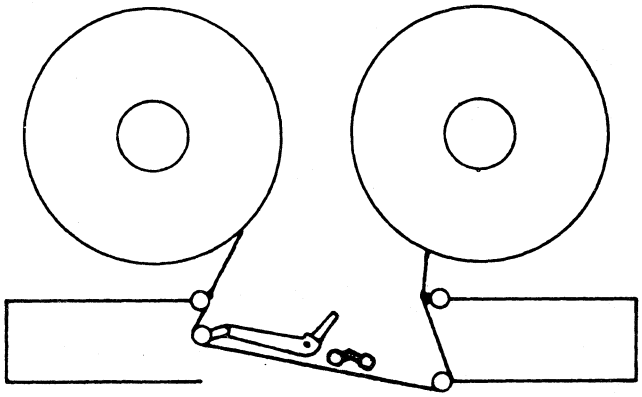


Figure 1H

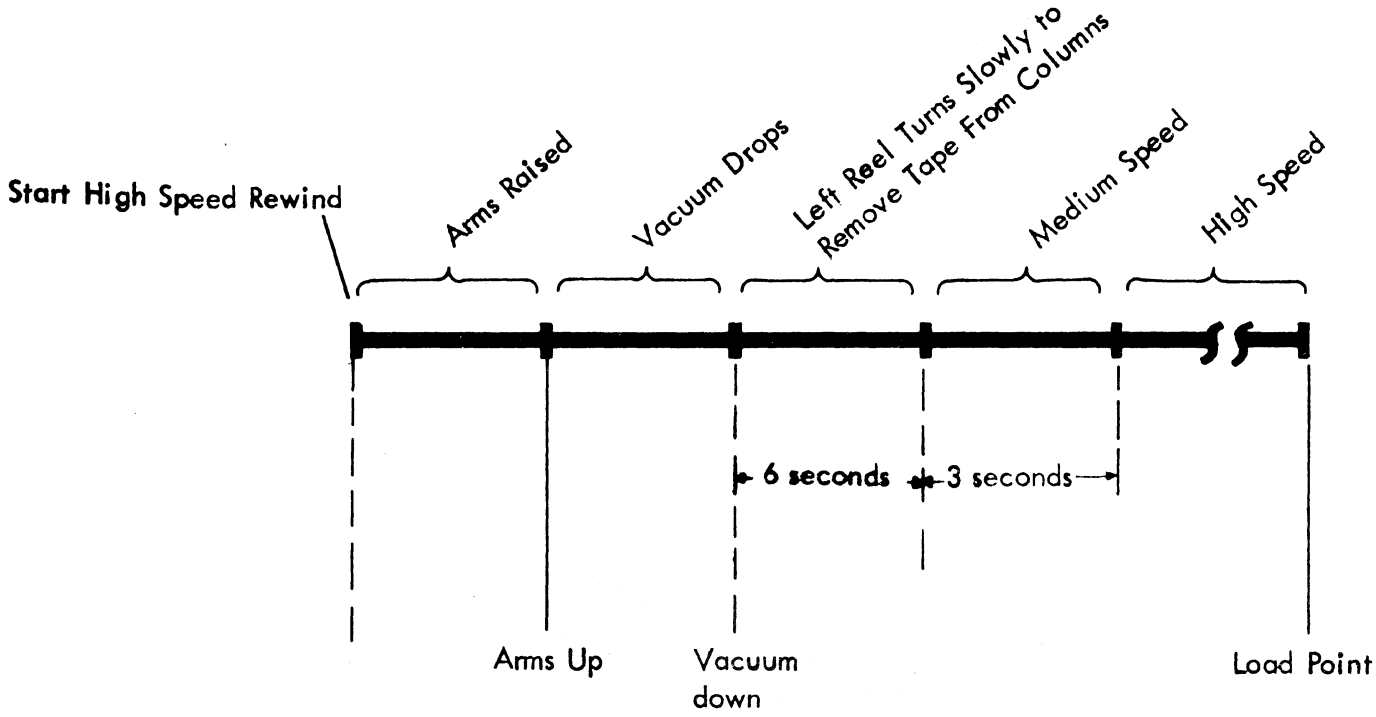

Start High Speed Rewind
Arms Raised
Vacuum Drops
Left Reel Turns Slowly to Remove Tape From Columns
Medium Speed
High Speed
6 seconds
3 seconds
Arms Up
Vacuum down
Load Point

Figure 2

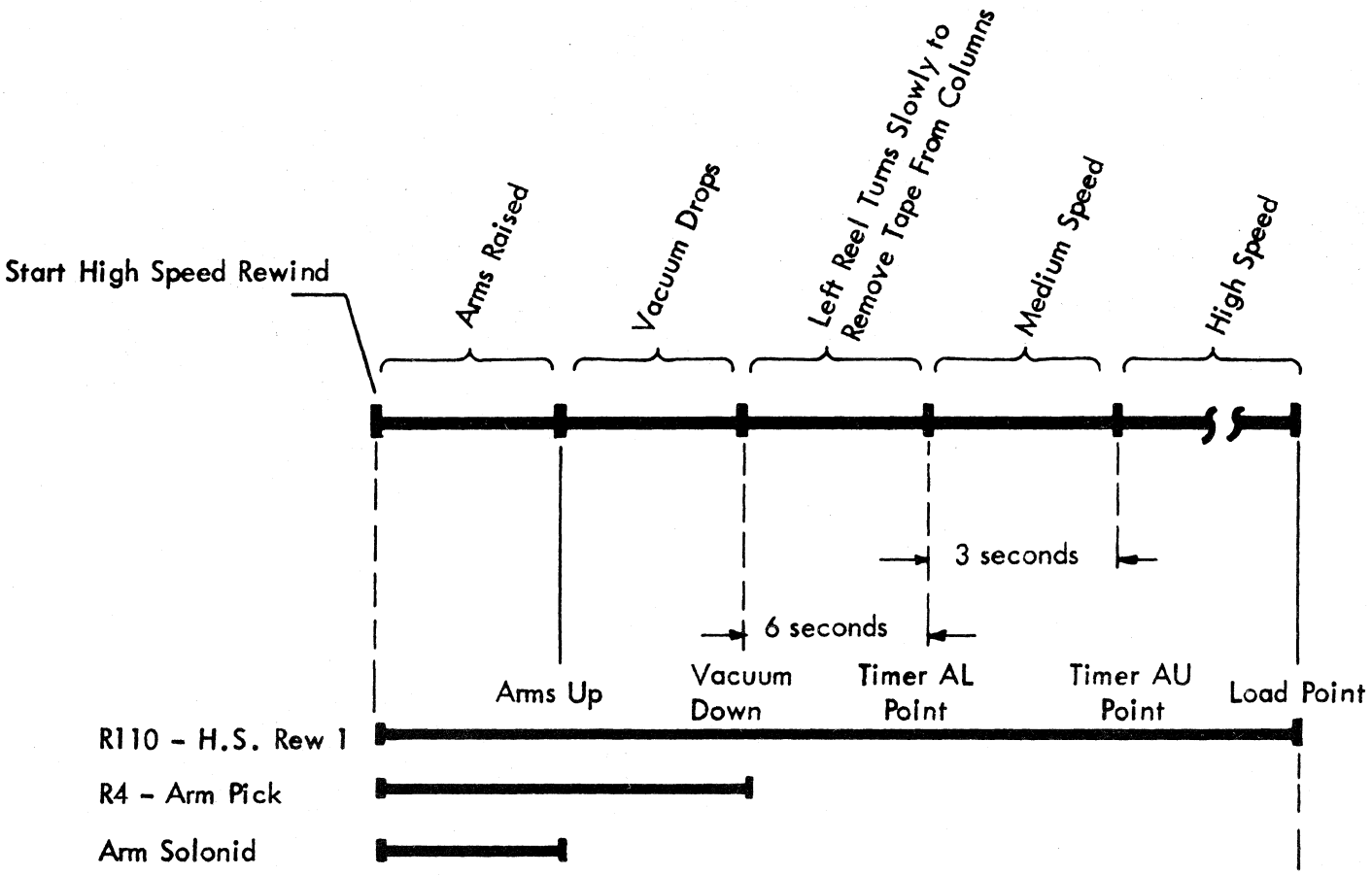

Start High Speed Rewind
Arms Raised
Vacuum Drops
Left Reel Turns Slowly to Remove Tape From Columns
Medium Speed
High Speed
3 seconds
6 seconds
Arms Up
Vacuum Down
Timer AL Point
Timer AU Point
Load Point
R110 - H.S. Rew 1
R4 - Arm Pick
Arm Solonid

Figure 3

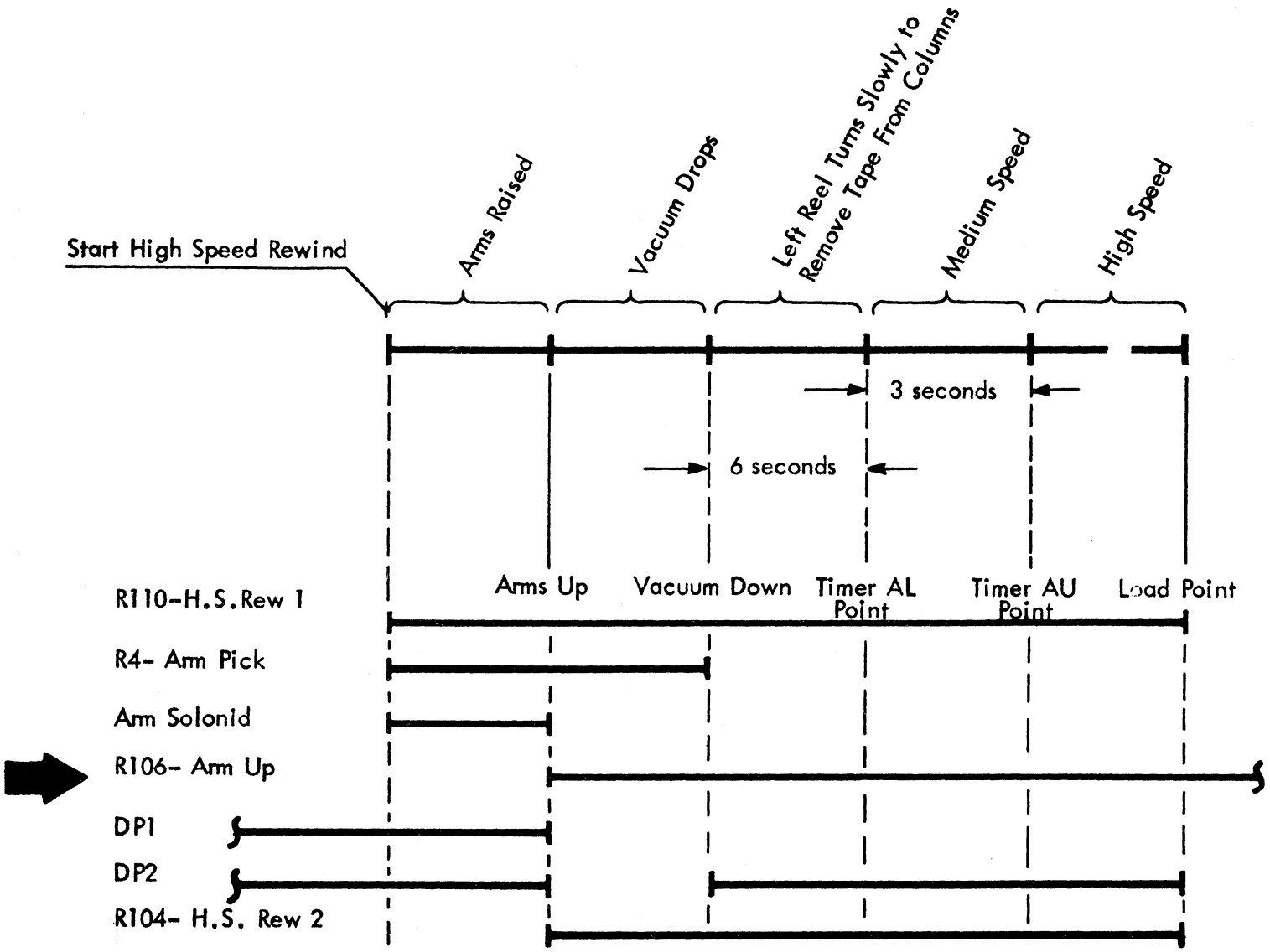
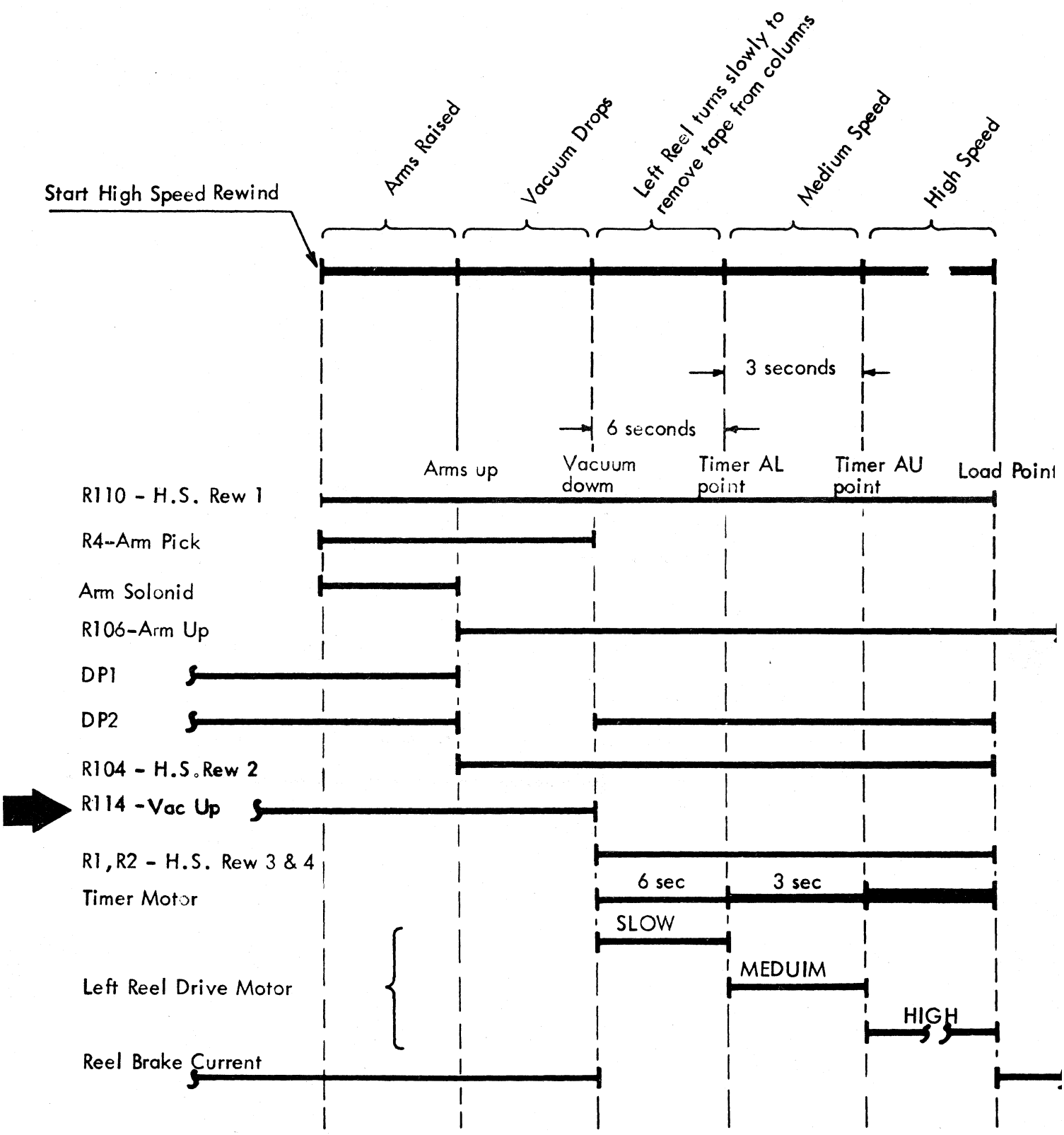

Start High Speed Rewind
Arms Raised
Vacuum Drops
Left Reel Turns Slowly to Remove Tape From Columns
Medium Speed
High Speed
3 seconds
6 seconds
Arms Up
Vacuum Down
Timer AL Point
Timer AU Point
Load Point
R110-H.S.Rew 1
R4- Arm Pick
Arm Solonid
R106- Arm Up
DP1
DP2
R104- H.S. Rew 2

Figure 4


Start High Speed Rewind
Arms Raised
Vacuum Drops
Left Reel turns slowly to remove tape from columns
Medium Speed
High Speed
3 seconds
6 seconds
Arms up
Vacuum down
Timer AL point
Timer AU point
Load Point
R110 - H.S. Rew 1
R4--Arm Pick
Arm Solonid
R106-Arm Up
DP1
DP2
R104 - H.S. Rew 2
R114 -Vac Up
R1, R2 - H.S. Rew 3 & 4
Timer Motor
6 sec
3 sec
SLOW
MEDUIM
HIGH
Left Reel Drive Motor
Reel Brake Current

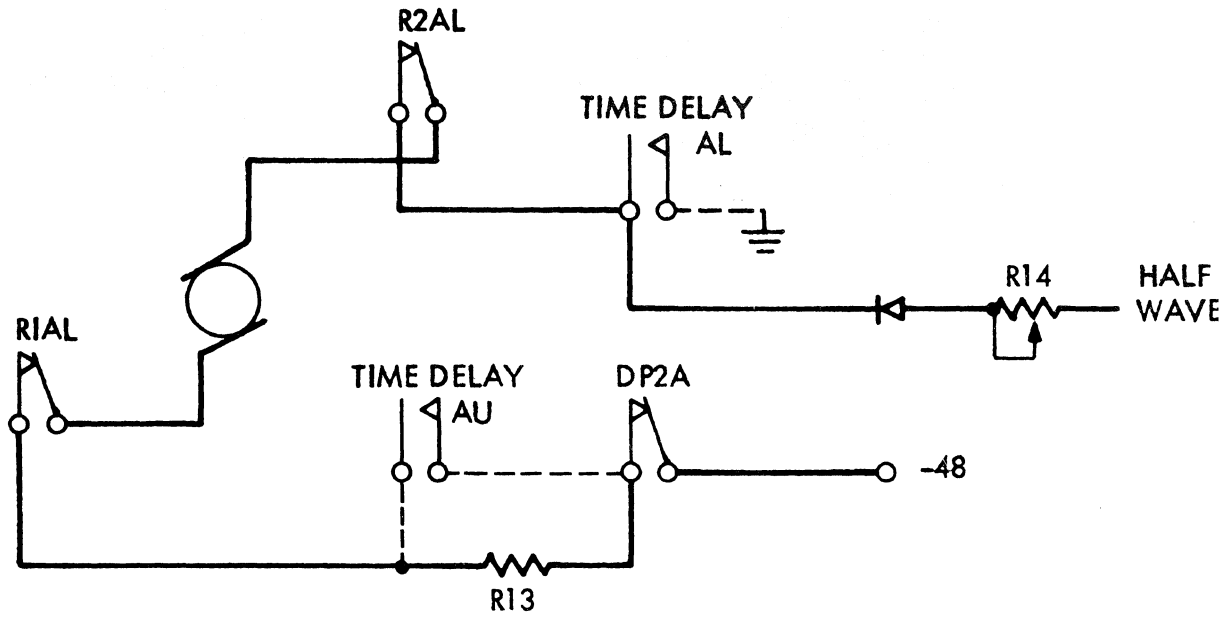


Figure 6A. Left Reel Drive Motor - SLOW SPEED

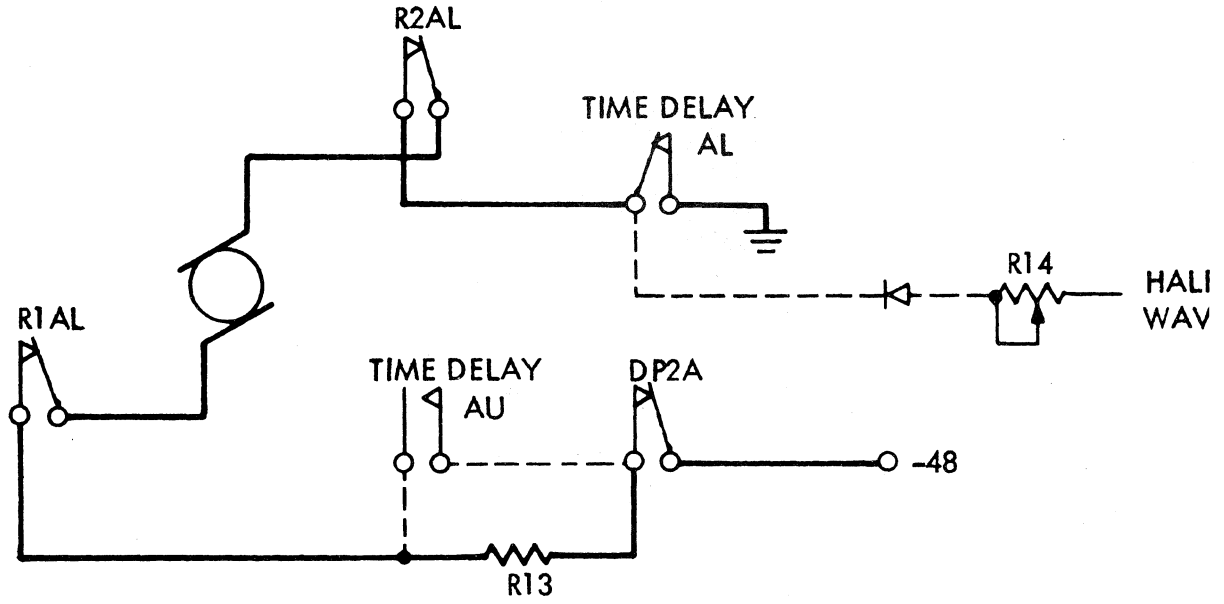


Figure 6B. Left Reel Drive Motor - MEDIUM SPEED

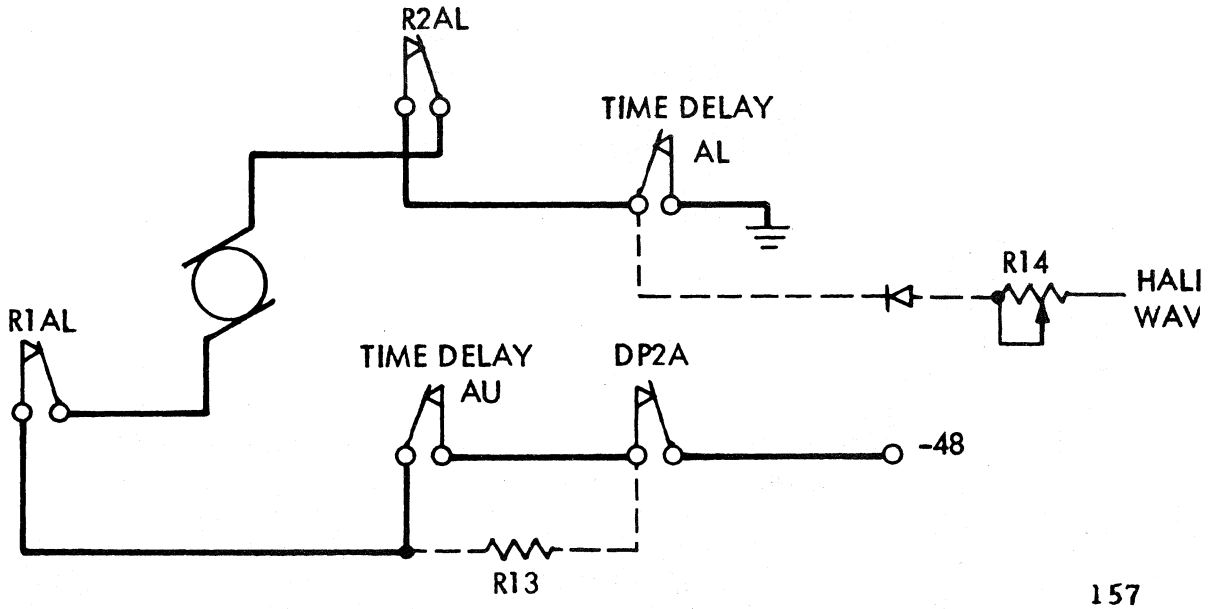


Figure 6C. Left Reel Drive Motor - HIGH SPEED

ISD Review of High Speed Rewind Circuits

Using the sequence chart, Fig. 5, Page 156 follow the circuits in the ISD's.

R110 is located at B1 (73.50.01.0). Notice that R110 can be picked two ways. Trace the pick of R110 when the H.S. Rewind key is used. Trace the pick of R110 when picked by the computer. Follow the PLUS W High Speed Rewind line back to page 73.20.05.1. This line is developed by the AND circuit at 4H.

R4 (B4 73.50.05.0) is picked by the R110-5 point through R114-3.

The arm solenoid (B8 73.50.15.0) is picked by the R4 AL point through DP 1A. When the arm solenoid is energized, it will raise the rewind arms.

When the rewind arms are raised, the arm down switch will close. In Section B2 (73.50.01.0) locate R106. Relay 106 can now pick.

Locate DP 1 in section B3 (73.50.05.0). Notice that R106-5 point will drop out DP1. When DP1 drops it will open the following circuits: (73.50.15.0) arm solenoid B8, moving coil B8 (not energized at this time), right reel motor (not energized at this time), left reel motor circuit (not energized at this time). In section B11 (73.50.20.0) DP1-B point will drop out the vacuum motor.

Locate DP2 in section B3 (73.50.05.0). DP2 has been held energized through R114-4 N/O, and R106-1 N/C. DP2 and DP1 will then drop out at the same time because both will be dropped by R106.

In section B8 (73.50.15.0) locate the left brake coil and the right brake coil. While the arms were down, left brake was applied by current through the left brake coil, Resistor 4, DP 1A to -48 volts. Right brake was applied by current through the right brake coil, Resistor 3, and DP 1A to -48 volts. When the arms are raised and DP1 is dropped, this brake circuit is opened. When DP 1 dropped, DP 2 is also dropped and a new brake circuit is established. Left brake current can now flow through the coil, Resistor 7, Reel Release B (Reel Release Key), DP 2A N/C and -48 volts. Right brake current can flow through the coil, Resistor 5, Reel Release Key, DP 2A N/C and -48 volts.

The purpose of the Reel Release Key (located on the front of the transport near the file reel) is to provide the operator with a method of removing brake from both reels. The operator would remove brake from both reels when threading tape through the transport or when removing tape from the drive.

Locate R104 in Section B1 (75.50.01.0) and trace its pick circuit.

Even though the vacuum motor was de-energized when DP 1 was dropped, it will take some time before vacuum actually drops in the columns. When vacuum does drop, Relay 114 will drop out. Locate R114 in section B4 (73.50.05.0).

When R114 drops out, DP 2 will be picked again (Section B3). Trace the pick of DP 2 through the R114-4 N/C points. When DP 2 picks, brake will be removed from both reels. Brake is removed because the file reel will be driven and the machine reel must of course be free to follow.

Locate R1 in section B4 (73.50.05.0). Notice that R1 can now pick because vacuum is down.

Locate R2 in section B4. R1 and R2 are used in the motor circuits.

Locate the Timer Motor in Section B11 (73.50.20.0). The Timer Motor is energized by R1 BU points.

Use Figure 6A and ISD Page 73.50.15.0 and trace the current path to energize the left reel motor to take tape out of the columns.

Use Fig. 6B and trace the current path to energize the left reel motor to move tape at a medium speed.

Use Fig. 6C and trace the current path to energize the left reel motor to move tape at high speed.

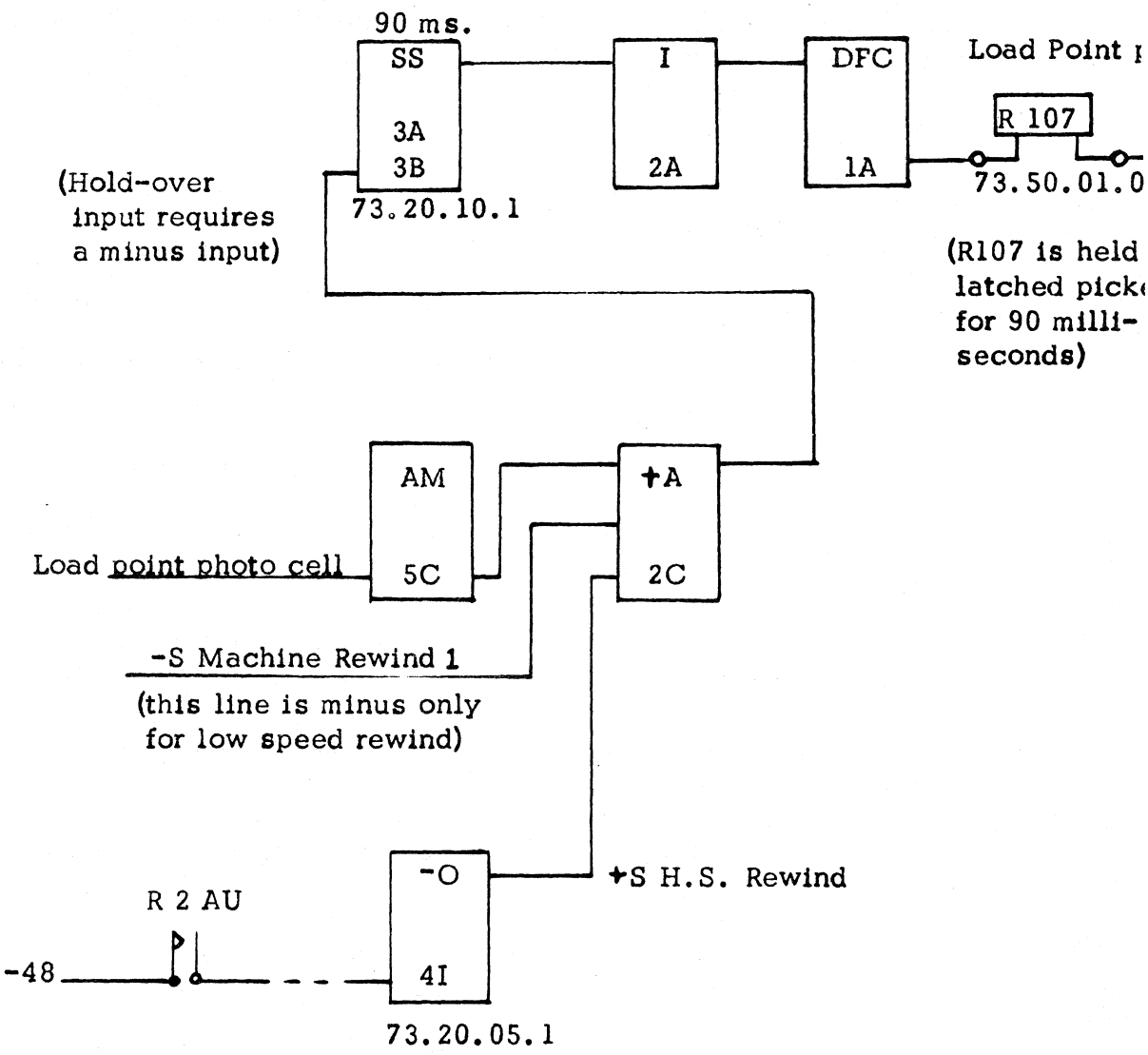
Notice that the right reel motor can not be energized. The field coil to the right reel motor is energized, but this alone has no effect on the motor.

When load point is sensed, brake will be applied to both reels by dropping out DP 2. DP 2 is dropped when the rewind relays are dropped.

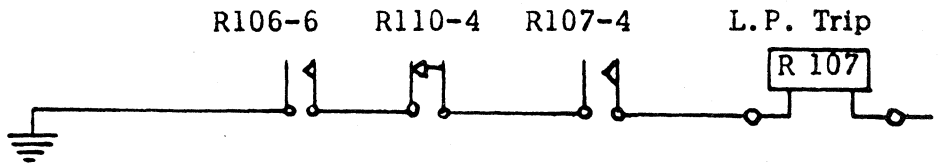
Locate R110 in Section B1 (73.50.01.0). The load point relay, R107, will pick and drop R110.

Continue on the next page.

Using the diagram below, trace the pick of R 107 through the ISD's.



R 107 will be latched tripped by the circuit shown below. Trace this circuit in the ISD's.



Continue on the next page

1. The things listed below occur during a high speed rewind. Arrange them in the proper sequence.

   Tape moving at a medium speed
   Loadpoint relay latch tripped
   Vacuum motor de-energized and vacuum drops
   High speed rewind initiated
   Tape moving at high speed
   Rewind arms raised by the solenoid
   Tape moving at a slow speed to remove tape from the columns
   Loadpoint relay latch picked
   Timer motor energized
   Loadpoint sensed

2. The high speed rewind key is depressed, the rewind arms raise but no further action occurs. The trouble was found to be:
   a. 73.50.05.0, (B4), R110-5 N/O failed to make.
   b. 73.50.05.0 (A4) R106-5 N/C failed to make.
   c. 73.50.15.0, (A7), R5AL N/O failed to make.
   d. 73.50.05.0, (A4), R106-5 is shorted.

3. The high speed rewind key is depressed and the rewind arms raise. After vacuum drops, the left reel removes the tape from the columns very quickly.
   The trouble was found to be:
   a. 73.50.15.0, (B7), R14 misadjusted.
   b. 73.50.15.0, (B7), R2AL N/C fails to make.

4. The drive will high speed rewind when the high speed rewind key is depressed. However, it does not high speed rewind from the external system. The trouble was found to be:
   a. 73.20.25.1, 5A, pin B is always minus.
   b. 73.20.25.1, 5F, pin K is always minus.
   c. 73.20.01.1, 1E, pin F is always minus.

Check your answers on Page 162.

Answers to Page 161

1. High speed rewind initiated
   Rewind arms raised by the solenoid
   Vacuum motor de-energized and vacuum drops
   Timer motor energized
   Tape moving at a slow speed to remove tape from the columns
   Tape moving at a medium speed
   Tape moving at a high speed
   Loadpoint sensed
   Loadpoint relay latch picked
   Loadpoint relay latch tripped

2. a. No, this would prevent R4 from picking. R4 AL picks the arm solenoid (73.50.15.0, A8)
   b. No, R 106-5 is transferred because the arms are raised.
   c. No, R5 points are not used for high speed rewind.
   d. Yes, DP 1 would not drop to drop the vacuum motor. The operation will not proceed until vacuum drops.

3. a. Yes, this is the adjustment to control the speed in which tape is removed from the columns.
   b. No, R2 AL N/C would be in the left reel motor circuit for forward movement of tape.

4. a. No, this should be minus unless a low speed rewind is being initiated from the external system.
   b. Yes, plus rewind and unload call initiates a high speed rewind.
   c. No, this should be minus unless a low speed rewind is being initiated from the external system.

Turn ON the recorder.

SECTION 19:

LINES CONNECTING THE 7330 TO A COMPUTER SYSTEM

OBJECTIVE:

Given a list of the lines that enter and leave the 7330, you must be able to pick out the lines that are necessary to perform the write or read operations:

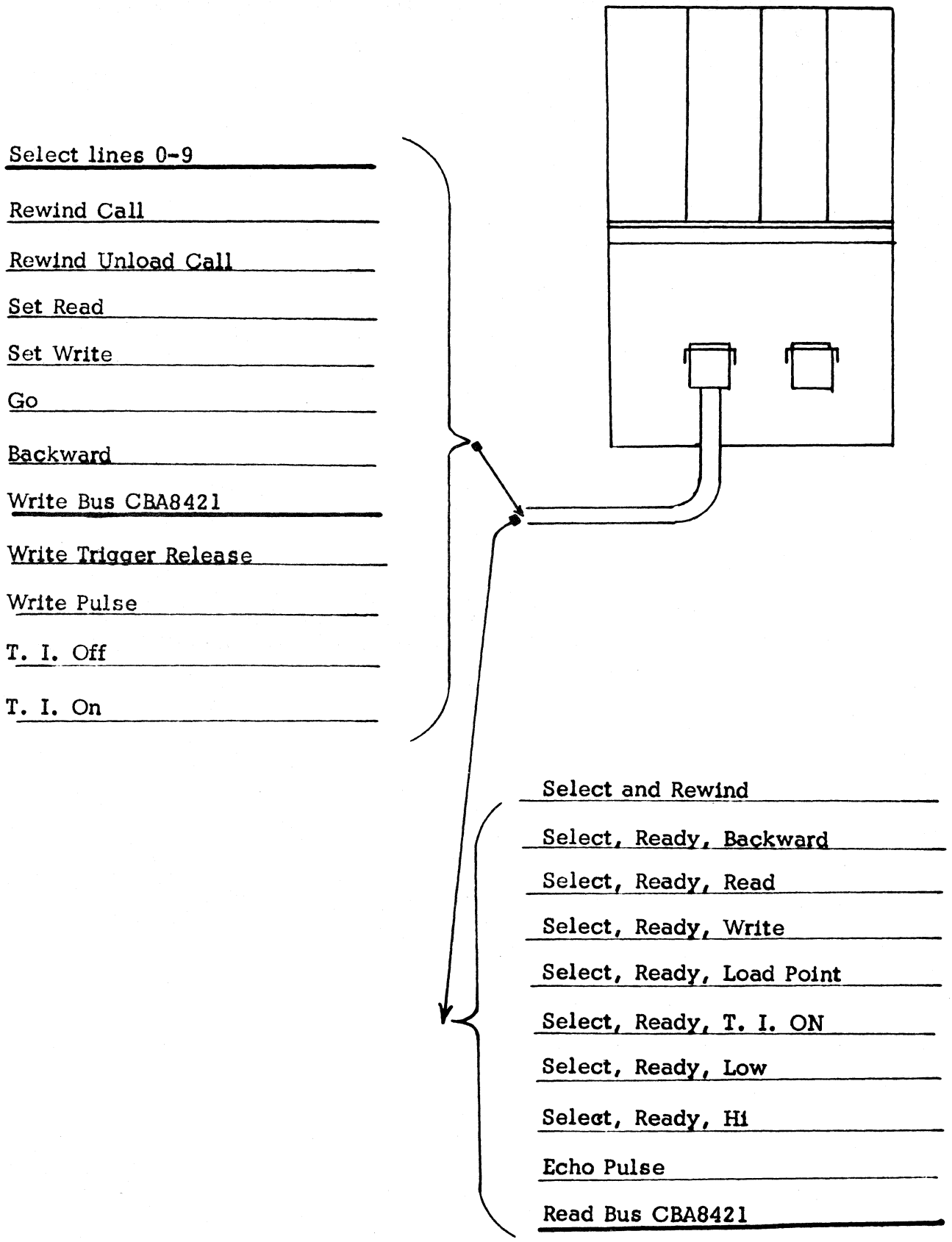

Select lines 0-9
Rewind Call
Rewind Unload Call
Set Read
Set Write
Go
Backward
Write Bus CBA8421
Write Trigger Release
Write Pulse
T. I. Off
T. I. On
Select and Rewind
Select, Ready, Backward
Select, Ready, Read
Select, Ready, Write
Select, Ready, Load Point
Select, Ready, T. I. ON
Select, Ready, Low
Select, Ready, Hi
Echo Pulse
Read Bus CBA8421

Figure 1

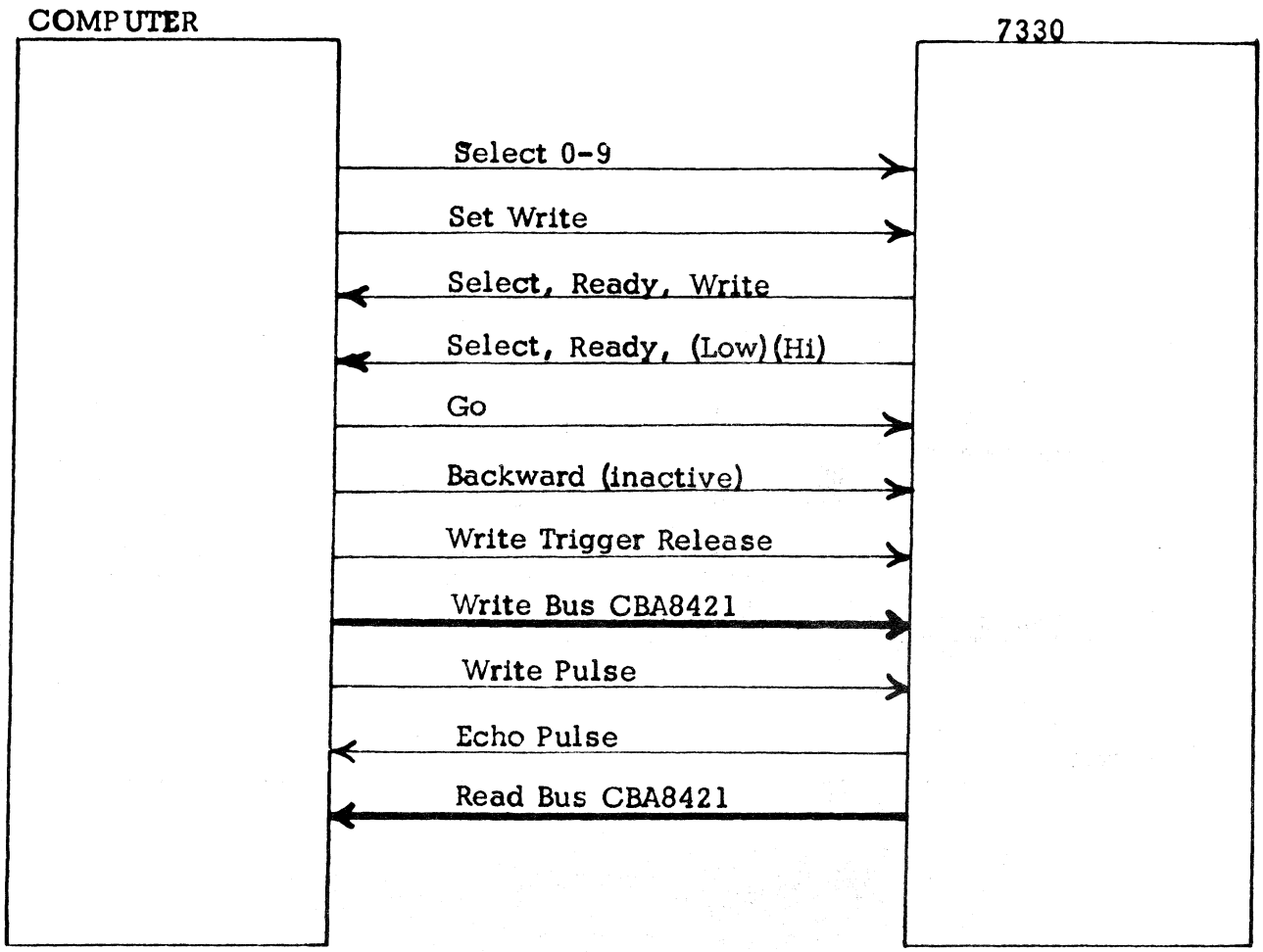


Figure 2 - Lines used to perform a Write Operation.

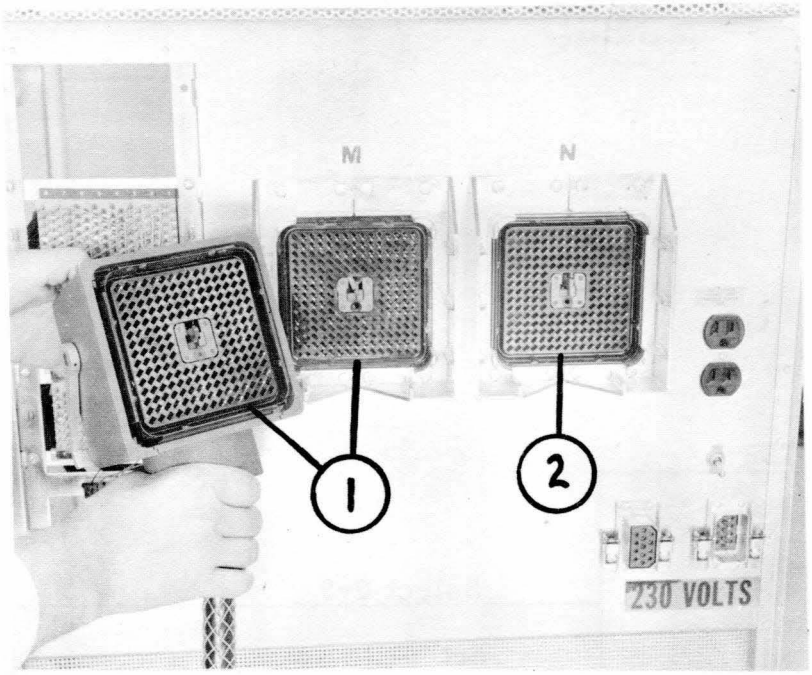


Figure 3

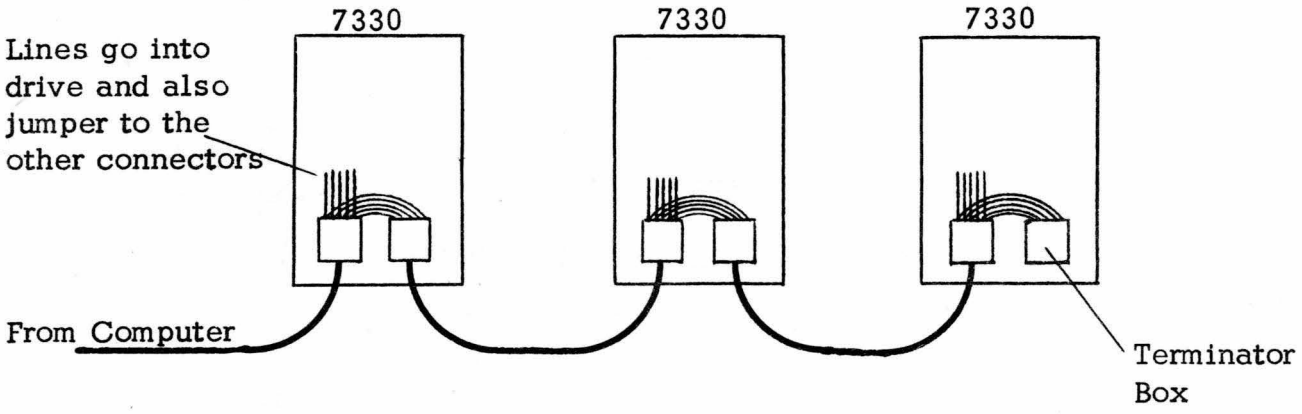


Figure 4

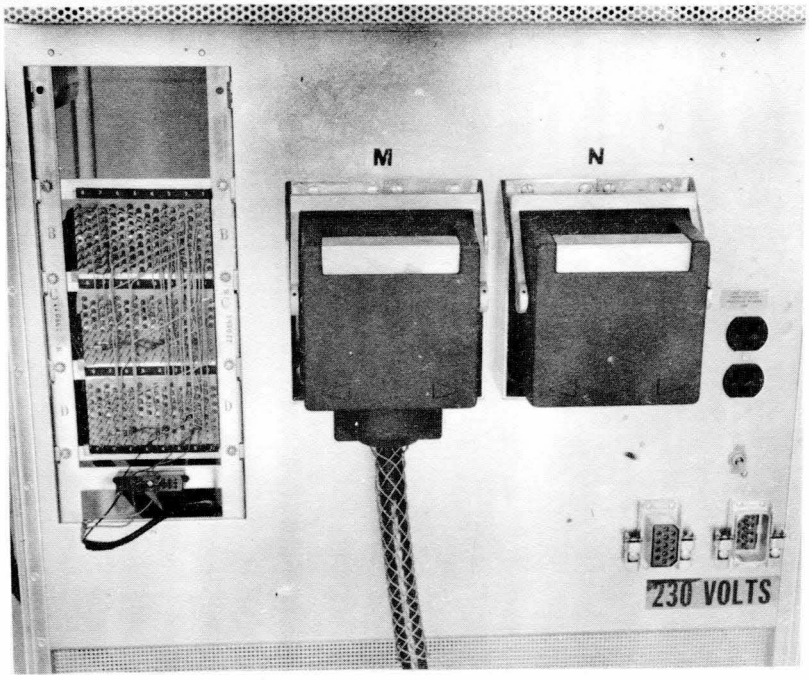


Figure 5

REVIEW QUESTIONS:

1. To perform any operation, the computer must _____ which drive it intends to use.

2. To keep tape from being erased, the drive must be in Read status. Operations in which tape should not be erased are: Read, Backspace, Rewind, and Rewind Unload. To get the drive in Read Status, the computer will send the line _____ _____.

3. When the Read/Write Status Trigger is set to Read Status, the drive sends a response line to the computer called _____ _____ _____.

4. To perform a Write Operation, the drive must be in Write Status. The computer sends the line _____ _____ to set the drive to Write Status.

5. When the drive is in Write Status, it will send the response line to the computer called _____ _____ _____.

6. To move tape, the computer will activate the _____ line.

7. If tape is to move forward, the computer will not activate the _____ line.

8. The computer sends characters to the drive over the _____ _____ lines.

9. To control the time that the Write Triggers will flip to write, the computer will send a _____ _____ for each character to be written.

10. To allow the write triggers to flip, the computer must activate the _____ _____ _____ line. The computer deactivates this line to reset the write triggers.

11. Each time that a character is written, the drive will send the _____ _____ response line to the computer.

12. The characters that are read are sent to the computer over the _____ _____ lines.

13. When a drive is Selected and Ready, it will send a response line to the computer indicating which density switch setting is being used. This could be the response line called _____ _____ _____ density or _____ _____ _____ density.

Continue on next page.

14. When the computer has told the drive that it is to move tape backward, the drive will send the response line called _____ _____ _____.

15. A low speed rewind operation is initiated by the computer by the line _____ _____.

16. A high speed rewind operation is initiated by the computer by the line _____ _____ _____.

17. While the drive is performing a rewind operation, it sends the response line called _____ and _____.

18. If a drive is selected, ready and positioned at loadpoint, the drive will send the response line called _____ _____ _____.

19. The computer can reset the TAPE INDICATE trigger with the line __ ___ _____.

20. The computer can turn on the TAPE INDICATE trigger with the line __ ___ _____.

21. When a drive is selected, ready and TAPE INDICATE trigger is on, the response line _____ _____ and ___ _____ _____ is sent to the computer.

Continue on next page.

ANSWERS TO PAGES 167 and 168

1. Select
2. Set Read
3. Select Ready Read
4. Set Write
5. Select Ready Write
6. Go
7. Backward
8. Write Bus
9. Write Pulse
10. Write Trigger Release
11. Echo Pulse
12. Read Bus
13. Select Ready High or Select Ready Low
14. Select Ready Backward
15. Rewind Call
16. Rewind Unload Call
17. Select and Rewind
18. Select Ready Loadpoint
19. T.I. Off
20. T.I. On
21. Select Ready and T.I. On

Continue on the next page.

TO THE 7330	FROM THE 7330
Select lines 0 - 9	Select and rewind
Rewind call	Select, ready, backward
Rewind unload call	Select, ready, read
Set read	Select, ready, write
Set write	Select, ready, load point
Go	Select, Ready, T.I. On
Backward	Select, Ready, low
Write bus	Select, Ready, high
Write trigger release	Echo pulse
Write pulse	Read bus
T.I. Off	
T.I. On	

From the above list, pick out the lines necessary to perform the following operations:

WRITE

READ

Check your answers on Page 171

ANSWERS TO PAGE 170

WRITE

Select
Set write
Go
Write bus
Write trigger release
Write pulse
Select, ready, write
Select, ready, low or high (density)
Echo pulse
Read bus
(In addition, you may have listed that the BACKWARD line must be inactive. Also, you may have listed, that if, the End of Reel reflective mark was reached during this operation, the line SELECT, READY AND T.I. ON would be active.)

READ

Select
Set read
Go
Select, ready, and read
Select, ready, high or low (density)
Read bus
(In addition, you may have listed that the BACKWARD line must be inactive).

Turn to the next page to continue the review.

ISD Review of input and output lines.

On Page 73.00.20.0 are listed the lines entering the 7330.
Note: "Select TF" is an abreviation of Select Tape Frame, this is the same as saying tape unit or tape drive.

On Page 73.00.30.0 are listed the lines leaving the drive.

Look at Page 73.04.06.0. This is the pin location layout of the 200 position signal cable receptacle.

There are places in the connector for 200 wires not all are used.
Notice that in the upper right hand corner pin location 1 is assigned to the command line to turn on T.I.

Pin location 3 is assigned the line to turn off the T.I. trigger.

Location 5 is assigned to the Go line and so forth.

Notice that beside each signal line is a position marked shield. The shield of a coax cable on the common of a two ply twisted pair would connect to these pins. Every signal line has some kind of shielding to prevent cross talk between lines.

Turn ON the tape recorder.

SECTION 20:

POWER SUPPLY

OBJECTIVE:

Be able to list the two input voltages that can be used to power the 7330, and the voltages that are developed within the 7330.

Be able to locate the various power supplies in the machine diagrams.

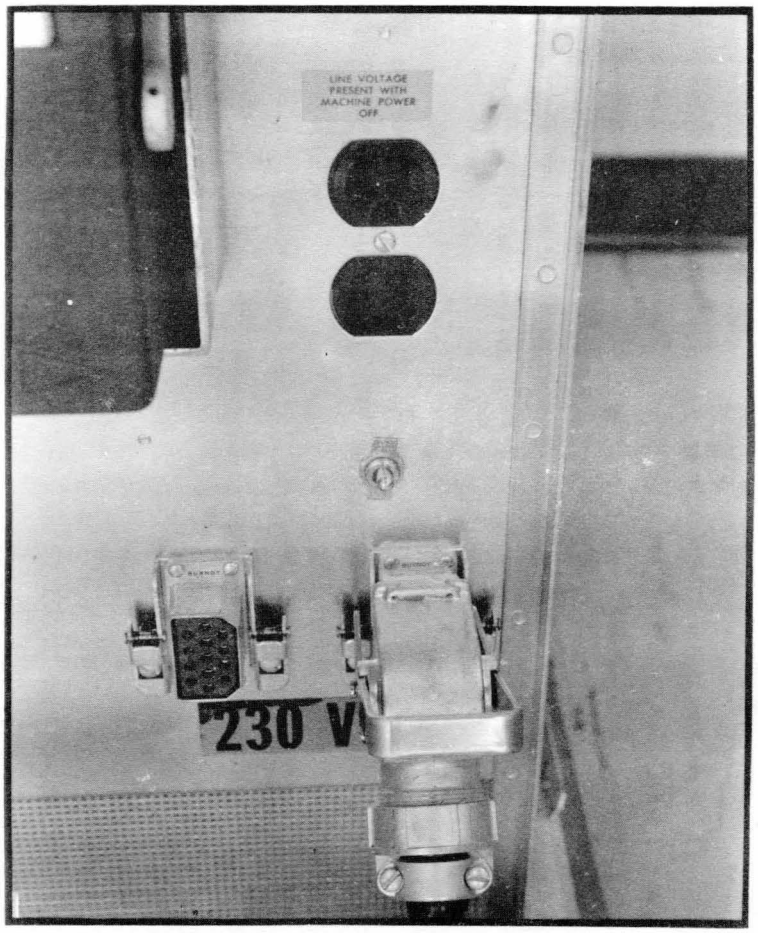
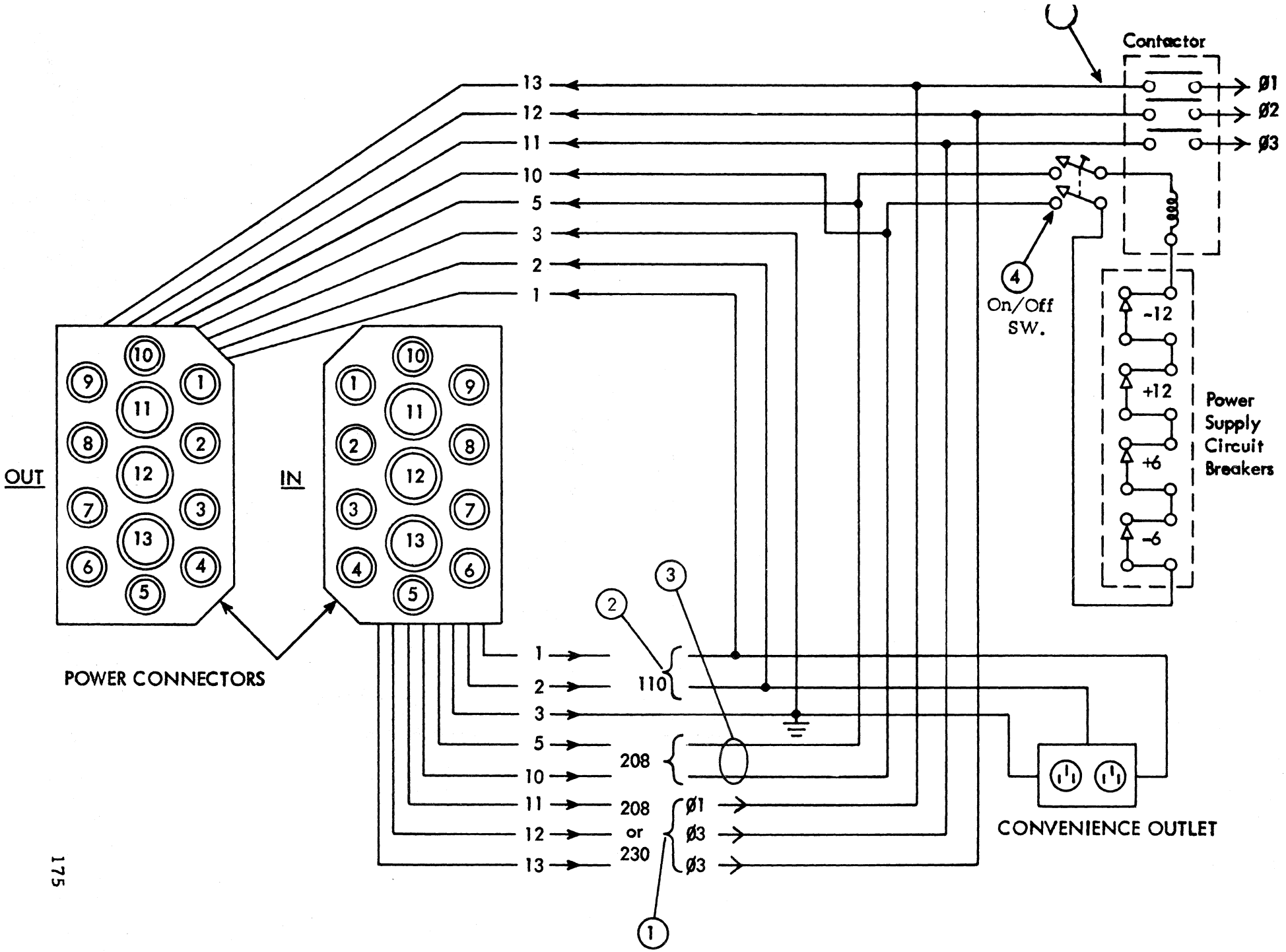
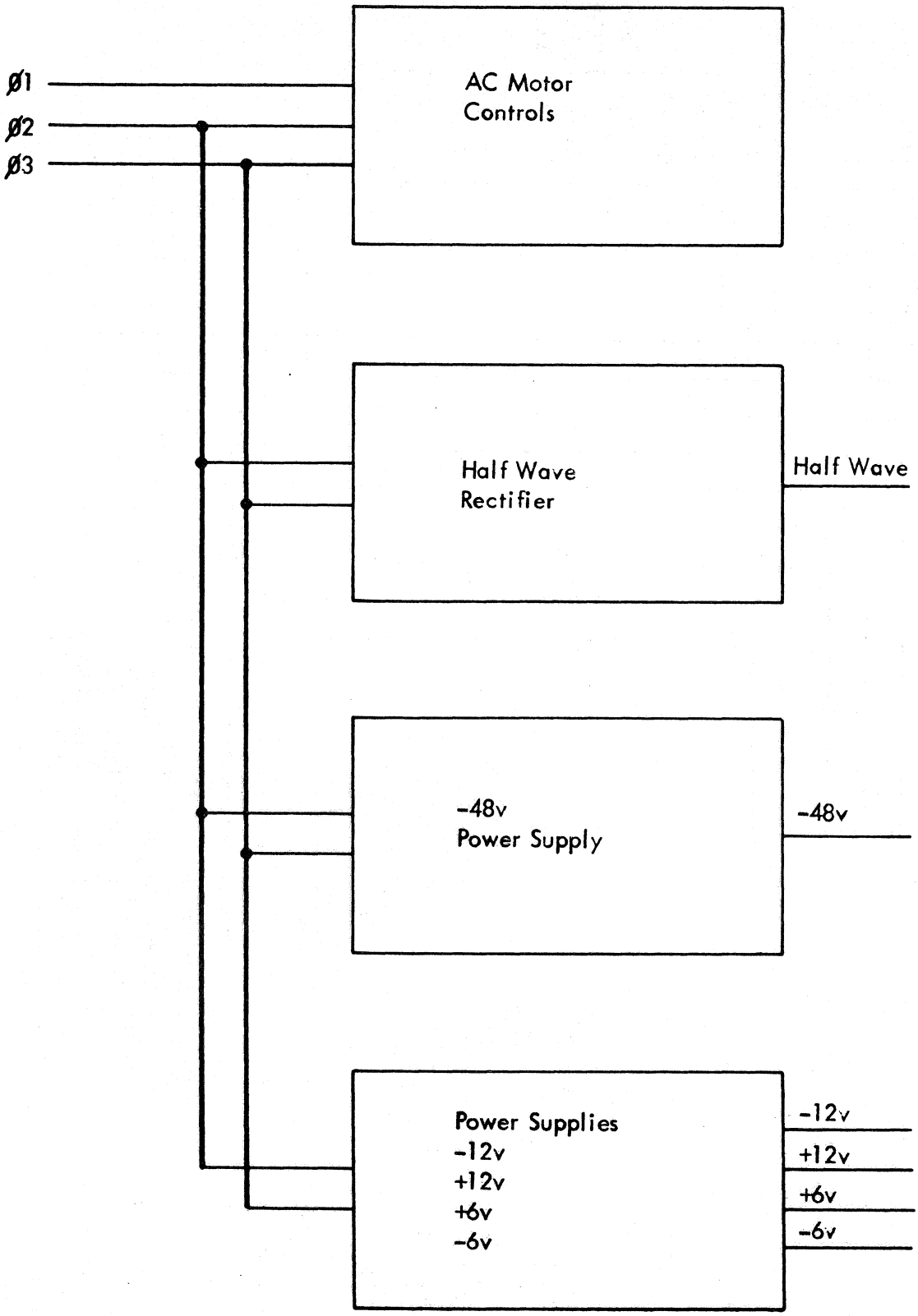


Figure 1 Power recepticles, ON-OFF switch, and convenience outlets


Contactor
Ø1
Ø2
Ø3
13
12
11
10
5
3
2
1
4
On/Off
SW.
-12
+12
+6
-6
Power
Supply
Circuit
Breakers
OUT
IN
POWER CONNECTORS
2
3
1
110
208
208
or
230
Ø1
Ø3
Ø3
CONVENIENCE OUTLET

175

Figure 2



When finished with this page, turn in your I.S.D.'s to page 73.50.20.0 sheet 1 of 2

Figure 3

Power Supply Review

1. The 7330 can be modified to accept either _____volts 3-phase or _____volts 3-phase.

2. List the voltages that are developed within the 7330. (In addition to the special half wave voltage)
   a._____
   b._____
   c._____
   d._____
   e._____

3. If power is supplied to a drive and the ON-OFF switch is Off, are there any dangerous voltages on the drive?

4. Which power supply would prevent the contactor from being picked if they were open?

5. Would the convenience outlets be hot if the drive were plugged into a wall outlet?

6. The voltage regulators for the plus and minus 12 volt supplies are on Page _____in the ISD's.

7. The voltage regulators for the plus and minus 6 volt supplies are on Page _____in the ISD's.

8. The plus and minus 6 and plus and minus 12 power supplies are on Page_____of the ISD's.

Check your answers on the next page.

Answers to Page 177

1. 208 or 230

2. plus 6, minus 6, plus 12, minus 12, minus 48

3. Yes, the input voltages are present at the contactor points, the On-Off switch and the convenience outlets.
THE POWER CABLE SHOULD NEVER BE PLUGGED INTO OR REMOVED FROM A DRIVE UNLESS THE MAIN LINE POWER IS TURNED OFF!

4. CB's for the plus and minus 6 and 12 volt supplies.

5. No

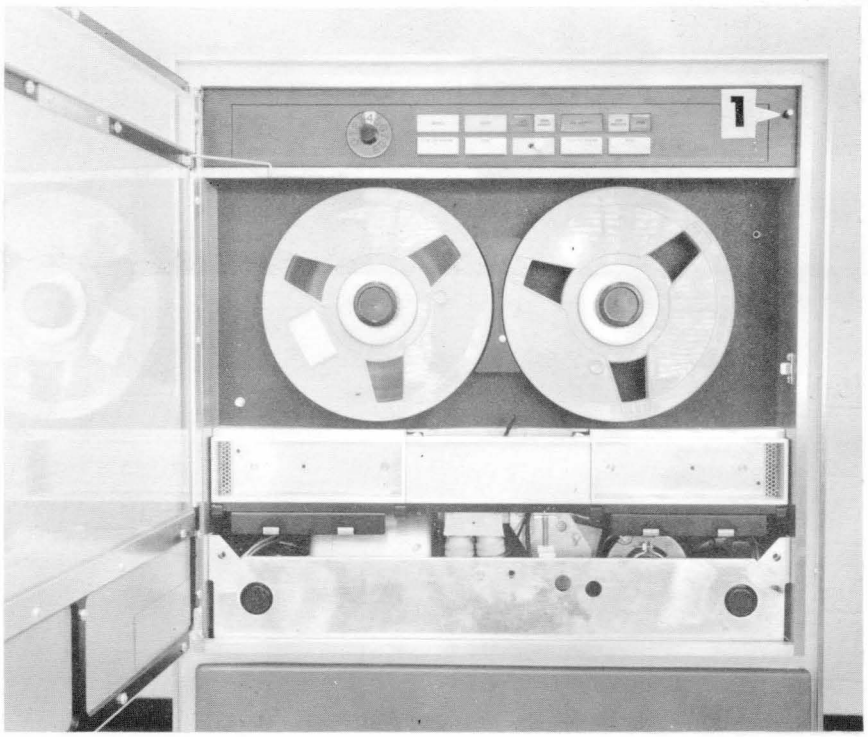
6. A0.00.04.3

7. A0.00.04.2

8. A0.00.04.5

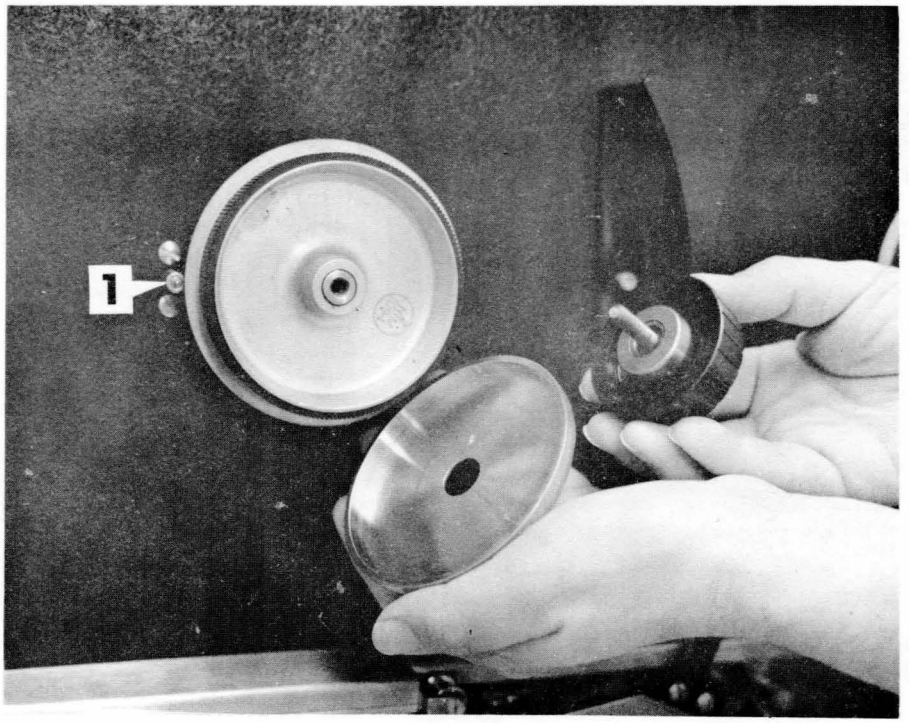
Turn on the recorder.

7330 Front View



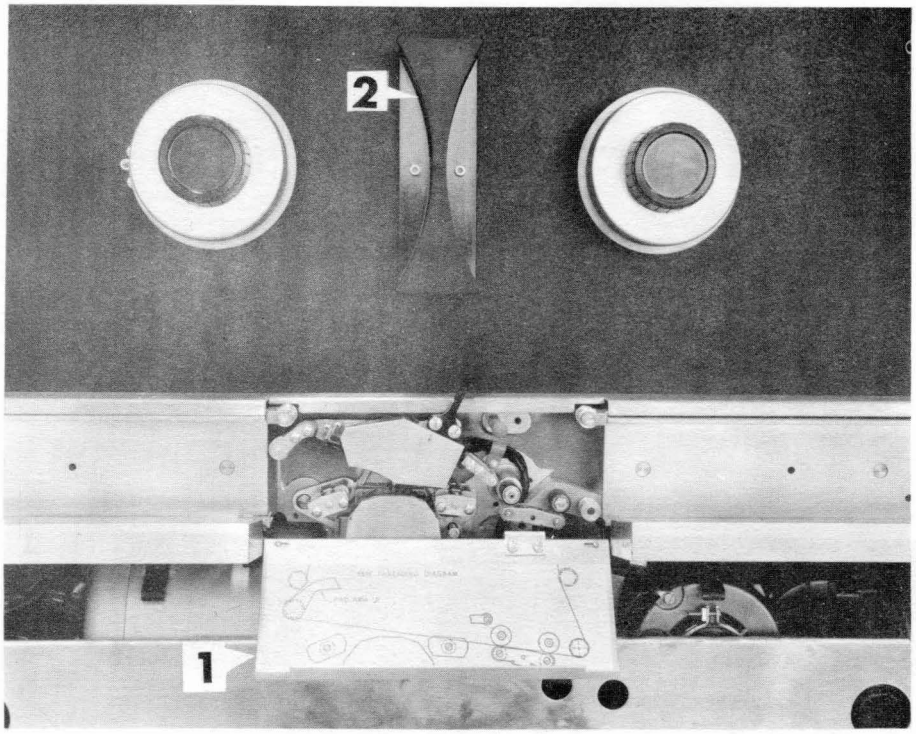
1 Door Interlock Plunger

Tape Transport Area--Front Door Open



1 File Protect Ring Sensing Pin

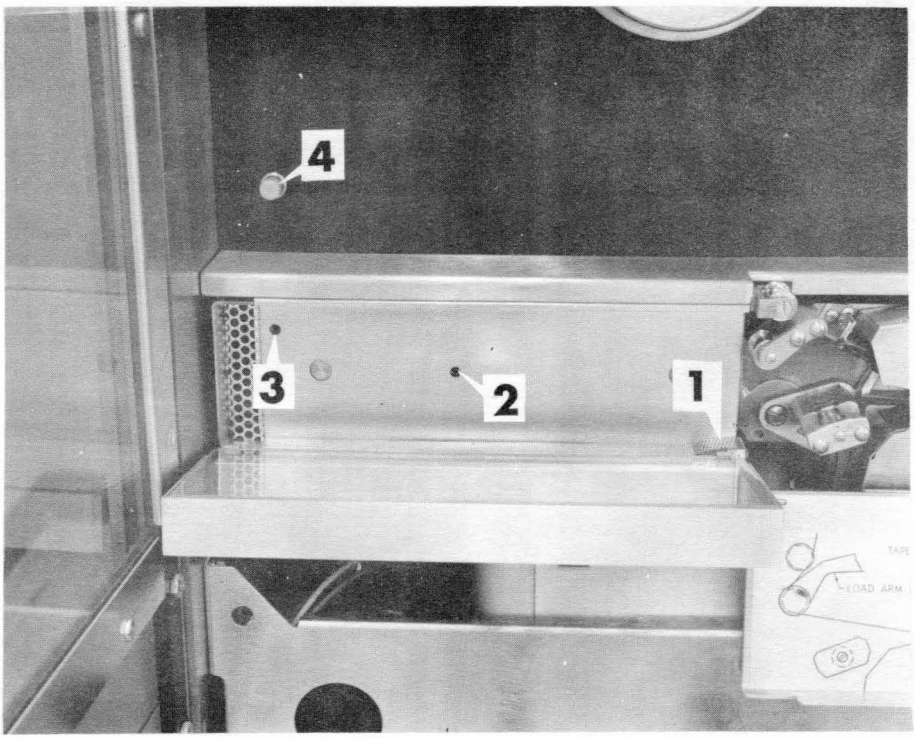
File Reel Hub



1 Center Cover Door

2 Finger Guard

Transport Area--Doors Open



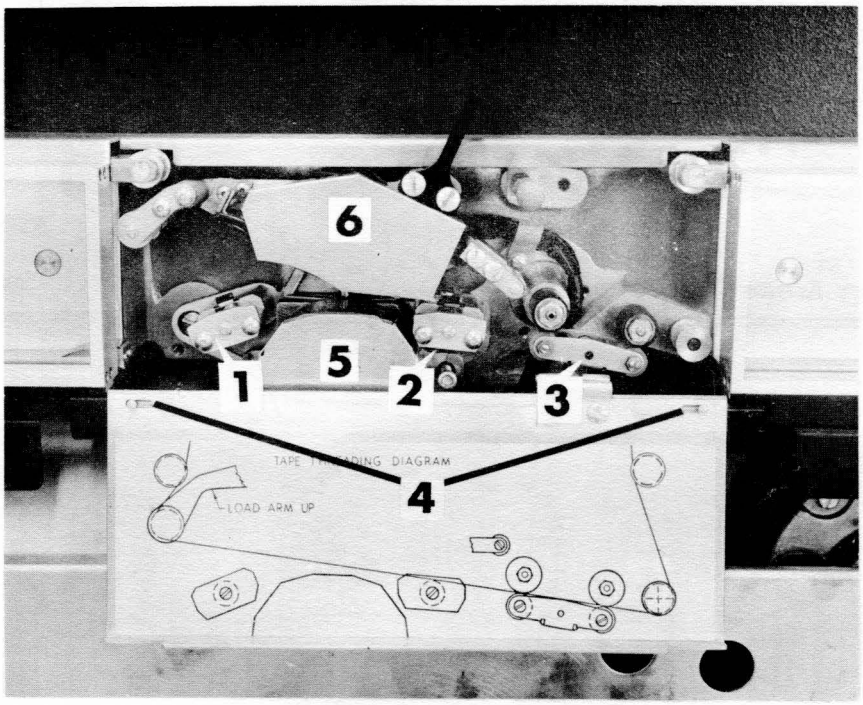
1 Tape Cleaner Blade

2 Tape Position Sensing Hole

3 Tape in Column Sensing Hole

4 Reel Release Key

Left Vacuum Column



1 Left Tape Guide

2 Right Tape Guide

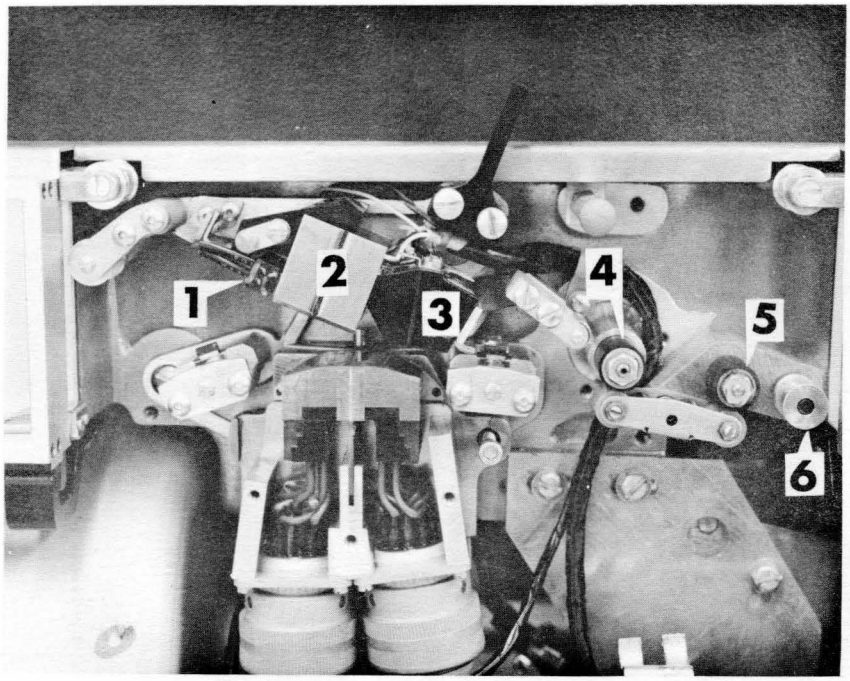
3 Rocker Arm Assembly

4 Door Latches

5 R/W Head Cover

6 Feed-Thru Shield and Erase Head Cover

Transport Center Area



1 Erase Head

2 Feed-Thru Shield

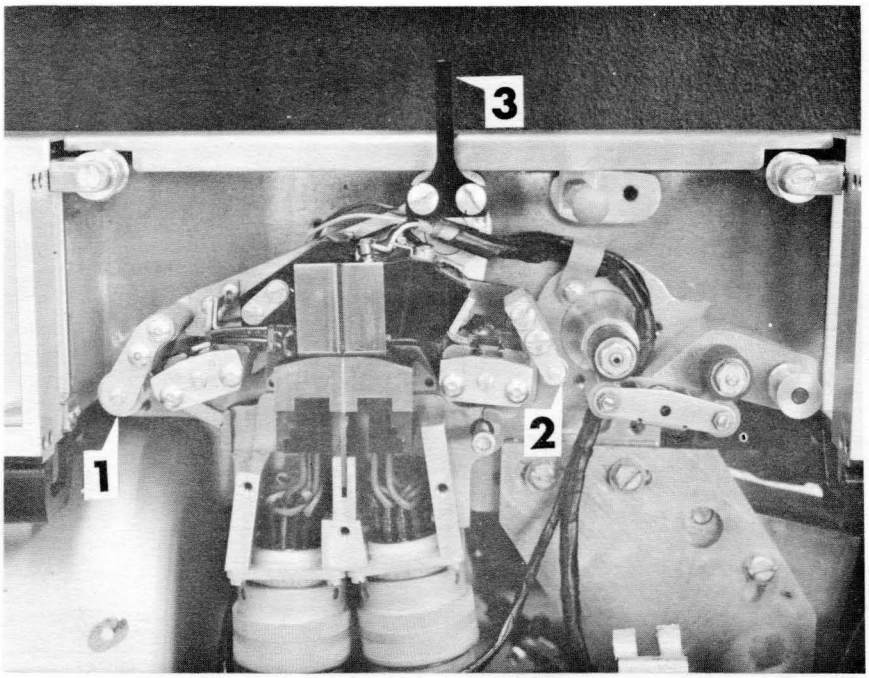
3 Photo Sensing Assembly

4 Start Capstan

5 Stop Capstan

6 Right Rewind Idler

Covers Removed--Arms Raised

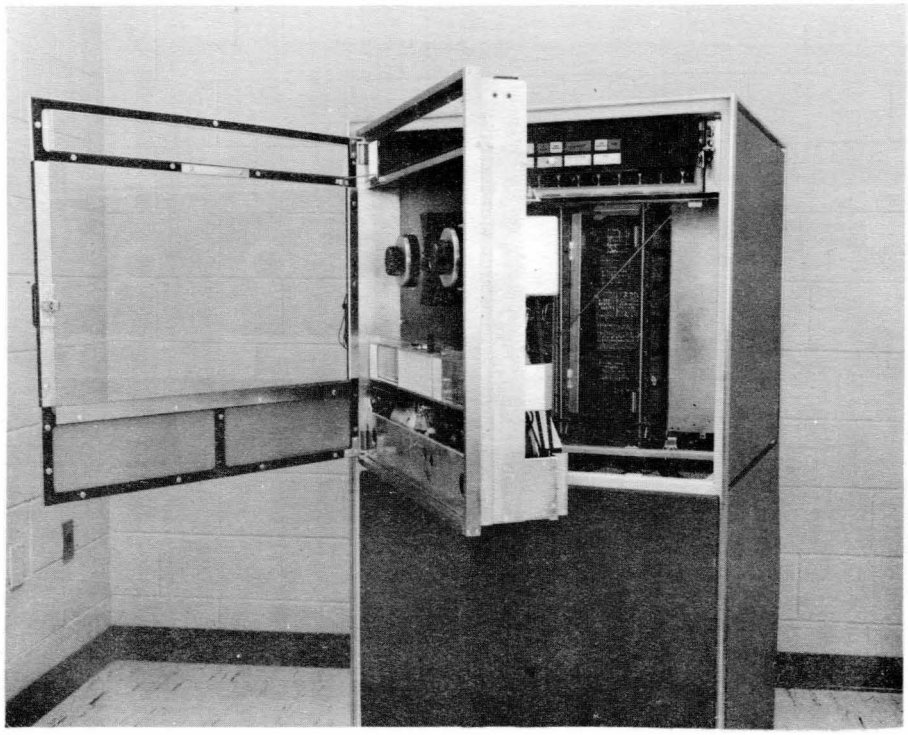


1 Left Rewind Arm Idler

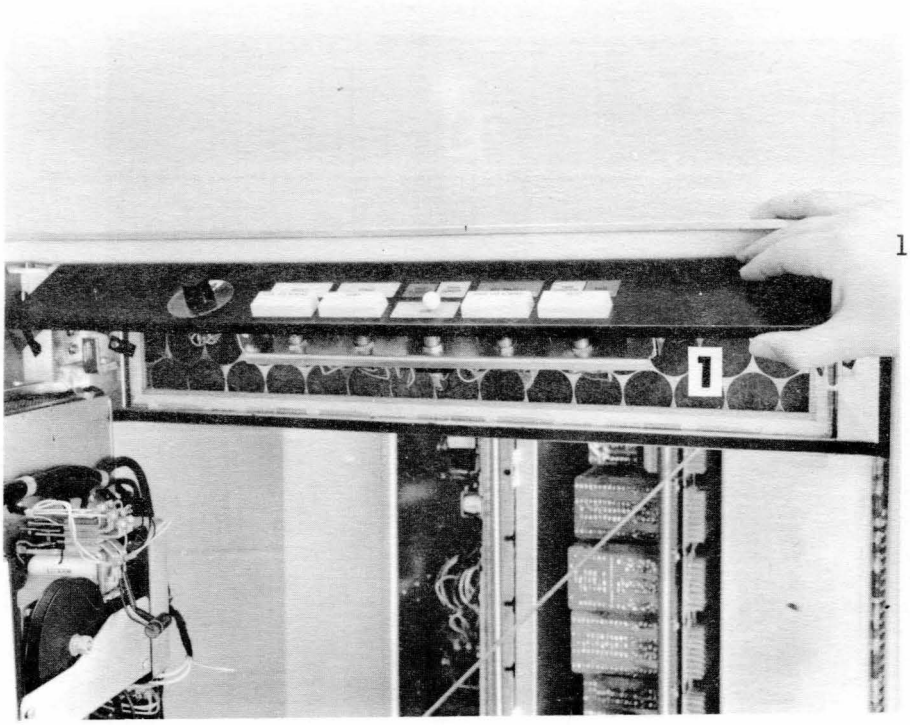
2 Right Rewind Arm Idler

3 Operating Lever

Arms Down

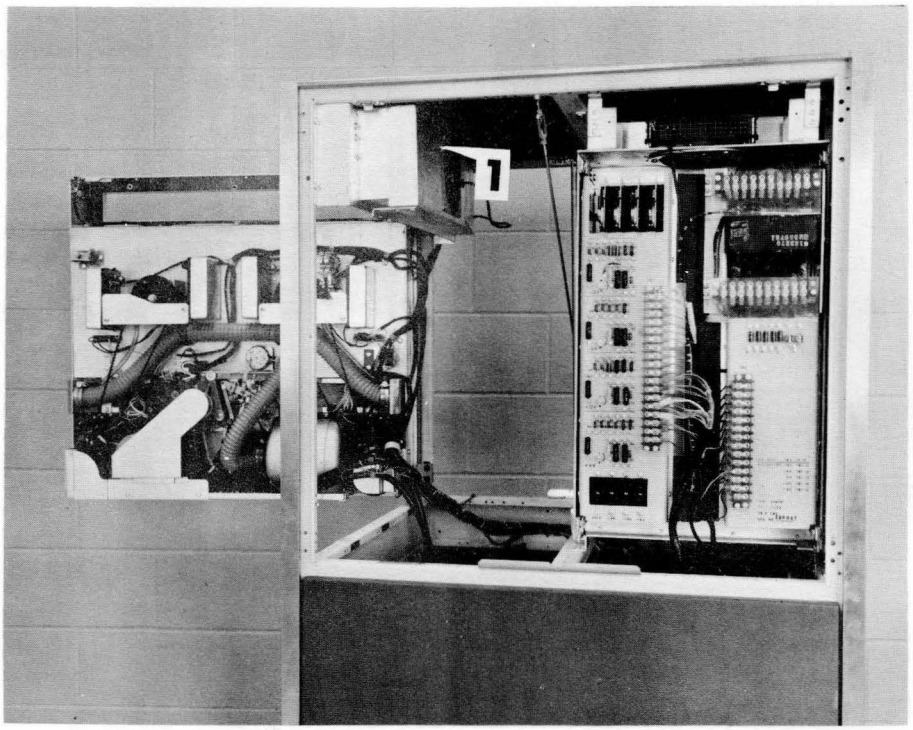


Transport Gate Open



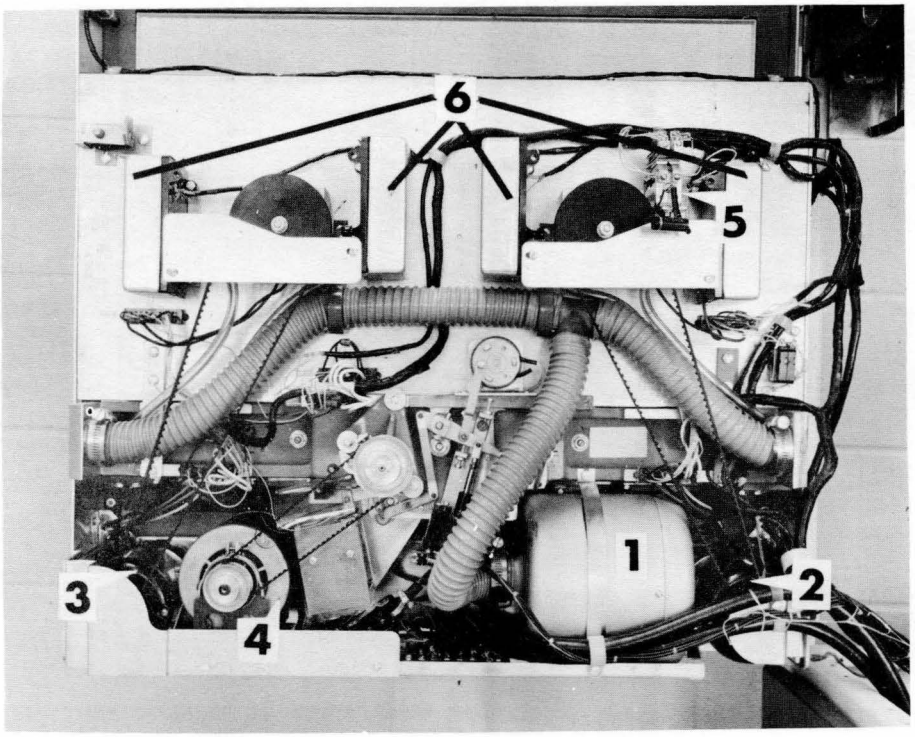
1 Pressurizing Blower and Filter

Operators Panel



1 Pressurizing Blower

Right Side--Transport Open



1 Vacuum Pump

2 Left Reel Drive Motor

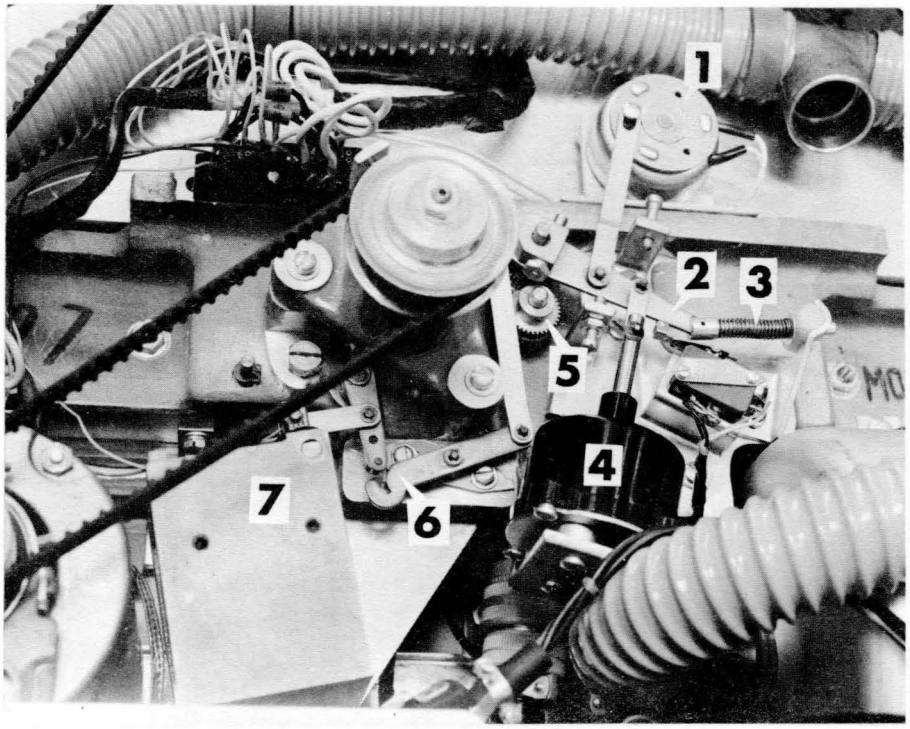
3 Right Reel Drive Motor

4 Capstan Drive Motor

5 File Protect Relay

6 Vacuum Column Switches

Rear Transport Area



1 Solenoid

2 Rear Rewind Arm

3 Toggle

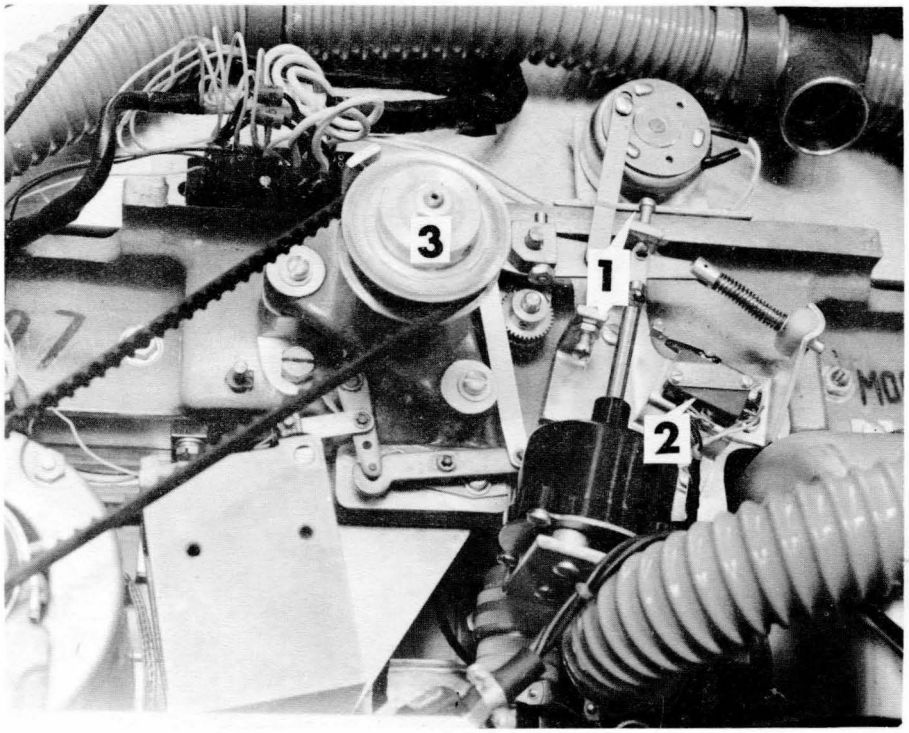
4 Dashpot

5 Spur Gears

6 Centering Device

7 Moving Coil Assembly

Transport Mechanisms--Arms Down

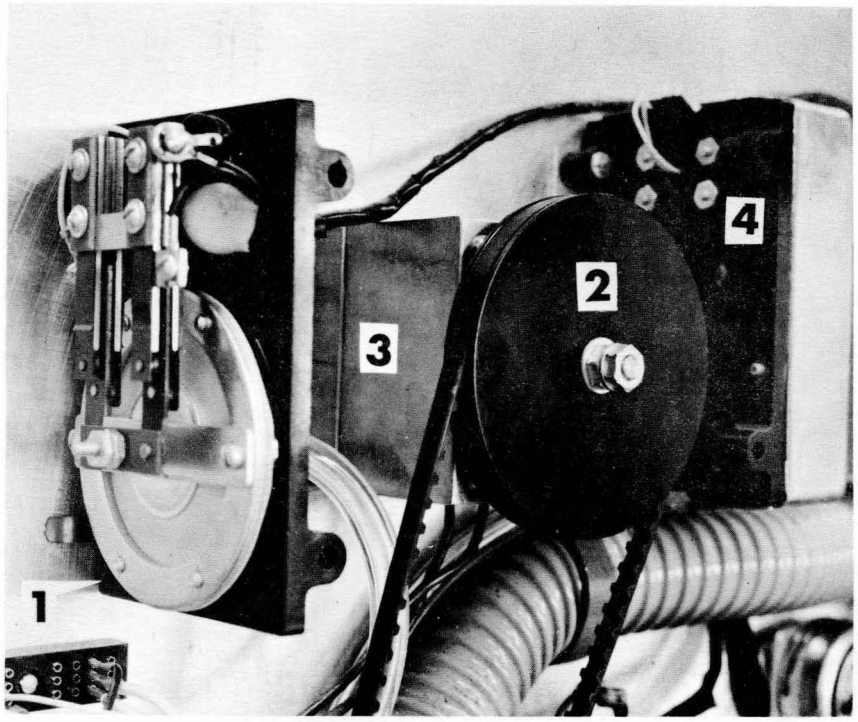


1 Rewind Arm Upper and Lower Limit Screws

2 Arm Sensing Switch

3 Capstan Drive Pulley

Transport Mechanisms--Arms Raised



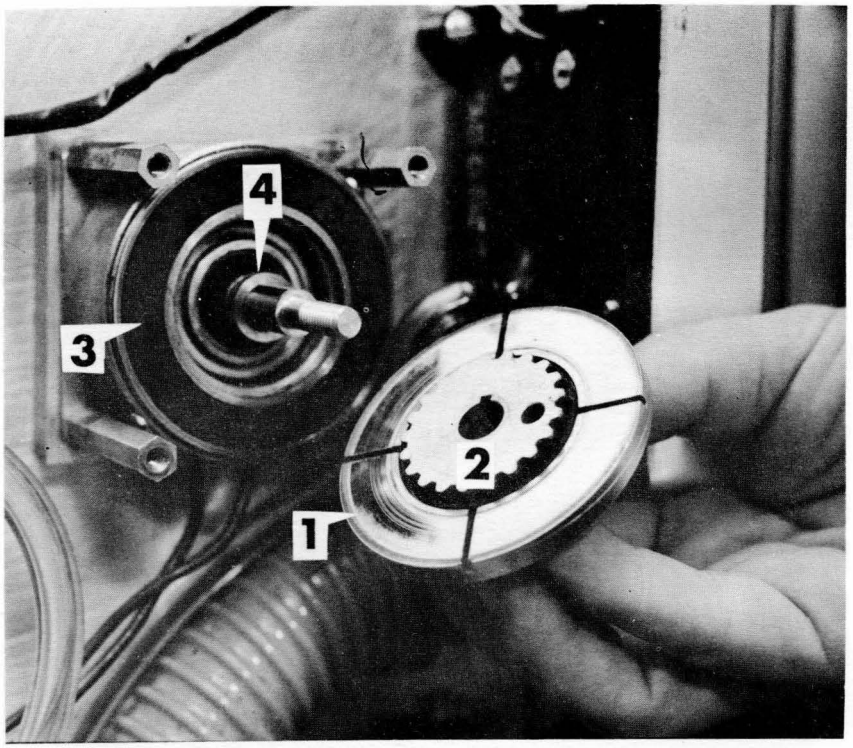
1 Right Tape In Column Switch

2 Right Reel Drive Pulley

3 Right Reel Brake Assembly

4 Right Column Tape Position Sensing Switch

Right Tape In Column Vacuum Switch and Brake Assembly



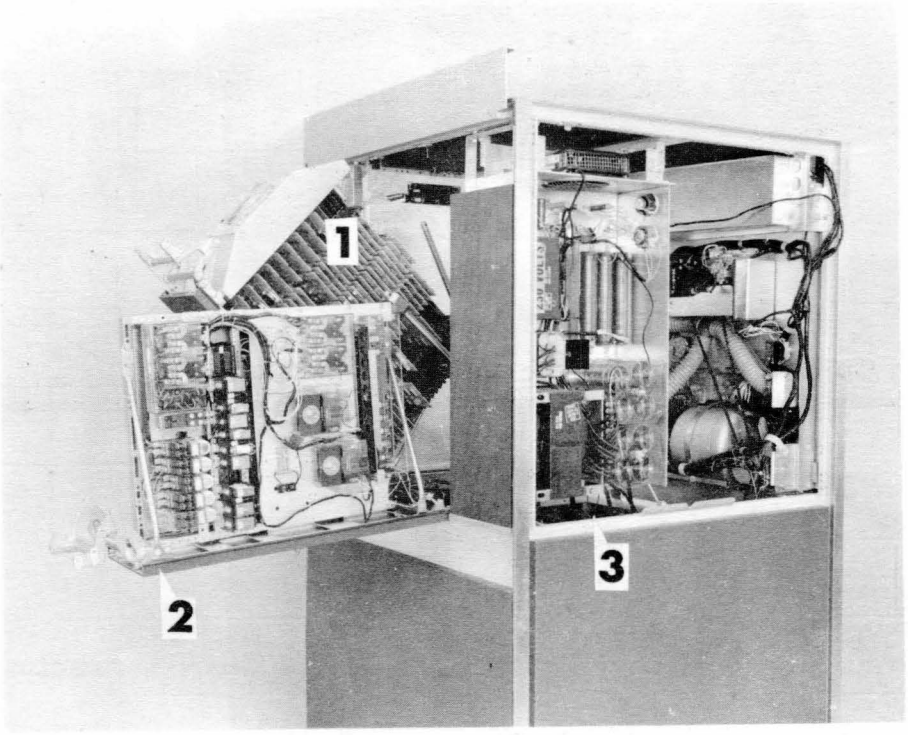
1 Armature

2 Spline

3 Brake Surface

4 Shims

Brake--Pulley, Cover, and Armature Removed

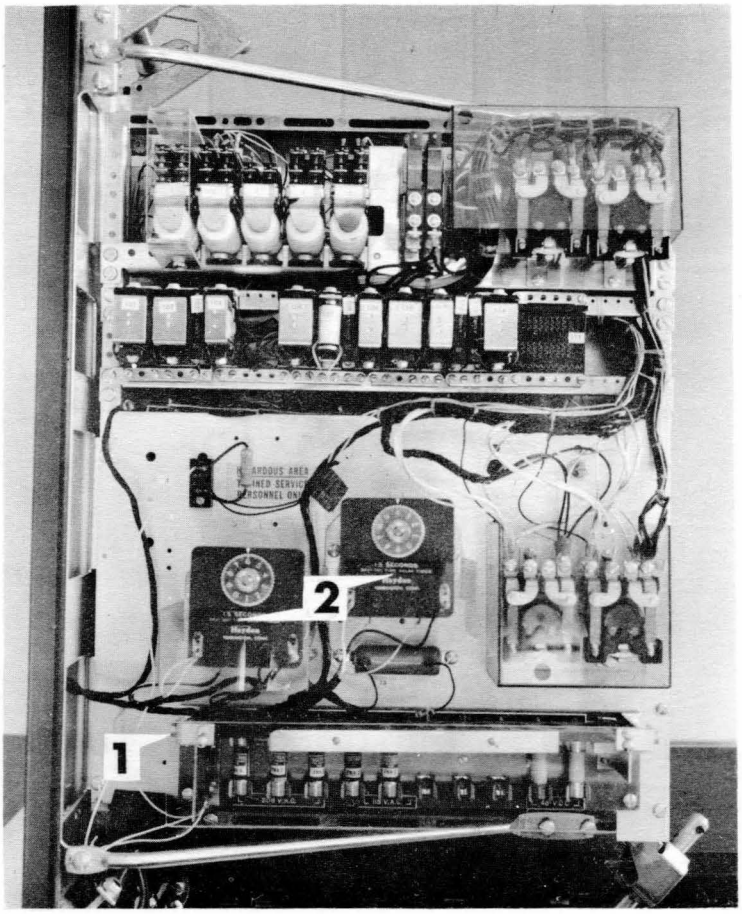


1 Gate 6

2 Gate 7

3 Gate 8

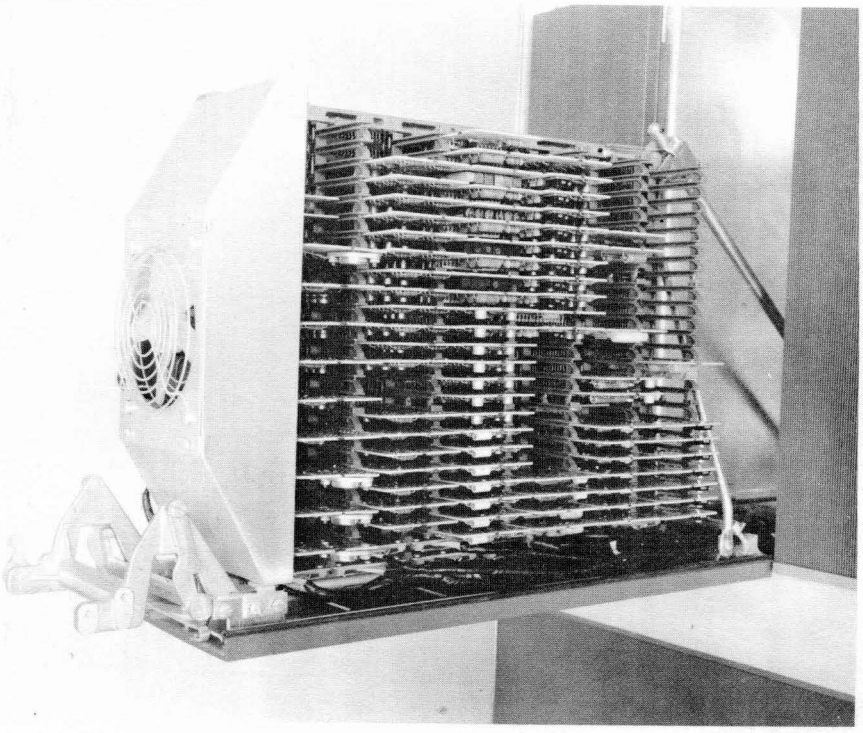
Gate 8--Minus 48 Volt Supply



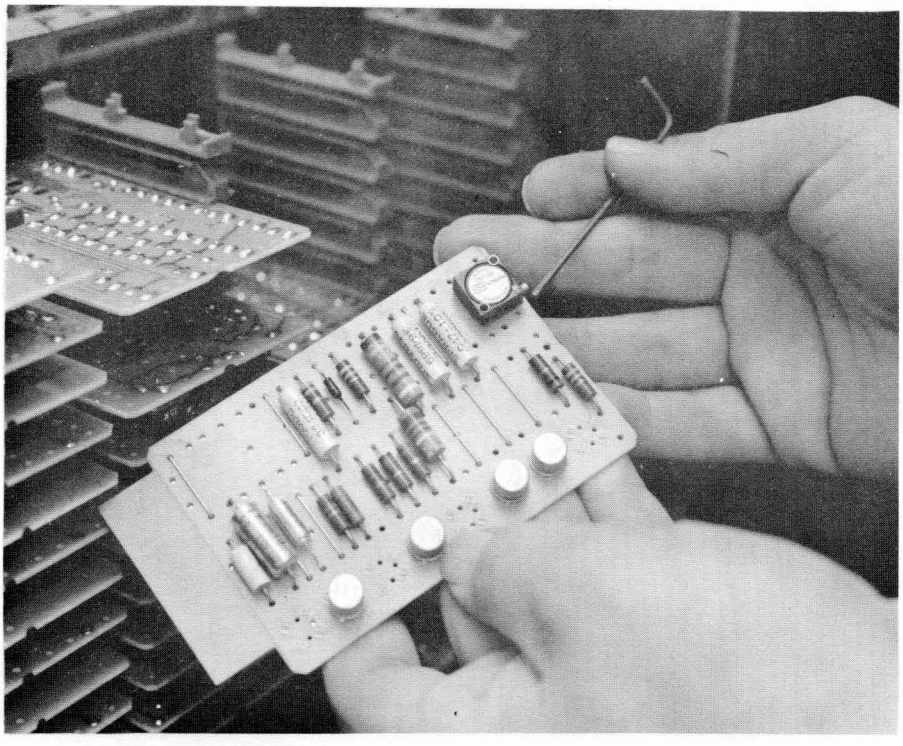
1 Fuses and Fusebail

2 Timer Motors

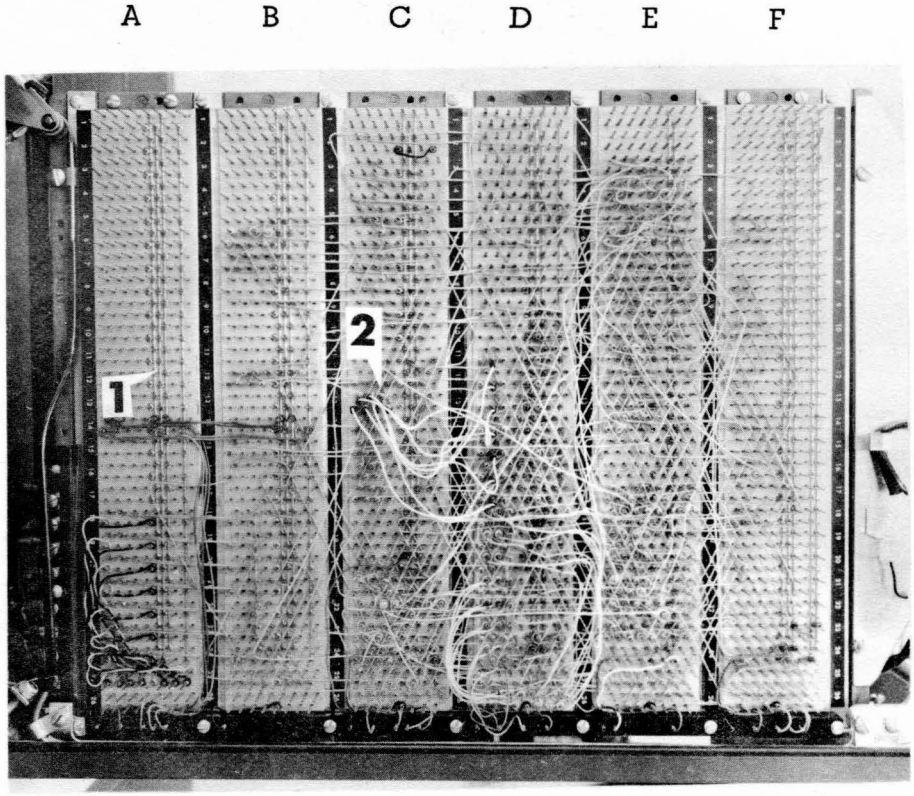
Gate 7--Relays



Gate 6--Transistor Cards



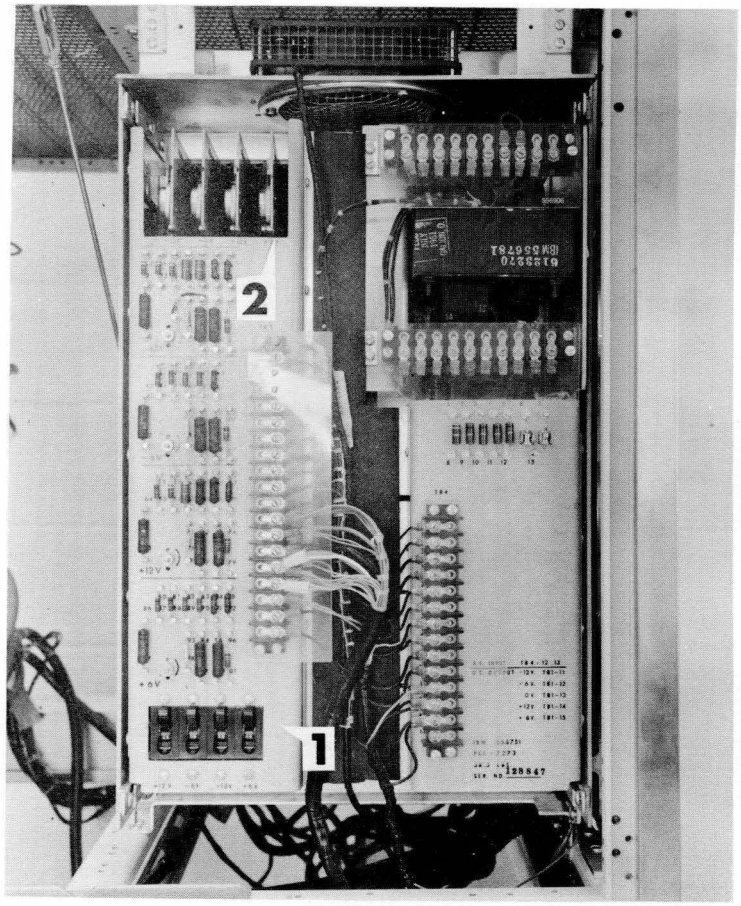
Transistor Card



1 Voltage Distribution Overlays

2 Write Delay Taps

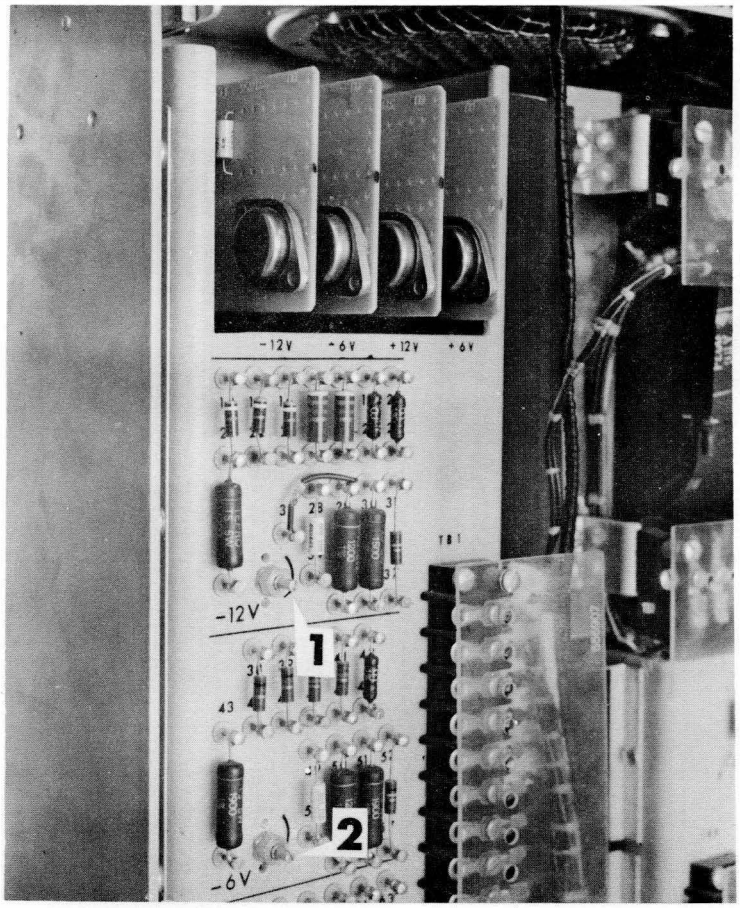
Gate 6--Wiring Side



1 Circuit Breakers

2 Regulator Cards

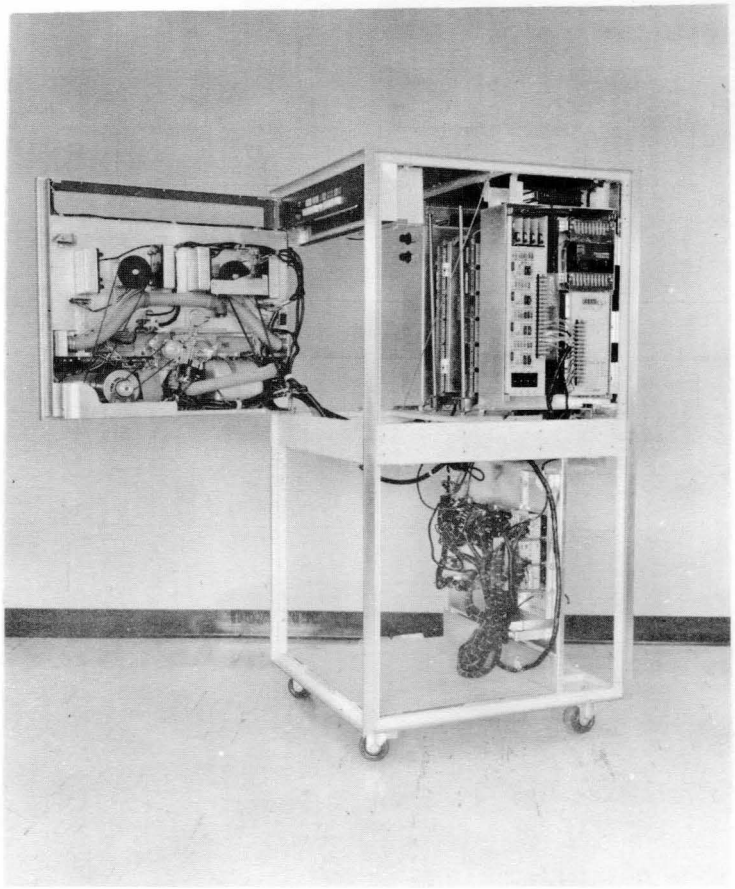
Gate 5--6 and 12 Volt Supplies



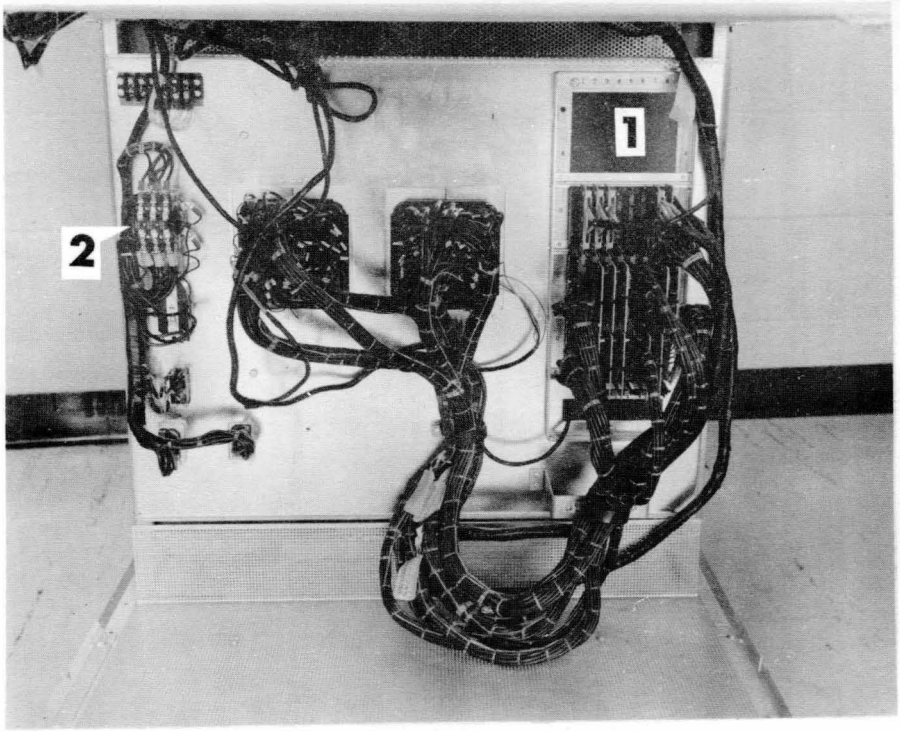
1 Adjustment Pot. for -12

2 Adjustment Pot. for -6

Gate 5--Regulator Cards



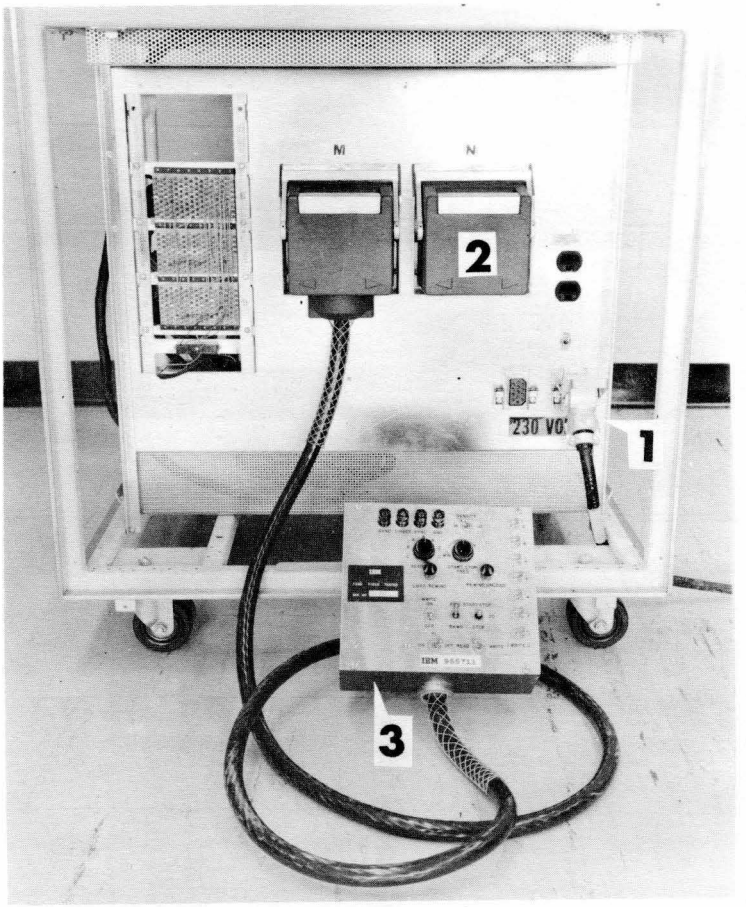
Right Front View--Covers Removed



1 Gate 5,
Module B

2 Contactor

Module B--Cabling

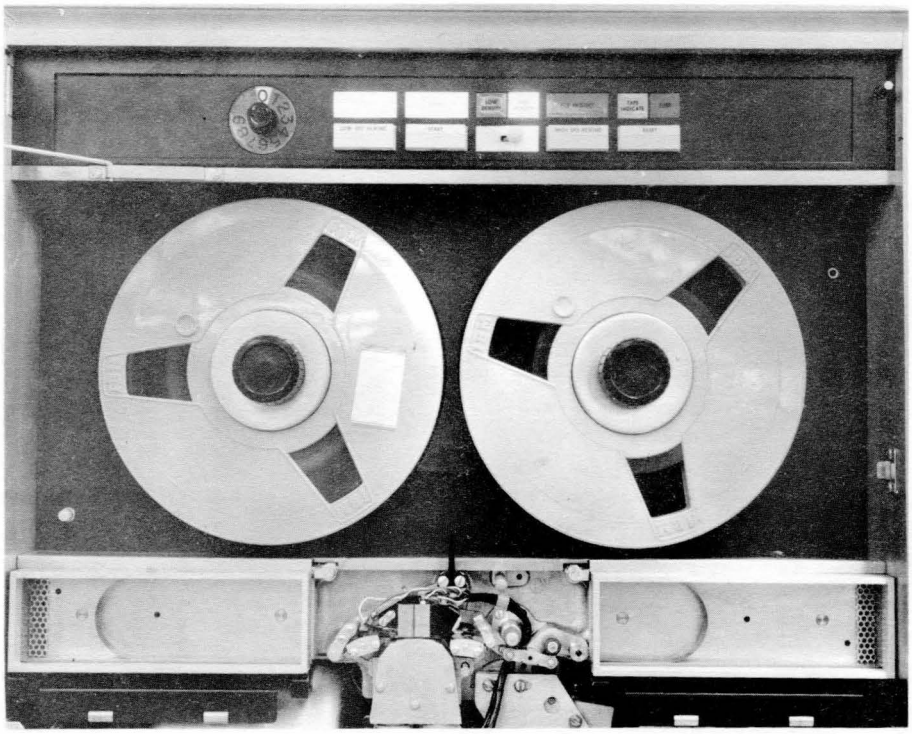


1 Power Cable

2 Terminator

3 Tape Drive Tester

Tape Drive Tester

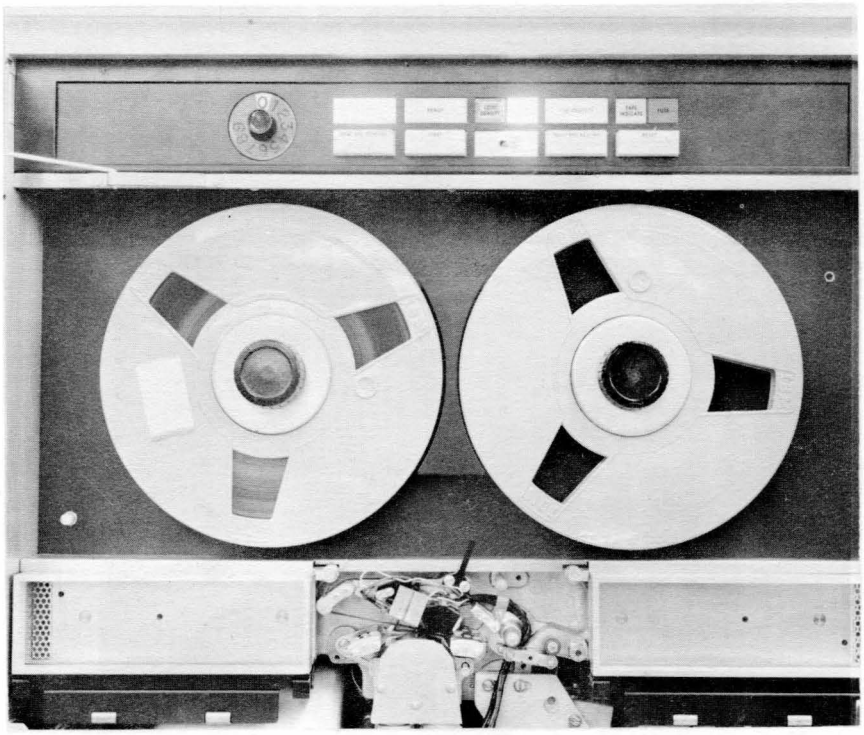


Tape Loaded

High Speed Rewind--Arms Raised

High Speed Rewind--File Reel Removing Tape From the Columns

High Speed Rewind--File Reel Driven At Full Speed



High Speed Rewind--Tape Stopped At Load Point

Selected and Ready

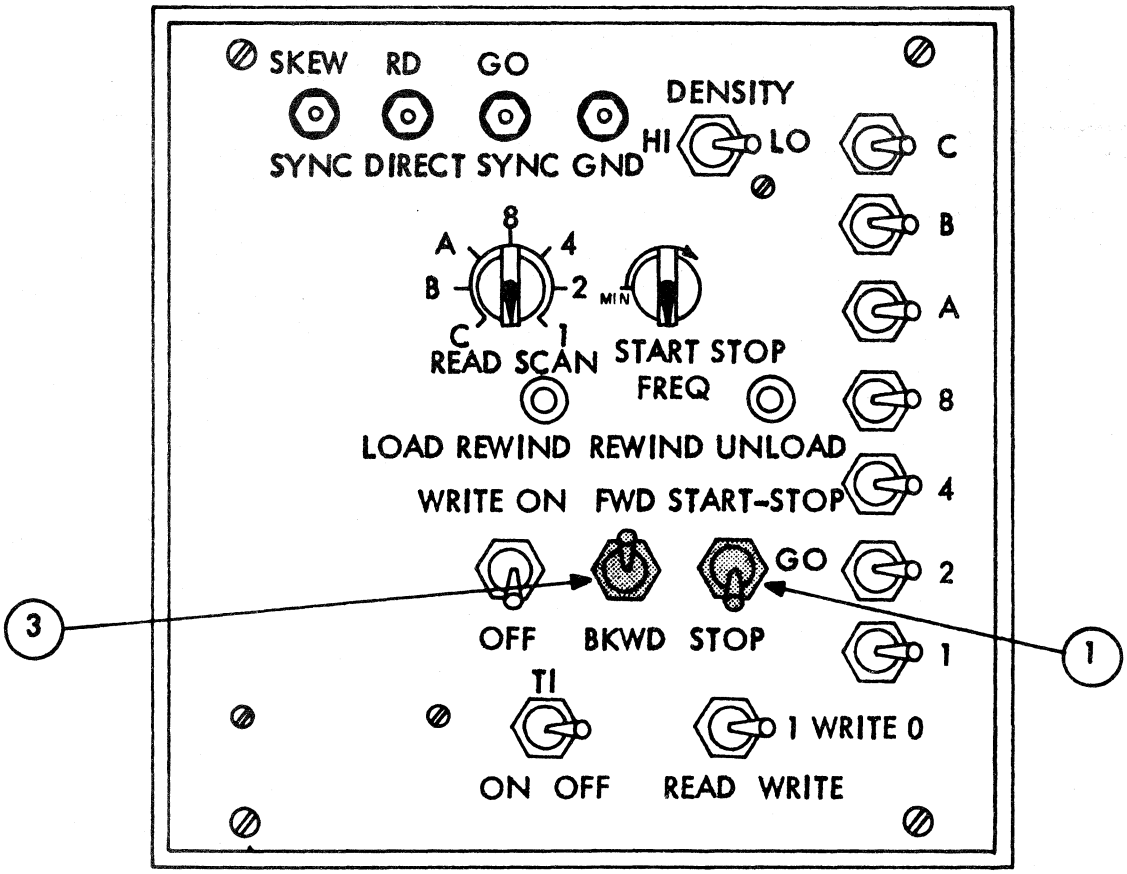
SECTION 22:

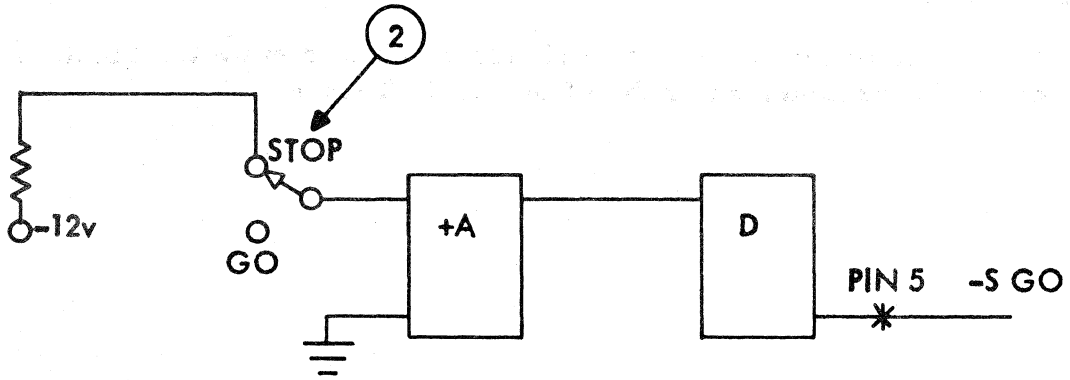
C. E. TESTER

OBJECTIVE:

At the end of this section you should be able to state the function of all the switches and hubs of the C. E. Tester.

Turn to Page 73. 04. 06. 0 in the ISD's


SKEW
RD
GO
SYNC DIRECT SYNC GND
DENSITY
HI
LO
C
B
A
8
4
2
1
A
B
C
MIN
READ SCAN
START STOP
FREQ
LOAD REWIND
REWIND UNLOAD
WRITE ON
FWD START-STOP
GO
OFF
BKWD
STOP
TI
ON OFF
1 WRITE 0
READ WRITE
3
1


2
STOP
-12v
GO
+A
D
PIN 5
-S GO

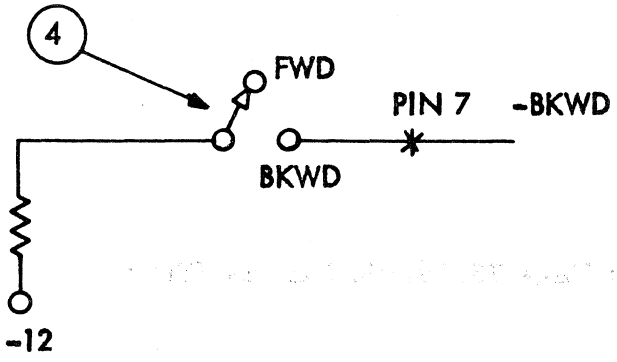

4
FWD
PIN 7
-BKWD
BKWD
-12

Figure 1

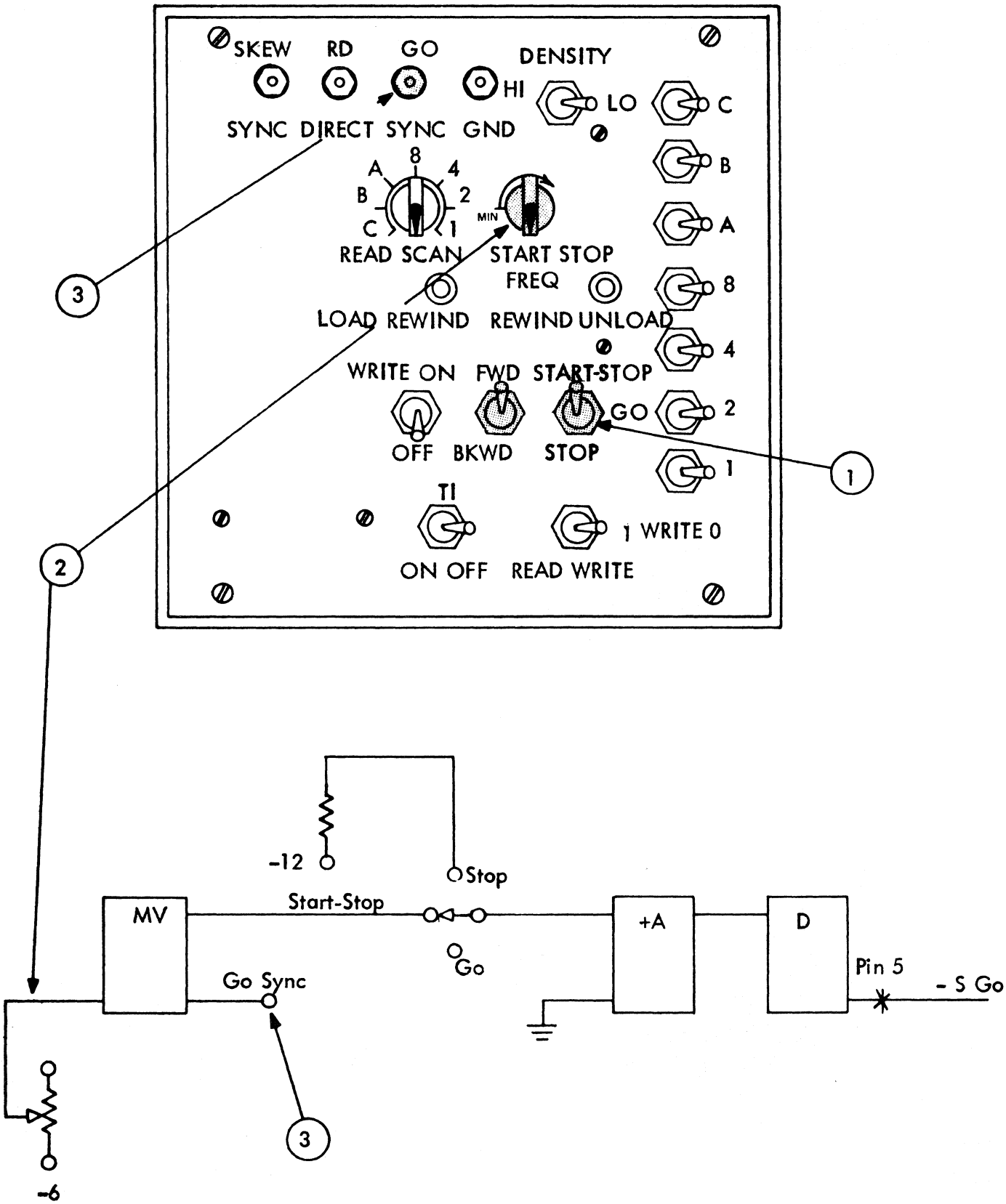

SKEW
RD
GO
DENSITY
HI
LO
C
B
A
SYNC DIRECT SYNC GND
8
4
2
1
A
B
C
MIN
READ SCAN
START STOP
FREQ
8
LOAD REWIND
REWIND UNLOAD
4
WRITE ON
FWD
START-STOP
GO
2
OFF
BKWD
STOP
1
TI
1 WRITE 0
ON OFF
READ WRITE
3
2
1
-12
Stop
Start-Stop
MV
+A
D
Go
Pin 5
- S Go
Go Sync
3
-6

Figure 2

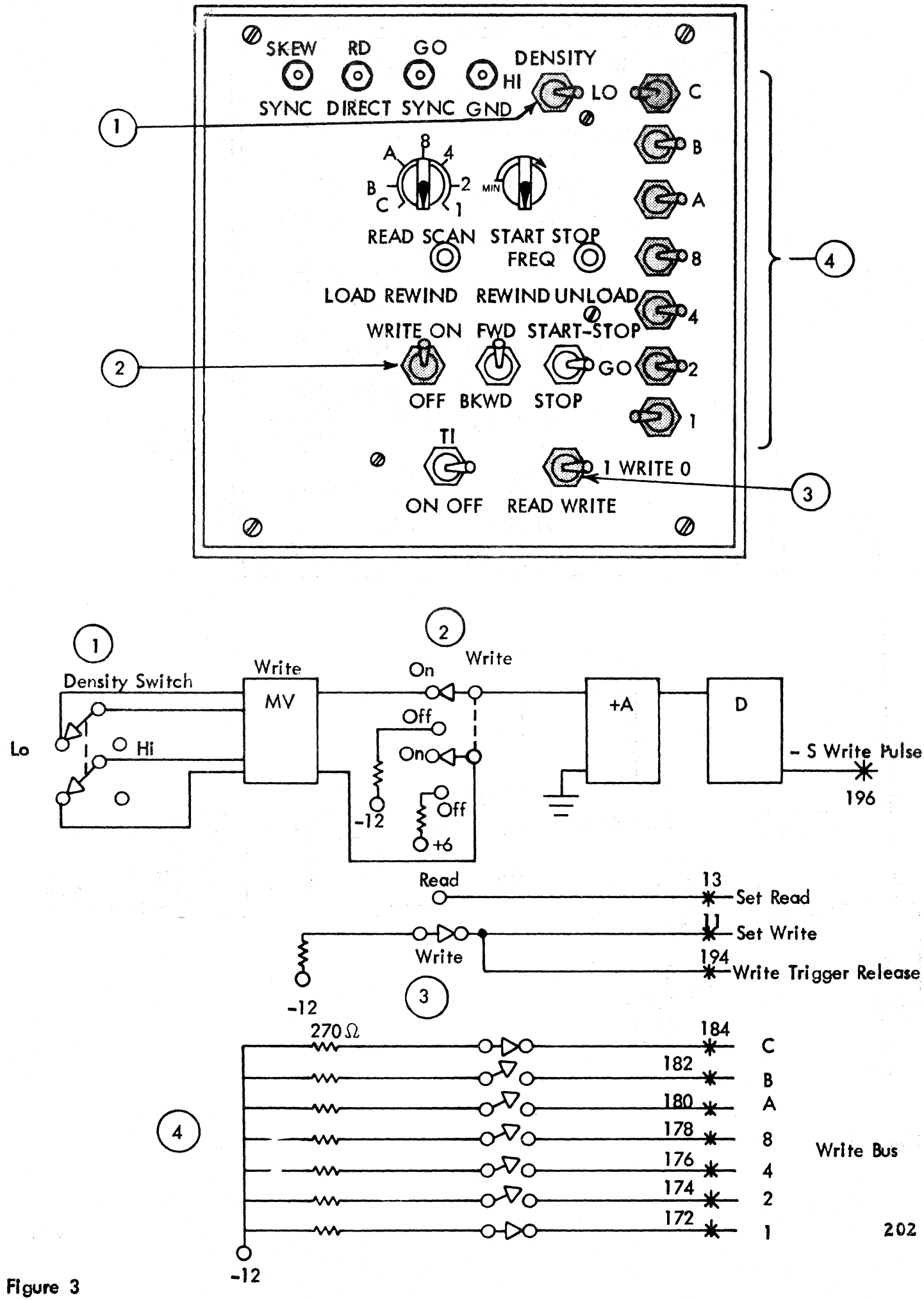
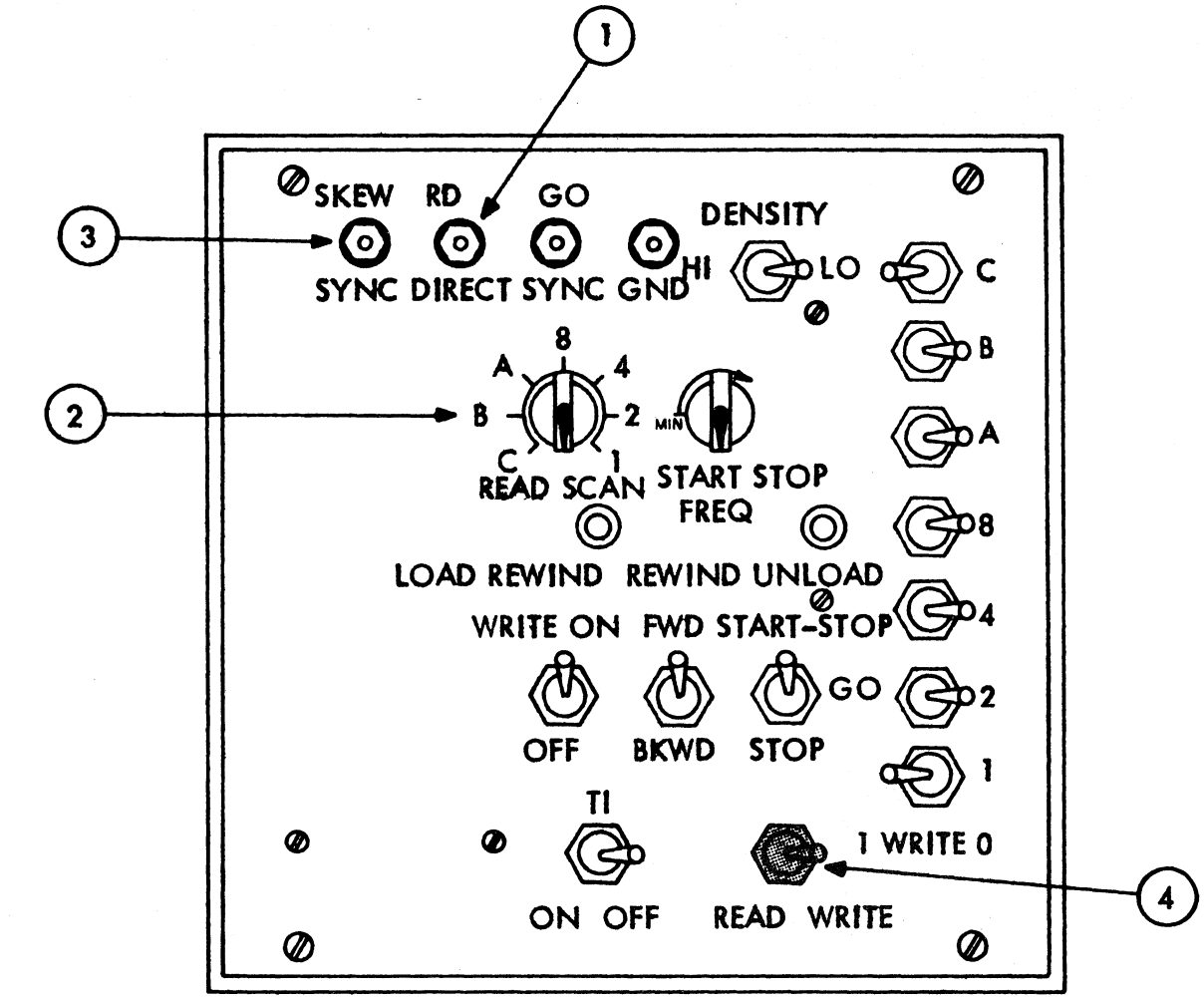

SKEW
RD
GO
DENSITY
HI
LO
SYNC DIRECT SYNC GND
C
B
A
8
4
2
1
MIN
READ SCAN
START STOP
FREQ
LOAD REWIND
REWIND UNLOAD
WRITE ON
FWD START-STOP
GO
OFF BKWD STOP
TI
1 WRITE 0
ON OFF
READ WRITE
1
2
3
4
Density Switch
Lo
Hi
Write
MV
On
Write
Off
On
-12
Off
+6
+A
D
- S Write Pulse
196
Read
13
Set Read
Set Write
Write
194
Write Trigger Release
-12
270 Ω
184
182
180
178
176
174
172
C
B
A
8
4
2
1
Write Bus
202
-12

Figure 3


1
2
3
4
SKEW
RD
GO
DENSITY
SYNC DIRECT SYNC GND
HI
LO
C
B
A
8
4
2
1
A
B
C
MIN
READ SCAN
START STOP
FREQ
LOAD REWIND
REWIND UNLOAD
WRITE ON
FWD START-STOP
OFF
BKWD
STOP
GO
TI
ON OFF
READ WRITE
1 WRITE 0

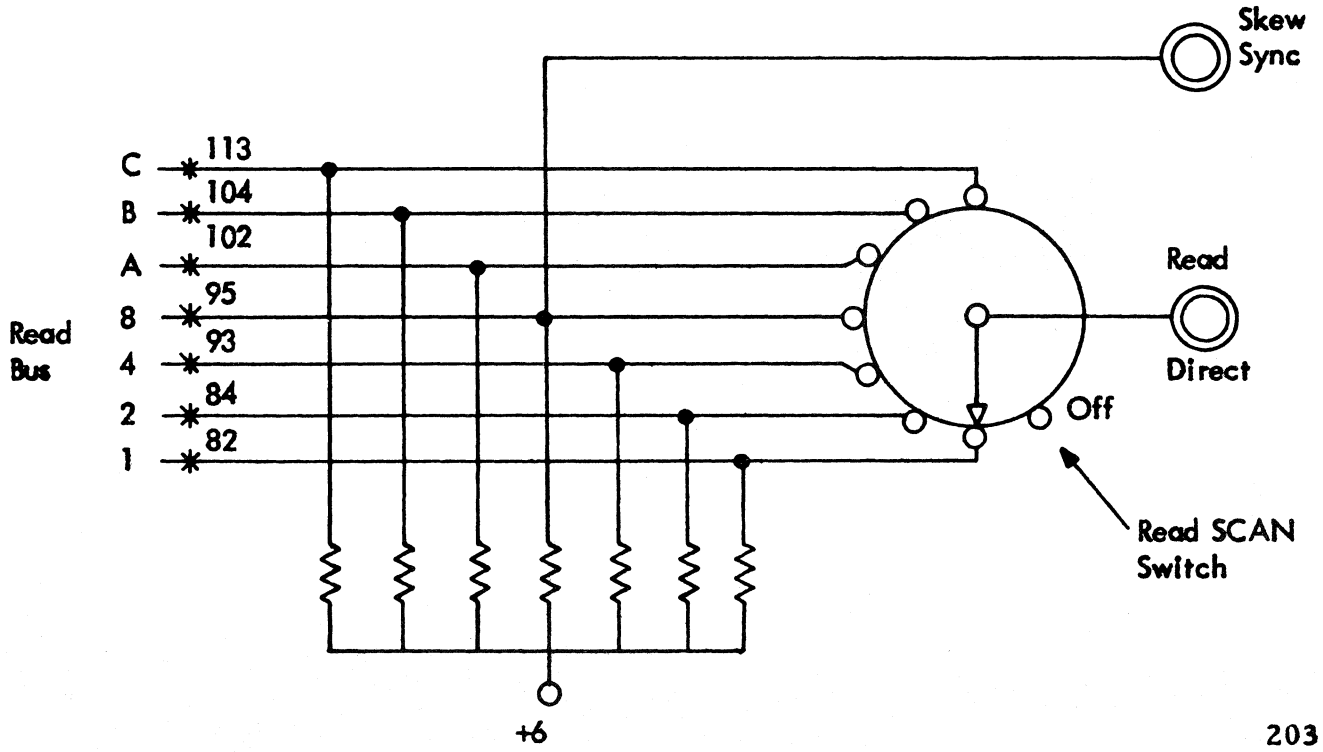
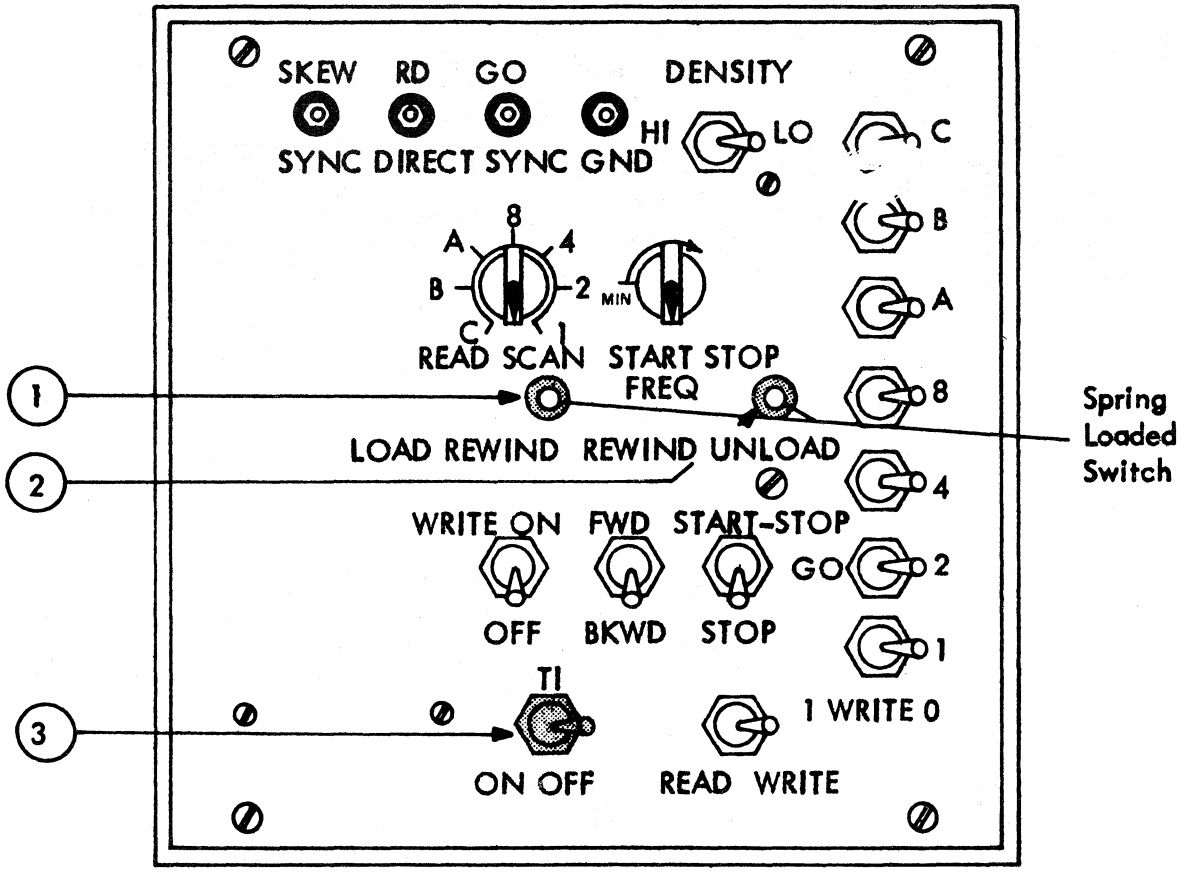
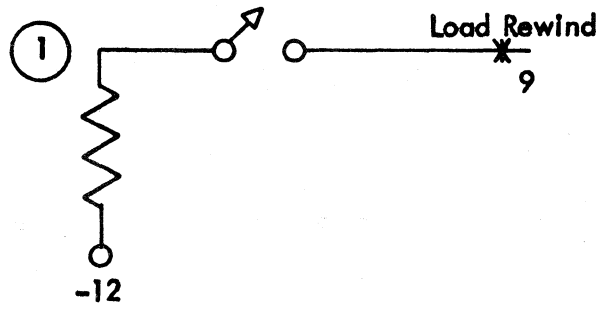
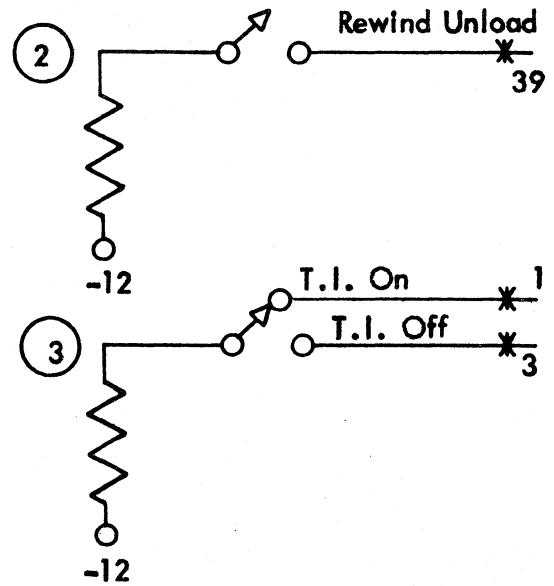

Skew
Sync
C
B
A
8
4
2
1
113
104
102
95
93
84
82
Read
Bus
Read
Direct
Off
Read SCAN
Switch
+6
203

Figure 4


SKEW
RD
GO
DENSITY
SYNC DIRECT SYNC GND
HI
LO
C
B
A
8
4
2
1
MIN
READ SCAN
START STOP
FREQ
LOAD REWIND
REWIND UNLOAD
WRITE ON
FWD
START-STOP
GO
OFF
BKWD
STOP
TI
ON OFF
READ WRITE
1 WRITE 0
Spring Loaded Switch


Load Rewind
9
-12


Rewind Unload
39
-12
T.I. On
1
T.I. Off
3
-12

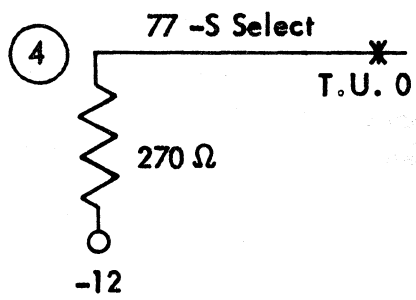

77 -S Select
T.U. 0
270 Ω
-12

Figure 5

ISD Review of CE Tester

Compare Figures 1 - 5 on Pages 200 - 204 with Systems Page 73.50.35.0

You should be able to compare the figures to the ISD page directly since they are very similar in layout.

Turn to Page 206

C. E. Tester Review:

1. The select switch on the operators panel must be set to position _____.

2. The _____ _____switch will perform the same function as "rewind call" from the computer.

3. A high speed rewind can be initiated by the _____ _____ switch.

4. When the Go-Stop-Start/Stop switch is in the Start/Stop position, a multivibrator will pulse the _____line.

5. The _____ _____ _____potentiometer will control the frequency of the start/stop multivibrator.

6. The direction that tape can move is controlled by the _____ _____ switch.

7. When the Read/Write switch is in the write position, two lines are activated. They are the _____ _____line and the _____ _____ _____line.

8. Write pulses will be sent to the drive only when the _____ _____ _____switch is in the on position.

9. Write pulse frequency will be determined by the _____ _____ _____switch on the tester and the density switch on the operator's panel will have no affect.

10. When the Go line is made active a negative shift is available at the _____ _____hub.

11. To write bits in a particular bit track the write 1 or 0 switch for that track must be in the _____position.

12. The output of any of the 7 read preamps can be scoped at the _____ _____hub by selecting the track wanted with the _____ _____rotary switch.

13. The output of the 8 bit preamp is directly wired to the _____ _____hub.

14. The tape indicate trigger can be turned On or Off depending on the setting of the _____ _____ _____switch.

15. When using the tester a terminator must ALWAYS be in place in the 7330. (T or F)

Check your answers on Page 207.

ANSWERS TO PAGE 206

1. 0 (zero)
2. Load rewind
3. Rewind unload
4. Go
5. Start Stop Frequency
6. Forward - Backward
7. Set write - write trigger release
8. Write ON-OFF
9. High - Low density
10. Go sync
11. 1 position
12. Read direct, Read scan
13. Skew sync
14. T.I. ON-OFF
15. True

TURN ON THE RECORDER

ADJUSTMENT CONCEPTS

1. Tracking
2. Start-Stop Timing
3. Skew

OBJECTIVE: In this section you will learn the theory behind the most important adjustments.

TRACKING is the alignment of the tape in relation to the Read-Write Head Assembly.

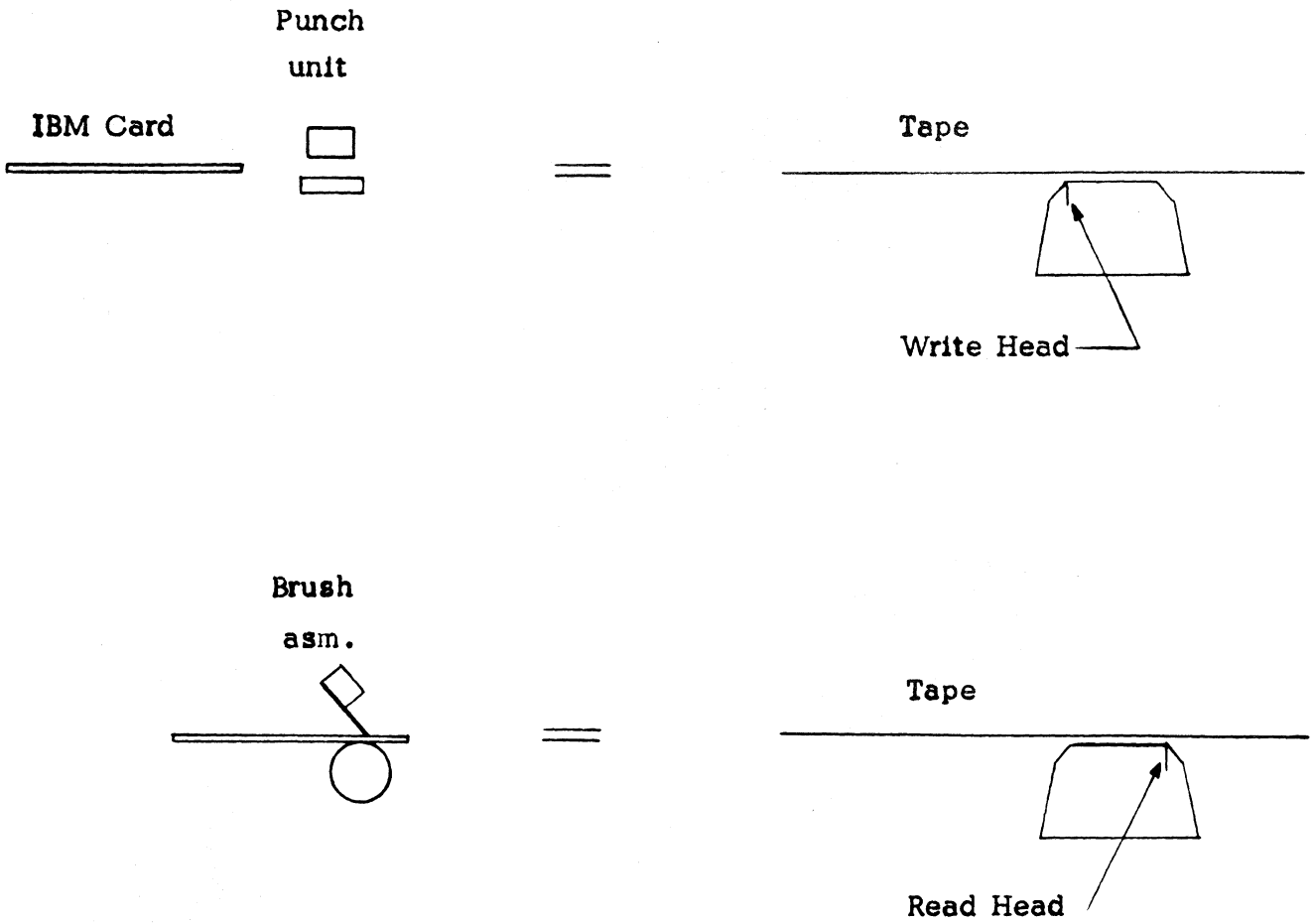


Figure 1

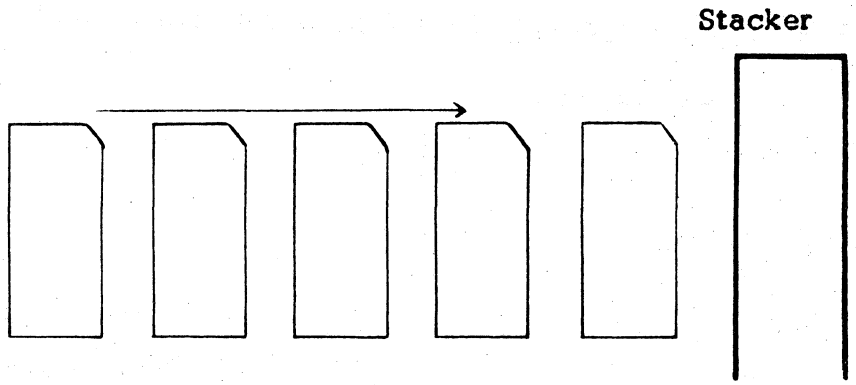


Figure 2

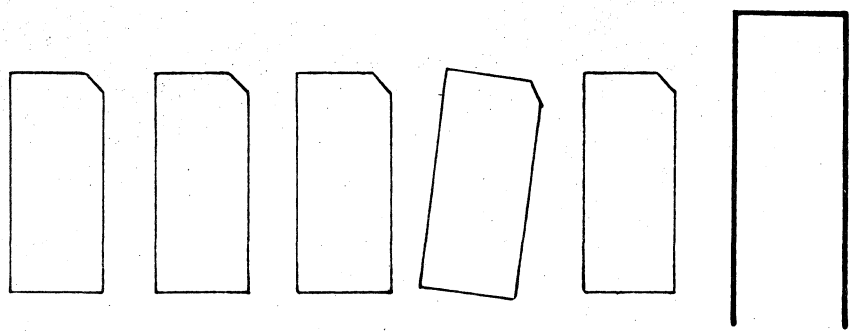


Figure 3

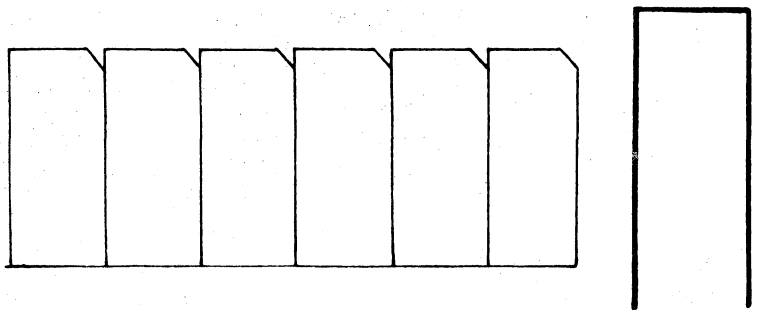


Figure 4

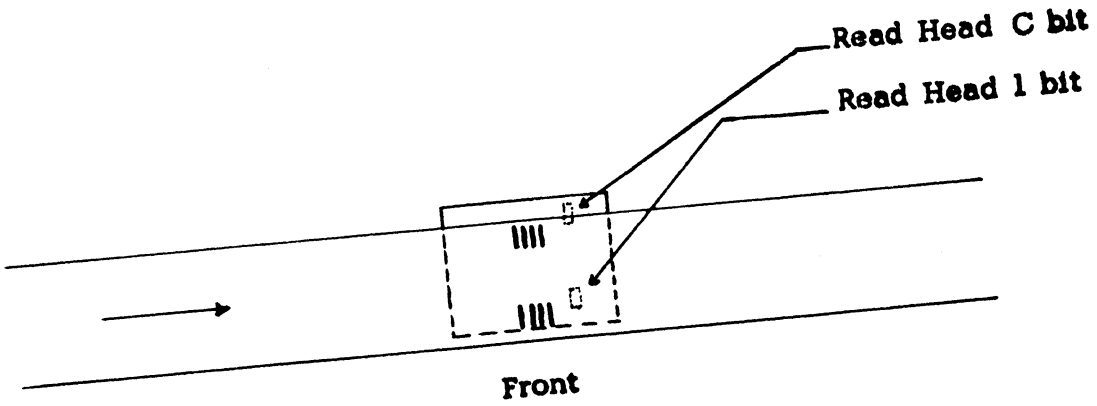


Figure 5 Tape path too far toward the front of the transport.

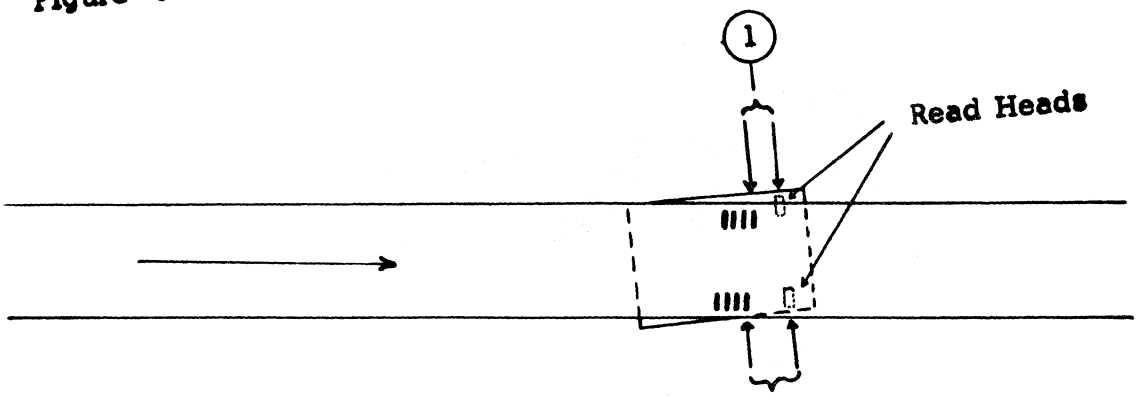


Figure 6 Tape crossing the head at an angle.

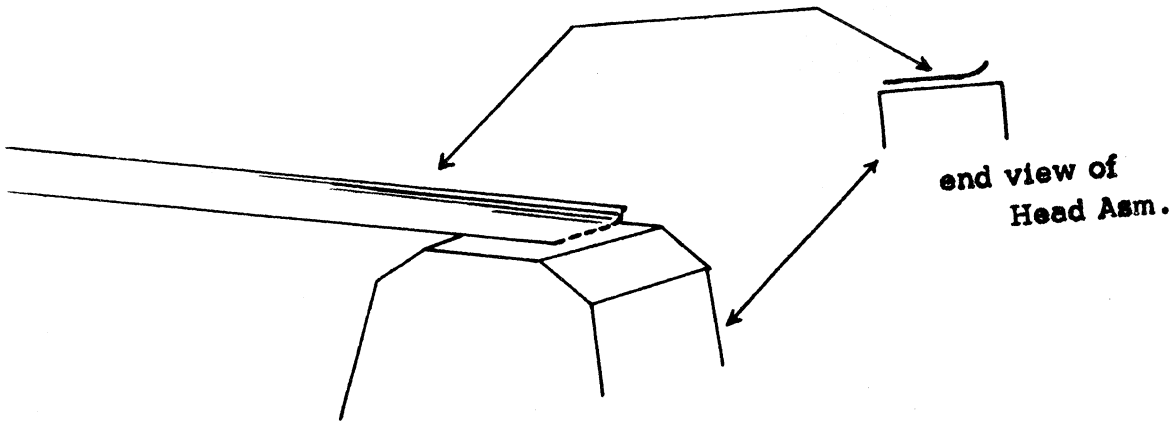


Figure 7 Tape curling as it passes over the head assembly.

TRACKING

refers to the

TAPE PATH

through the entire transport----

and its relation to the Read-Write Head Assembly

both in the horizontial and the vertical plane.

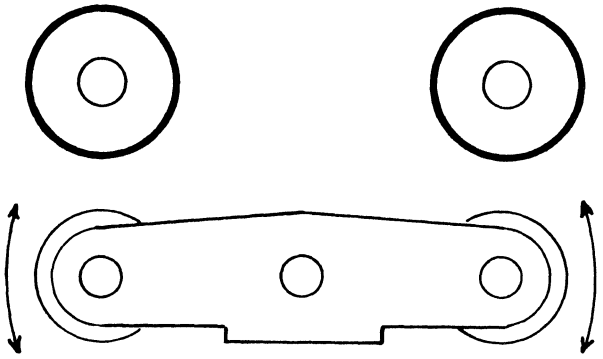


Figure 8 Rocker Arm

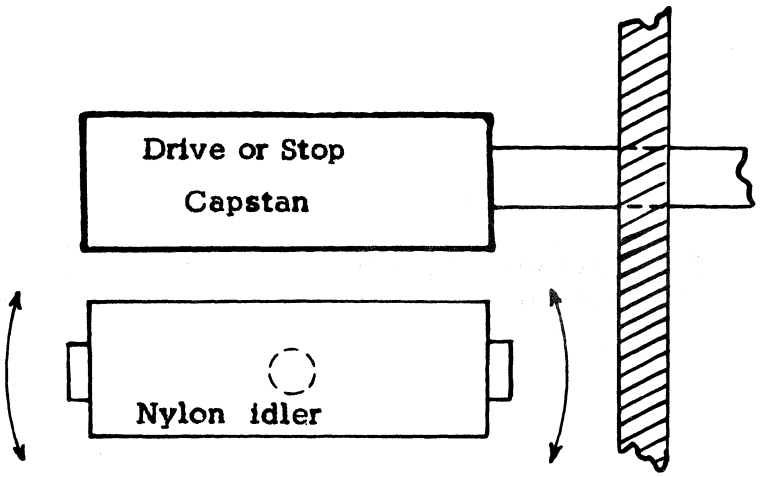


Figure 9 Side View

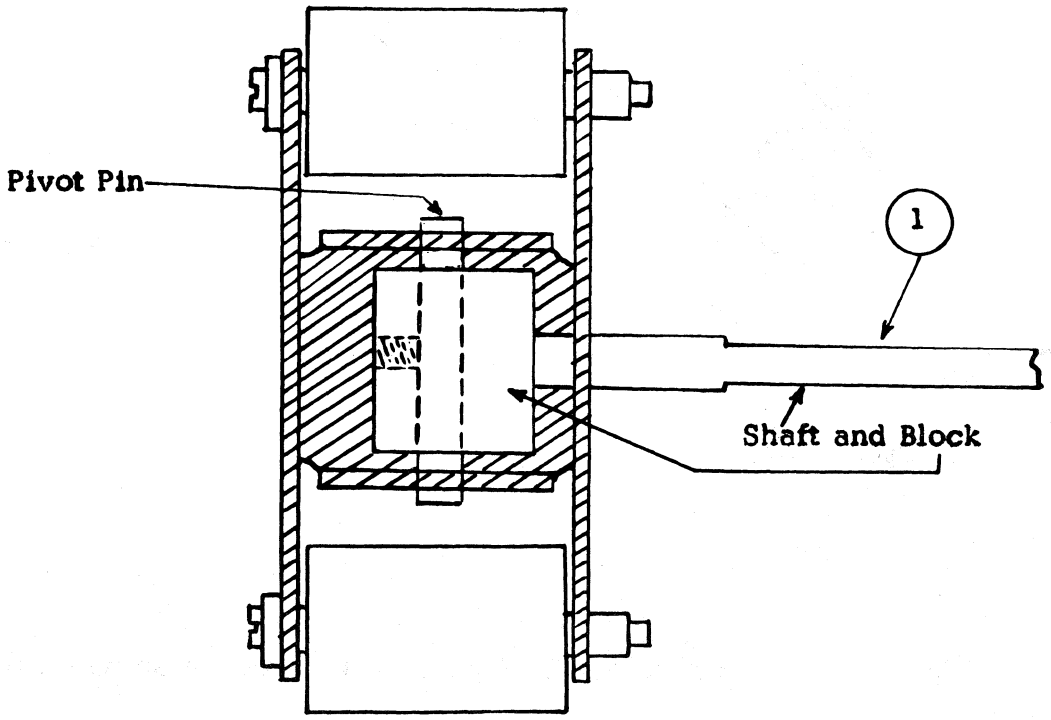


Figure 10 Top View

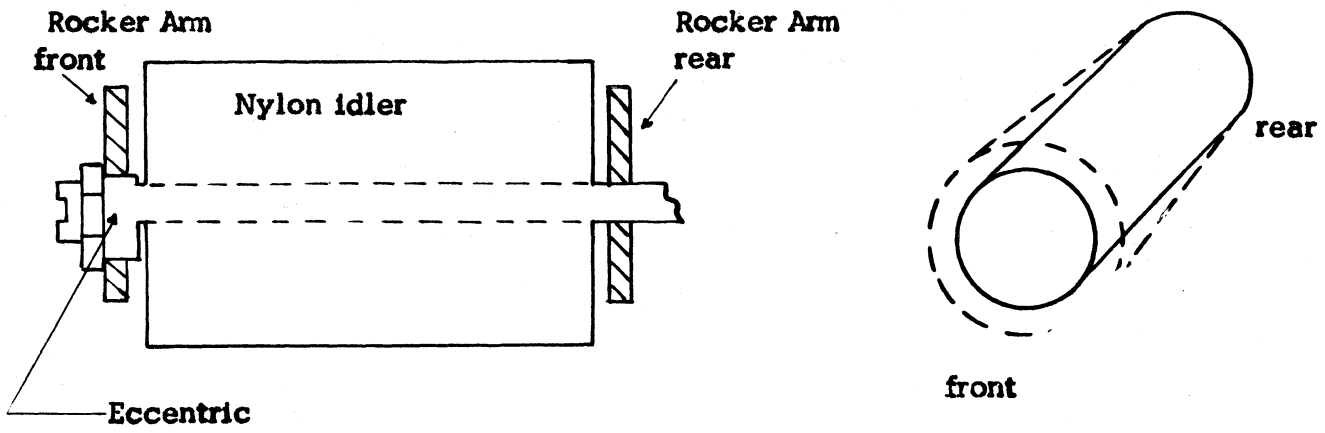


Figure 11 Side view of the Rocker Arm Assembly showing idler eccentric.

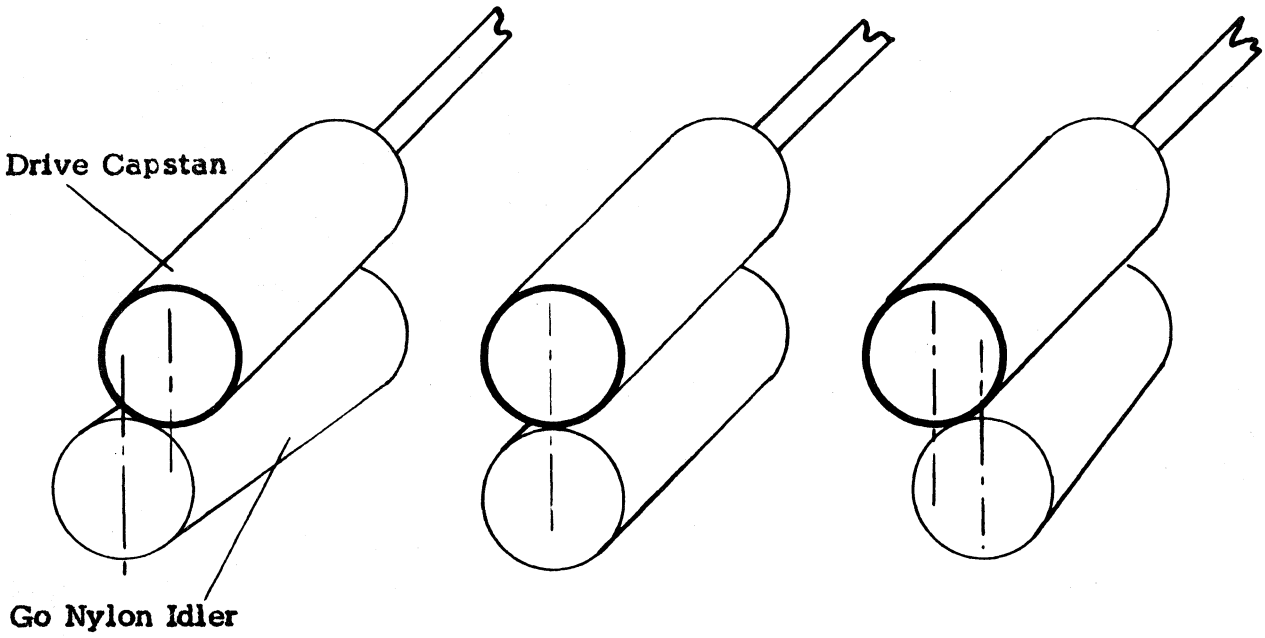
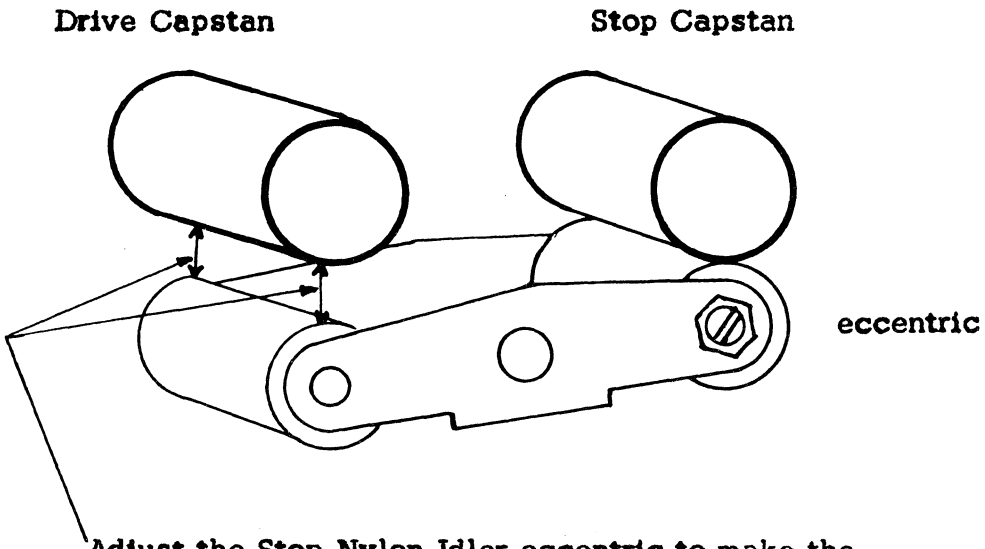


Figure 12 Effect of the Go Nylon Idler eccentric adjustment.



Adjust the Stop Nylon Idler eccentric to make the Go Nylon idler parallel with the Drive Capstan.

Figure 13

7330

tape tracking

Concepts

The figures referred to in this text are on Pages 225 to 230.

7330 TAPE TRACKING

The tracking adjustment is probably the most important adjustment concerning the 7330 tape drive. Of course all adjustments should be correct to give maximum customer operation. The tracking adjustment is a combination of several adjustments. Therefore, it is important that a knowledge of the adjustments and the objectives of those adjustments be thoroughly obtained.

First, let's consider two basic questions: (1) What is tracking? (2) Why is it necessary? Tracking refers to the tape passing over the Read-Write head. The tape must pass over the Read-Write head in such a manner that the individual tracks, and therefore, bits are always aligned with the corresponding Write or Read head. Tracking also implies that tape must pass across the Read-Write head in an even plane. The front or rear edge of the tape must not dip or curl toward or away from its desired path across the head. And now, why is tracking adjustment necessary? You will recall that the 7330 uses a tape-to-head air-film principle. The 729 does not. The air-film principle means that when tape is moving across the head assembly, it is not in contact with it, but separated by a thin film of air. Comparing this to the 729, the tape is wrapped partially around the head and is essentially forced into contact with the head at all times.

Thus, 7330 tracking is not something that will come about automatically, but is a result of properly made adjustments. Since correct tracking is a result of several adjustments and conditions, it is difficult to state an exact starting point for any particular "cure-all" type of adjustment.

To begin with, let's divide the adjustments into two major areas: (1) Tape path to the head (2) Tape path leaving the head. We shall assume at this point a forward tape motion. If the tape path to the head is not following a desired path, it is inconceivable that other adjustments will be able to over-ride or compensate this condition effectively. You will notice we have just enlarged our original definition of tracking so that it now concerns the tape path through the entire transport mechanism.

What are the factors then that contribute toward a good tape path to the head? First of all, cleanliness. The vacuum columns are precision made; between the sides and the upper and lower surfaces a 90 degree angle exists. Oxide can build up in this area and cause the tape path into and out of the column to be effected. Regardless of one's past experience in vacuum-column

cleaning, the 7330 vacuum columns must be clean. (Refer to the CE Reference Manual for cleaning procedure).

The column idler is factory adjusted and should not need adjusting. However, tape must be supplied to or taken from the idler in a correct manner. Warped or incorrectly mounted reels will not furnish a good tape path from or to the column idlers. If the tape appears to be fluttering excessively as it leaves or enters the column idlers, this may indicate that it is riding up on the flange of the idler and then falling back off again. Several different reels (machine or file) should be tried to determine if this condition is being caused by the reel.

After it has been determined that the reel or reels are not causing this excessive fluttering, two other possibilities exist: (1) The reel hub (2) The column idler. As we have stated, the column idlers are factory adjusted. Since they can be adjusted in the field only by a trial and error method, it is desirable to make sure that the adjustment is absolutely necessary.

The left rewind arm lower limit adjustment should cause .030 to .060 of an inch of clearance between the lower surface of the left vacuum column and the lower surfaces of the rewind arm idler. The left rewind arm must be free of binds so that it will always seat. The erase head, feed through shield, arm up solenoid, dashpot or right rewind arm must not in any way interfere with the travel of the left rewind arm. We have stated that the left rewind arm must be free of binds. It should also be pointed out that there should be no perceptible end play movement of the left rewind arm pivot.

The left rewind arm idler is factory adjusted. If adjustment is necessary, however, it can be performed; the basic idea being, to loosen the idler bracket while moving tape and let the idler seek a position allowing tape to leave the left column without favoring either the rear or front of the column.

Continuing the tape path to the head, the tape now passes over the left tape guide. The tape guides are designed in such a manner that their width is slightly less than the width of tape. The tape guide assembly employs two carbon alloy guides. The front guide (1 bit edge) is stationary and the rear guide (C bit edge) is epoxied to a flat steel spring. The rear carbon alloy guide can, therefore, move back slightly and allow the tape to fit between the rear and front guides of the assembly. See Figure 1. The tape should never buckle or curl as it passes over

the left or right tape guide assemblies. No adjustments are to be made on the tape guide assemblies. They are a part of the Read-Write head assembly, if defective, the entire Read-Write head assembly must be replaced. Caution should be taken when cleaning the tape guide assemblies. The rear carbon alloy guide can be broken loose from its spring, or the spring itself damaged. Excessive cleaning fluid can also leach the oil from the bearings. (Refer to CE Reference Manual for the cleaning procedure).

In discussing the left tape guide, we have also mentioned the right tape guide (tape path now beyond the Read-Write head). If the tape path on both sides of the head is correct, the path across the head will be correct.

After the tape leaves the right tape guide, it now passes under the right rewind arm idler. At this point we shall assume the idler block to right tape guide assembly clearance has been obtained. (Refer to the CE Reference Manual for this adjustment.) We will, however, point out the importance of the right rewind arm spur gear spring adjustment.

The left rewind arm is held up or down by a toggle-spring action. The right rewind arm is then gear driven from the left rewind arm. A spring has been added to more closely couple the two gears together. This spring engages in the teeth of both gears and removes any wink or play that might appear. Visualize the rewind arms lowered and no tape in the machine; the left arm is held stationary by the toggle-spring arrangement, and the right arm has some motion due to the gear lash of the spur gears. See Figure 1 and Figure 2. Now the spring is installed in such a manner as to cause the right rewind arm to travel upward slightly as the gear play is eliminated. Since the tape path is under the right rewind arm idler, the tape will not be trying to move the arm up when the spring adjustment has been made properly.

The rocker arm, drive and stop capstan area is next. The drive capstan should not be worn or out of round. The capstan drive assembly should, of course, be free of binds, belt tension correct, and the pulleys tight and positioned correctly. The rocker arm assembly is most generally thought of first where tracking problems are concerned. However, tracking problems can be caused by other areas of the transport. This does not imply that all of these areas will need adjustment.

Let's briefly review the motions of the rocker arm assembly. Some method must be supplied to cause tape motion and to stop

tape motion. Referring to Figure 1, when the rocker arm assembly is pivoted in such a way that the Go nylon idler is holding tape against the drive capstan, tape will move. If it is pivoted in the opposite direction, tape will be held between the Stop capstan and the Stop nylon idler. This motion is obtained by the rocker arm pivot shown at point A, Figure 3. The rocker arm shaft then is coupled through a linkage arrangement to the moving coil. Figure 3, point B, shows another motion of the rocker arm. This piece is sometimes referred to as the "basket". The purpose of this motion is to allow for parallelism between the nylon idlers and their respective capstans.

The next motion is brought about by the Go idler eccentric, Figure 3, point C. If the Go idler eccentric is rotated, the front portion of the idler will effectively travel in a large circle, whereas the rear of the idler does not feel this eccentric and merely pivots. The portion of this motion that we are interested in, is the left-to-right motion of the idler in relation to the drive capstan. If you visualize the eccentric adjusted such that the front of the idler is at its highest point and touching the drive capstan (Go energized) it might appear that the rear of the idler would not be touching the capstan. However, if you recall that the entire basket will pivot, it follows that the Go idler will touch the capstan along its entire length. This parallelism is brought about by the basket being able to pivot. We will later make an adjustment to create the parallel condition as if the basket did not pivot. The conclusion is, then, that the Go nylon eccentric is adjusted for a side-to-side motion in relation to the drive capstan.

The Stop nylon idler and eccentric is identical to the Go nylon idler and eccentric. If we assume that the Go nylon idler eccentric has been adjusted correctly, we can now adjust the Stop nylon idler eccentric. The theory here is to cause both the Go idler and the Stop idler to be parallel with their respective capstans. In a stop condition with the Stop idler against the Stop capstan, the Stop eccentric is adjusted to cause the Go nylon idler to be parallel with the drive capstan. This eccentric motion is effectively an up and down motion. We will adjust the Go nylon eccentric for a side-to-side motion (with respect to the drive capstan) to obtain tracking, and we will adjust the Stop idler eccentric for parallelism. The Stop nylon idler eccentric adjustment, not the basket motion, is responsible for the parallel condition between both nylon idlers and their capstans.

We have not yet mentioned the right vacuum column. The action of the tape path, cleanliness, and column idler are the same as for the left column. The right rewind idler serves the same function as the left rewind arm idler (with left rewind arm down).

Another point concerning the flanged idlers should be brought out. These idlers should have practically no perceptible end play. The bearing assembly is epoxied to the idler. If this end play is checked using too much pressure, the epoxy will be broken loose. The point here is that the idler being checked has just been made defective. To check the idlers, use one finger and very little pressure.

THE TRACKING ADJUSTMENT

The tracking adjustment will range from a simple touch-up adjustment to a more complex one. In either case the end results should be the same. To emphasize the relation of the tracking adjustment to the start-stop mechanism, we will consider a complex tracking adjustment.

Let's approach this tracking adjustment by assuming that no portion of the start-stop mechanism is in adjustment. If we assume this worst possible condition, we must find some starting point. The Go nylon idler eccentric has been provided to effect the actual tracking adjustment. The starting point for this eccentric adjustment should be that point which causes the Go nylon idler to be at its farthest travel away from the rocker arm toward the drive capstan.

The source of the start-stop motion is the moving coil assembly. Therefore, we will make an initial adjustment here also. (Keep in mind we are assuming a worst possible condition.) At this time we are interested in positioning the moving coil assembly so that it does not top. (Refer to Figure 4). In other words, we want full travel of the rocker arm assembly so that the Go nylon idler will hold tape firmly against the drive capstan.

We must also investigate two other conditions before we can continue. (1) Is the rocker arm centering device so far out of adjustment that there is danger of bending the linkage when the rewind arm is raised? An initial adjustment of the centering device will be necessary if this condition exists. (2) Is the stop capstan clearance such that we will damage tape? It may be necessary to rotate the stop capstan up out of the way.

With these conditions satisfied, we can continue the adjustment. The Go nylon eccentric is now adjusted while moving tape forward in a continuous motion. This side-to-side motion of the Go nylon idler at some point will cause the tape to buckle or curl. The object then is to find a point on the eccentric where tape runs flat.

To do this, we will turn the eccentric until tape runs flat, then turn the eccentric counterclockwise and clockwise until buckling or curling takes place. We will then locate the eccentric midway between these two extremes. If tape cannot be made to buckle on both sides, replace the rocker arm assembly. We will also observe that tape does not continuously favor either the rear or the front of the transport mechanism at any place. Again, tape should not be in continuous contact with either side of the vacuum column while entering or leaving.

If forward tracking is not satisfactory at this point, further investigation of the transport will be necessary. Left rewind arm, right rewind arm, idlers, rocker arm assembly, etc.

Reviewing briefly our progress:

1. Go nylon set at its highest point above the rocker arm.
2. Moving coil assembly positioned to allow the Go nylon full travel against the drive capstan.
3. Centering device will allow the rewind arm to be raised without damage to the linkage.
4. Stop capstan to stop nylon clearance sufficient to prevent damage to the tape while adjusting the Go nylon eccentric.
5. Go nylon eccentric adjusted for tracking while continuously moving tape in a forward direction. The eccentric has been located midway between the two extremes.
6. Tape should be traveling through the transport without continuously touching either the front or the rear of the transport mechanism.
7. There is no buckling or curling of tape. Tape is passing over the tape guide assemblies without curling against the front guide or pushing the rear guide back.

After the above conditions have been obtained, we can now look at backward tracking. Initiate a Low Speed rewind and observe tracking. With tape continuously moving backward, we will adjust the Go nylon eccentric (if necessary) for the least amount of buckling or curling that can be obtained. This should be a very small amount. This adjustment should of course be in the range of the forward adjustment. Observe tape entering the left column and observe the left rewind arm idler area. Observe the right tape guide assembly very thoroughly for curling at the fixed guide or pushing back of the rear guide. If backward tracking cannot be obtained satisfactorily, check forward tracking again and be more critical.

After backward tracking has been obtained, check forward tracking again. Backward tracking should meet the requirements mentioned above, however, do not at any time sacrifice good forward tracking for further improvement of backward tracking.

Since we are assuming that no portion of the start-stop mechanism was in adjustment, we must perform other adjustments before continuing with the tracking adjustment. As we discussed the rocker arm assembly, it was stated that the stop nylon idler eccentric is adjusted to cause parallelism between the Go nylon idler and the drive capstan. This adjustment can now be made. As you recall, the stop capstan was adjusted to give enough clearance to allow for the tracking adjustment. It will now be necessary to readjust the stop capstan. With the stop capstan properly adjusted, there will be .012 to .014 of an inch between the Go nylon and the drive capstan. These two adjustments are made without tape in the machine. It is good practice to recheck these two adjustments at this time.

Now the Go nylon idler, Stop capstan, and Stop nylon idler have been adjusted. We can now adjust the rocker arm centering device. This final centering will allow for .007 of an inch between the Go nylon idler and drive capstan and the Stop nylon idler and the Stop capstan, (power off, no tape in the machine). If we place a .007 gage between the Go nylon and drive capstan and .007 gage (IBM card will work satisfactorily) between the Stop nylon idler and Stop capstan, when the rewind arm is slowly raised the rocker arm centering device should engage without causing any motion of the moving coil. Referring to Figure 5, the hook should fit over the stud without being forced.

When the rocker arm centering device has been adjusted, we can now make a final adjustment on the moving coil. With the rewind arm up, the rocker arm assembly is being held in a neutral position. There is approximately .007 of an inch between the nylon idlers and their respective capstans. While the rocker arm is in this neutral position we will adjust the moving coil assembly so that the moving coil will also be in a neutral position. To do this we will position the moving coil assembly so that the linkages are approximately 90 degrees. See Figure 5. With the moving coil assembly adjusted, we will observe the following: rewind arm down, move the rocker arm to the Go position and it should return to the stop position by itself if no binds are present. Even the wires leading to the moving coil can cause failure to return to the stop position if improperly dressed. We should also be aware of topping or bottoming. See Figure 4. Erratic results will occur when the travel of the moving coil is restricted by the topping or bottoming condition.

Now that the start-stop mechanism is in adjustment, we will check forward and backward tracking again. If we have made the preceding adjustments correctly, we should see the same forward and backward tracking conditions previously obtained. We can now progress toward our final checks of tracking.

First we will do a start-reset-start-reset operation in a forward direction. Do not use tester Start-Stop Mode. Looking down on the tape in the area of the rocker arm, we will perform the start-reset-start-reset operation. Upon depressing the start key, tape may move toward the front or rear of the transport. It is the amount of this lateral motion of tape that we are interested in. As the tape is released by the stop capstan and the Go nylon engages the tape against the drive capstan, there is a tendency for tape to move laterally. This lateral motion should be a very slight perceptible amount. If an excessive amount of this lateral motion is seen, the preceding adjustments must be re-checked. When this forward start-reset tracking has been observed to be correct, we can now perform another check.

We will now perform a low speed rewind-reset-low speed rewind-reset operation. Again we will be looking down on the tape in the area of the rocker arm. Again, we will be looking for this lateral shifting of tape. The amount seen here can be more than seen in the forward start-reset check, but it should still be a slight amount.

When tracking has been observed to be correct, we can now check start-stop envelopes. If the preceding adjustments have been properly made, good start-stop envelopes should result. Skew should also be checked at this time.

The preceding example was based on a complex tracking adjustment. If a touch up tracking adjustment is all that is necessary, many of these adjustments can be eliminated. However, it is a good practice to rapidly check their adjustment in the order that they were preformed here. After any tracking adjustment has been made, skew should be checked.

Excellent results have been obtained by using a dental mirror, observing the tape as it travels through the transport, watching for dipping or curling.

In the preceding pages, you may have noticed the use of such terms as; excessive, slight amount, very slight amount, perceptible, etc. The use of these was not intended to imply a vague or general approach. It is not practical to assign a specific decimal equivalent to these terms, but it is practical to assign a specific amount of skill to obtain these terms. Some adjustments, then, will not be measured in thousandths of an inch, but rather by successful system operation.

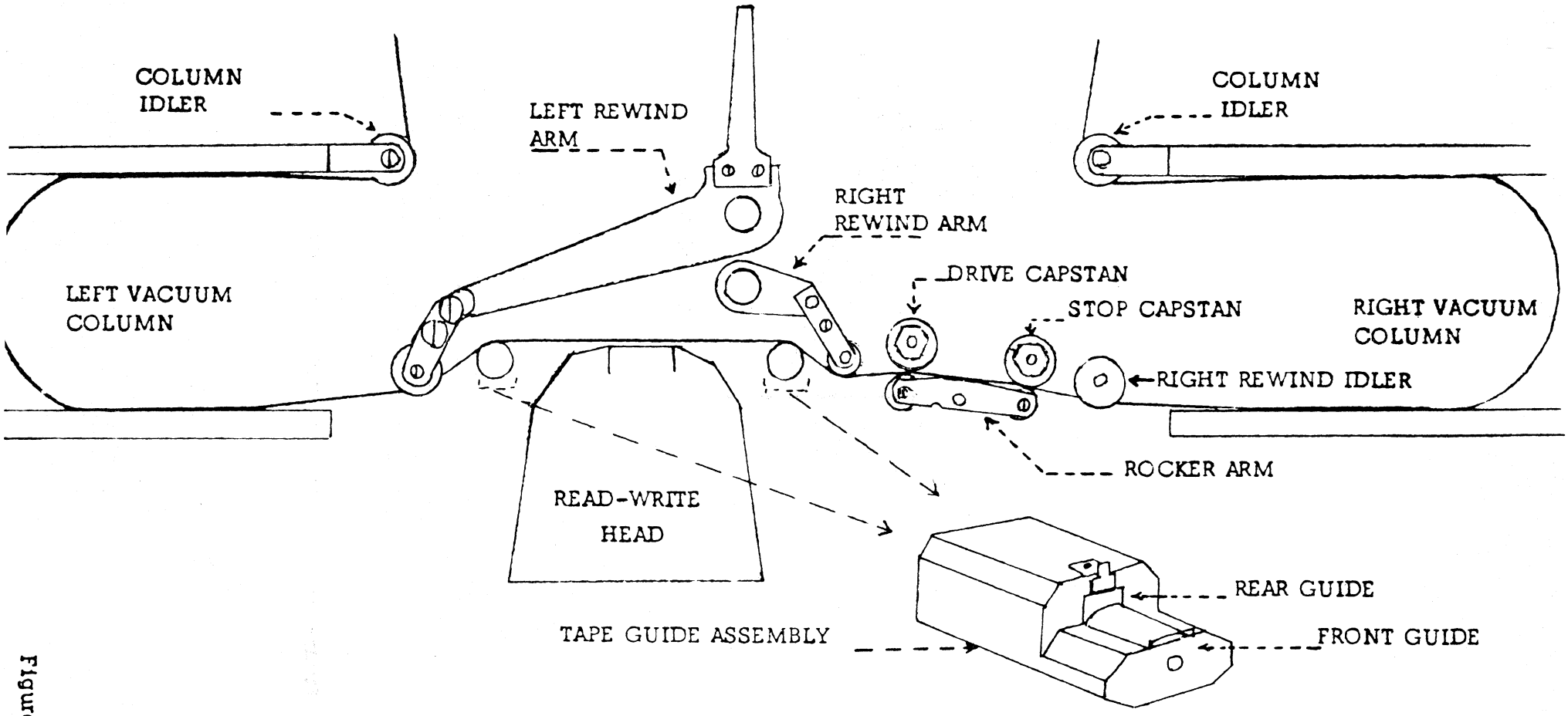

COLUMN
IDLER
LEFT REWIND
ARM
COLUMN
IDLER
RIGHT
REWIND ARM
DRIVE CAPSTAN
STOP CAPSTAN
LEFT VACUUM
COLUMN
RIGHT VACUUM
COLUMN
RIGHT REWIND IDLER
ROCKER ARM
READ-WRITE
HEAD
REAR GUIDE
TAPE GUIDE ASSEMBLY
FRONT GUIDE

Figure 1

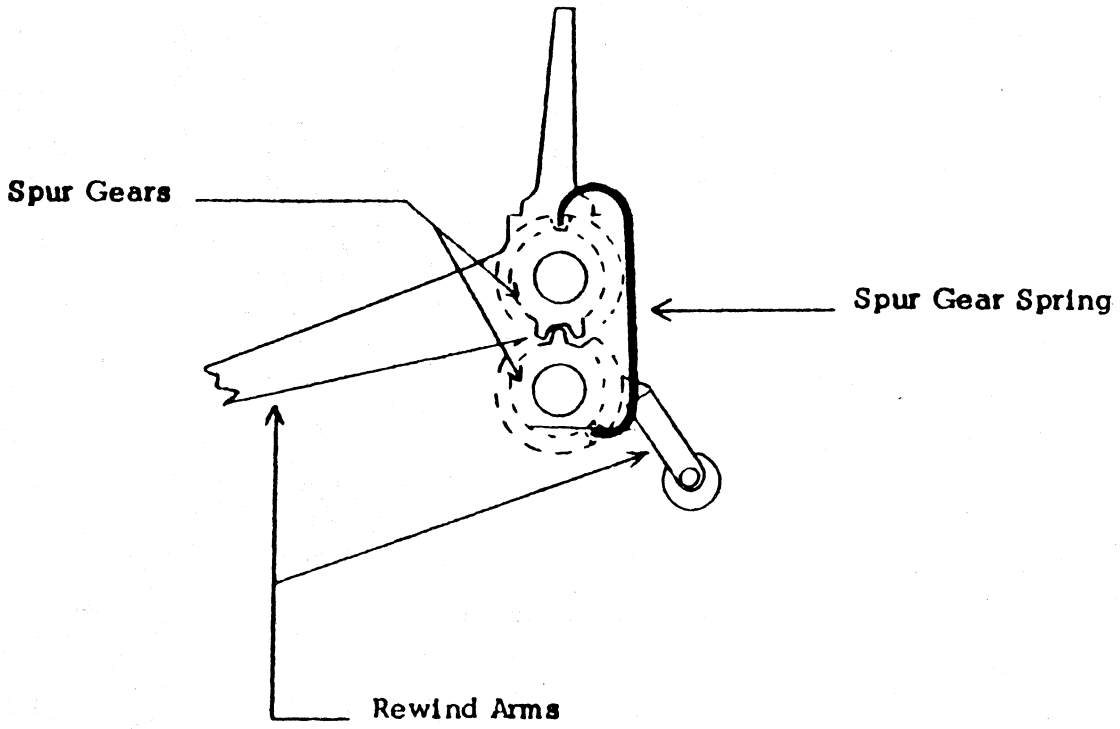
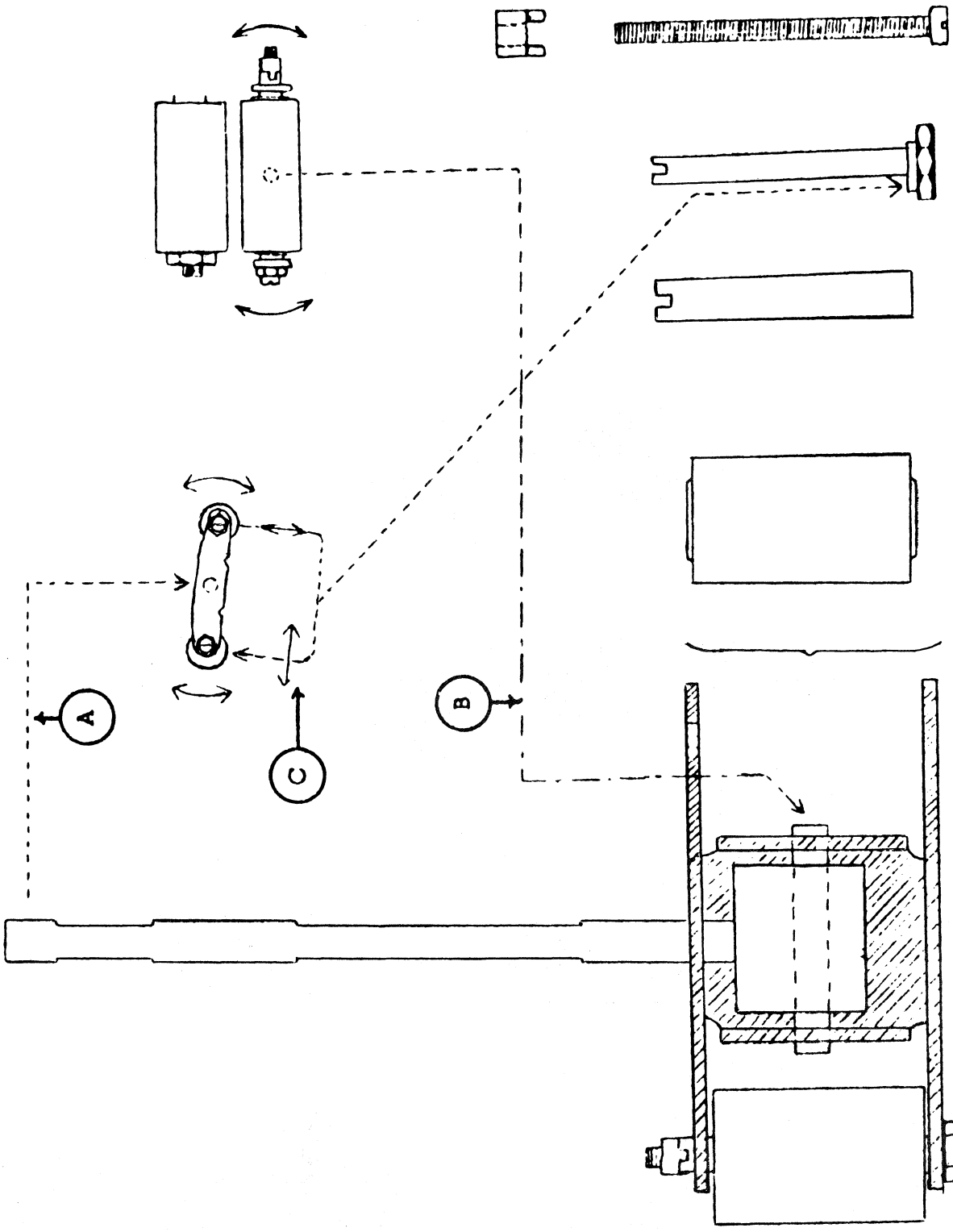


Figure 2- View from the front of machine



227

Figure 3

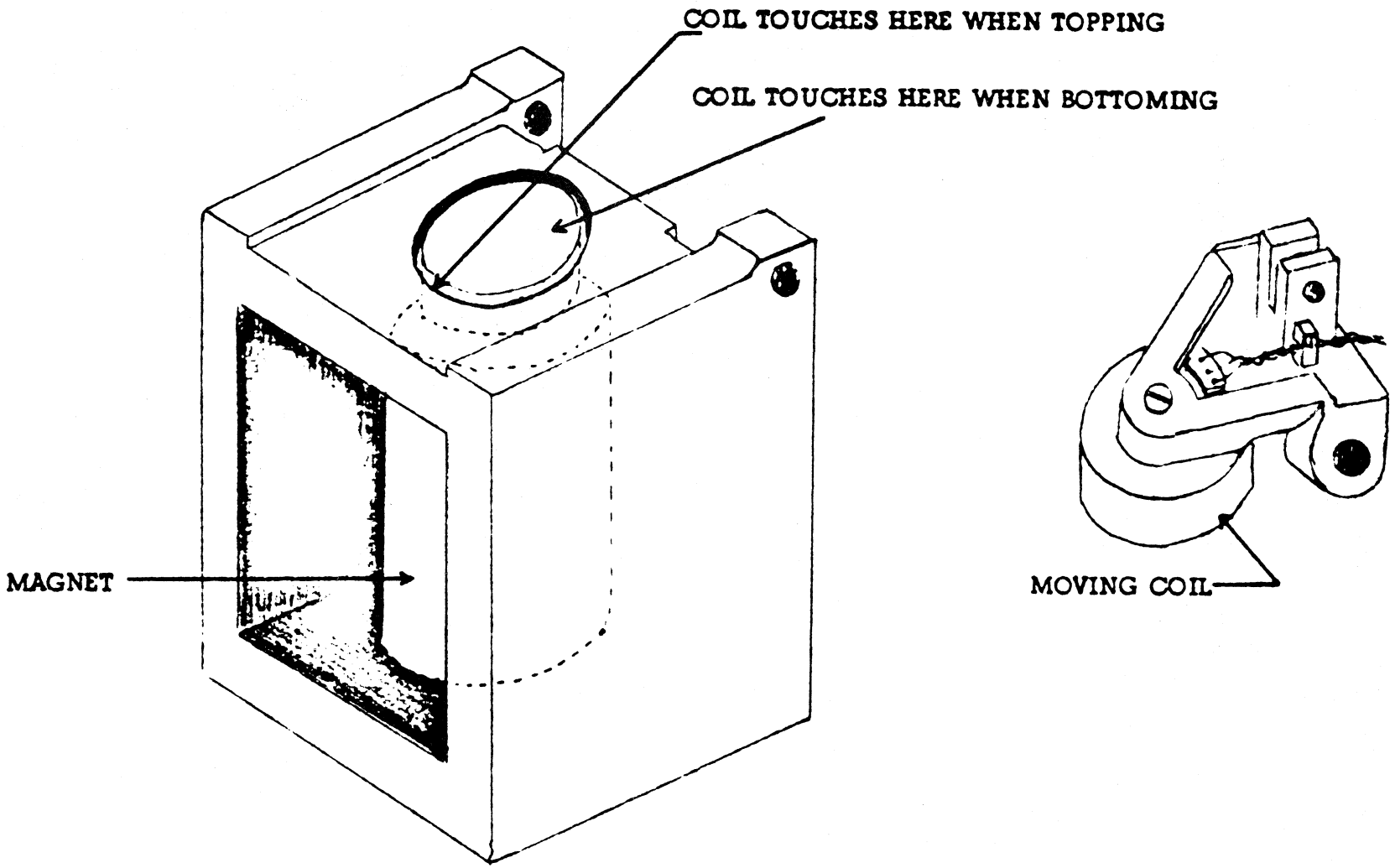

COIL TOUCHES HERE WHEN TOPPING
COIL TOUCHES HERE WHEN BOTTOMING
MAGNET
MOVING COIL

Figure 4

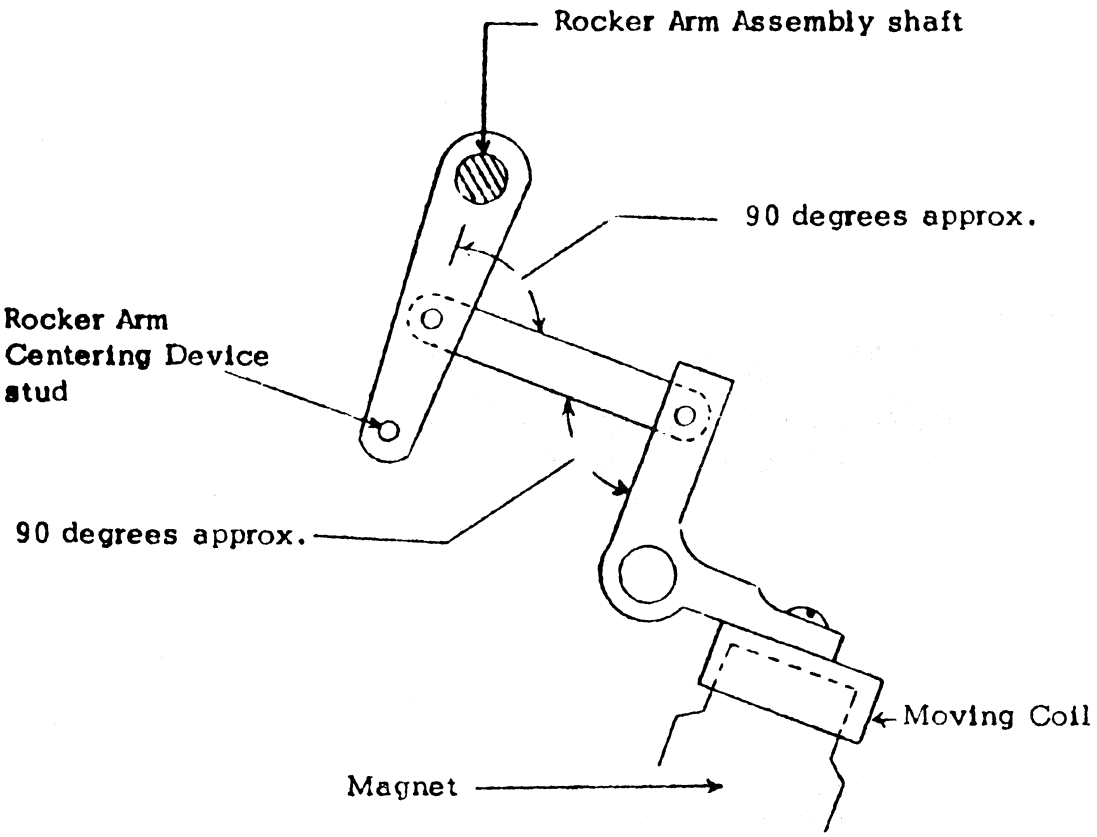

Rocker Arm Assembly shaft
90 degrees approx.
Rocker Arm
Centering Device
stud
90 degrees approx.
Moving Coil
Magnet

Figure 5

REVIEW OF TAPE TRACKING

In making the final tracking adjustments on the 7330, it is difficult to verify the accuracy of these adjustments. One method that can be employed is outlined as follows:

After making the initial tracking adjustments using the GO idler eccentric to eliminate all visible buckle, you will note that the range of adjustment is quite broad. In order to effect a finer adjustment, run tape continuously in a forward direction and observe the clearance between the rear edge of the tape and the back of the right vacuum column at the point where tape immediately enters the column.

Carefully readjust the GO idler eccentric approximately 5 to 10 degrees each side of the previous setting and note that this clearance will vary or wobble. There will generally be one point within the 5 or 10 degree fine adjustment at which the wobble will disappear and the clearance will remain constant.

The left vacuum column should be observed for this same condition.

At this point, if the fine adjustment cannot be obtained, go back and make all the preliminary adjustments again being more critical of their setting.

After this adjustment is obtained, gently force the tape, in the vicinity of the right rewind idler, toward the rear of the transport. Upon release of this pressure, the tape should immediately recover to its former position without any overshot or seeking of that position. If this condition is not observed, readjust the GO idler eccentric very carefully to obtain the proper recovery of the tape.

This procedure should be repeated for the left vacuum column but DO NOT AT ANY TIME SACRIFICE GOOD FORWARD TRACKING FOR FURTHER IMPROVEMENT OF BACKWARD TRACKING.

The final check of any tape drive adjustments should be the results obtained from running the drive on the system.

Continue on the next page.

Read the 7330 Tracking Concepts booklet and then answer the following questions.

The rocker arm assembly is most generally thought of first where tracking problems are concerned. However, tracking problems can be caused by other areas of the transport.

Choose from the following list those items that could affect tape tracking:

1. Cleanliness of the transport, particularly the vacuum columns.
2. Warped or incorrectly mounted tape reels.
3. Left Rewind Arm failing to seat properly in the down position.
4. End play of the Left Rewind Arm pivot shaft.
5. Left Rewind Arm Idler alignment.
6. Defective or dirty tape guides.
7. Incorrect adjustment of the spur gear spring.
8. Drive capstan worn or out-of-round.
9. Binds in the rocker arm assembly or operating linkages.
10. The Go Nylon Idler eccentric out of adjustment.
11. The Stop Nylon Idler eccentric adjustment.
12. Moving coil assembly adjustment.
13. Excessive play in the flanged idlers.
14. The price of tea in China

When you are through, turn on the recorder.

START - STOP TIME

Tape Motion can be seen by using the Read Head as a tool.

1. Write continuous bits on an entire reel of tape.
2. Rewind the tape and put the drive into Read status.
3. Pulse the "GO" line so that tape will start and stop.
4. Voltage induced into the read head will be a "picture" of tape motion.

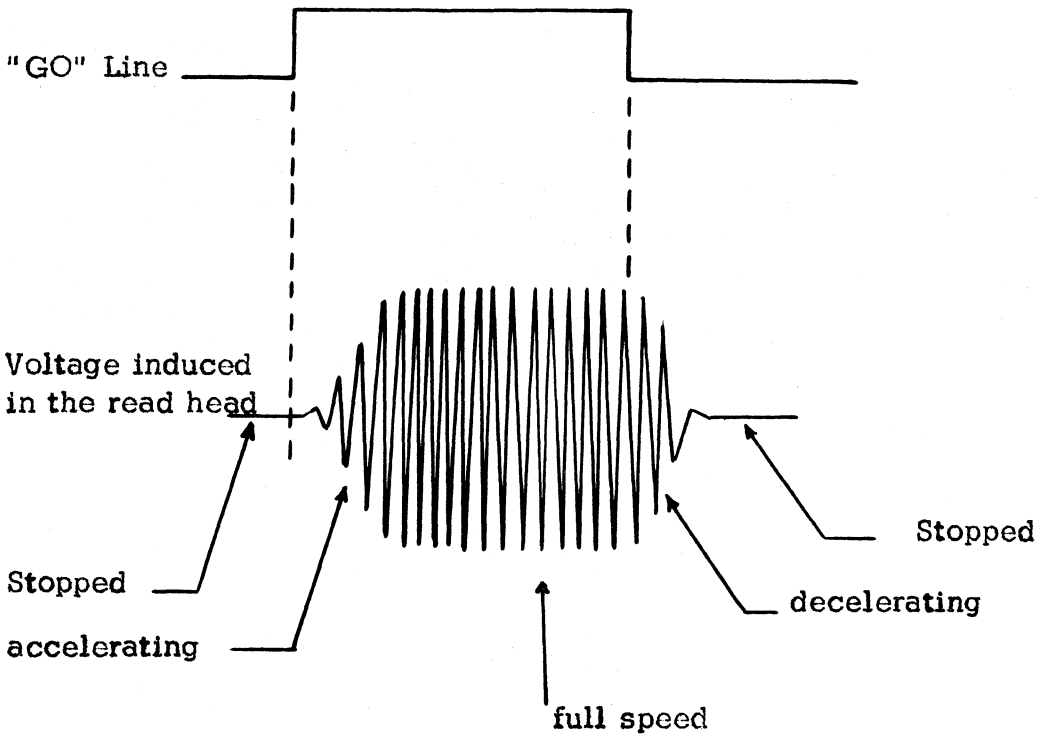


Figure 1 Scope picture of tape motion.

If you want to see the starting of tape, sync the scope on GO and look at the read bus.

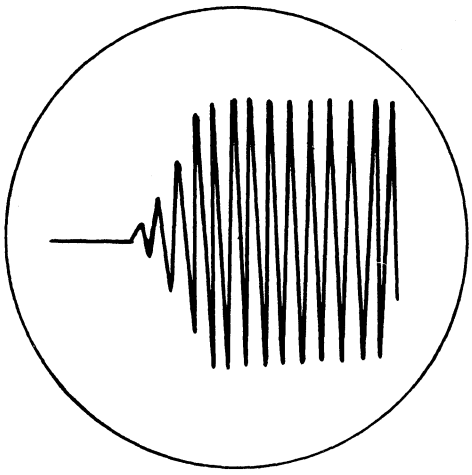


Figure 2 Tape Starting

To see the stop envelope, sync on the fall of GO.

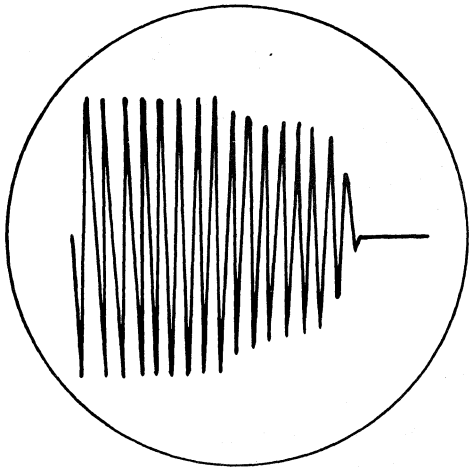


Figure 3 Tape Stopping

Any variations in tape speed will show up as a variation in the envelope.

NOTE:
This dip in the envelope was caused by a momentary decrease in tape speed.

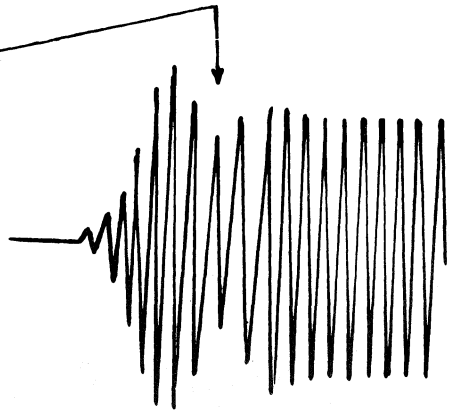


Figure 4

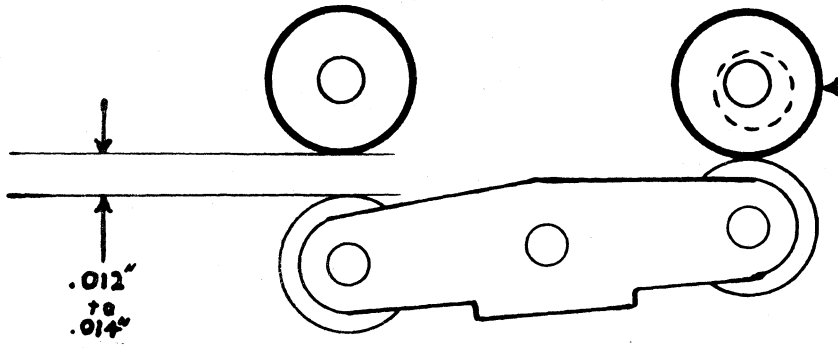

.012"
to
.014"
Adjust Stop Caps
eccentric for .01
.014 between the
drive capstan and
the Go nylon

Figure 5

1. In order to move tape, the moving coil moves (away from)(toward the stationary permanent magnet)

2. The Go nylon idler will not push the tape against the drive capstan with enough force if the travel is restricted by the moving coil (bottoming)(topping).

3. The entire moving coil assembly can be positioned so that the moving coil does not top or bottom. True or False

4. When it is known that the moving coil is not topping, the _____ nylon idler eccentric is adjusted for correct tracking. This is done first while moving tape continuously in the (forward)(backward) direction.

5. As a starting point, the Go nylon idler eccentric is set so that the nylon idler is at its farthest point (above the rocker arm)(below the rocker arm).

6. As the Go nylon idler eccentric is being varied from each side of the initial starting point, there is a chance that the distance between the stop nylon idler and stop capstan will not be great enough to allow tape to pass through unrestricted.

   The distance between the stop capstan and stop nylon idler can be increased by _____.

7. When forward tracking has been observed to be correct, _____ _____ tracking should now be checked. Tape should be moved backward (at a continuous speed) (starting and stopping).

8. If backward tracking needs adjustment, then forward tracking should be checked again after backward tracking has been adjusted. If you have to make some compromise between forward and backward tracking, _____tracking should always be the best that it is possible to obtain.

9. After tracking is correct with tape moving continuously, it should now be checked (and adjusted if necessary) with tape starting and stopping. But the rocker arm assembly will need further adjustment before this is done.

   To make the Go nylon parallel with the drive capstan, the _____ _____ eccentric is adjusted. This is done with tape out of the machine and the rocker arm in a stop position.

10. If the moving coil is bottoming when the parallelism adjustment is attempted, the adjustment can not be obtained satisfactorily. The starting point for the stop nylon eccentric is the (same as) (opposite of) the Go nylon idler eccentric.

11. When parallelism has been obtained, the .012 to .014 of an inch adjustment can be made. This means .012 to .014 of an inch between the _____ nylon idler and the _____ capstan. Tape is removed, the arms are down, and the capstan motor is unplugged when making this adjustment.

12. Tracking should now be checked with the tape moving forward starting and stopping. This (is) (is not) done with the tester in a start stop mode.

13. After Start-Reset, Start-Reset tracking is correct, then a series of Rewind-Reset, Rewind-Reset is done to check backward tracking. Again, forward is the most important.

    If the Go nylon idler eccentric was adjusted during this starting and stopping check of tracking, two adjustments should be rechecked. These are _____ and _____.

14. During the time all the tracking adjustments are being made, you will have raised and lowered the rewind arms. If the centering adjustment is too far off, the linkages can be bent. Final rocker arm centering device adjustments and moving coil adjustments should be checked.

    The Start Stop timings can now be checked. Which of the statements below are correct?

    a. Write a tape with continuous forward motion, Rewind and Read in a start-stop tester mode.
    b. Write a tape in Start Stop mode, rewind and read continuously.

15. The scope should be synced on the

    a. 1 bit track
    b. 4 bit track
    c. 8 bit track
    d. C bit track

16. If necessary, the start time can be improved by adjusting the _____ single shot timing.

17. Correct stop timing should result while maintaining the .012 to .014 of inch adjustment. True or False

    WHICH SEQUENCE IS CORRECT?

18. a. Rewind arms adjusted, tracking, start stop time
    b. Tracking, Rewind arms, start-stop time
    c. Start Stop time, rewind arms, tracking

19. a. .012 to .014 adjustment, parallelism adjustment
    b. parallelism adjustment, .012 to .014 adjustment

ANSWERS TO PAGES 235 - 236

1. away from

2. topping

3. true

4. Go; forward

5. above the rocker arm

6. loosening the stop capstan (rear of transport) and rotating it on its eccentric to increase this clearance.

7. backward; at a continuous speed

8. forward

9. stop nylon

10. same as (see question 5 above)

11. Go; drive

12. is not

13. parallelism and .012 to .014

14. a.

15. c. (skew sync hub on the tester)

16. variable

17. true

18. a.

19. b.

Turn ON the recorder.

SKEW

Skew can take two forms:

1. Read Skew - a condition that exists when the bits of a character are read at slightly different times.

   This will increase the time required to read a complete character.

2. Write Skew - the condition where the bits of a character are not written in a straight line across tape.

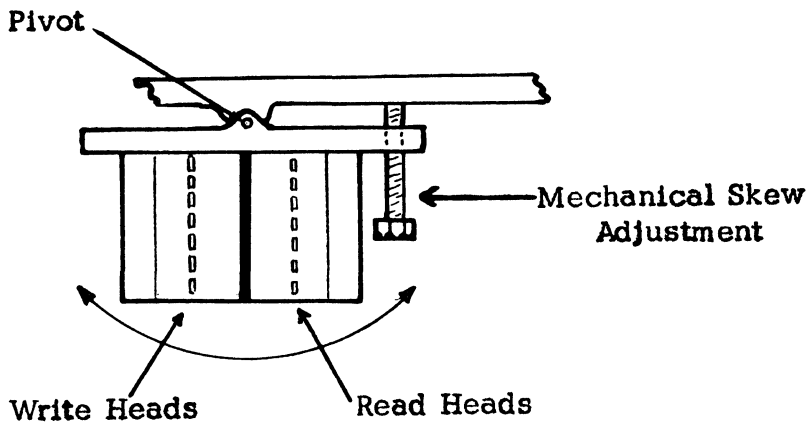


Figure 1 Top view of head assembly showing mechanical adjustment

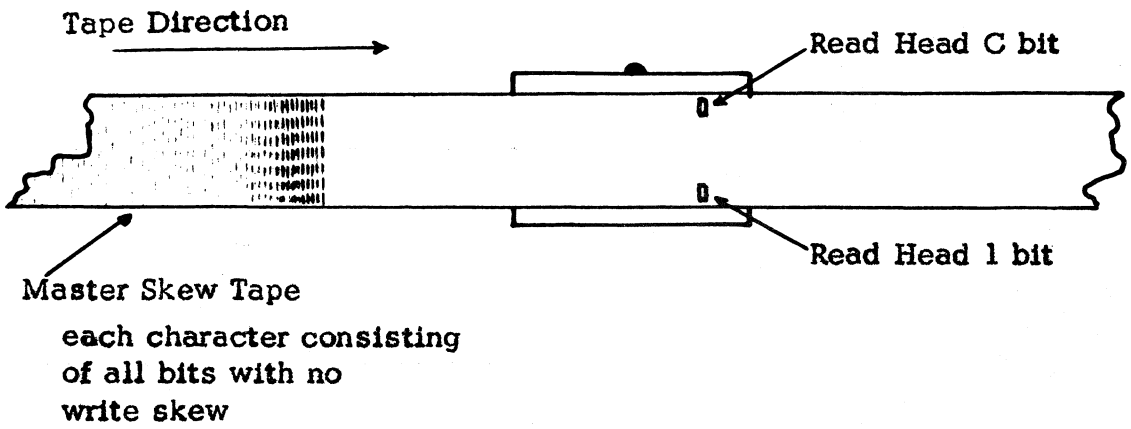


Figure 2

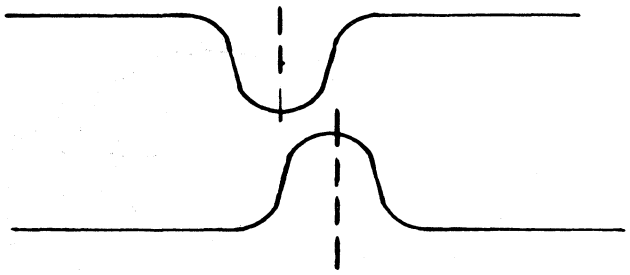


Figure 3A Mechanical skew present

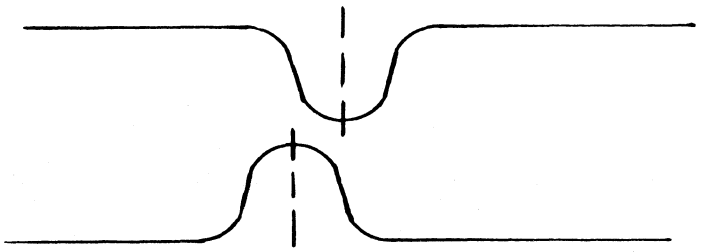


Figure 3B Mechanical skew present

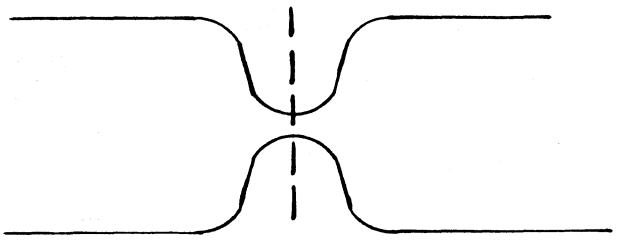


Figure 3C No mechanical skew present

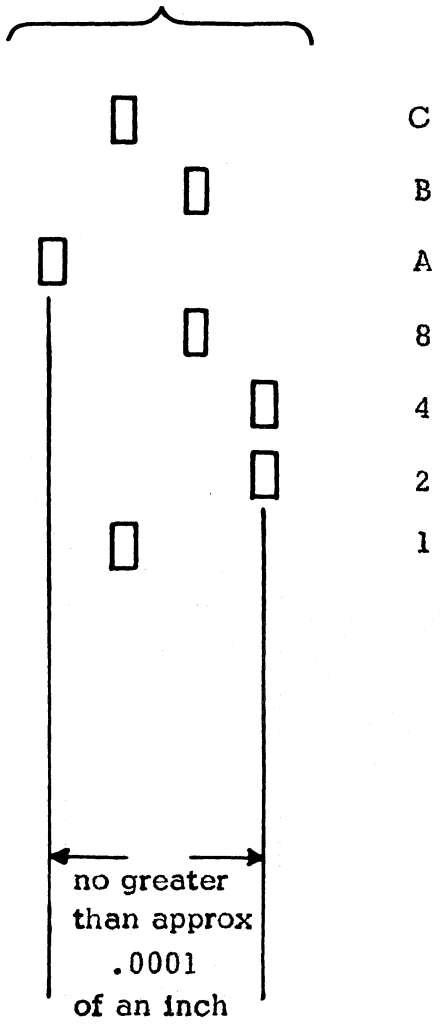
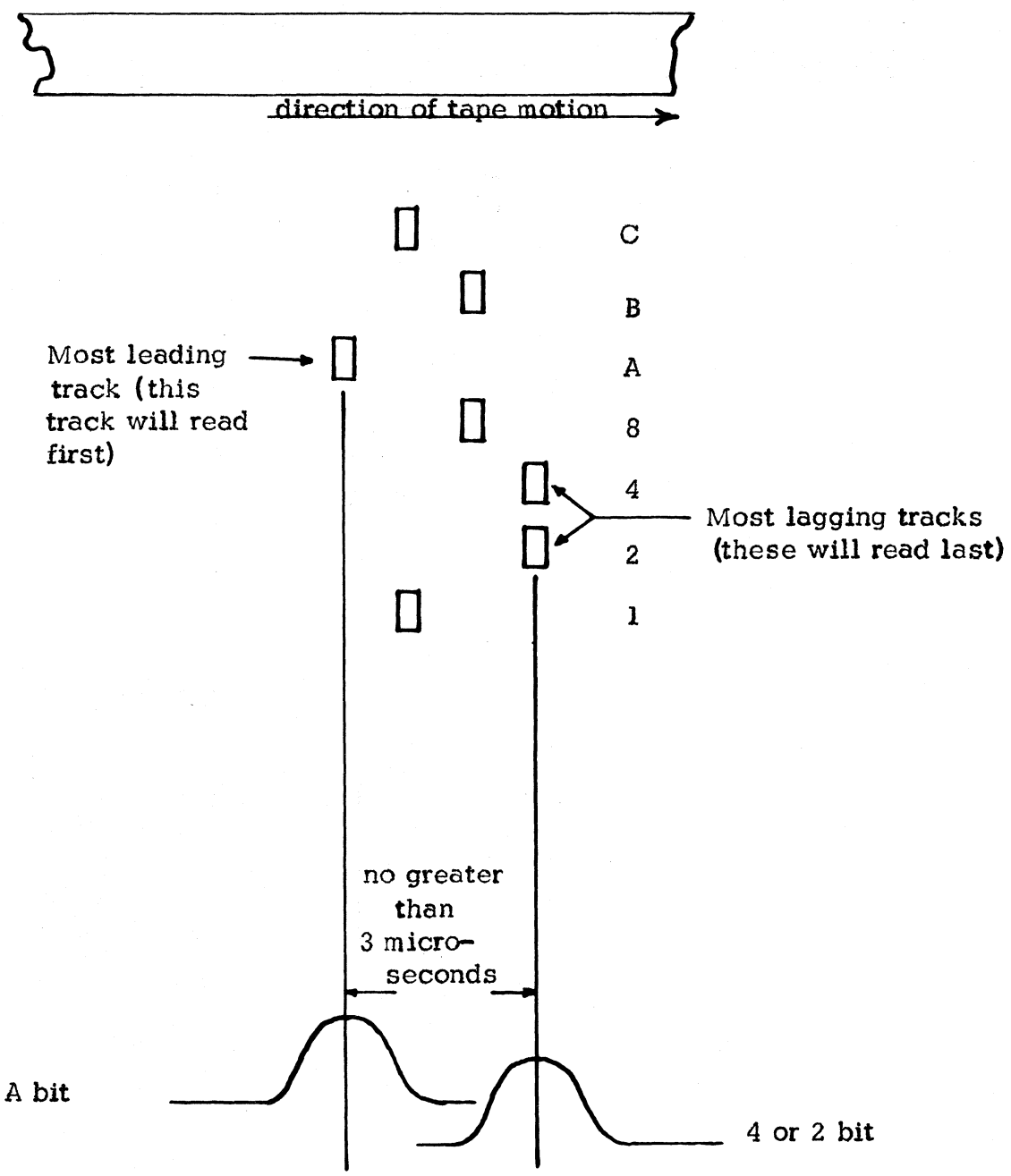


Figure 4 Greatly magnified view of the Read head



Tape speed = 36 inches per second or .000036 of an inch in 1 microsecond.

3 X .000036 = .000108 of an inch in 3 microseconds

Figure 5

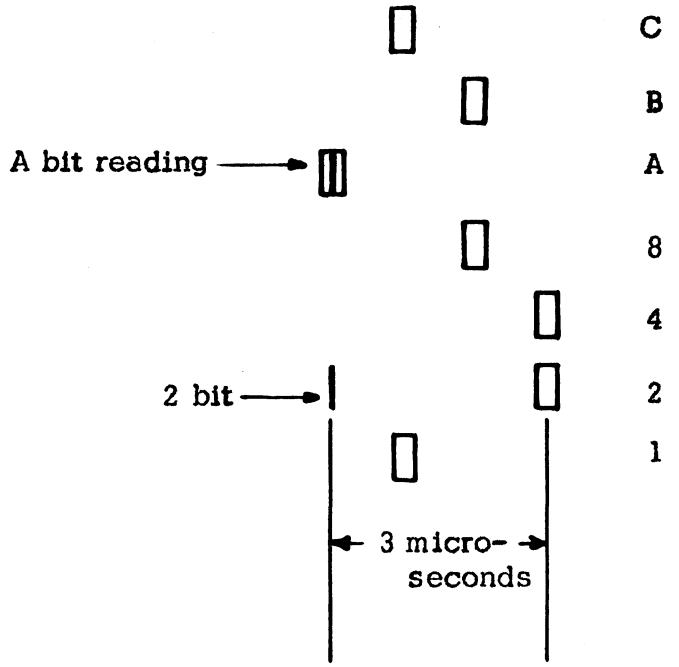


Figure 6. A and 2 bit (BCD S) reading-3 microseconds of inherent Read skew

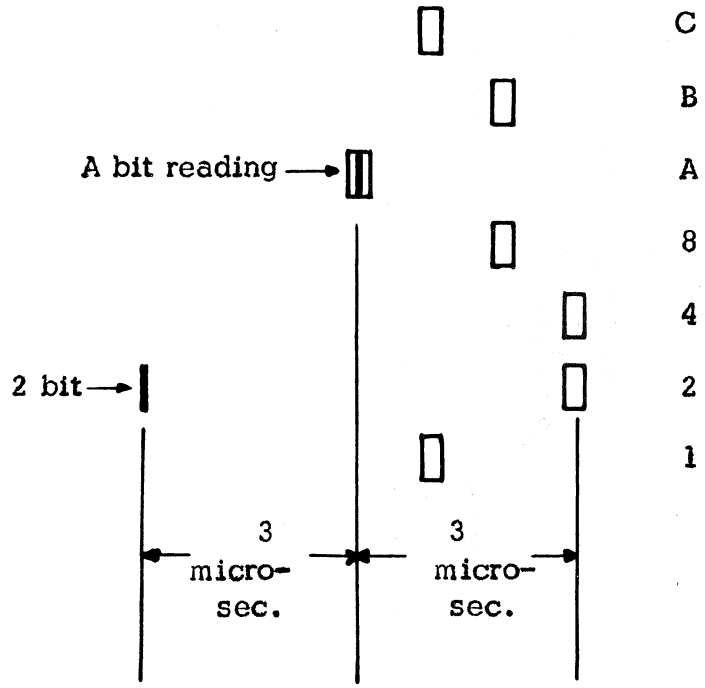


Figure 7. A bit and 2 bit, written with 3 microseconds of skew, being read with a Read head which has 3 microseconds of skew.

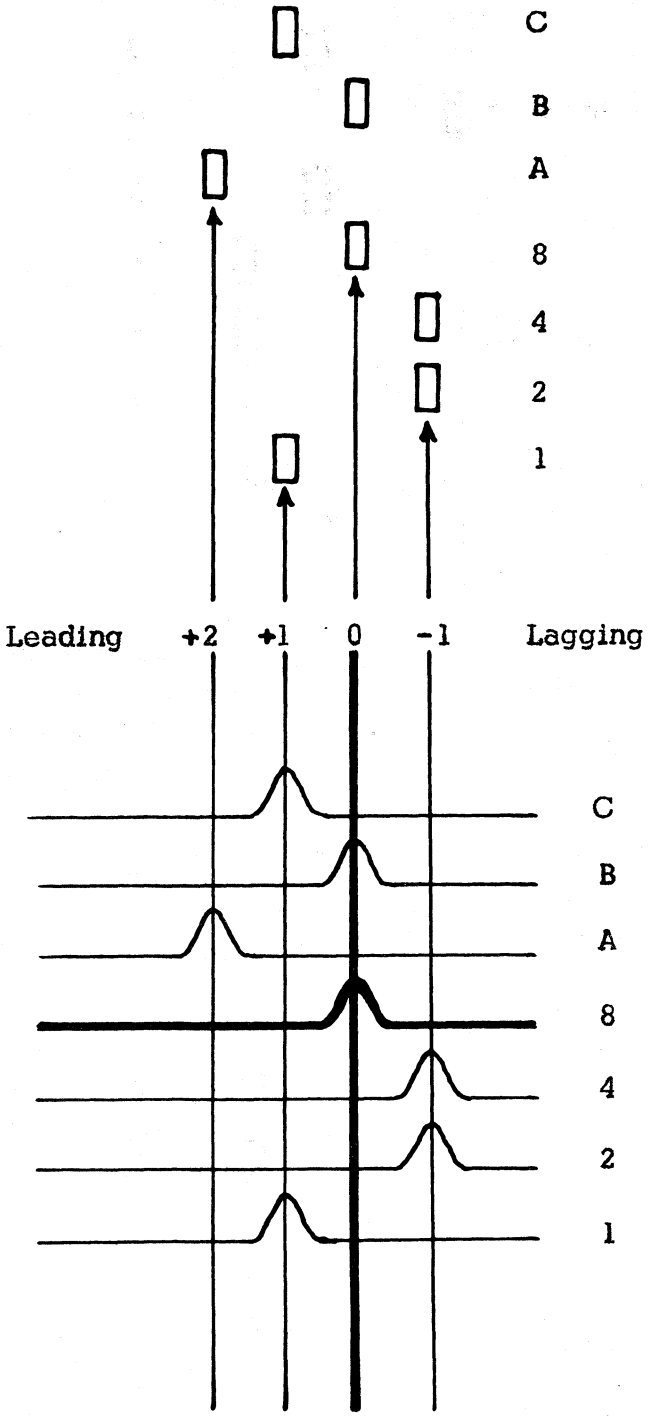


Figure 8 Measured Read skew

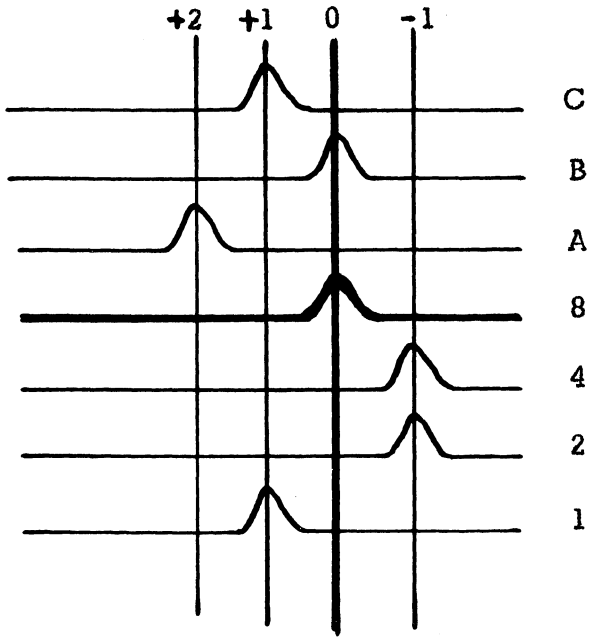


Figure 9 Read Skew

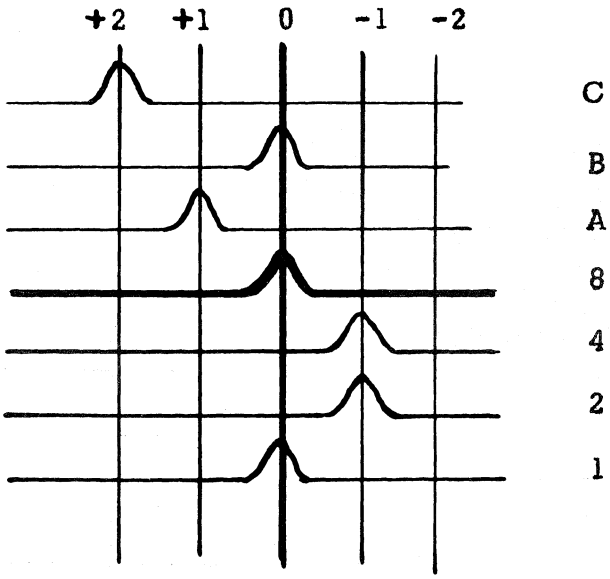
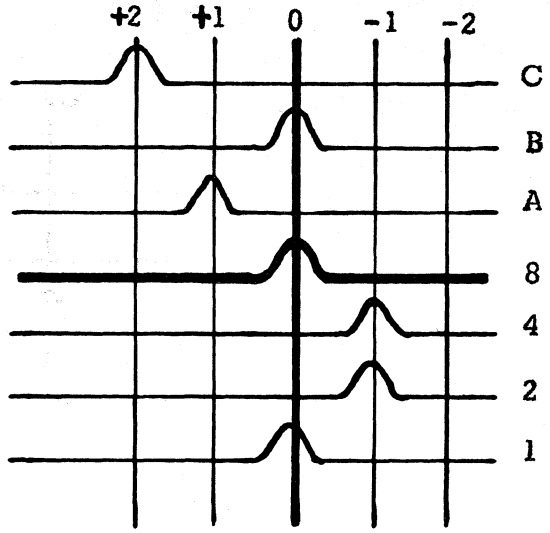


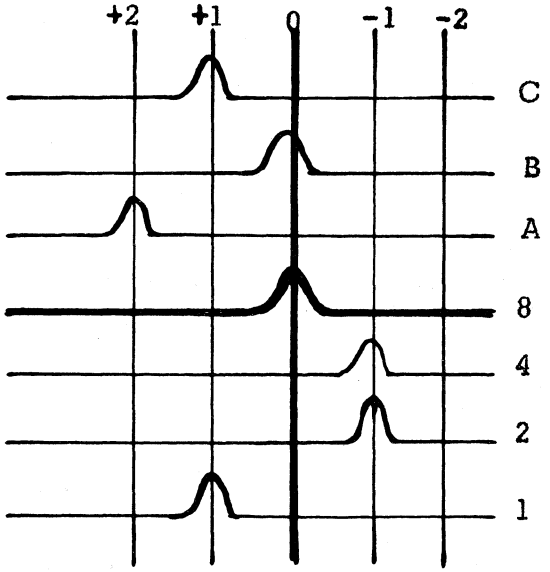
Figure 10 Combined Read-Write Skew



Combined
Read-Write
Skew

Figure 11

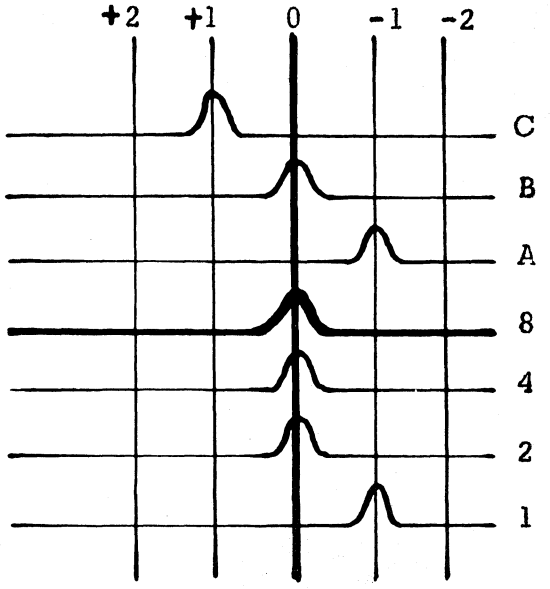
minus



Read
Skew

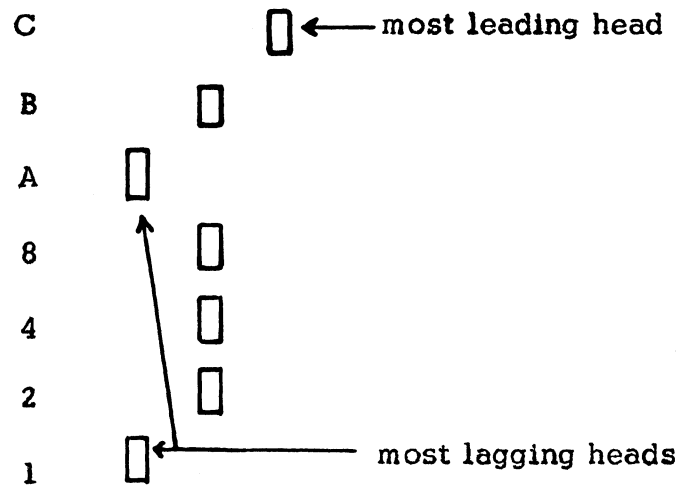
Figure 12

equals



Actual
Write
Skew

Figure 13



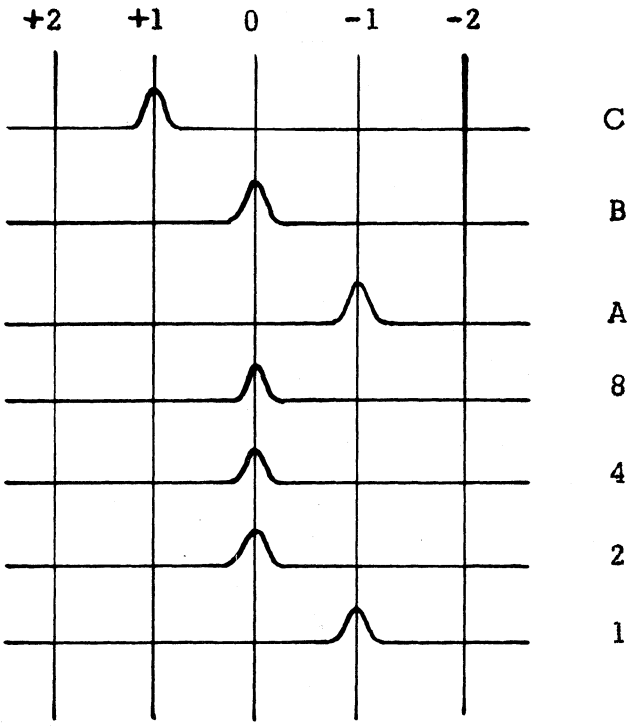


Figure 14 Illustration of the Write head and the actual write skew

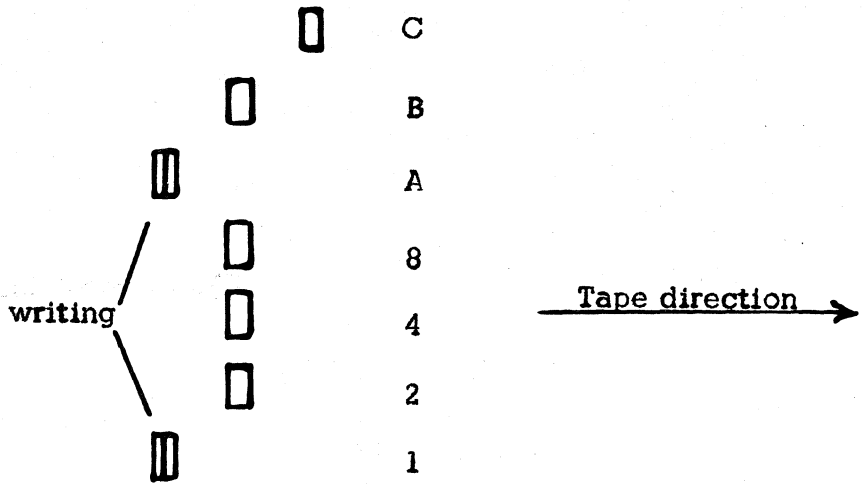


Figure 15

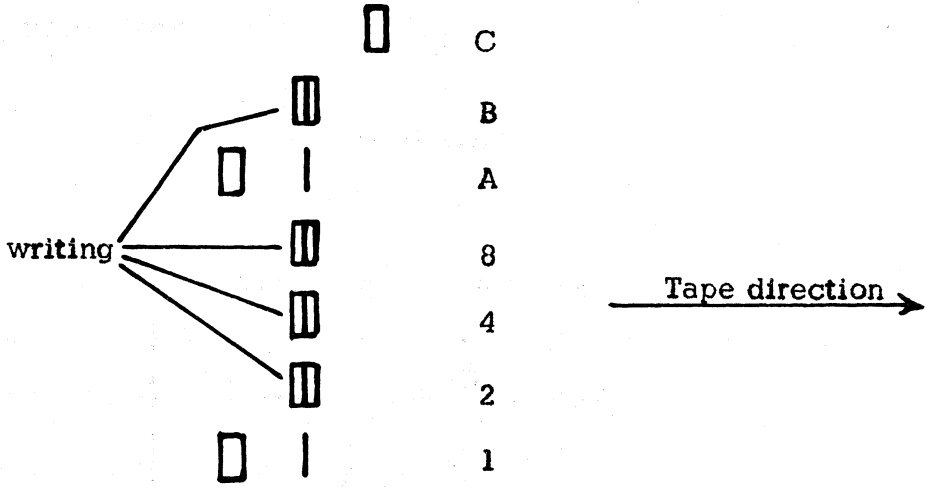


Figure 16

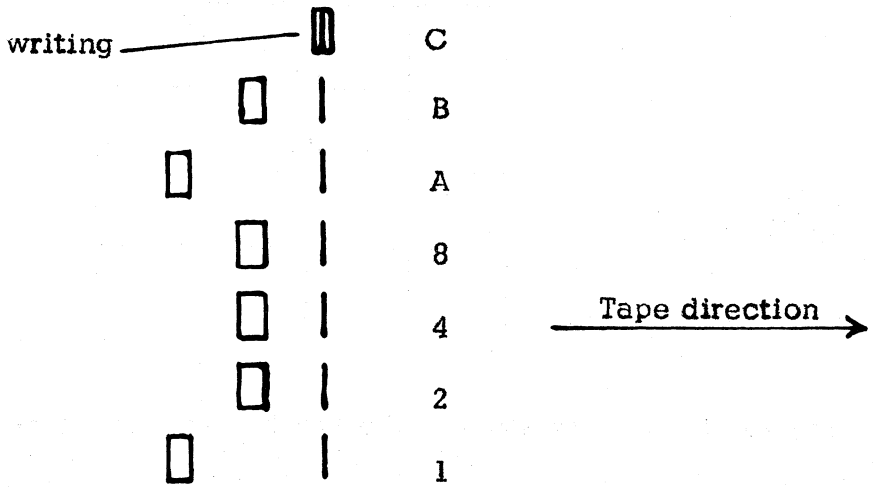
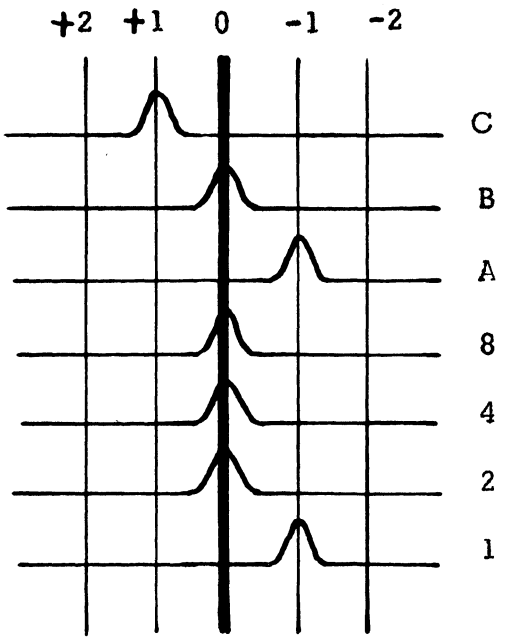


Figure 17

Actual Write Skew



Reference changed so the most lagging track is the reference

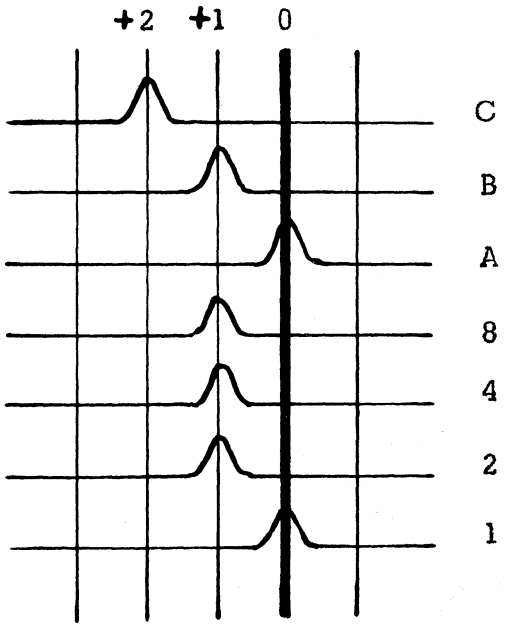
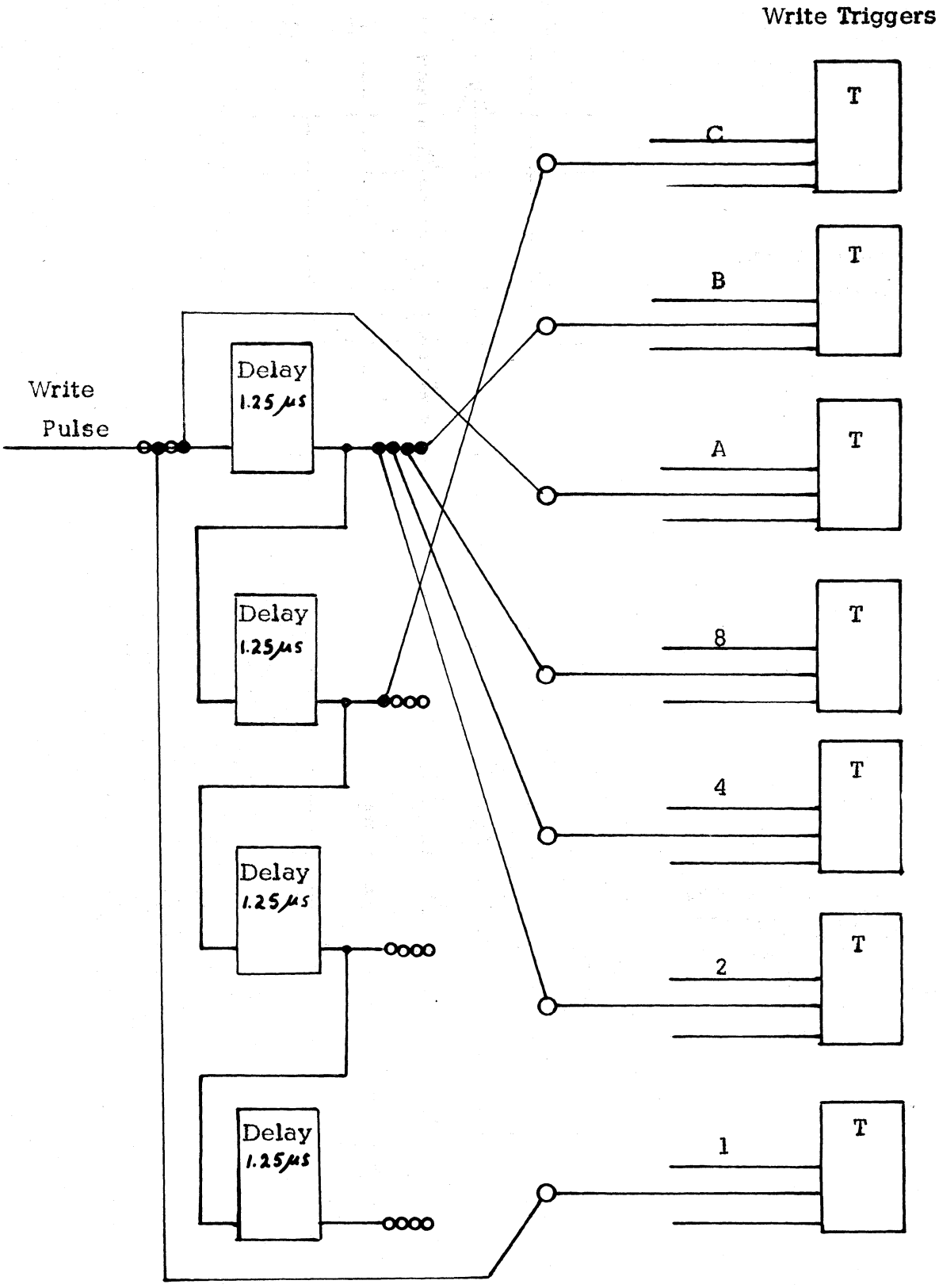
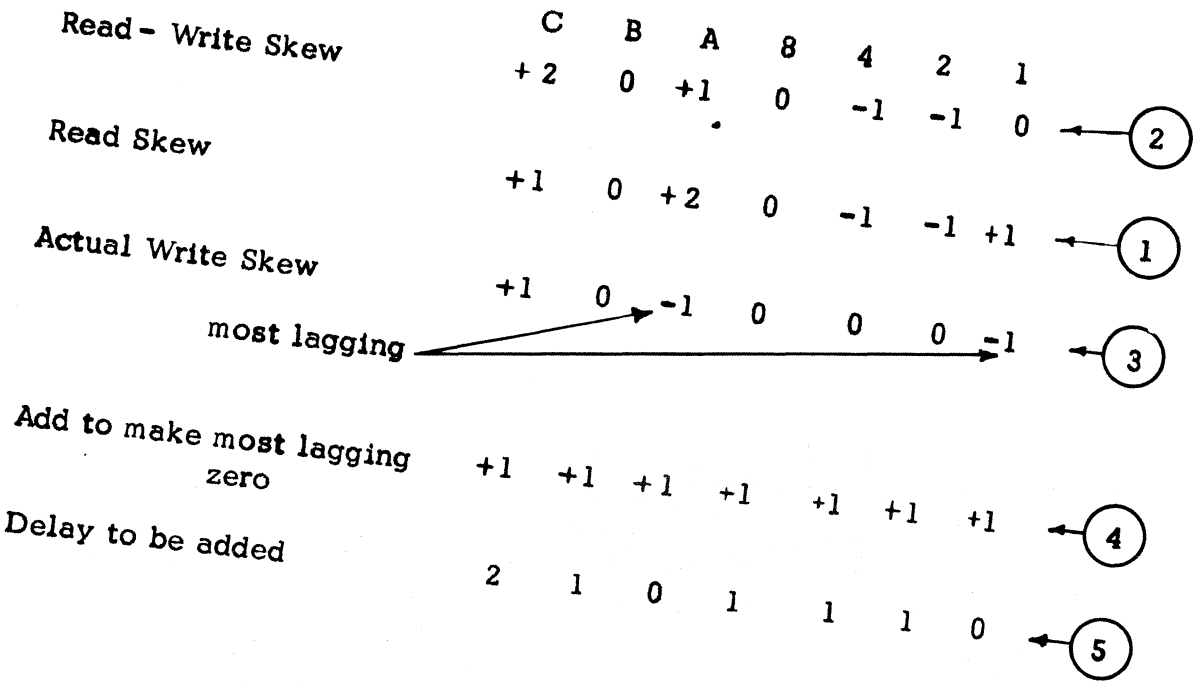


Figure 18



Each Delay is approx. 1.25 microseconds

Figure 19


C B A 8 4 2 1
Read - Write Skew
+2 0 +1 0 -1 -1 0
2
Read Skew
+1 0 +2 0 -1 -1 +1
1
Actual Write Skew
+1 0 -1 0 0 0 -1
3
most lagging
Add to make most lagging zero
+1 +1 +1 +1 +1 +1 +1
4
Delay to be added
2 1 0 1 1 1 0
5

REVIEW

1. Assume that Read Skew was recorded as shown below.

C	B	A	8	4	2	1
+2	+1	0	0	-1	+1	+2

Read-Write Skew was recorded as shown below

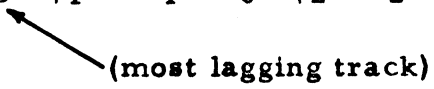
C	B	A	8	4	2	1
-1	+2	-1	0	+1	-1	0

Use the space below to compute the amount of delay necessary to correct write skew. (Use the format shown on previous page.) All values shown are in microseconds.

Check your answer on the following page.

ANSWER TO QUESTION 1

	C	B	A	8	4	2	1
R/W Skew	-1	+2	-1	0	+1	-1	0
Read Skew	+2	+1	0	0	-1	+1	+2
Actual Write Skew	-3	+1	-1	0	+2	-2	-2
Add	+3	+3	+3	+3	+3	+3	+3
Delay to be added	0	+4	+2	+3	+5	+1	+1



Each day tap equals 1.25 microseconds. Therefore the B track could be set on the 3rd tap, A bit - 2nd tap, 8 bit - 2nd tape, 4 bit - 4 taps, 2 bit - 1 tap and the 1 bit - 1 tap.

Continue on the next page.

2. Assume that read skew was recorded as shown below.

C	B	A	8	4	2	1
+1	-1	-2	0	+1	0	+1

Read-write skew was recorded as shown below.

C	B	A	8	4	2	1
+3	-1	-3	0	0	+2	-1

Compute the amount of delay necessary to correct write skew.

Check your answer on the next page.

ANSWER TO QUESTION 2

	C	B	A	8	4	2	1
R/W Skew	+3	-1	-3	0	0	+2	-1
Read Skew	+1	-1	-2	0	+1	0	+1
Actual Write Skew	+2	0	-1	0	-1	+2	-2
			(most lagging track)				
Add	+2	+2	+2	+2	+2	+2	+2
Delay to be added	+4	+2	+1	+2	+1	+4	0

Each delay equals 1.25 microseconds.
C bit 3rd delay tap, B bit 2 delay taps, A bit 1 delay tap, 8 bit 2 dealy taps, 4 bit 1 delay tap, 2 bit 3 delay taps, 1 bit no delay.

Turn On the recorder

MACHINE EXPERIENCE GUIDE

This Machine Experience Guide is included as a guide for you and an experienced 7330 Customer Engineer to follow while you get your hands-on experience. The experienced CE will be performing the role of a Laboratory Instructor.

Make it your responsibility to see that everything is covered to your complete satisfaction, and work closely with the experienced CE to insure that you get the most out of his experience.

FAMILIARIZATION - POWER OFF AND NO POWER OR SIGNAL CABLES CONNECTED

A. Work along with the student and have him point out and do the following things:

1. Open door and operate the interlock plunger.

2. Remove a tape reel.

3. Remove a reel knob and explain the operation of the parts of the reel hub assembly.

4. Remove the transport center cover door.

5. Raise and lower the rewind arms with the operating lever.

6. Point the following items:
   - a. Column idlers
     CAUTION: The bearing of the flanged idlers are epoxied to the idler. When checking end play, care must be taken to prevent breaking the epoxy.
   - b. Tape guides
     CAUTION: Here again care must be taken with the rear guide epoxied to the spring.
   - c. Left and right rewind arms and idlers.
   - d. Right rewind idler
   - e. Drive capstan
   - f. Stop capstan
     CAUTION: Cleaning fluid can not be used to clean the stop capstan because tape will stick to it.
   - g. Rocker Arm Assembly
     Notice: With the arms up it is held in the neutral position.
     Notice: The eccentrics for adjusting the Go and Stop nylon idlers.
     Notice: The amount of end play in the nylon idlers.
     Notice: The spring to absorb the left to right end play of the Rocker Arm Assembly.

h. Read/Write Head Assembly
Notice: The tape guides are a part of the whole Read/Write Head Assembly and cannot be removed. If anything goes wrong with either the guides or Read/Write heads, the entire assembly must be replaced.

i. Mechanical Skew Adjusting Screw

7. Open the Vacuum Columns
   a. The two holes in each column to sense if tape is in the column and the position of tape in the column.
   b. The cleaner blade in the left column.
      CAUTION: The left column cover door could easily be damaged if it were open and the front door pushed against it.

8. Remove the cover fastened to the left rewind arm and point out:
   a. Erase head
   b. Feed through shield
      Notice: It is spring loaded so that it can seat against the Read/Write head.
   c. Lamp and photocell assembly
      (1) See how a lamp and a photocell would be removed and replaced.

9. Swing the Transport Open

10. Raise the Operator's Panel
    a. See how a bulb is replaced.

11. Pressurizing Blower and Filter

12. Vaccum Pump and Hose
    CAUTION: Ground bond to vacuum motor must be tight.

13. Vacuum Column Switches and Hoses
    a. Remove switch cover and observe.

14. File Protect Duo Relay
    a. Operate sensing pin and observe that the AL point closes first.

15. Reel drive pulleys, belts, and motors

16. Housing of brake assembly
    a. Housing of brake assembly

17. Capstan drive motor, belt, and pulley.

18. Raise and lower the rewind arms and observe:
    a. Rear rewind arm
    b. Solenoid
    c. Dashpot
    d. Rear rewind arm limit screws and switch.
    e. Toggle
    f. Spur gears
       Notice: Spring to eliminate gear play in order to keep the right rewind arm from having any upward play when the arms are down.
    g. Rocker arm centering device
       Notice: Position of centering device pivot is adjustable.

19. Lower the rewind arms and observe:
    a. Moving coil and linkage to the rocker arm.
       (1) If a newer drive is being used there is a permanent magnet in place of a stop coil.
       (2) Notice how moving coil assembly is mounted.

20. Remove the side covers and look at the power supplies in gates 5 and 8.
    a. Locate the regulator cards.
    b. Locate the ± 6v, and ± 12v adjusting potentiometers.

21. Open Gate 6
    a. Locate pin locations for example
        (1) 00A6A25P
        (2) 00A6C26F
        (3) 00A6E19D
    b. Locate voltage distribution overlays for
        (1) Ground (pin J)
        (2) -6 (pin K)
        (3) +6 (pin L)
        (4) -12 (pin M)
        (5) +12 (pin Q)
    c. Locate the write pulse delay tap jumpers.
    d. Using the ALD's as a reference locate
        (1) The preamp cards for the 1 bit track.
        (2) The write trigger for the C bit track.
        (3) One of the write pulse delay cards.

22. Open Gate 7 and Locate
    a. Fuses, fuse bail and fuse bail switch.
    b. There may be one or two timer motors depending on the engineering change level.
        (1) If there are two timers, each has it's own switch.
        (2) If there is only one timer, it has two switches.
    c. Locate the D. P., wire contact, and duo relays.

23. Locate Gate 5 in Module B
    a. Locate for an example 00B5D03R.
    b. Notice cabling to the 200 position connectors.

24. Look at the two hundred position connectors.
    a. Notice that caution must be taken to prevent pushing the pins back into the connectors.
    b. Notice the latch and keeper plate mechanisims.
    c. Practice connecting the input cable and terminator.
        CAUTION: Use care to avoid breaking the keeper plate.
    d. Plug in the tester cable and the terminator.

25. Remove the safety cover over the power components and locate the contactor and wiring to the power recepticles. Then replace the cover.

26. Replace all covers.

27. The power ON/OFF switch on the drive should be OFF.

28. After checking that the wall breaker supplying input power has been turned OFF, plug in the power cable.

MACHINE PROJECT II

OPERATION - POWER ON

CAUTION: Before turning ON power make sure.

1. Rewind arms are in the raised position.(could blow fuses)

2. Terminator box is in place.(various component damage could result)

Work along with the student and have him point out and do the following things:

1. Turn ON power

2. Mount take up reel on machine reel hub and a reel of tape on the file reel hub.

3. Set up the following switches on the tester.
   a. "START/STOP-GO-STOP" to STOP
   b. "FORWARD-BACKWARD switch to FORWARD

4. Load tape following the procedure in the Reference Manual (223-6967)
   a. Practice loading and unloading several times.

5. Set Select to position zero.
   a. Drive should be ready from the loading procedure.

6. Put START/STOP-GO-STOP switch to GO and observe the following:
   a. Go nylon pinching tape against the drive capstan.
   b. Action of the left vacuum column and the file reel.
   c. Action of the right vacuum column and the machine reel.

7. Stop tape by placing tester in STOP.

8. With tape stopped, change tester switch back and forth from Forward to Backward, Backward to Forward and observe the positioning of tape in the vacuum columns.

9. Bring up Go and move tape Backward.
   a. Observe the left vacuum column and file reel.
   b. Observe the right vacuum column and machine reel.

10. Put tester in START/STOP and observe the action of the rocker arm.
   a. Vary the START/STOP frequency.

11. Continue moving tape forward and backward, both continuously and in START/STOP until the action of the following are thoroughly observed:
   a. Rocker arm
   b. Tape reels
   c. Vaccum columns
   d. Capstan drive
   e. Moving coil
   f. Reel drive motors

12. Perform high speed rewind operations observing the following sequences:

   CAUTION: For safety keep front door closed.

   a. Arms being raised
      (1) Solenoid
      (2) Toggle
      (3) Linkage
      (4) Vacuum Motor Stopping
   b. File reel removing tape slowly from both columns.
      (1) Timer Motor
   c. Intermediate speed
   d. High speed
   e. Stopping at load point
      (1) Brake on both reels
      (2) Note position of load point marker.

13. Set up tester to write and tape moving continuously forward.
   a. Scope the READ DIRECT hub and with the READ SCAN switch set to the "C" bit track, flip the "C" bit switch to see the effect.
   b. Observe all tracks.
   c. Observe changing density.

14. Scope start stop time.
    a. Write continuously an entire reel of tape.
    b. Rewind
    c. Set to read status
    d. Set START STOP
    e. Sync negative on the GO SYNC hub
    f. Scope the READ DIRECT hub
        (1) The 8 bit track is the most stable to look at.
    g. While observing the start waveform, vary the start/stop frequency.
    h. Observe the stop waveform by syncing positive on the GO SYNC hub.
    i. Repeat observations while moving tape backward.

15. Have the student practice cleaning the entire tape transport area. This is extremely important for reliability.
    a. Refer to the procedure in the reference manual.

16. Show the student how to develop tape. (Developer and bit viewer)
    a. If a bit viewer is available, refer to the procedure in the Reference Manual.

MACHINE PROJECT III

ADJUSTMENTS

A. It will be a great advantage to the student to look over, check, and "dry run" all the adjustments before he attempts to do any of them.

B. When making the adjustments work closely with the student so that he can gain the most from your experience.

* This project outlines the key areas to observe. Refer to your Reference Manual for the adjustment details. (Form 223-6967)

1. Left and Right Rewind Arms
   a. Key areas to observe
      (1) With rewind arms raised there should be a tenth of an inch (0.1") clearance between the left rewind arm idler mounting bracket and the front flange of the left column idler.
      (2) Is the upper and lower limit stop screw bracket tight?
      (3) With the rewind arms down, there should be .030" to .060" clearance between the lower surface of the left rewind arm idler (not the flange) and the lower inside surface of the left vacuum column.
      (4) Does the dashpot interfere with the travel of the rewind arms?
      (5) Does the solenoid interfere with the travel of the rewind arms?
      (6) Does the erase head or the feed through shield limit the travel of the rewind arm?
      (7) Clearance between right rewind arm idler mounting bracket and right tape guide block. (.020" to .045")
      (8) The rewind arm should be free of binds, but there should be practically no end play.
      (9) With the arm in the up position and tape held taut in the high speed rewind path, check for clearance between the tape and the right tape guide front and rear edges.

2. Arm Down Switch
   a. Key Areas to observe
      (1) Don't adjust the switch until the rewind arm adjustment is correct and you have determined that there isn't anything impeding the downward travel of the rear rewind arm.

3. Erase Head
   a. Key areas to observe
      (1) Make sure that no portion of the erase head assembly touches the left tape guide when the erase head is down.
      (2) Proper erase head to tape clearance

4. Solenoid
   a. Key areas to observe
      (1) When energized the left rewind arm should be raised fully against the upper stop limit screw.
      (2) When de-energized, the solenoid should not interfere with downward movement of the rewind arm.

5. Dashpot Adjustment

   a. Key areas to observe.
      (1) The dashpot should not interfer with either the upward or downward movement of the rewind arm.
      (2) Dashpot should cushion downward travel of the rewind arm.

6. Spur Gear Spring
   a. Key areas to observe
      (1) Without tape in the transport, lower the rewind arms. Slightly depress the right rewind arm. If spring is properly adjusted, the arm will move downwards slightly and then return to its original position when released.

7. Photocell Assembly
   a. Key areas to observe.
      (1) Check voltage across photo lamps.
      (2) The eyes of the photocells should be parallel to the edge of tape.
      (3) With the rewind arms raised and tape taut the left side of the photocell block should be approximately .020 of an inch from the tape.
      (4) Make sure that the Read/Write head surface is not tarnished or dull so that tape break could be sensed during a high speed rewind.

8. Door Interlock Switch
   a. Key areas to observe
      (1) Switch adjustment most critical during high speed rewind because if the switch is too sensative the additional vibration of high speed rewind may cause it to open.

9. File Protect Mechanism
   a. Key areas to observe
      (1) Make sure the file protect plunger and relay armature are free to move.
      (2) With the file protect ring inserted and power off make sure that proper rise is obtained on the Not File Protect 1 A contacts.
      (3) With the Not File Protect 1 Relay energized check for a clearance between the plunger and the plastic reel insert.

10. Vacuum Columns
   a. Key areas to observe
      (1) Vacuum columns are precision made. They must be kept clean and handled with care to prevent damage or mis-adjustment.
      (2) Test for adequate vacuum

11. Vacuum Column Switches

a. Key areas to observe

With power off check to insure that tension on the contacts does not exert pressure on the diaphragm.

12. Fuse Bail

a. Key areas to observe

The fuse bail should be free of bind and the switch adjusted correctly, but keep in mind that sometimes the plunger of a fuse itself will not operate if the fuse is blown.

13. Power Supply

a. Key areas to observe

(1) Most important that the tap set-up on the power supply agrees with the input power used. That is, a 208 power supply must be used with 208 source. A 230 power supply must be used with a 230 source.

(2) The power supplies are adjusted while writing because this is the heaviest strain on the plus or minus 6 and plus or minus 12 voltages.

14. Reel Drive and Brake Assembly

a. Key areas to observe

(1) Pulley alignment and belt tension should be checked.

(2) Armature to braking surface clearance is adjusted by removing or adding shims.

(3) Care must be taken when tightening the reel knob that the threads are not stripped or that particles of the threads break off and get down in the tape area. Lubricating the reel knob threads lightly with IBM 24 grease will tend to retain any chips from the threads. If threads do strip, a 1/4-20 tap is used to remove the stripped threads from the shaft.

(4) If it ever becomes necessary to drive the pin holding the reel hub to the shaft, make certain that the shaft is backed to prevent bending it.

15. High Speed Rewind

a. Key areas to observe

(1) The speed changes should be smooth to prevent damage to tape.

(2) If tape is taken out of the columns too quickly, there is a chance that it will not follow the idlers but will jump up on the flange of some idlers.

(3) Another critical point is the change between intermediate and high speed. If tape has not had a sufficient chance to build up speed in the intermediate range, it could jump or jerk and damage tape.

(4) If tape is wound too tightly on the file reel, it can also be damaged. If this condition exists, check to make sure that unwanted drag is not present on the machine reel.

(5) Tape is stopped at load point with brake on both reels. Adjust the right reel brake so that when the reels are stopped, tape is neither too loose or too tight. When stopped, if the reel release key is pressed, the reels will relax slightly. Reel movement will be approximately an eighth of an inch. If there is too much movement, the tape is too taut indicating too much brake. The adjustable resistor on the right hand brake is used to control the braking action.

16. Capstan Drive Assembly

a. Key areas to observe

(1) Check belt tension and pulley alignments.

(2) Clean the drive capstan surface carefully to insure that flat spots are not worn into the capstan.

17. Tracking

The total tracking adjustment must be considered to be a combination of the rewind arm adjustments, the rocker arm adjustments, moving coil adjustments; the stop/start adjustments; in short, almost anything can affect proper tracking.

MOST IMPORTANT: Be sure that the student has read and understood the reference manual material covering tracking, start/stop adjustments, the moving coil adjustment, and the rocker arm adjustment.

In making the final tracking adjustments on the 7330, it is difficult to verify the accuracy of these adjustments. One method that can be employed is outlined as follows:

After making the initial tracking adjustments using the GO idler eccentric to eliminate all visible buckle, you will note that the range of adjustment is quite broad. In order to effect a finer adjustment, run tape continuously in a forward direction and observe the clearance between the rear edge of the tape and the back of the right vacuum column at the point where tape immediately enters the column.

Carefully readjust the GO idler eccentric approximately 5 to 10 degrees each side of the previous setting and note that this clearance will vary or wobble. There will generally be one point within the 5 or 10 degree fine adjustment at which the wobble will disappear and the clearance will remain constant.

The left vacuum column should be observed for this same condition.

At this point, if the fine adjustment cannot be obtained, go back and make all the preliminary adjustments again being more critical of their setting.

After this adjustment is obtained, gently force the tape, in the vicinity of the right rewind idler, toward the rear of the transport. Upon release of this pressure, the tape should immediately recover to its former position without any overshot or seeking of that position. If this condition is not observed, readjust the GO idler eccentric very carefully to obtain the proper recovery of the tape.

This procedure should be repeated for the left vacuum column but DO NOT AT ANY TIME SACRIFICE GOOD FORWARD TRACKING FOR FURTHER IMPROVEMENT OF BACKWARD TRACKING.

The final check of any tape drive adjustments should be the results obtained from running the drive on the system.

18. Pre-amplifiers

a. Key areas to observe

(1) Use standard signal level tape.

(2) Make adjustment while writing at high density.

(3) It's most important that the scope probe you are using is correctly calibrated and compensated.

(4) Prior to adjusting pre-amps the tape transport must be thoroughly cleaned.

(5) Do not over-drive the pre-amplifiers. Pre-amplifiers will peak at approximately 10 volts peak-to-peak.

19. Erase Head Electrical

a. Key areas to observe

(1) Check for proper erasing of tape.

(2) Check erase head polarity if the erase head has been replaced.

(3) After electrical check, make sure that the mechanical clearance is still correct.

20. Interhead Shield (Feed thru Shield)

a. Key areas to observe

(1) Check each track that there is a maximum of .4 of a volt feed through.

(2) Check that the feed thru shield is free of binds.

(3) Check that it does not interfer with the downward travel of the left rewind arm.

(4) Check that the feed thru shield does not touch the erase head.

21. Skew Adjustment

a. Key areas to observe

(1) Prerequisites - Make sure the student has read the portion that pertains to the skew in the General Information section of the Reference Manual.

(2) Make sure he has read the skew adjustment procedure.

(3) Use master skew tapes for mechanical and read skew.

(4) When adjusting mechanical skew make sure that the C and the 1 bit you are using are of the same character.

(5) If the write pulse taps are taken off and moved while the drive is writing, it is very possible to have one trigger out-of-phase with the others. It will be necessary to re-set the drive and then re-start to get all seven write triggers back in phase.

(6) Skew must be checked anytime a tracking adjustment is changed.

MACHINE PROJECT IV - TROUBLESHOOTING

Here is a list of some "bugs" you can put on the drive to give the student experience in troubleshooting. Some of the bugs included in the list can be put on the machine by blocking the listed point with a loadpoint sticker.

Make sure the card contacts are free of gum after removing the L. P. sticker. Contact cleaner (Part No. 451053) can be used for this purpose.

SYSTEM LOCATION	COMPONENT TROUBLE	EFFECT ON MACHINE
6E11E 73.20.10(2C)	Pin Taped	Won't recognize load-point high speed rewind
6E19R 73.20.05(3D)	Pin Taped	No Go Pulse
R114-1 N/O 73.50.01	N/O FTM	No Ready, R101 will not pick
R110-5 N/O 73.50.05	N/O FTM	Arm will not raise on H.S. rewind. R-4 will not pick.
6E17L 73.20.15(4B)	Pin Taped	Left reel motor all the time tape dumps.
R5 BL N/O	N/O FTM	No right reel motor on reverse.
6E06E 73.20.01	Pin Taped	Tape will not move. No select and ready.
6E17K 73.20.15(3C)	Pin Taped	Tape goes backward on read or write.
6E21A 73.30.01(2I)	Taped	Write triggers will not flip are always held reset
6E19R 73.20.05(3D)	Pin Taped	No Go on low speed rewin

MACHINE PROJECT V - LOCAL PROCEDURES

A. PREVENTIVE MAINTENANCE

1. Discuss procedure used in the installation.

B. PARTS SYSTEM

1. Look through the parts catalog.

2. Discuss system of parts ordering and parts kept on hand.

C. CUSTOMER TAPE PROCEDURES

1. Discuss any regulations the customer may have concerning tape handling and machine room practices.

2. Discuss customers tape storage and tape library facilities.

D. SERVICE AIDS

1. Look through and discuss the latest CEM's and service aids (both the regular CEM's and the service aids section of the manual).

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