IBM® Customer Engineering

Manual of Instruction

7900 Inquiry Station

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C. IBM 7900 INQUIRY STATION

CONTENTS

FOREWORD

This manual is intended for use in training Customer Engineers in the operation of the IBM 7900 Inquiry Station used with the IBM 7070 System. Illustrations accompany the text. In most cases, the sections, sub-sections, and items contained within this manual, are written so that the preceding information serves as a building block for subsequent study.

Each program controlled operation is discussed in detail and is accompanied by operation flow charts and sequence charts. Major signals, key timings, and logic locations are also given.

Future engineering changes may cause minor discrepancies in some of the timings given in sequence charts and other charts (signal, timing and location). They should not change the philosophy of the operations unless the changes are of a major nature and constitute revisions to data flow and operation sequence.

ILLUSTRATIONS

1.0.00 INTRODUCTION

1.1.00 PURPOSE

With the IBM 7900 Inquiry Station feature connected to a 7070 System, it is possible to enter information into and/or receive information from the computer without interferring with the program routine.

1.2.00 OPERATION

When under program control, the 7900 Inquiry Station has the ability to (1) request information from any record in storage, and, (2) transmit information to any record in storage. The typed message also serves as a record of the request. This request record, along with the reply, can be typed in any format desired. The typing format is under control of the Format Tape.

2.0.00 PHYSICAL COMPONENTS OF 7900 INQUIRY STATION

2.1.00 INQUIRY STATION TYPEWRITER (Figure 2.2-1)

The typewriter associated with the 7900 Inquiry Station is a modified Model B typewriter. In adddition to the 26 upper case alphabetic characters, there are ten numeric characters and eight special characters.

2.2.00 OPERATING KEYS AND LIGHTS (Figure 2.2-1)

Located on the right hand end of the typewriter keyboard is an area containing the Inquiry Station Operating Keys and Lights. The operation of each key and light follows:

2.2.01 Ready Light (left hand light in upper row)

The Ready Light is illuminated when the Inquiry Station is available for use.

2.2.02 Request Light (middle light in upper row)

The Request Light is illuminated when a request for an inquiry has been made (Request Key depressed). Light turned Off when Proceed Light is illuminated.

2.2.03 Proceed Light (right hand light in upper row)

The Proceed Light illuminated when 7070 is ready to accept typed inquiry. Depression of Release Key turns the light Off.

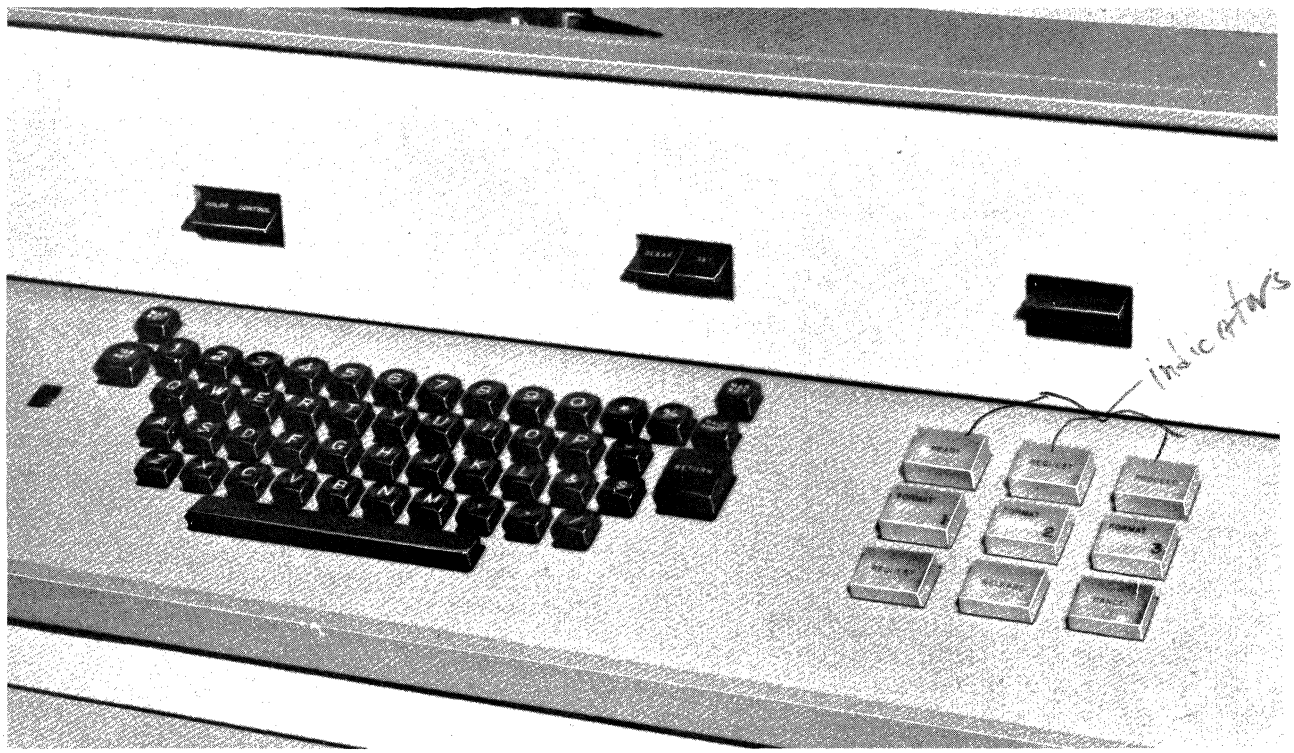


FIGURE 2.2-1 INQUIRY STATION TYPEWRITER KEYBOARD AND OPERATING KEYS AND LIGHTS

2.2.04 Format 1, 2 or 3 Illuminated Key (middle row)

One of the Format keys is depressed to advance the format tape to the specified format. The key is illuminated by the key depression. Depression of the Release Key or Cancel Key turns the light Off.

2.2.05 Request Illuminated Key (left hand key in lower row)

The Request key is illuminated when previously specified format in format tape is reached. Depression of the Request Illuminated Key signals the 7070 that permission to type an Inquiry Request is desired. The key depression also turns Off its associated light.

2.2.06 Release Illuminated Key (middle key in lower row)

The Release key is illuminated when the manual typing of the inquiry request message is complete (end of input format or format tape reached). Depression of the Release Key (now illuminated):

1. Signals the 7070 that the typing of the inquiry request message is complete and can be processed.

2. Turns Off its associated light.

3. Turns Off the Format Key Light.

4. Turns Off the Proceed Light.

2.2.07 Cancel Illuminated Key (right hand key in the lower row)

The Cancel key is illuminated when an error is recognized by the inquiry station. Depression of the Cancel Key:

1. Turns Off its associated light (When On).

2. Resets the Error circuits Off.

3. Reverts the inquiry station to the "Ready" Status. The request procedure must now be started over again by depressing the desired Format Key.

2.3.00 ILLUMINATED POWER ON BUTTON

The Power On Button is located above the Operating Key and Light area. Illumination of the button signifies that Inquiry Station power is On.

3.0.00 DATA FLOW

3.1.00 LOADING DRUM - (Figure 3.1-1)

As the inquiry request is manually typed, the information is translated into a two-out-of-five code. On its way to the drum, two-out-of-five coding is checked in a checking unit. Any non-check condition lights the illuminated Cancel Key. Correctly coded information is then gated by timed drum pulses and format tape gates which allow the information to record in the proper area of the drum. Because of the drum's speed, it is possible to read the recorded information back off the drum and check for validity before the next typewriter key depression. This read-back is matched against the original coding of the key contact output. A mis-match lights the illuminated Cancel Key. A correct match, together with a correct check of tape and key contact output, advances the Format Tape.

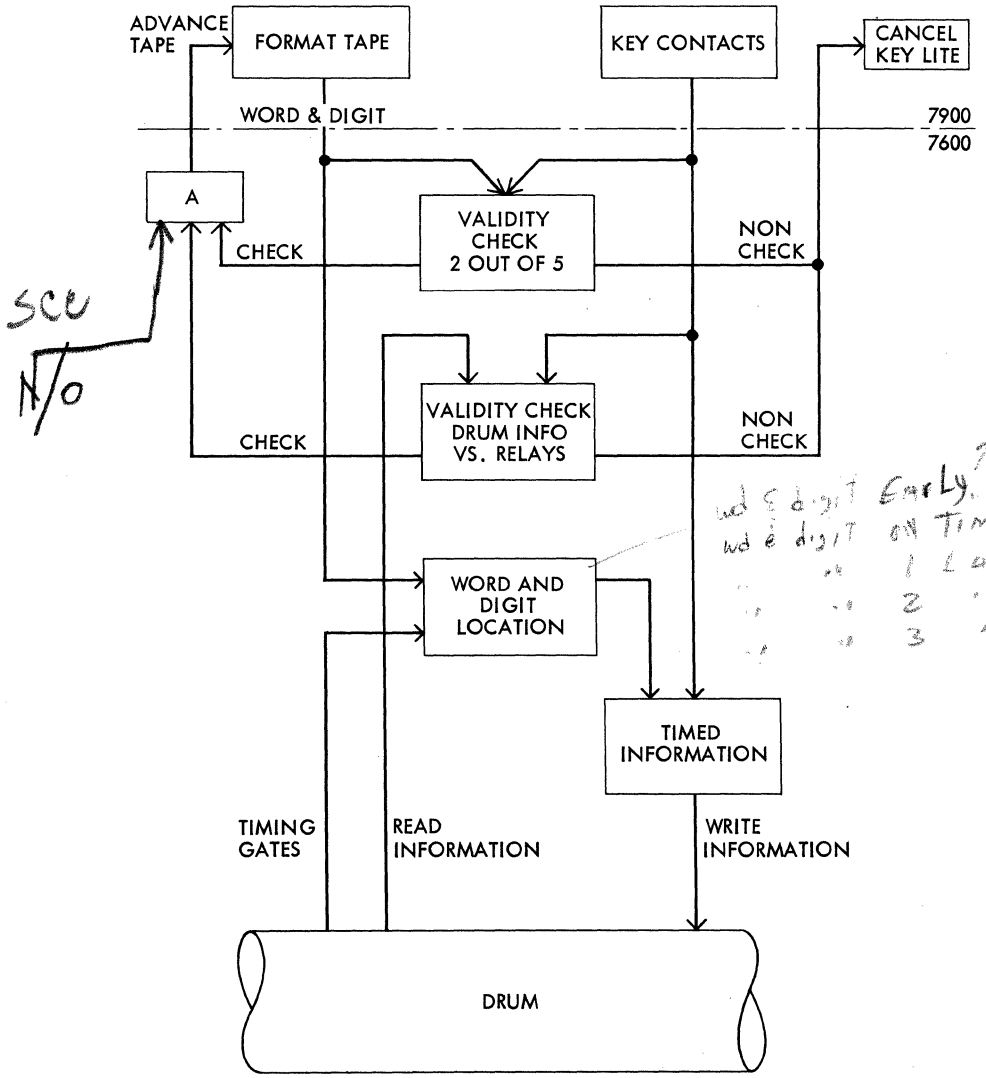


FIGURE 3.1-1 LOADING DRUM

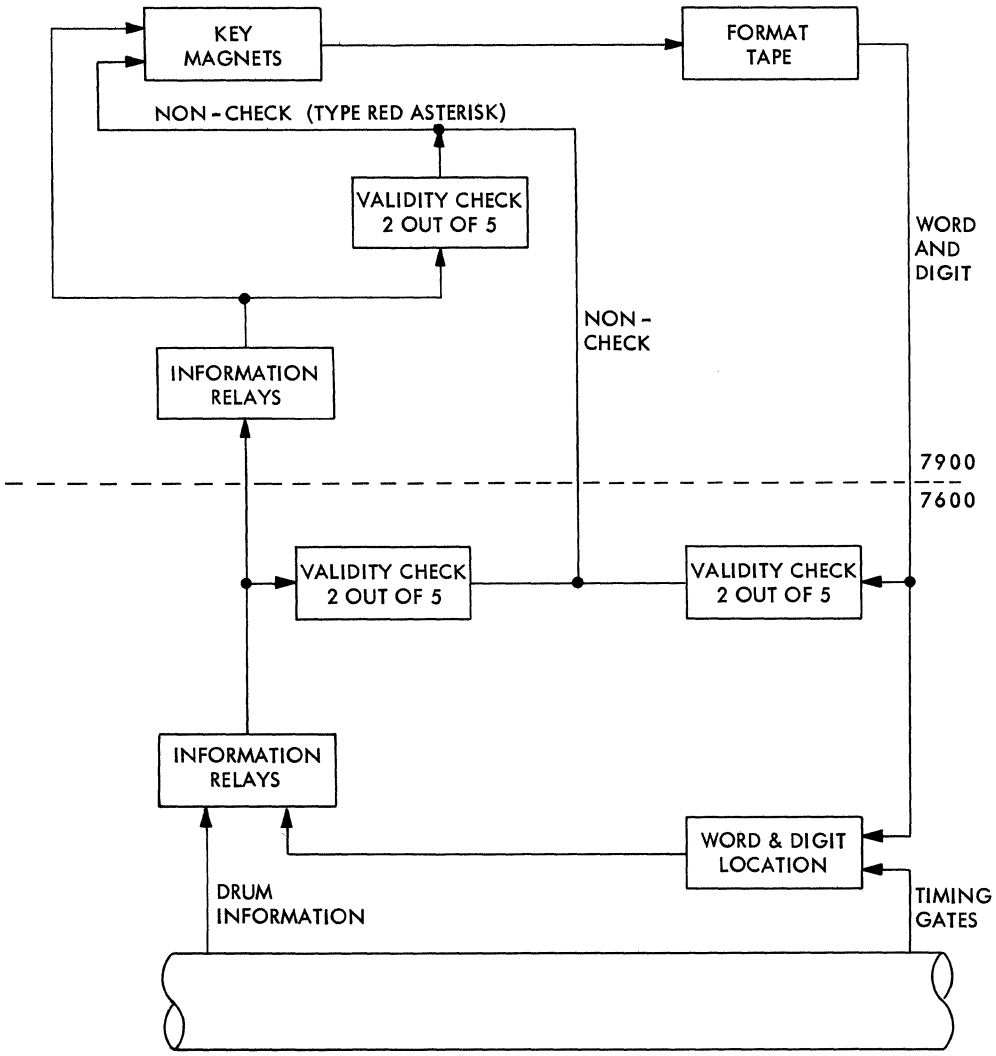


FIGURE 3.2-1 REPLY

3.2.00 REPLY (Figure 3.2-1)

The flow of information on an inquiry reply is from the drum to the Inquiry Station. To type an inquiry reply in its designated place, it is necessary to time the information reading off the drum with some kind of typewriter timing. This timing is originated by the Format Tape and is available in a two-out-of-five code. The tape coding is validity checked (invalid format tape condition causes a red asterisk (*) to type) before switching with the drum timing gates. The resultant timing gates the information reading off the drum and picks information relays. The relay outputs are validity checked on the way to the Inquiry Station. In the Inquiry Station, another set of information relays are picked. The output of these relays is checked for validity and also used to pick the typewriter key magnets. Activation of a key magnet allows the format tape to advance.

4.0.00 FUNCTIONAL PRINCIPLES

4.1.00 SEQUENCE OF OPERATION

Remote inquiry of the 7070 is possible with the 7900 Inquiry Station. Following is the sequence of operations as they normally occur during an Inquiry Request and its associated Inquiry Reply:

1. Illuminated Power Button On signifies that Inquiry Station Power is On.

2. Green Ready Light On indicates format can be selected.

3. Desired Format Key (1, 2 or 3) depressed.
   a. Format Tape advances to selected format.

4. Selected format reached.
   a. Illuminated portion of previously depressed Format Key is turned On.
   b. Illuminated portion of Request Key is turned On.

5. Operator depresses Request Key
   a. Illuminated portion of Request Key is turned Off.
   b. Request Light is turned On.
   c. Inquiry Control Unit signalled that Inquiry Request is desired.

6. When Inquiry Control Unit can accept an Inquiry Request:
   a. Request Light is turned Off.
   b. Proceed Light is turned On.
   c. Information can now be typed.

7. Manually typed information is transferred to the Inquiry Drum Buffer Area.
   a. Any error occurring during the manual typing of the information causes the keyboard to lockup and turns On the illuminated portion of the Cancel Key. Depressing the Cancel Key (1) turns Off the illuminated portion of the Cancel Key, (2) Resets the error circuits, and, (3) releases the system. The Inquiry Request must now be started over again with a Format Key depression.

8. End of Inquiry Request Format is signaled by A14 hole in output channel of Format Tape.
   a. Signals start of Inquiry Reply Format.
   b. Turns On illuminated portion of Release Key.

9. After a visual check of the manually typed information by the operator, the Illuminated Release Key is depressed.
   a. Signals Inquiry Control Unit that Inquiry Request message is complete and ready for processing.
   b. Illuminated portion of Release Key turned Off.
   c. Format Light turned Off.
   d. Proceed Light turned Off.

10. Information is processed and Inquiry Reply is placed in the Inquiry Drum Buffer Area prior to its transfer to the Inquiry Station which initiated the request.

11. Station and Format are selected from a previously entered control word.

12. Character by character, the Inquiry Reply is typed (Under control of an output format section of the Format Tape).
    a. Any errors occurring during the typing of the Inquiry Reply cause a red asterisk to type in the position of the character in error.

13. When the end of the Output Format is reached (first hole of Input Format is sensed), the Inquiry Control Unit is released and the operation is terminated.

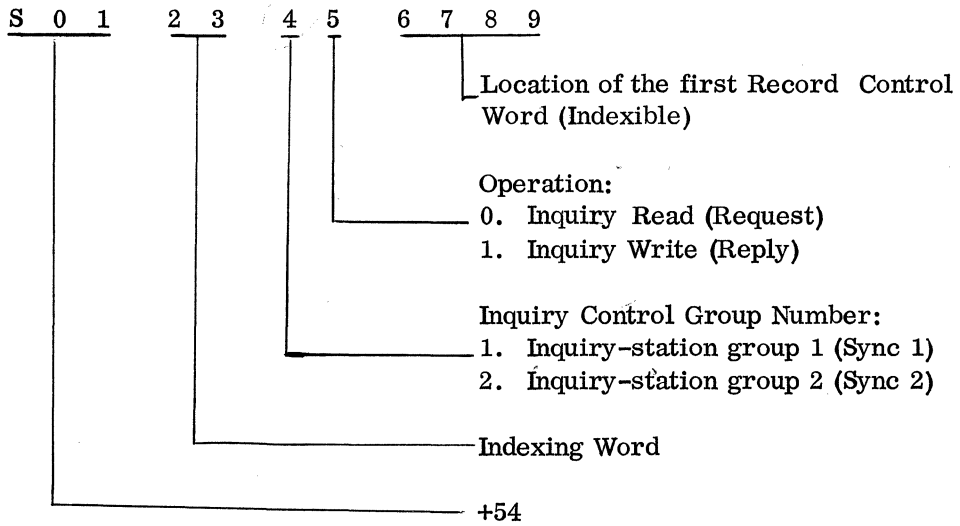
The 7900 is completely flexible as far as the typing format of an inquiry request or reply is concerned. The necessary control is provided by a Format Tape Unit in each 7900 unit. The tape unit reads A16 channel tape which can be a maximum of four feet in length. For more detailed information on the Format Tape, refer to Section 4.3.00 of this Manual.

On some occasions, more than one Inquiry Station may simultaneously request permission to make an Inquiry. The 7070 is designed to remember each request as it is received, but accept only one request for processing at a time. In effect, the 7070 stacks the requests and processes them in sequence.

4.2.00 OPERATION CODE

The only operation code that affects the IBM 7900 Inquiry Station is + 54 Inquiry Control.

As seen by the following format, either a request or a reply operation can be initiated from the same operation code.



4.3.00 FORMAT TAPE

Each IBM 7900 Inquiry Station utilizes a Format Tape which provides flexibility for:

1. Forms control through carriage tabulations, carriage returns and line spacing.

2. Control of data for 7070 processing.

3. Zero suppression.

4. Entry and exit arrangements for data transmission.

The format tape is mounted on the rear of the typewriter. Each of the 16 channels has an assigned function and holes are punched in the tape channels to control these functions. The tape is advanced in conjunction with (1) the operation of the keys on the typewriter keyboard, or, (2) the control keys of the Inquiry Station.

Separate format tapes are prepared for each application and are easily interchanged by the operator. In an application where the Inquiry Station serves as an input and an output device, both programs are punched into one tape. The ends of the tape are joined together to form a closed loop. This permits the Inquriy Station to proceed automatically from one routine to the other (Input to Output or Output to Input).

Since the format tape normally moves in conjunction with the operation of the typewriter character keys, each column of the tape is punched to correspond to a given position of the line being typed. As the typewriter advances serially from character to character, the format tape advances from one tape column to the next. On an Inquiry Request Routine, as each character is typed, the format tape designates the word and digit position of the 7070 Inquiry Drum Buffer Area which will accept the coded character just typed. On an Inquiry Reply Routine, the punching in the format tape designates the word and digit position of the 7070 Reply Drum Buffer Area from which information is read and subsequently typed.

The 16 channels of the format tape are assigned the following functions:

Channels	Function (s)
1 Through 5	Designate the Word Position of an Input or Output Word
6 Through 10	Designate the Digit Position of an Input or Output Word
11	Designates Alphabetic characters when used with Digit Positions 1, 3, 5, 7, 9. Also Designates Sign Position when used with Digit Sign Coding
12	Inquiry Request - Control Word Inquiry Reply - Zero Suppression
13	Ends preceding Inquiry Reply Format and begins an Inquiry Request format.
14	Ends preceding Inquiry Request Format and begins an Inquiry Reply format.

Channels	Function (s)
15	Carriage Return
16	Tabulate
12 And 13	Ends Output Format for skipping over tape lap.
13 And 14	Ends preceding Inquiry Request Operation but does not begin an Inquiry Reply Operation.
15 And 16	Space

4.3.01 Word Position of Input or Output Word

The punching in channels 1-5 for any particular tape column designates the specific word in the Inquiry Drum Buffer Area which will (1) receive the character typed, or, (2) transmit the character to be typed. Each of the five channels is assigned one of the bit values that make up the 5 bit code. This five bit code (0, 1, 2, 3, 6) is the same code that is used internally by the 7070. The code is a self-checking code in that any digit representation is made up of two out of the five bits. More or less than two bits cause a validity error condition. The following chart shows the channels and the bit values assigned to each channel:

Channel	Assigned Bit Value
1	0
2	1
3	2
4	3
5	6

The following chart shows the channel punching used to designate every one of the ten words found in the Inquiry Drum Buffer Area. The bit value assigned to each channel is shown, in parentheses, beside that channel.

Channel Punching & Assigned Bit Value in Parentheses			Word Within Inquiry Synchronizer Drum Buffer Area
1 (0)	And	2 (1)	1
1 (0)	And	3 (2)	2
1 (0)	And	4 (3)	3
2 (1)	And	4 (3)	4
3 (2)	And	4 (3)	5

Channel Punching & Assigned Bit Value in Parentheses			Word Within Inquiry Synchronizer Drum Buffer Area
1 (0)	And	5 (6)	6
2 (1)	And	5 (6)	7
3 (2)	And	5 (6)	8
4 (3)	And	5 (6)	9
2 (1)	And	3 (2)	10

With the exception of Word 10, the sum of the bit values is the number of the Drum Buffer Word it represents. The forgoing table illustrates that Word 2 is designated by holes punched in channel 1 and 3. The bit values for channels 1 and 3, when added together (0 bit plus 2 bit), result in a total of two. Word 10 is designated by holes punched in channels 2 and 3. This combination of bit values (1 bit for the two and a two bit for the the three) normally represents the value of zero. In this instance, however, the combination represents a value of ten. The functions performed by channel 1-5 is different when channel 12 is also punched in the same tape column. This function is explaned in the channel 12 description (Section 4.3.04).

4.3.02 Digit Position of Input or Output Word

The punching in channels 6-10 for any particular tape column designates the specific digit position within the previously designated word of the Inquiry Drum Buffer Area which will (1) receive the character typed, or, (2) transmit the character to be typed.

Each one of the five channels is assigned one of the bit values that make up the 5 bit code. The channels and the bit values assigned to each channel are as follows:

Channel	Assigned Bit Value
6	0
7	1
8	2
9	3
10	6

The following chart shows the channel punching used to designate the ten digit positions which can be found in any one of the ten words of the Inquiry Drum Buffer Area. The bit value assigned to each channel is shown, in parentheses, beside that channel:

Channel Punching & Assigned Bit Value in Parentheses			Digit Position Within Word
7 (1)	And	8 (2)	0
6 (0)	And	7 (1)	1
6 (0)	And	8 (2)	2
6 (0)	And	9 (3)	3
7 (1)	And	9 (3)	4
8 (2)	And	9 (3)	5
6 (0)	And	10 (6)	6
7 (1)	And	10 (6)	7
8 (2)	And	10 (6)	8
9 (3)	And	10 (6)	9

With the exception of digit 0, the sum of the bit values is the number of the digit position it represents within the Word. The foregoing table illustrates that the digit 8 position is designated by holes punched in channels 8 and 10. The bit values for channels 8 and 10, when added together (2 bit plus 6 bit), result in a total of eight. The digit 0 bit value (1 bit for the seven and two bit for the eight) used here is the standard two out five bit code value for a zero.

Channel 7, 8 and 9 are also used in conjuction with the Format Keys. Their function is explained more fully in the channel 13 description (Section 4.3.06).

4.3.03 Alphabetic Character

When used with digit positions 1, 3, 5, 7 and 9, a hole punched in channel 11 designates the character being transmitted or received as alphabetic. The Channel 11 hole, in combination with a ch 7 and a ch 8 hole, also designates the Sign Position. Alphabetic data is processed by the 7070 as a two-digit number. On an inquiry operation, channel 11 changes the typed alphabetic character to a two-digit number for storage in the Inquiry Drum Buffer Area. On a reply operation, a punch in channel 11 causes two positions in the Reply Drum Buffer Area to be analyzed and converted to an alphabetic character for typing.

4.3.04 Control Word (Input)

When the Inquiry Station is operating under Input Format Control, a channel 12 punch identifies that tape column as a position of a Control Word. The Control Word must be a numerical word and is automatically transmitted and recorded in Word 1 of the Inquiry Drum Buffer Area.

The format of the Control Word is as follows:

Digit Sign, Zero and One Position - contains the sign and op code of the Control Word. These positions are used at the programmer's discretion.

Digit Two and Three Position - contains the address of an indexing word and is used at the discretion of the programmer.

Digit Four Position - The format to be used is designated by the Digit Four Position.

Digit Five Position - contains the Inquiry Control Station Number. The Inquiry Control Station Number identifies the Inquiry Station which will receive the reply.

Digit Six, Seven, Eight and Nine Position - contains an address which is used at the discretion of the programmer.

Since the Control Word automatically enters Word 1, the word designating function of channels 1-5 is no longer needed. Therefore, a hole in channel 12 changes the function of channels 1-5 from designating a word location in the Inquiry Drum Buffer Area to that of a digit bit value emitter for that tape column. Channels 1-5 are now punched to represent the digit value that is transmitted to a specified digit position within word 1 of the Inquiry Drum Buffer Area. Channels 6-10 continue to designate the digit position within the specified word - in this instance, the Control Word.

Following is an example of one tape column:

Channels	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Punches	X				X		X	X				X				
Digit Bit Value	0				6		1	2								

By substituting the bit values assigned the various channels, the tape column example shown above is transmitting a digit value of six into the digit zero position of Word 1.

4.3.05 Zero Suppression (Output)

When the Inquiry Station is operating under Output Format Control, the function of channel 12 is to suppress typing of all the zeros which precede the first significant digit. in a field. A channel 12 hole is punched in the tape column which corresponds to the high order position of the numeric field. When the hole is sensed, a zero suppression device is turned on and remains active until the first significant digit in the field is typed.

4.3.06 Input Format

The 7900 Inquiry Station has an option of 3 separate Input Formats on one format tape. A hole punched in Channel 13 in combination with another hole punched in either channel 7, 8 or 9 indicates the beginning of the Input Format. Channel 7 is associated with Format 1, while channel 8 is associated with Format 2 and channel 9 is associated with Format 3.

Upon depression of the Format 1 Key, the format tape advances until a combination of a 7 and a 13 hole in the same tape column is sensed. The circuitry is so designed that Format 2 and/or Format 3 are not recognized even if the holes are sensed. When Format 1 is reached, the illuminated portion of the previously depressed Format 1 Key is turned on. The illuminated portion of the Request Key is also turned on at this time.

4.3.07 Output Format

A Channel 14 hole, combined with a channel 7, 8 or 9 hole in the format tape indicates the beginning of an Output Format. The hole activates the circuitry which permits the Inquiry Station to accept Inquiry Reply information from the 7070. Sensing a hole in Channel 14 also signals the operator that the end of the Input Format has been reached (Turns on illuminated portion of Release Key).

4.3.08 Carriage Return

The sensing of a hole in Channel 15 of a Format Tape initiates an automatic carriage return operation. Manual typing or data transmission from the 7070 to the Inquiry Station is suspended until the carriage return operation is completed.

Variable field length typing applications may require the operator to depress the typewriter carriage return key before a Channel 15 hole is sensed. In this case, the format tape automatically advances to a position that is one tape column past the first channel 15 hole encountered.

4.3.09 Tabulate

The sensing of a hole in channel 16 of the format tape causes the typewriter to automatically tabulate to the next tab stop. Manual typing or data transmission from the 7070 to the Inquiry Station is suspended until the tabulate operation is completed. Manual operation of the typewriter tab key, and the subsequent advancement of the format tape to a position that is one tape column past the next channel 16 hole, is identical to the Manual operation of the typewriter carriage return key previously described in Section 4.3.08 of this manual.

Tabulate operations should not be programmed for fewer than three spaces of tabulation.

4.3.10 Lap Skip

When holes in both Channel 12 and 13 are sensed at the end of an Output Format, the format tape is advanced one tape column. Skipping over the lap is done by depressing one of the Format Keys.

4.3.11 Input Format Ends

When holes in both Channels 13 and 14 are sensed, the Input (Inquiry Request) operation is ended; but, an Output (Inquiry Reply) operation is not initiated.

4.3.12 Space

When holes in both Channels 15 and 16 are sensed, the typewriter is impulsed to move the carriage one space. During the spacing operation, manual typing or data transmission from the 7070 to the Inquiry Station is suspended until the spacing operation is completed. The format tape is also advanced one tape column.

5.0.00 MECHANICAL PRINCIPLES

The Mechanical Principles for the Modified B1 Electric Typewriter used in 7900 Inquiry Station can be found in the Customer Engineering Manual of Instruction titled "B1 Electric Typewriter Modified for DP Equipment (Form 223-6653)"

5.1.00 FORMAT TAPE UNIT

The format tape unit is mounted on the rear of the typewriter and consists of a gear drive assembly, friction type clutch, escape magnet assembly, and a contact roll (Figure 5.1-1). This unit is powered by a 1/40 hp motor which runs continuously to drive the format tape clutch through the gear drive assembly when the power is on. The clutch rotates at a speed of approximately 160 rpm.

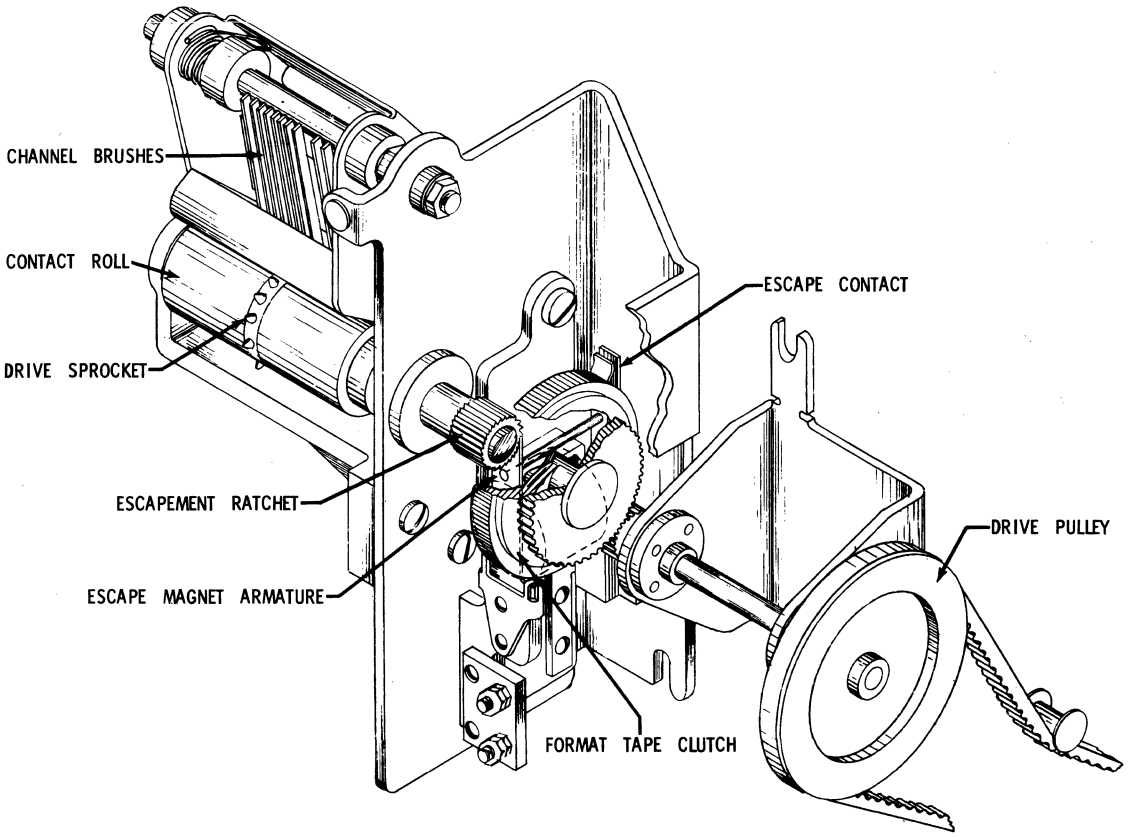


FIGURE 5.1-1 FORMAT TAPE UNIT

5.1.01 Format Tape Clutch

The format tape clutch permits the format tape to move under the control of the escape magnet which is energized whenever a character is typed. This clutch is a newly designed friction clutch which consists of a nylon shoe, pressure spring carrier, pressure spring, and a clutch housing (Figure 5.1-2). This clutch acts on a principle of pressure on the nylon shoe against the inside surface of the clutch housing. The amount of torque is controlled by the adjusting screw and pressure spring.

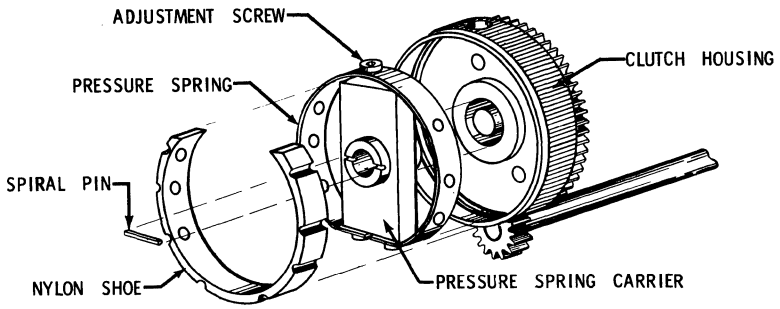


FIGURE 5.1-2 FORMAT TAPE CLUTCH

This friction clutch is adjusted to deliver 1/2 inch pounds of torque on the drive shaft the moment the escape magnet is energized. The armature is pulled out of the 24 tooth escape wheel when the magnet is energized. This causes the contact roll to rotate advancing the format tape one column. As the escape magnet is de-energized, the armature slips into the next tooth of the escape wheel causing the contact roll to stop. A spring reverse lock prevents the contact roll from being reversed and causing damage to the brushes.

5.1.02 Escape Magnet Assembly

When a character is typed, the escape magnet is energized causing the escape magnet armature to pull out of the tooth in the escape wheel, allowing it to rotate through the force from the friction drive. At the end of the escape magnet armature travel, the armature pin closes the escape contact and picks up the circuit to release the escape magnet. The time interval is short enough to drop the escape armature back into approximately the center of the next tooth of the escape wheel. Each tooth on the escape wheel causes the contact roll to advance one column. When the format tape must be advanced more than one column, the escape magnet must be repetitively impulsed.

6.0.00 INQUIRY STATION CONTROL KEY AND LIGHT CIRCUITS

6.1.00 READY LIGHT

Green Ready Light

The Green Ready Light, when illuminated, indicates that both the Inquiry Station typewriter and the 7070 system are ready for operation.

6.2.00 FORMAT KEY (Figure 6.2-1)

Before an inquiry request can be accepted by the 7070, it is necessary that the format tape be positioned at the beginning of the desired input format. If the Format 1 Key is depressed and the format tape is not correctly positioned (holes in channels 7 and 13), the tape advances until holes in channels 7 and 13 are sensed.

Depression of the Format 1 Key causes the following:

1. Format tape checked for holes in channels 7 and 13.

2. Absence of channel 7 and 13 holes cause advance of format tape.

3. Holes in channels 7 and 13 stop tape advance operation and turn on Request Key light and illuminated portion of previously depressed Format 1 Key.

Format Tape Checked for Holes in Channel 7 and 13

Depressing the Format 1 Key picks the Format 1 relay, R13, which, in turn, picks the Advance Tape relay, R11. Normally, the circuit to pick the Tape Space relay, R32, is through the R11-5 N/O point in 5B. Sensing a hole in channel 13 of the format tape picks the Input Format relay, R7, and breaks the circuit through R11-5 N/O which picks R32. The hole in channel 7 of the format tape must also be sensed to prevent the initiating of another circuit to pick R32. Both channel 7 and 13 holes must be sensed to keep the tape from advancing.

Absence of Channel 7 and 13 Holes Cause Advance of Format Tape

If the holes in channels 7 and 13 are not sensed, R32 can be picked. R32 then combines with the Escape Delay relay, R28, (picked when 48 volt line came on) to (1) pick the Brush Control relay, R29, and (2) energize the escape magnet. R29 terminates the picking of any relays from holes in the format tape. The escape magnet attracts the escape magnet armature, allowing the format tape contact roll to move and closing the escape magnet contact. The Escape Control relay, R27, is picked by the closing of the escape magnet contact. R27 drops the Escape Delay relay, R28, and R28 causes the drop out of the Brush Control relay, R29, and the escape magnet. The return of the escape magnet armature to its normal position stops the format tape contact roll movement and opens the escape armature contact. Opening the escape armature contact drops out R27. R28 now repicks and another tape space operation is initiated.

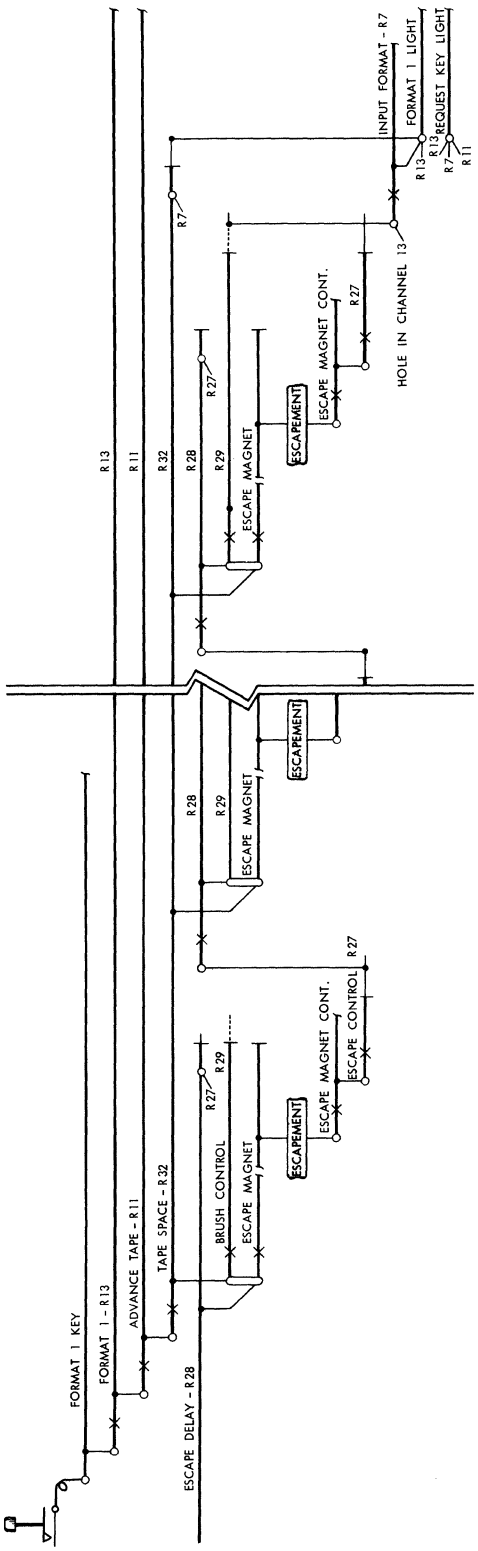


FIGURE 6.2-1 OPERATION CHART - FORMAT 1 KEY DEPRESSION ADVANCES TAPE TO HOLES IN CHANNELS 7 AND 13 OF TAPE

Holes in Channels 7 and 13 Stop Tape Advance and Turn On Lights

The tape advances until holes in channels 7 and 13 are sensed. R29 has a long drop out so that the sensing of the holes in the format tape occurs after the tape movement has stopped. The holes, when sensed, initiate a circuit through normally closed R29 points and the sensing of a channel 13 hole picks the Input Format relay, R7.

R7 causes the following:

1. Tape Space relay, R32, drops out.

2. Assists in turning on the Format 1 light.

3. Assists in turning on the Request light.

Tape Space Relay, R32, drops out R32 is dropped out when R7 picks, since the hold was through an R7 - 3 N/C point. If the channel 7 hole is not sensed, however, R32 could remain energized by the presence of a channel 8 or 9 hole. Although the channel 13 hold drops 32, the channel 7 hole must also be present so that a channel 8 or 9 hole can not hold R32.

Turn On Format 1 Light. The Format 1 light is turned on whenever R7 is picked and R32 is dropped out. Both channel 7 and 13 holes must be present and sensed to set up the conditions necessary to turn on the Format 1 light.

Turn On Request Key Light. The same conditions needed to turn on the Format 1 light are needed to turn on the illuminated porition of the Request key. The only additional point needed is an Advance Tape relay, R11, normally open point.. R11 was picked at the beginning of the operation and remains picked until a Request operation is initiated.

Sense Format 2 or Format 3 Before Format 1

It is possible that a 2 Format (holes in channels 8 and 13) or a 3 Format (holes in channels 9 and 13) may be sensed before reaching the desired 1 Format (holes in channels 7 and 13). When any channel 13 hole is sensed, the Input Format relay, R7, is picked. The R7-3 N/C point normally drops out the Tape Space relay, R32. In this instance, however, R32 is kept picked by a circuit initiating from either a channel 8 hole or a channel 9 hole which is present in the same tape column as the channel 13 hole. The 8 or 9 hole initiates a circuit which travels through the Advance Tape R11 points in 5A, through the normally closed R14 (2 Format) point or a normally closed R15 (3 Format) point and through a normally open R7 point, now closed, to keep R32 picked.

With R32 remaining picked, the format tape continues to advance until a channel 7 hole and a channel 13 hole are sensed in the same tape column.

6.3.00 REQUEST ILLUMINATED KEY (Figures 6.2-1, 6.3-1)

The illuminated portion of the Request key (14A) is turned On when the format tape reaches the format designated by the previously depressed Format key. The illumination of the Request Key light indicates:

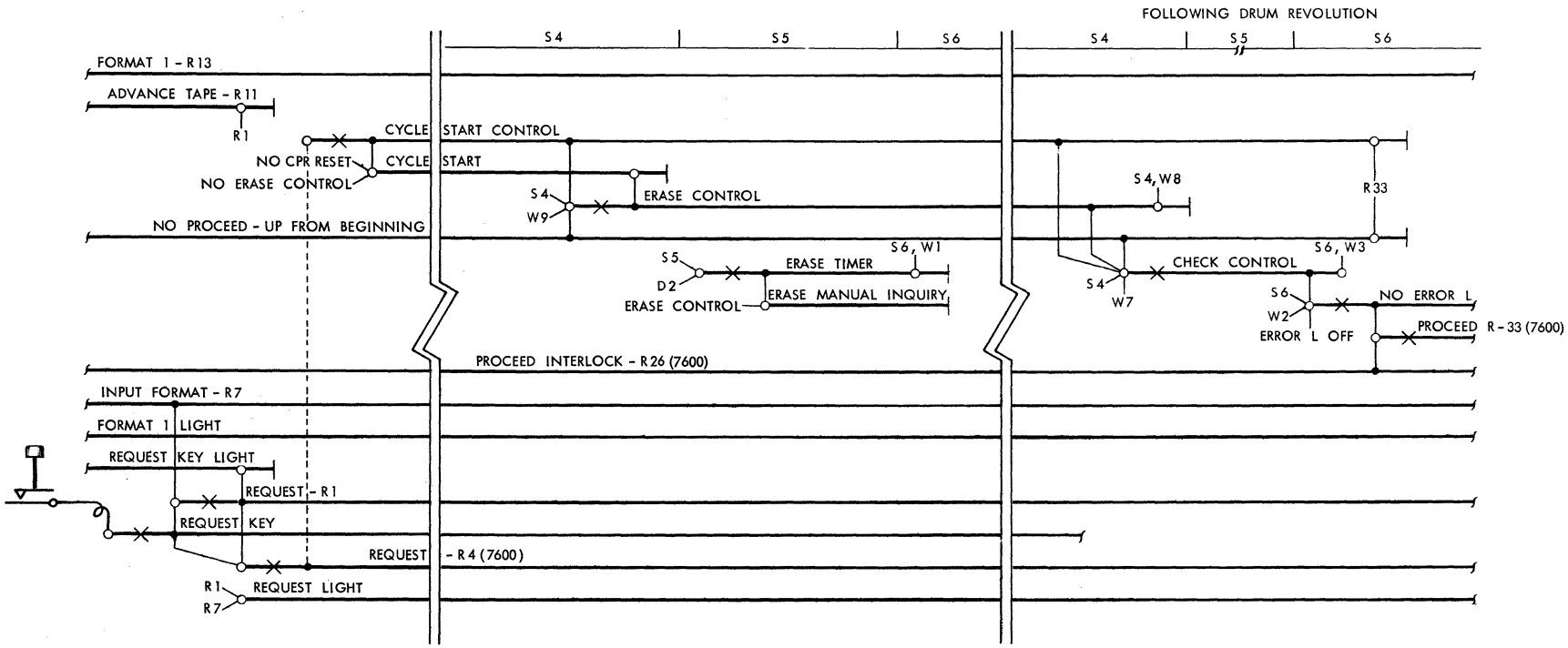


FIGURE 6.3-1 OPERATION CHART - REQUEST KEY DEPRESSION

1. The format tape is positioned at designated format.

2. The inquiry station is ready to initiate an inquiry request.

Depression of the Request key causes the following:

1. Illuminated portion of Request key turned Off.

2. Request light turned On.

3. Inquiry Control Unit signalled that an inquiry request is desired.

4. Sector 5 of drum erased and checked for validity.

Illuminated Portion of Request Key Turned Off

With the Input Format relay, R7, picked, a depression of the Request key picks the Request relay, R1 (4B). When the R1 points transfer, the illuminated portion of the Request key (16A) is turned off.

Request Light Turned On

The same Request relay, R1, point that turned off the Request Key light also turns on the Request light (16A).

Inquiry Control Unit Signalled that an Inquiry Request is Desired

With R1 picked, another normally open Request key point, (7A), now closed, initiates a circuit to the Inquiry Control Unit through the Station 1 line to pick the 7600 Request relay, R4.

Sector 5 of Drum Erased and Checked for Validity

The closing of the R 4-4 N/O point initiates a circuit called Cycle Start, later called Cycle Start Control. The Cycle Start Control signal combines with No Erase Control and No CPR Reset conditions to turn on the Cycle Start latch.

At the first Sector 4, Word 9 time following the origination of the Cycle Start Control signal, the Erase Control latch is turned on. The Erase Control latch turns off the Cycle Stt latch.

At Sector 5, Digit 2 time, the Erase Timer latch is turned on. The Erase Timer Latch On output combines with the Erase Control signal and originates a signal called Erase Manual Inquiry. The Erase Manual Inquiry signal initiates the erasing of Sector 5 of the drum.

At Sector 4, Word 7 time of the following drum cycle, Cycle Start Control, No Proceed and Erase Control combine to pick Check Control latch.

During Sector 5 time, the drum area is validity checked. Any bits present pick the Error latch. If there are no bits present, the Check Control Latch signal combines with an Error Latch Off condition at Sector 6, Word 2 time to pick the No Error latch. The On output of the No Error latch indicates that the Inquiry Drum Buffer Area (in this case, Sector 5) is ready to accept the typed inquiry request.

6.4.00 PROCEED LIGHT (Figure 6.4-1)

The turning on of the No Error latch indicates that Sector 5 (1) has been cleared of all bits, and, (2) is ready to receive the typed inquiry request. The On output of the No Error latch combines with the previously picked Proceed Interlock relay, R26, to pick the 7600 Proceed relay, R33. R33 points then:

1. Turn off the Cycle Start Control latch.

2. Turn off the No Proceed signal.

3. Combine with the 7600 Proceed Interlock relay, R26, and the 7600 Request relay, R4, to pick the 7600 Input Switch relay, R5.

R5 points then:

1. Drop the 7600 Proceed Interlock relay, R26.

2. Drop the 7600 Request relay, R4.

3. Combine with a normally closed point of the Request key to pick the 7900 Operate 1 relay, R56.

R56, in turn, picks the 7900 Operate 2 relay, R58. R58 turns off the Request Light and picks the 7900 Operate 3 relay, R59. R59 picks the 7900 Input Switch relay, R36. R36, in turn, (1) turns on the Proceed light, and, (2) combines with the Input Format relay, R7, to initiate one tape space operation. The sequence of operation for the tape space operation is as described in Section 6.2.00 of this manual.

During the tape spacing operation, the Brush Control relay, R29, breaks the circuit between the brushes reading the channel holes and their associated relays. The channel 7 hole was previously isolated when R11 was dropped before the sector 5 erase operation. The channel 13 hole, however, had still kept the Input Format relay, R7, picked. R7 is now dropped. When R7 drops, the circuit to the Tape Space relay, R32, is opened and R32 drops out.

The Inquiry Station Operator may now manually type the inquiry request. Each typed character is directed to its place in the inquiry buffer area by the channel 1 - 10 format tape punching being read during the typing operation. The actual typing operation is described in Section 7.0.00 of this manual.

6.5.00 CANCEL ILLUMINATED KEY

During an input format operation, any of the input errors discussed in Section 9.9.01 of this manual turns on the illuminated portion of the Cancel key (86.00.16).

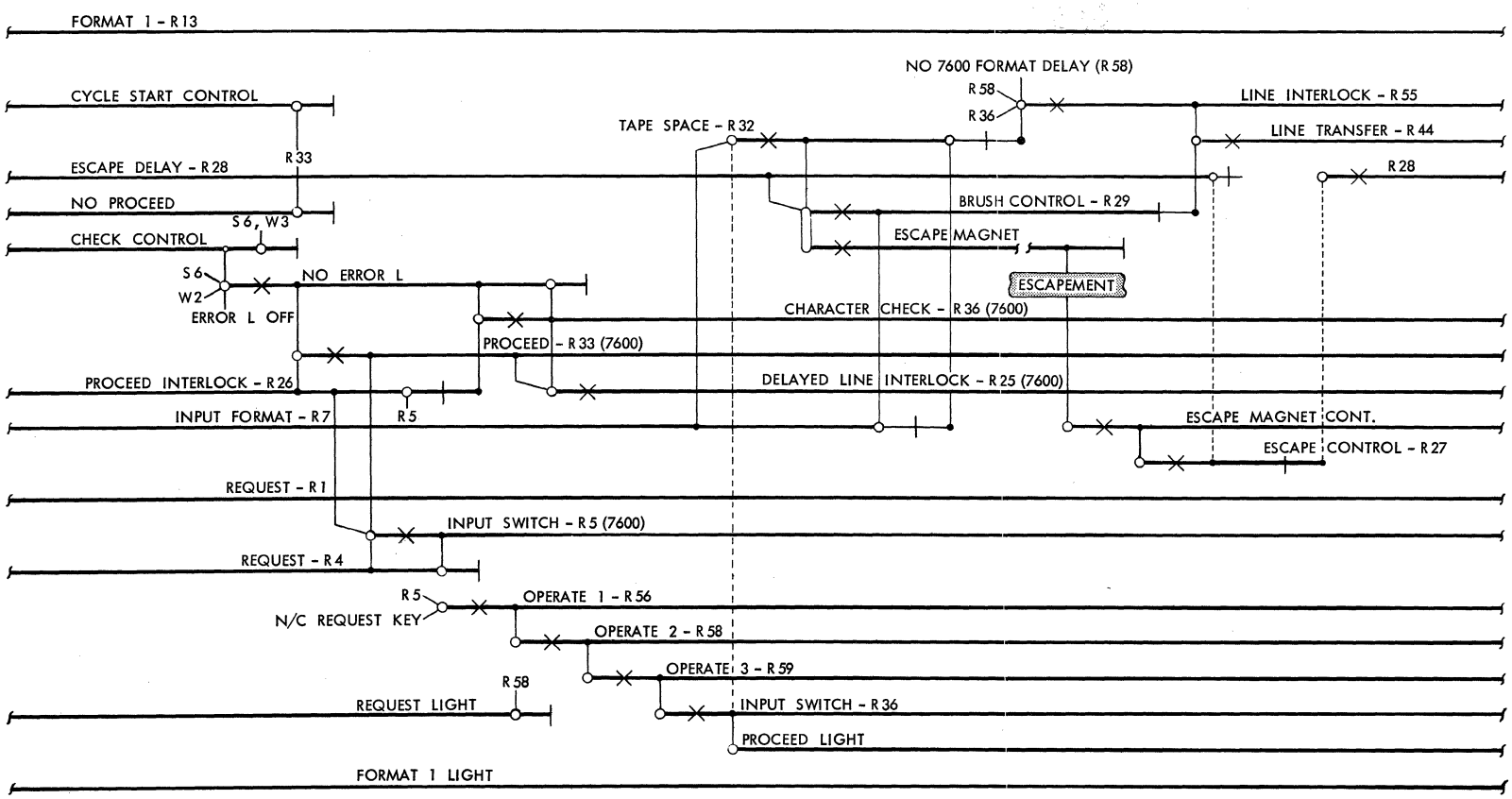


FIGURE 6.4-1 OPERATION CHART - TURN ON PROCEED LIGHT

Depressing the Cancel key extinguishes the Cancel key light and drops the inquiry station out of request status. The operator must then re-request and, upon receipt of the Proceed signal, retype the message.

The depression of the Cancel key picks the Cancel relay, R2, in 86.00.03. The R2 points (1) drop out the applicable Format relay, (2) drop out the Advance Tape relay or the Request relay (depending on which part of the input operation the error occurred in), and, (3) send a signal, called Cancel Reply, from 86.00.08 to 86.03.22 to pick the 7600 Cancel Reply relay, R22.

The R22 points (1) drop the Format relays (if picked), (2) drop the 7600 Proceed relay, R33 (if picked), (3) drop the 7600 Error relay, R32 (4) pick the 7600 End of Scoot relay, R35, (5) pick the applicable 7600 Release relay.

6.6.00 RELEASE ILLUMINATED KEY (Figure 6.6-1)

The Release key is used to signal the 7070 that the manually typed inquiry station message has been completely typed and is stored in the inquiry drum buffer area. As the last character of the message is typed (end of input format area punched in format tape has been reached), the format tape advances to the next tape column. The next tape column should contain (1) a hole punched in channel 14 and (2) a hole punched in channel 7, 8 or 9. The channel 14 hole signals the beginning of an output format and lights up the Release Key light. The operator then visually verifies the typed message. If the message is correct, the operator depresses the Release key which signals the 7070 that the message has been typed and can now be processed.

If the Release key is depressed when an output format has not been sensed, an error is signalled. The error signal requires the cancellation and retyping of the message (see Section 9.9.01 of this manual).

Sensing of a channel 14 hole in the format tape picks the output format relay, R8, in 86.00.16. R8 completes a circuit to the illuminated porition of the Release key in 86.00.16. The manual typing of the information should be completed. If found correct upon visual examination, the Release key can be depressed. Depressing the Release key initiates the following operations:

1. 7900 input circuitry and associated lights turned off.

2. 7600 release circuitry turned on.

3. System signalled that manually typed message is ready for processing.

7900 Input Circuitry and Associated Lights Turned Off

The Release key n/o point combines with R8, R58 and R36 points to pick the 7900 Release relay, R3. R3 points (1) drop the Format 1 relay (or whichever Format relay is in use), R13, which extinguishes the Format 1 light, and, (2) drop the Request relay, R1.

7600 Release Circuitry Turned On

The 7900 Release relay, R3, also initiates a signal called Release in 86.00.07 which is sent to the 7600. The Release signal enters 86.03.22 and picks the 7600 Re-

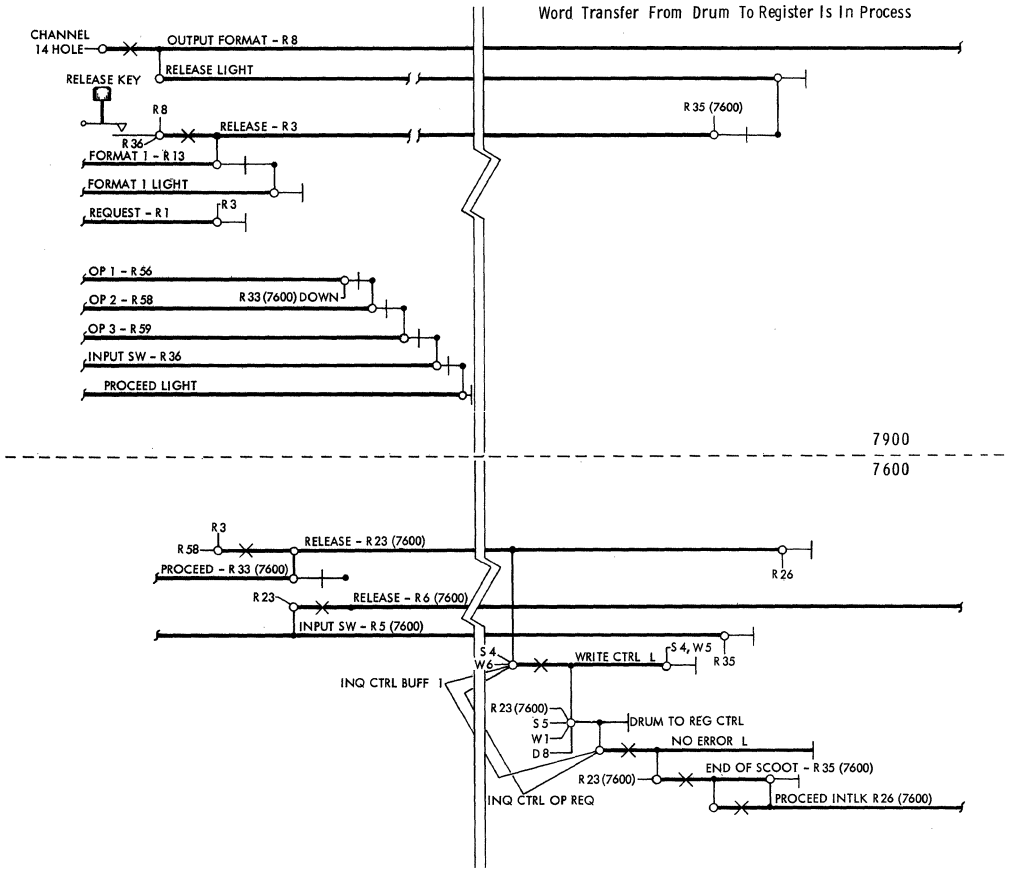


FIGURE 6.6-1 OPERATION CHART - RELEASE KEY DEPRESSION

lease relay, R23. R23 points (1) drop the 7600 Proceed Relay, R33, and (2) combine with the 7600 Input Switch relay, R5, to pick the 7600 Release relay, R6.

R33, the 7600 Proceed relay, when originally picked, helped activate the Station 1 line between the 7600 and the 7900. The Station 1 line kept the Op 1, 2, 3 and Input Switch relays picked in the 7900. R23, however, causes the drop of R33, opening the Station 1 line and dropping the above mentioned relays. In addition, the Proceed light is also turned off.

System Signalled that Manually Typed Message is Ready for Processing

The 7600 Release relay, R23, also initiates a circuit which sets a stacking latch in the 7070 System (86.01.60). Further processing of the manually typed information now stored on the Drum is now under control of the 7070 Priority Processing System.

When the 7070 is ready to transfer the information stored on the drum, the previously originated Release signal combines with (1) an Inquiry Control Buffer 1 Signal, (2) an

Inquiry Control Op Request Signal, (3) a sector 4 pulse, and, (4) a Word 6 pulse to a activate the Write Control latch. The Write Control latch then combines with the 7600-R23 Release signal at Sector 5, Word 1, Digit 8 Time to generate a Drum to Register Control signal. The Drum to Reg Ctrl signal then combines with an Inquiry Control Buffer 1 signal and an Inquiry Control Op Request signal to turn on the No Error latch. The On output of the No Error latch picks the 7600 End of Scoot relay, R35. R35 points drop the 7600 Input Switch relay, R5, and pick the 7600 Proceed Interlock relay, R26. R26, in turn, drops out the 7600 Release relay, R23, and the 7600 End of Scoot relay, R35. The drop out of R35 causes the drop out of the 7900 Release relay, R3, and in turn, extinguishes the Release light.

7.0.00 DRUM INPUT (MANUAL TYPING)

During a manual typing operation, the depression of a typewriter key activates (1) the circuitry necessary to transfer the character from the Inquiry Station to the Inquiry Drum Buffer Area, and (2) the associated cam lever, which closes certain letter cam contacts and the Selector Common Contact.

For each alphabetic or numeric character typed, two letter cam contacts are closed: One contact develops the two out of five bit coding which represents the zone portion of the character; the other typewriter contact develops the two out of five bit coding which represents the numeric portion of the character.

The Selector Common Contact (SCC) closes approximately 50 ms after the typewriter key is depressed. Mechanical action is responsible for the 50 ms delay. The character is typed 19 ms after the SCC makes. The SCC remains closed for another 20 ms after the character is typed. The sequence of operations for a Drum Input operation is as follows:

1. Word and Digit Position of Inquiry Drum Buffer Area is determined by holes in the Format Tape.

2. Character is typed and recorded on the drum and recorded character is validity checked.

3. Format tape is advanced.

7.1.00 NUMERIC INPUT

7.1.01 Word and Digit Position of Inquiry Buffer Area Designated (Figure 7.1-1)

In Section 6.4.00 (Proceed Light), the turning on of the Proceed light informs the Inquiry Station operator that the manual typing of an Inquiry Request can proceed. As the Proceed light turns on, a tape space operation is also initiated. This tape space operation is performed so that the tape column following the Input Format tape column is in position to be read. The tape columns following the Input Format tape column contain the word and digit location information which is used to direct the typed character to the designated position in the Inquiry Drum Buffer Area. Channel 1-5 punching designates the Word Position in the Inquiry Drum Buffer Area which will receive the character typed. Channel 6-10 punching designates the Digit Position within the previously designated word in the Inquiry Drum Buffer Area which will receive the character typed. The coding used to designate the word and digit positions is described in Section 4.3.01 and 4.3.02 of this manual.

Before manual typing is started, the word and digit location coding is read from the Format Tape. The coding is combined with drum pulses and sets up the word and digit gates needed to direct the typed character to its designated word and digit location. The operation takes place as follows:

1. Word and Digit coding read from Format Tape.

2. Word and Digit Relays picked and validity checked in 7600.

3. Word and Digit Relays initiate partial formation of necessary timing gates.

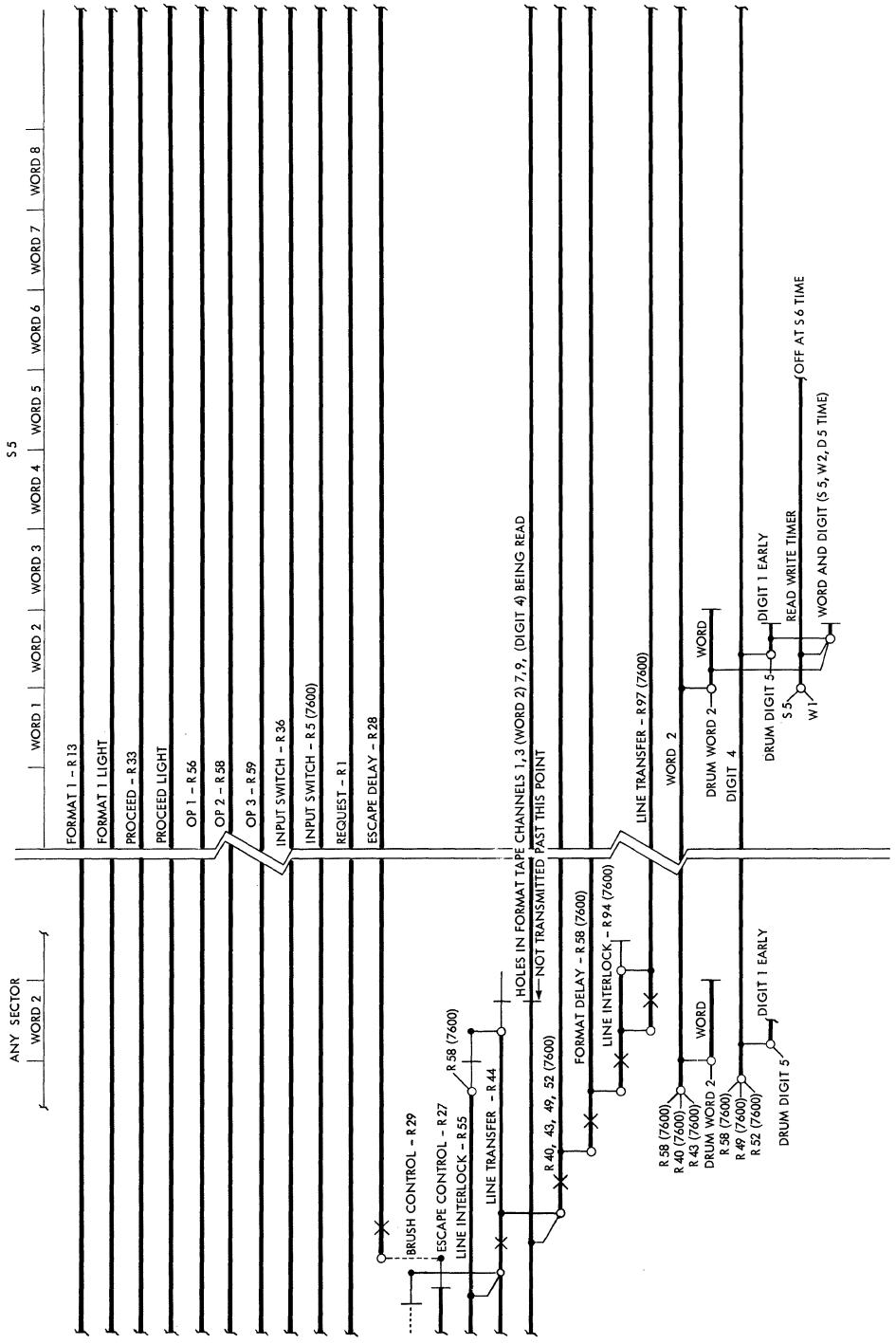


FIGURE 7.1-1 OPERATION CHART - WORD AND DIGIT POSITION OF INQUIRY DRUM BUFFER AREA DESIGNATED

Word and Digit Coding Read from Format Tape

Near the end of the tape space operation from the Input Format tape column to the adjacent tape column, the holes in the newly positioned column are read. The tape column should contain the Word and Digit destination of the characters to be typed. Consider the tape column being read to contain punched holes in the following Channels: 1, 3, 7, 9. Channels 1 and 3, when decoded, represent Word 2 of the Inquiry Drum Buffer Area; Channels 7 and 9, when decoded, represent one of the Digit Four positions of the Inquiry Drum Buffer Area. Therefore, the character typed while the Format Tape is in this position should be recorded in the Digit Four Position of Word 2 of the Inquiry Drum Buffer Area.

Near the end of the tape spacing operation (Figure 6.4-1), the Line Interlock Relay, R55, is picked. R55, in turn, picks the Line Transfer Relay, R44 as soon as R29 is down. With the R44 points transferred, the impulses from the holes in Channels 1, 3, 7, and 9 can be sent from the 7900 to the 7600 over the transmission lines shown in 86.00.14.

Word and Digit Relays Picked and Validity Checked in 7600

The transmission lines enter the 7600 and pick the associated Word and Digit Relays (R40, 43, 49, 52) in 86.03.20. The Word and Digit Relays then pick the 7600 Format Delay Relay, R58. R58 (1) drops the 7900 Line Interlock Relay, R55, (2) allows a validity check operation to take place, (3) picks the 7600 Line Interlock Relay, R94, and, (4) initiates the partial formation of the word and digit gating.

7900 Line Interlock Relays Dropped. The picking of the 7600 Format Delay Relay, R58, dropped the 7900 Line Interlock Relay, R55. R55, in turn, causes the drop of the 7900 Line Transfer Relay, R44. R44, when dropped, isolates the reading of the channel holes from the transmission lines.

Validity Check Operation Initiated. In 86.03.61, the 7600 Word and Digit Relays (R40, 43, 49, 52) previously picked are checked to see that two, and only two, of each group of relays are picked. If any condition other than two picked Word Relays and two picked Digir Relays exists, the 7600 Error Relay, R32, picks.

7900 Interlock Relays Picked. The 7900 Line Interlock Relay, R94, is picked in 86.03.21 by a Format Delay point. R94 then picks the 7600 Line Transfer Relay, R97. These relays are used for switching incoming 7900 signals to pick various 7600 relays.

Partial Formation of Word and Digit Gating Initiated

Word Gating. By means of the matrix in 86.03.40, which uses the previously picked Word Relays (R40, 43), an integrated signal, called Word 2, is sent to 86.01.07. From 86.01.07, the "Word 2 Integrate" Signal goes to 86.01.20, where it combines with a Drum Word 2. The resultant output is called Word and is available every Word 2 time of every Drum revolution.

Digit Gating. By means of the matrix in 86.03.41, which uses the previously picked Digit Relays (R49, 52), an integrated signal, called Digit 4, is sent to 86.01.06. From 86.01.06, the "Digit 4 Integrate" Signal goes to 86.01.21 where it combines with a Drum Digit 5. The resultant output is called Digit 1 early and is available every Digit 5 time of every drum revolution.

The Read Write Timer (86.01.31) generates a gate from S5, W1 time until S6 time. The output of the Timer is combined with the Word and Digit gating just covered. The resultant output called Word and Digit, is a S5, W2, D5 pulse. The final gating necessary for recording the transmitted bits is not formed until the bits are transmitted to the Inquiry Drum Buffer Area.

7.1.02 Type Character, Record and Validity Check Character on Drum

Depression of a typewriter character key results in that character being typed, the two-out-of-five bit code for that character recorded on the drum (and later validity checked) and a one tape column space operation.

Type Character

Depressing a typewriter character key activates the letter cam trip lever and initiates a typing cycle which lasts approximately 100 ms.

During the typing operation, the following sequence of events occur:

1. Bit lines originated.

2. 7600 Character Select Relays picked and validity checked.

3. Integrated Relay Pulses are combined with Write Numeric to record on the Drum.

4. Recorded character is validity checked.

Bit Lines Originated

During the typing cycle, the individual letter cam contacts close, followed by the closing of the Selector Common Contact. Each character is sent to the drum in a two digit alphabetic representation. The coding of each character is as shown in Figure 3.1-2 of Input/Output Section of the CE Instruction Manual. The character 1 upper letter cam contact in 86.00.09 originates pulses on the 1 N bit line and the 0 N bit line in 86.00.12. The character 1 lower letter cam contact in 86.00.09 originates pulses on the 6 bit Z line and the 3 bit Z line in 86.00.12.

The bit lines pass through the normally closed Reply and Line Transfer Relays and out the cable to the 7600 Relay Chassis.

7600 Character Select Relays Picked and Validity Checked

The bit lines enter the 7600 Relay Chassis and pick the Numeric and Zone Character Select Relays in 86.03.20. The validity of the character represented by the picked Character Select Relays is verified in 86.03.62. The checking circuitry in 86.03.62 also causes the 7900 Character Delay relay, R61, to drop. The down condition of R61 helps originate a Cycle Start Signal in 86.03.30. The Cycle Start Signal combines with S6, W4 and Proceed signals to pick Write Control. Write Control then combines with the the previously developed Word and Digit Pulse, (S5, W2, D5 time), a B to D Gate and Proceed to originate the Write Numeric signal used to record the bits in the Drum Buffer Area "on time" (D4 time). Even though the word and digit pulse is available at D5 time, one digit time is lost by the time the bits are recorded.

Integrated Relay Pulses Combined with Write Numeric to Record on Drum

The bit pulses used to record on the Drum originate in 86.03.42 and 86.03.43. Both the Zone and Numeric Bit pulses are sent to the 7600 electronic chassis. The Numeric Bit pulses enter 86.01.51 as integrated pulses and go to 86.01.41 where they combine with the previously developed Write Numeric Signal. The resultant output is sent to the drum and recorded. The Zone Bit pulses enter 86.01.52 as integrated pulses and also go to 86.01.41. The integrated Zone Bit pulses must combine with a Write Zone Signal to record on the drum. Since there is no Write Zone Signal available, the integrated Zone Bit pulses do not record on the drum.

Recorded Character Validity Checked

The character recorded is read from the drum and validity checked on the following drum revolution. The two out of five bit configuration is read from the drum and enters the electronic chassis in 86.01.10. With a numeric 1 recorded, a one bit and a zero bit are read. The zero and 1 bit then "attempt" to combine with original integrated bit pulses and energize the line called Numeric Line in 86.01.51. The Numeric Line is not picked if the following conditions exist:

1. If the bits read from the drum have their associated integrated bit pulses present.

2. If the bits not recorded on the drum do not have their associated integrated bit pulses present.

The Numeric Line is used to assist in the picking of the Error Latch. If the Numeric Line is not energized, it means that the bits recorded on the Drum are the correct bits and the Error Latch does not turn on.

Previous to the above checking operation (S4, W4 time), the Proceed Signal combined with a Write Control Signal to turn on the Check Control Latch in 86.01.53. The Check Control Latch remains energized during the checking operation described and at S6, W2 time combines with the Off output of the Error Latch to turn On the No Error Latch (86.01.54).

The On output of the No Error Latch picks the 7600 Character Check Relay, R36, (86.03.30). R36 points (1) combine with the 7600 Proceed Relay, R33, to originate a Checking Reset Signal which turns Off the No Error Latch, and (2) picks the 7600 Delayed Line Interlock Relay, R25. R25 drops the 7600 Format Relays, R40, 43, 49 and 52. With the Format Relays dropped, the 7600 Format Delay Relay, R58, drops out, causing the drop of the 7600 Line Transfer Relay, R97. Besides the relays mentioned, R58 caused the dropping of the following relays and signals: Word 2, Digit 4 and the 7600 Station Check Relay, R80. R97 caused the dropping of the 7600 Character Select Relays, and their integrated bit lines.

With the 7600 R58 down, a pulse is originated in 86.03.21 which travels to the 7900 relay chassis and picks the 7900 Line Interlock Relay, R55 in 86.00.06. R55, in turn, picks the 7900 Line Transfer Relay, R44. The R44 points break the circuit between the letter cam contact and the 7600 relay chassis. As soon as the Format Tape is advanced, the holes in the various channels of the newly positioned tape column can pick the word and digit relays in the 7600 relay chassis.

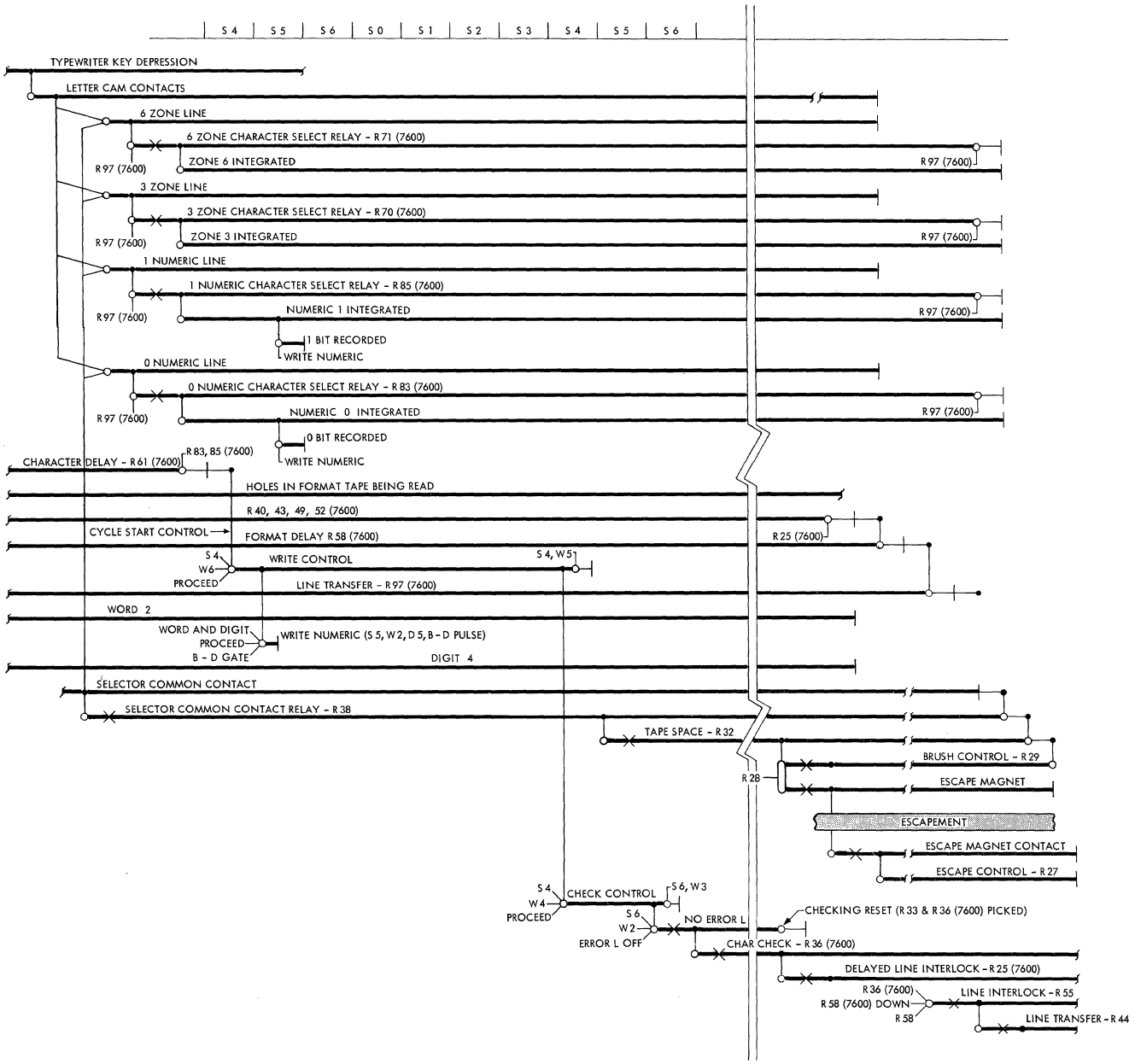


FIGURE 7.1-2 OPERATION CHART - TYPED CHARACTER RECORDED ON DRUM

7.1.03 Format Tape Column Space Operation

Approximately 50 milliseconds after the typing cycle starts, the Selector Common Contact (SCC) closes. When the SCC closes, a circuit to pick the SCC Relay, R38, in 86.00.05 is completed. R38 combines with an Operate 3 relay point to pick the 7900 Tape Space Relay, R32. The spacing of the format tape now proceeds exactly as previously described in the tape spacing resulting from a depression of a Format Key (Section 6.2.00). The tape moves only one column since the SCC opens before the tape spacing operation is completed.

7.2.00 ALPHABETIC INPUT

By reading a punch in channel 11 of the Format Tape, alphabetic information can be transferred from the 7900 Inquiry Station to the 7070 System whenever the 7900 is in an input format. The format tape must also specify the word and odd digit position which will store the numeric portion of the alphabetic character being transferred. The zone portion of the alphabetic character is automatically stored in the following adjacent even digit position.

Every depression of a numeric or alphabetic typewriter character key originates a two character numeric representation for that particular character. For instance, the two character numeric representation for the alphabetic character "D" is 64. There, Therefore, whenever the D character typewriter key is depressed, the zone lines necessary to represent a six and the numeric lines necessary to represent a four are manufactured.

The reading of the punched hole in channel 11 of the format tape picks the 7900 Alpha relay, R96. An R96 point then combines with an R10 point and an R59 point to activate the Alph-Reply-Inlk line to the 7600 relay chassis and pick the 7600 Alpha relay, R59, in 86.03.22. Picking R59 activates the Zone Select Line in 86.01.05. The Zone Select line is used to gate the zone porition of the alphabetic character being transferred into the correct even drum digit position.

The numeric portion of the alphabetic character is stored in the drum digit position specified by the format tape. The gating is as shown in Figure 7.1-2 of this manual.

The gating necessary to store the zone portion of the alphabetic character in the adjacent even drum digit position is a combination of the following signals:

Zone Select - signal originating from sensing of a channel 11 hole in format tape.

Write Control - same signal used to gate numeric portion of the character.

Proceed - same signal used to gate numeric portion of the character.

Word and Digit 1 Late - pulse is generated from original word and digit gate used to store the numeric portion of the character and is available one drum digit time after the original word and digit pulse.

The validity checking of the alphabetic character bits is accomplished in much the same manner as validity checking is done on a numeric input operation.

7.3.00 SIGN INPUT

7.3.01 Alpha Sign

Besides setting up the circuitry for alphabetic input, the reading of a Channel 11 hole in the format tape also initiates the circuitry to automatically enter an alpha sign in the digit sign position of the specified word (DS position not specified by holes in format tape).

The first operation performed is the checking of the digit sign position of the specified word to see if a sign has been previously entered. The checking operation takes place before any typewriter character key is depressed. A combination of the following signals are used to accomplish the checking.

Read Write Timer - available every drum cycle from sector 5, word 1 time until sector 6 time.

Word - a pulse developed from a combination of the word specified in the format tape and the actual drum word timing. The Word signal specifies the word being loaded within sector 5.

D (Digit) 8 - the D8 pulse is needed to further pinpoint the exact digit position which is to be checked for the presence of any bits. D8 is used because of the two digit time circuitry delay encountered when reading off the drum.

Numeric Line - if this line was energized, it would mean that bits were previously recorded in the digit sign position of the specified word and the Sign Blank latch could not be picked. The Numeric line is used to prevent repetitive Alpha Sign Inserts for any one word on later alphabetic typewriter character key depressions.

Therefore, the absence of any bits (down condition of Numeric Line) in the DS position (tested two digit times later at D8 time) of the specified word (Word line) in Sector 5 (Read Write Timer) turns on the Sign Blank latch in 86.01.42.'

With the Sign Blank latch turned on, it is possible, during the following drum revolution (before depression of typewriter key) to insert an alpha sign into the DS position of the specific word being loaded. A coincidence of the following signals are needed to turn on the Sign Insert latch: Read Write Timer, Word, DS Sign Blank latch (On) and Zone Select. The Read Write Timer, Word and DS Signals are used to guide the alpha sign into the digit sign position of the specified word in sector 5. The ON condition of the Sign Blank latch signifies that the DS position is presently blank. The Zone Select line is energized as a result of reading a hole in channel 11 of the format tape, signifying that the character to be typed is alphabetic. The coincidence of these lines turn ON the Sign Insert latch in 86.01.42. The ON output of the Sign Insert latch activates a 0 bit insert line and a 3 bit insert line which record on the drum.

7.3.02 Minus Sign

To supply a minus sign for storage in the digit sign position of a specified word, the following operations must take place:

1. Format tape specifies DS position and word to be loaded in sector 5.

2. Dash Key signal lines converted to 2-out-of-5 signal lines representing a minus sign.

Format Tape Specifies DS Position and Word to be Loaded in Sector 5

The holes in format tape channels 1 through 5 are processed exactly as described in Section 7.1.01. The resultant gating is called Word.

The DS position is specified by sensing holes in format tape channels 7, 8 and 11. The sensing of the channel 11 hole in the format tape picks the 7900 Alpha relay, R96. An R96 point then combines with an R10 point and an R59 point to activate the Alph-Reply-Inlk line to the 7600 relay chassis and pick the 7600 Alpha relay, R59, in 86.03.22. In 86.03.41, R59 combines with R49 and R50 (picked from 7 and 8 holes in format tape) to pick the 7600 Sign relay, R55. R55, when picked, then combines with an R49 and an R50 point to activate the the Digit S line in 86.03.41. The Digit S line combines with a Drum DS pulse in the electronic chassis to activate the Digit 1 Early line.

Dash Key Signal Lines Converted to 2-Out-Of-5 Signal Lines Representing a Minus Sign

The R55 Sign points also convert the signal lines originated by depressing the dash typewriter key into the 2-out-of-5 signal lines which represent a minus sign. Depressing the dash key activates (1) the one numeric and two numeric lines in the 7900, and (2) the zero zone and two zone lines. The activated lines enter the 7600 in 86.03.20. The One Numeric line picks the 7600 Zero Numeric Character Select Relay, R83, through an R55 point. The Two Numeric line picks the 7600 Six Numeric Character Select Relay, R89. through an R55 point. The zero zone line picks the 7600 Zero Zone Character Select relay, R65, and the two zone line picks the 7600 Two Zone Character Select relay, R68. Picking the Zone Character Select relays do not cause any trouble since the operation is numeric. The one numeric and two numeric lines are kept from picking their respective Numeric Character Select relays by R55 Sign points. Therefore, the two bits that will be recorded in the digit sign position of the specified word are a zero bit and a six bit, which is a minus sign.

7.3.03 Plus Sign

If a plus sign is wanted in the Digit Sign Position of a specified word, a typewriter space operation is intiated. The spacing operation, in effect, (1) spaces the format tape over the tape column specifying the DS position, and, (2) leaves that particular DS position on the drum blank. If no other sign is typed at a later time, A blank DS position will be present on the transfer of the word from the drum to the Word Buffer Register.

The blank DS positions in words two through ten are sensed and plus signs are inserted in the following manner; The Blank Insert latch in 86.01.31 is turned ON during Word One (Control Word) time. At Digit 8 time of Word Two (When the DX position read off the drum is available for checking), the Blank Insert latch is turned OFF. The OFF output of the latch combines with a D8 pulse and a no bits pulse to activate the Sign Insert line. In 86.03.02, the Sign Insert line combines with the Transfer Timer Pulse (Xfr Timer) and the down condition of the BP Reset line to turn ON the 3 Bit and the 6 Bit latches (not labeled). The output from the Bit latches combine with a D through A pulse and activate the 3 Bit and 6 Bit line to the word buffer register.

8.0.00 DRUM OUTPUT (INQUIRY REPLY TYPING)

Transmission of an output message from the inquiry drum buffer area is initiated by means of an Inquiry Write (Reply) Command. Station and format are selected from the fourth and fifth positions of the control word. Character by character, the reply is typed (under control of the specified output format of the format tape).

When the end of the specified output format is reached (input format is sensed), the inquiry control unit is released. Any validity error occurring during the reply typing causes an asterisk to type, in red, instead of the character in error.

The operations which take place during an inquiry reply typing operation are:

1. Inquiry station is prepared for receipt of reply information.

2. Selected character is transmitted and typed.

3. Inquiry reply typing operation is ended.

8.1.00 NUMERIC OUTPUT

8.1.01 Inq Station Prepared for Receipt of Reply Info (Figures 8.1-1, 8.1-2A & 8.1-2B)

Before the typing of any reply information can be performed, the inquiry station to be used must be set up to receive and type out the information that is sent to it. When these machine preparations are completed, the transmission, and subsequent typing, of the information can take place.

To prepare the inquiry station for the receipt of reply information, the following operations must be performed:

1. Reply operation signalled by op code.

2. Synchronizer channel selected.

3. Inquiry station within previously selected synchronizer channel selected.

4. Output format selected.

Reply Operation Signalled by Op Code

Transmission of the reply information to the inquiry station is initated by an op code + 54 (Inquiry Control Reply Command - QW). The digit five position of the op code contains a "1" which designates the operation as a reply operation (refer to section 4.2.00 of this manual for op code contents. With the op code in the program register, transmission of the "1" in the digit five position of the program register to the inquiry control unit is in the form of a signal called Inq Ctrl Op Reply.

Synchronizer Channel Selected

Another signal from the digit four position of the program register, which contains a "1", is transmitted to the inquiry control unit as an Inq Ctrl Buffer 1 signal. In the inquiry control unit, the Inq Ctrl Buffer 1 signal designates the inquiry synchronizer channel 1 area (sector 5) for use during the reply operation. The two signals are then combined, resulting in a signal called Op Inq Rpy 1.

Inquiry Station Within Previously Selected Synchronizer Channel Selected

The Op Inq Rpy 1 signal combines with a TWPR Delay Off signal (on when the 7600 Character Select relays are down) and a No Proceed signal to activate a single shot in 86.01.40. The ON output from the single shot combines with a No Proceed signal at sector 4, word 9 time to turn ON the Erase Control latch in 86.01.40. The on output of the Erase Control latch (1) combines with the on output of the Erase Timer (sector 5, digit 2 until sector 6) to initiate the erasure of sector 5 (which is Inquiry drum buffer 1), and, (2) combines with an Op Inq Rpy 1 signal and a TWPR Delay Off signal at sector 5, word 6 time to turn on the Write Control latch in 86.01.60. At sector 6 time, the on output of the Write Control latch combines with Op Inq Rpy 1 and TWPR Delay Off to turn on the TWPR Select latch in 86.01.70. The ON output from the TWPR Sel latch then combines with other pulses to (1) select the specific typewriter connected to synchronizer channel 1 that is to receive the reply, and, (2) select the output format to be used while typing the reply.

The specific inquiry station which is to be used to type the reply has been previously designated by the number located in the digit five position of the control word. The control word was recorded in word 1 of the synchronizer channel 1 drum buffer area during a previous drum input operation. The TWPR Sel latch signal is used and the ON output from the latch combines with the following pulses to form the Select Numeric line: Read Write Timer (S5, W1 to S6 time), Word 1, Digit 5, and a B-D Gate. The resultant output (Select Numeric) combines with the presently available drum bit pulses to turn on the associated 7600 Numeric latches (86.01.72). If a zero bit and a one bit were read, the Zero Numeric latch and the One Numeric latch would be turned on.

Before the zero and one numeric latches pick their associated station select relays, the same gating, with one exception, is used to pick up the Zone latches. The exception is digit 4 time instead of digit 5 time. If a zero and a one bit were recorded in the digit 4 position of the word being typed, the Zero and One Zone latches would be picked.

The On outputs from the numeric latches and the zone latches pick their associated relays. The zero and one numeric latches pick the 7600 Station Select Relays (Zero numeric latch picks R103, One numeric latch picks 104). The Zero and One Zone latches pick the 7600 Zone Character Select Relays (Zero zone latch picks R65, One zone latch picks R67). The R103 and 104 points open the circuit to the 7600 Station Select Delay 2 Relay, R76, in 86.03.60. The drop of R76:

1. Picks the 7600 Station Select Delay 1 Relay, R100.

2. Picks the 7600 Line Control Relay, R93.

3. Combines with the 7600 Relays 65, 67, 103 and 104 to pick the 7600 Station Check Relay, R80, and the 7600 Line Interlock Relay, R94.

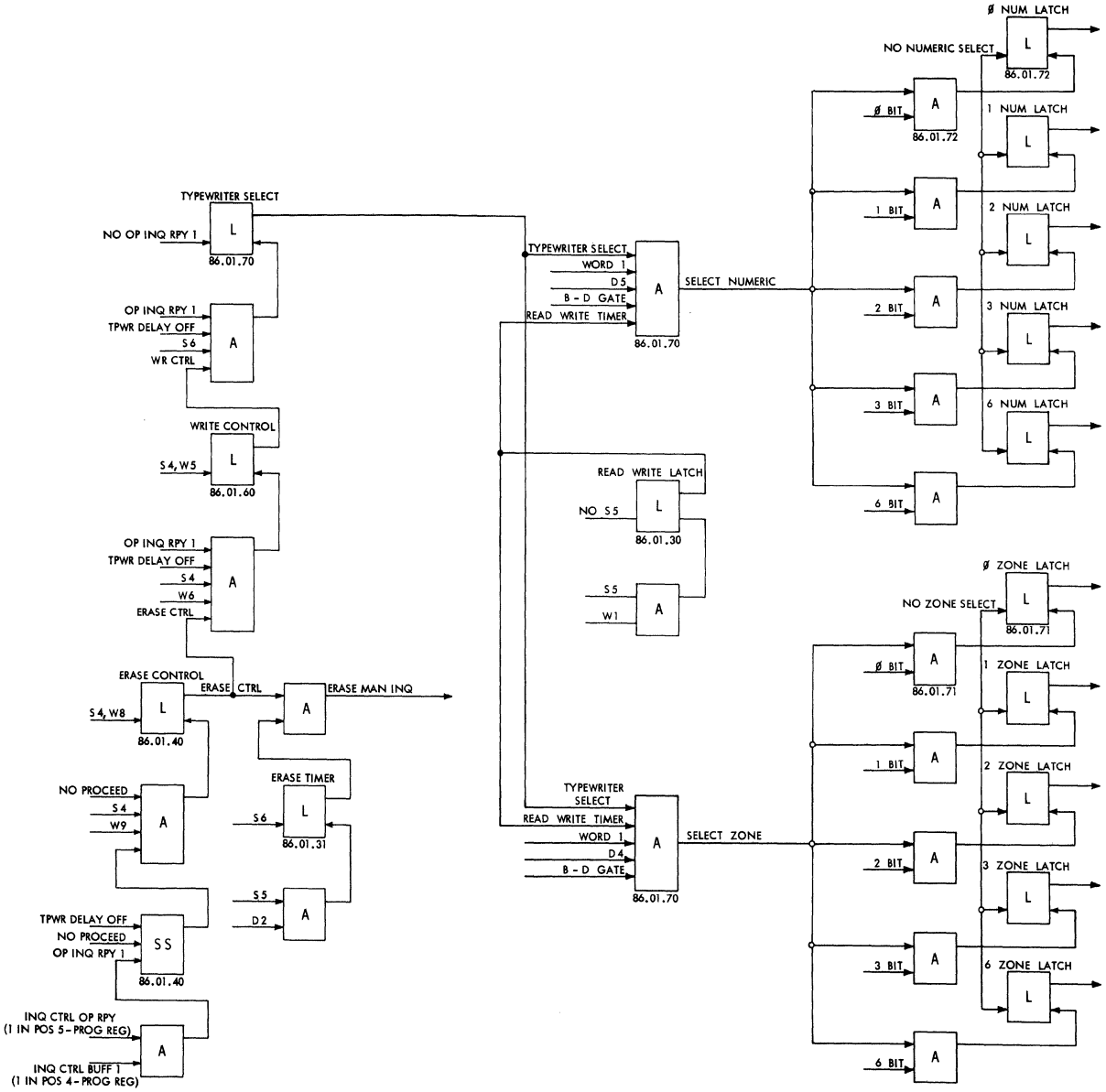


FIGURE 8.1-1 POSITIVE LOGIC CHART - INQUIRY STATION AND FORMAT SELECTION

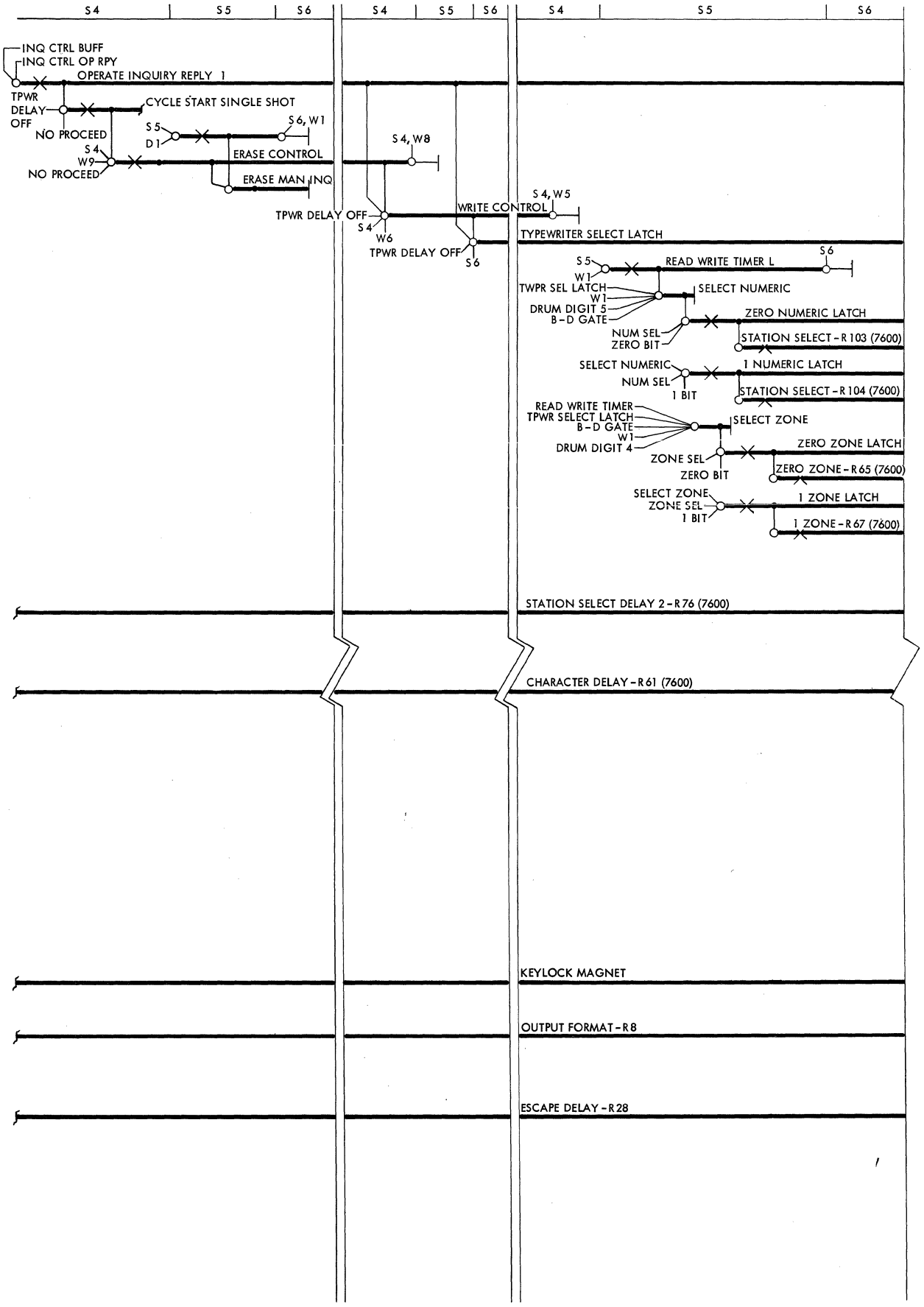


FIGURE 8.1-2A OPERATION CHART - INQUIRY STATION AND FORMAT SELECTION

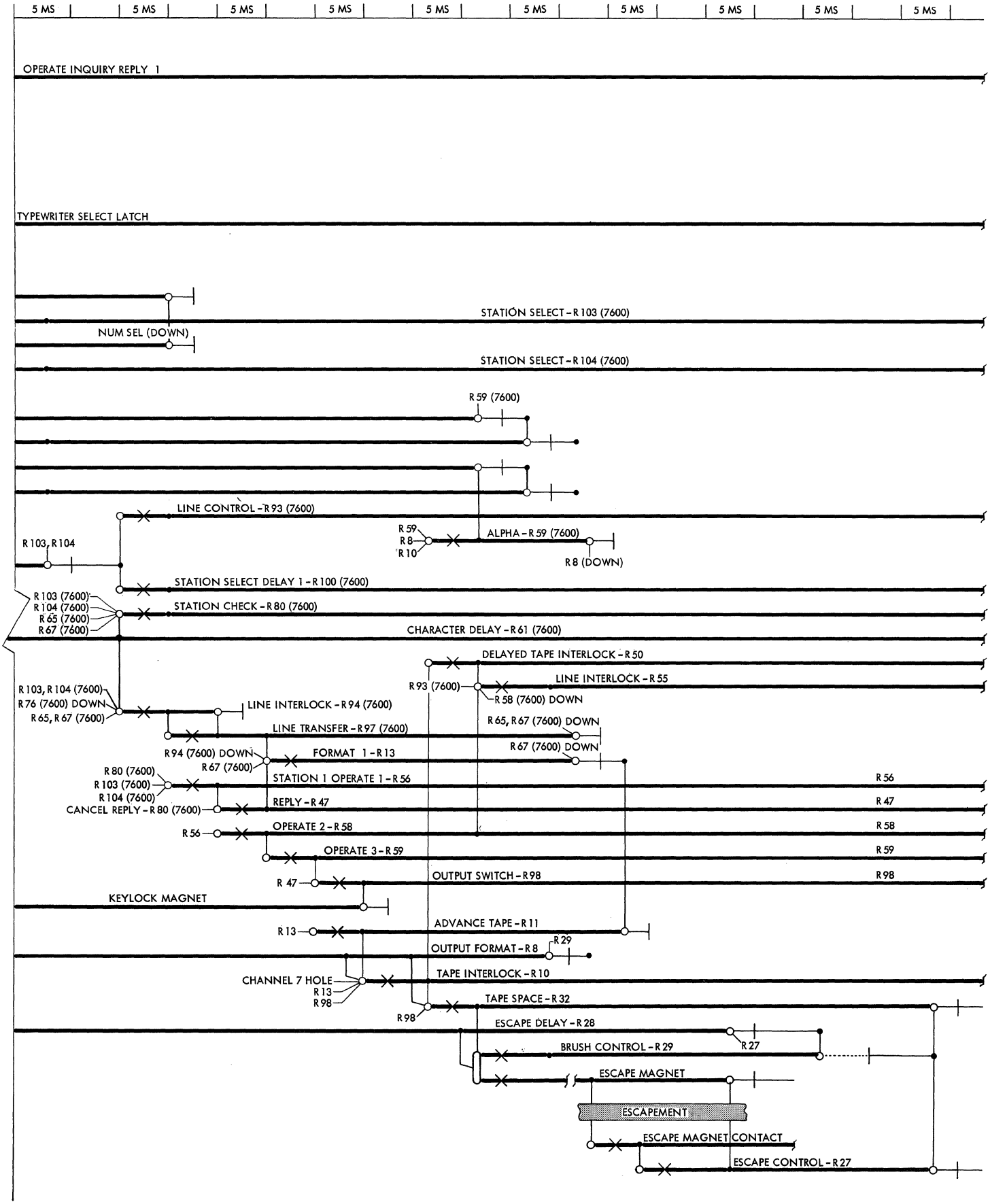


FIGURE 8.1-2B OPERATION CHART - INQUIRY STATION AND FORMAT SELECTION

R80 combines with R103 and R104 (in 86.03.10) to send a signal, called Station 1, to the 7900 inquiry station 1 which picks the Operate 1 Relay, R56 in 86.00.08. An R56 point then(1) combines with another pulse generated by the pick of R80 (7600) in 86.03.22, called Cancel Reply, to pick the Reply Relay, R47, and, (2) picks the Operate 2 Relay, R58. R58 picks the Operate 3 Relay, R59, which then combines with the previously picked R47 to pick the Output Switch Relay, R98. An R98 point opens the circuit to the Keylock manget, locking the keyboard so that no manual typing is possible during the Reply typing operation.

The transfer of the R80 points in 86.03.30 drops the Numeric Select Signal line. The drop of the Numeric Select signal turns off the zero and one numeric latches in 86.01.72.

Output Format Selected

The format tape is already positioned at one of the three possible output formats. If the positioned output format is not the one to be used, the format tape is advanced until the designated output format is sensed. The format tape is then advanced one more tape column so that the word and digit position of the first character to be typed can be read from the format tape.

It was previously stated that the drop of the 7600 R76 picked the 7600 Line Interlock Relay, R94. R94, in turn, picks the 7600 Line Transfer relay, R97. As soon as the R97 points transfer, a pulse is initiated in 86.03.20 through a zone character select relay point (in this case, R67) to go to the 7900 and pick the Format 1 Relay, R13 (86.00.14). R13 picks the Advance Tape Relay, R11, which then combines with other conditions to pick the Tape Interlock Relay, R10.

R10 combines with R8 and R98 points to pick the Tape Space Relay, R32. R32 initiates a tape spacing operation, as previously described in Section 6.2.00 of this manual. In addition, the Line Inlk, In-Out Line (86.03.21) furnishes a pulse which picks the Line Interlock Relay, R55, through an R58 and an R50 point (86.00.06). As soon as the tape spacing operation is completed, the Reply typing operation may start.

8.1.02 Selected Character is Transmitted and Typed (Figure 8.1-3)

Information transferred from the 7070 system to the drum is recorded on the drum two digits early. Therefore, reading information from the drum during a reply operation is on time. As the selected character is read from the inquiry drum buffer area, it is validity checked and then picks two 7600 relays. The picked relays are used to energize the specified two out of five character lines which go to the previously selected inquiry station. The energized character lines pick two 7900 relays which then energize the print magnet. Energizing the print magnet activates the letter cam, initiating the typing cycle. The typewriter keyboard is locked up to prevent manual typing. The operations which take place during the transmission and typing of the reply character are:

1. Selected character is transmitted to inquiry station.

2. Selected character is typed.

3. Format tape advanced and circuits readied for transmitting next character.

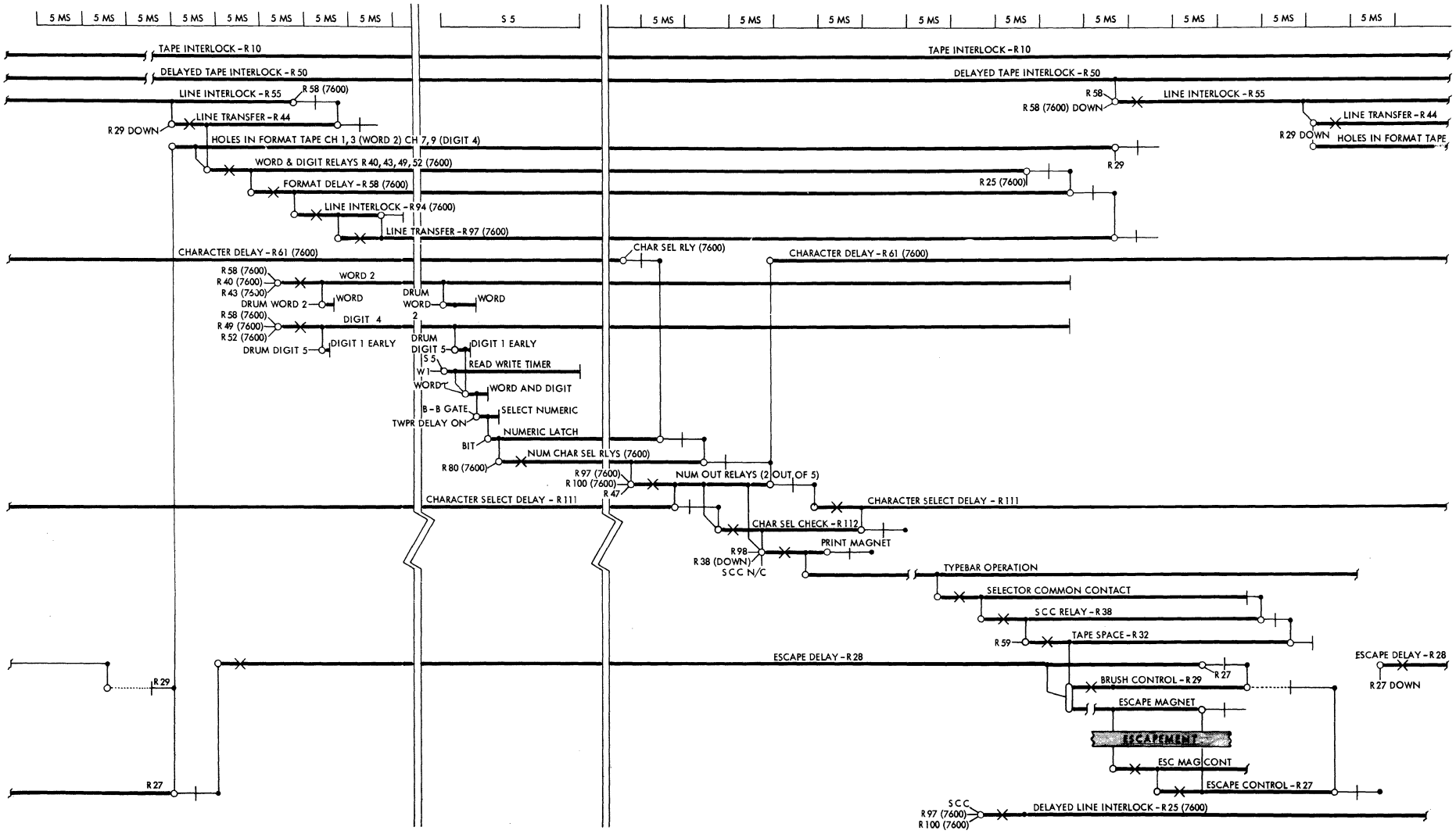


FIGURE 8.1-3 OPERATION CHART - TRANSMISSION AND TYPING OF REPLY CHARACTERS

Selected Character is Transmitted to Inquiry Station

The word and digit drum location of the character to be transmitted for typing is designated by the format tape. Tape channels 1-5 designate the specific word to be used in the inquiry drum buffer area. Tape channels 6-10 designate the specific digit, within the already specified word, which is to be transmitted for typing.

The last operation performed during the preparatory operation of the inquiry station was the picking of the Tape Interlock Relay, R10. R10 initiated (1) the tape spacing operation, and, (2) the picking of the circuitry needed to transfer the first format tape word and digit location to the inquiry control unit. R10 picked the Delayed Tape Interlock Relay, R50; which, in turn, combined with other conditions to pick the Line Interlock Relay, R55. R55 then picks the Line Transfer Relay, R44.

As soon as the Brush Control Relay, R29, drops, near the end of the tape spacing operation, the holes in the format tape are transmitted to the 7600 relay chassis. If the format tape contained holes in channels 1, 3 (word 2), 7 and 9 (digit 4), the 7600 Word Relays 40 and 43 and the 7600 Digit Relays 49 and 52 would be picked. The 7600 Word Relays, in turn, pick the 7600 Format Delay Relay, R58. R58:

1. Drops the 7900 Line Interlock Relay, R55.

2. Allows a validity checking operation to take place.

3. Picks the 7600 Line Interlock relay, R94.

4. Initiates the word and digit gating.

The details of 1, 2, 3 and 4 are exactly as previously described in section 7.1.01 of this manual.

The development of the necessary word and digit gating changes after the word pulse and the digit 1 early pulse are gated through the Read Write Timer. The resultant output is a S5, W2, D5 pulse which combines with a B to D Gate and a Typewriter Delay On signal in 86.01.70 to generate a Select Numeric Pulse. The Select Numeric Pulse combines with the actual drum bit pulse which sets the associated numeric latches in 86.01.72.

The output of the numeric latches picks the 7600 Numeric Character Select relays since the 7600 Station Check relay, R80, is still picked. The picked Numeric Character Select relays which are validity checked in 86.03.62, activate two circuits in 86.03.20 which pick up the associated Numeric Out relays in the 7900 (section 86.00.14).

Selected Character is Typed

The picking of the Numeric Out relays in the 7900 initiates (1) a validity checking operation, and (2) the selection of a typewriter print magnet. The picking of two numeric out relays (two out of five representation of character) cause the drop out of the Character Select Delay Relay, R11, in 86.00.20. The same two numeric out relays then combine with the down condition of R111 to pick the Character Select Relay, R112. R112 then combines the same two numeric out relays, and other conditions, to pick the print magnet. The energization of the print magnet activates the letter cam and initiates the typing of the character.

Format Tape Advanced and Circuits Readied for Transmitting Next Character

During the typebar flight, and before the character is typed, the Selector Common Contact (SCC) closes. The closing of the SCC initiates (1) a one tape column space operation, and, (2) the picking of the circuitry needed to transfer the new format tape word and digit location to the inquiry control unit.

Format Tape is Advanced. The SCC picks the SCC relay, R38, which, in turn, combines with an Operation 3 relay, R59, to pick the Tape Space relay, R32. The spacing operation is carried out as described in section 6.2.00 of this manual.

Pick Word and Digit Transfer Circuits. The same combination of R59 and R38 also sends a signal, called SCC (86.00.05), to the 7600 where it picks the 7600 Delayed Line Interlock relay, R25 (86.03.21). R25 causes the drop out of the 7600 Word and Digit relays. The dropping out of the 7600 Word and Digit relays cause (1) the end of the Word 2 and Digit 4 signals, and, (2) the dropping of the 7600 Format Relay, R58. The drop of R58 then:

1. Causes the drop of the 7600 Line Transfer Relay, R97.

2. Combines with the 7900 Operation 2 Relay, R58, and the Delay Tape Interlock Relay, R50, to repick the Line Interlock Relay, R55.

As soon as the tape space operation is completed, the down condition of R29 (1) combines with R55 to pick the Line Transfer Relay, R44, and, (2) allows the holes in the format tape to be read and initiates the selection of the next character to be typed.

8.1.03 Inquiry Reply Typing Operation is Ended (Figure 8.1-4)

A tape space operation is initiated near the end of every reply character typing cycle. As the last reply character is typed the format tape is advanced to the next tape column (contains a hole in channel 13). A channel 13 hole signifies the beginning of an input format and the the end of the reply operation.

As soon as the 13 hole is sensed, the Input Format relay, R7, is picked. In 86.00.07, R7 combines with R10 and R58 to generate a signal, called End of Reply, which is sent to the 7900 relay chassis. In 86.03.22 the End of Reply signal picks the 7600 End of Reply Relay, R92. R92 causes the drop of:

1. the 7600 Station Check relay, R80

2. The 7600 Station Select relays, R103 and R104

The drop of R103 and R104 causes (1) the pick of the 7600 Station Select Delay 2 relay, R76, and, (2) the drop of the Operate 1 relay, R56.

Station Select Delay 2 Relay Picked

The transfer of the R76 points cause the dropout of (1) the 7600 Station Select Delay 1 Relay, R100, and, (2) the 7600 Line Control Relay, R93. R93, when dropped, opens up the line to the hold of the 7900 Line Interlock Relay, R55. R55, in turn, causes the drop of the Line Transfer Relay, R44.

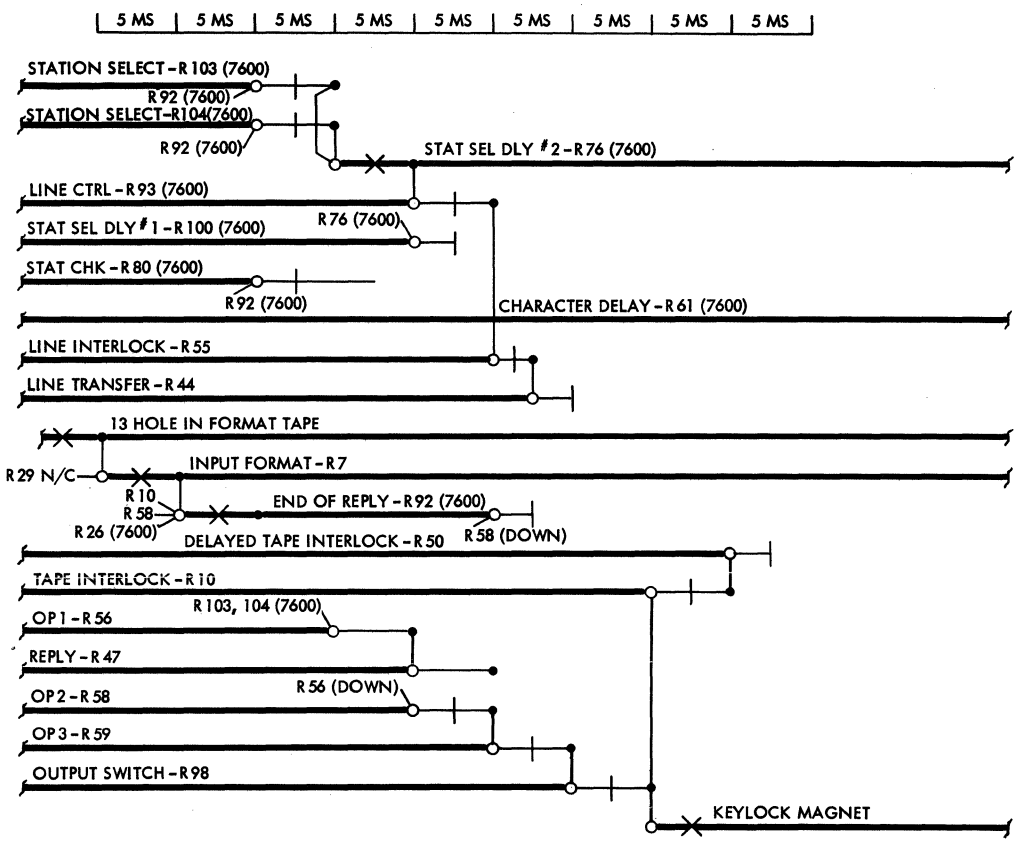


FIGURE 8.1-4 OPERATION CHART - END OF REPLY TYPING

Operate 1 Relay Dropped

The dropping out of R56 causes the drop out of (1) the Reply Relay, R47, and, (2) the Operate 2 Relay, R58. The drop of R58 causes the dropout of:

1. The 7600 End of Reply Relay, R92.

2. The Operate 3 Relay, R59.

R59 causes the drop out of the Output Switch Relay, R98. R98, in turn, (1) picks the Keylock magnet (allows manual typing), and, (2) drops the Tape Interlock Relay R10. R10 then causes the dropout of the Delayed Tape Interlock Relay, R50.

8.2.00 ALPHABETIC OUTPUT

When the 7900 is in the output format, the sensing of a channel 11 hole in combination with other channel holes (word and digit coding) designates the character about to be typed as alphabetic. During alphabetic character typing operations, only the odd digit positions of the designated word in the output buffer are specified by the format tape. The zone portion of an alphabetic character, which is stored in the adjacent even digit position, is read out automatically.

The alphabetic characters are checked for validity and sent to the selected inquiry station for typing. The sequence of operation for typing an alphabetic character during an output operation takes place as follows:

1. Sensing of channel 11 Hole in Format Tape Sets Up Alphabetic Operation.

2. Numeric Portion of Alphabetic Character Read From Drum.

3. Zone Portion of Alphabetic Character Read From Drum.

4. Alphabetic Character Validity Checked and Typed.

5. Advance Format Tape and Set Up Next Typing Cycle.

Channel 11 Hole Sets Up Alphabetic Operation

The sensing of a punched hole in channel 11 of the format tape picks the 7900 Alpha Relay, R96. An R96 point then combines with an R10 point and an R59 point to activate the Alph-Reply-Inlk line to the 7600 relay chassis and pick the Alpha Relay, R59, in 86.03.22. Picking R59 activates the Alpha line in 86.03.41 which becomes the Zone Select line in 86.01.05. The Zone Select line is used to keep the zone latches energized when turned on by the bits read off the Drum.

Numeric Portion of Alphabetic Character Read From Drum

The numeric portion of the alphabetic character to be read off the drum is specified by the format tape. The gating is as shown in Figure 8.1-3 of this manual.

Zone Portion of Alphabetic Character Read From Drum

The gating necessary to read the zone portion of the alphabetic character from the adjacent even drum digit position is a combination of the following signals:

Zone Select. Signal originating from sensing of channel 11 Hole in format tape.

TPWR Delay On. Signal originating from pick of station select relays, which are held until reply operation is ended.

Word and Digit 1 Late. Pulse is generated from original word and digit gating which was used to read the numeric portion of the character and is available 1 drum digit time later.

B-D Gate. Gated pulse generated from drum timing.

Alphabetic Character Validity Checked and Typed

The On output of the zone latches pick their corresponding zone character select relays in 86.03.50. The 7600 two-out-of-five validity checking of the alphabetic character bits (both zone and numeric portion) is accomplished in much the same manner as done for a numeric character.

The picked numeric character select relays (2 of 5) and zone character select relays (2 of 5) initiate circuits in 86.03.20 to the 7900 relay chassis where the corresponding numeric out relays and zone out relays are picked. The 7900 out relays initiate (1) a two-out-of-five validity check operation in 86.00.19 and, (2) the selection of the alphabetic character typewriter print magnet.

Advance Format Tape and Set Up Next Typing Cycle

The advancing of the format tape and the dropping of various relays in preparation for the next typing cycle occurs exactly as previously described in the Numeric Output Section (8.1.00) of this manual. In addition, the advancing of the format tape drops the 7900 Alpha Relay, R96, and all its associated circuitry in the 7600.

8.3.00 SIGN OUTPUT

Before any sign can be read from the drum and typed, the gating necessary to read that digit sign position must be originated. The holes in format tape channels 1-5 specify the word which is to be used. The actual processing of the format tape channel holes is exactly as previously described in section 7.1.01 of this manual.

The DS position is specified by sensing holes in format tape channels 7, 8 and 11. The channel 11 hole picks the 7900 Alpha Relay, R96. An R96 point then combines with an R10 point and an R59 point to activate the Alph-Reply-Inlk line to the 7600 relay chassis and pick the 7600 Alpha Relay, R59, in 86.03.22. In 86.03.41, R59 combines with R49 and R50 (picked from 7 and 8 holes in format tape) to pick the 7600 Sign relay, R55. R55, when picked, then combines with an R49 and an R50 point to activate the Sign Digit line in 86.03.41. The Sign Digit line combines with a Drum DX pulse in the electronic chassis to activate the Digit 1 Early line. The Digit 1 Early line then combines with Word and the On output of the Read Write Timer, resulting in an output called Word and Digit. The Word and Digit line combines with TWPR Delay On and a B-D Gate to bring up the Select Numeric line. It is the Select Numeric line timing that isolates the digit sign bits from the other bits being read off the drum.

8.3.01 Alpha Sign

The reading of an alpha sign causes an error condition, resulting in the typing of a red asterisk and the illumination of the Cancel Key Light.

The bits which represent an alpha sign are the zero and three bits. The reading of these bits from the drum pick the associated numeric character select relays in the 7600 which, in turn, pick the zero and the three numeric out relays in the 7900. In 86.00.19, the zero and the three numeric out relay points cause the Character Select Delay relay, R111, to drop. The Alpha relay, R96, has previously been picked when the hole in channel 11 of the format tape was sensed. Therefore, a circuit is established in 86.00.19 through the normally open R96 point, the normally closed zone out relay points and the R111-1 N/C point to pick the Error Relay, R113, in 86.00.04.

Since the Character Select Check relay, R112, was not picked, there is a circuit in 86.00.21 through R112-2 N/C and R113 N/O to energize the Asterisk print magnet. In 86.00.18, the pick of R113 also results in the energizing of the Color Control detent, shifting the ribbon from black to red. With the ribbon shifted and the asterisk print magnet energized, a red asterisk is typed.

During the typing operation, the Selector Common Contact (SCC) Closes and picks the SCC relay, R38. R38 combines with other points to pick the Color Control Transfer magnet. Since the Color Control detent magnet is still energized, the combination of the two magnets shift the ribbon back from red to black.

8.3.02 Minus Sign

The drum bits which represent a minus sign are the zero and six bits. Reading these bits from the drum pick the associated numeric latches, followed by the picking of their associated numeric character select relays (in this case, R83 and R89).

As previously mentioned, the 7600 Sign Relay, R55, is picked whenever the Digit Sign position is specified by the format tape. R55 points are used in 86.03.20 to convert the Zero Numeric line into a Zero Zone line and a Three Zone line which travel to the 7900 and pick the Zero Zone Out Relay, R101, and the Three Zone Out Relay, R105. Other R55 points convert the Six Numeric line into a One Numeric line and a Two Numeric line which travel to the 7900 and pick the One Numeric Out Relay, R84, and the Two Numeric Out Relay, R87.

A two-out-of-five validity check is performed and a combination of the picked Out Relay points pick the Dash print magnet in 86.00.25.

8.3.03 Plus Sign

The drum bits which represent a plus sign are the three and six bits. Reading these bits from the drum picks the associated numeric latches, followed by the picking of their associated numeric character select relays (in this case, R88 and R89).

As previously mentioned, the 7600 Sign relay, R55, is picked whenever the digit sign position is specified by the format tape. R55 points are used in 86.03.21 to convert the Three Numeric line into a One Zone line and a Two Zone line which travel to the 7900 and pick the One Zone Out Relay, R102, and the Two Zone Out Relay, R104. Other R55 points convert the Six Numeric line into a One Numeric line and a Two Numeric line which travel to the 7900 and pick the One Numeric Out Relay, R84, and the Two Numeric Out Relay, R87.

A two-out-of-five validity check is performed and a combination of the picked Out Relay points activate a line in 86.00.25 which energizes the Space magnet in 86.00.18. A typewriter space operation is initiated which causes, in turn, a format tape space operation.

8.4.00 VALID CHARACTER WITH NO CORRESPONDING TYPE BAR

There are a number of special characters which have valid numeric coding, but do not have corresponding type bars. If one of these characters is sent to be typed, no type bar magnet is impulsed. A red pound sign is typed, however, to bring attention to the condition.

In 86.03.62, the circuit to the 7600 Character Timer Relay, R110, is opened whenever the 7600 Format Delay Relay, R58, is picked. R110 has a long dropout, and under normal operating conditions is never fully dropped. If the format tape is not advanced as a result of a typing cycle, R58 remains picked and allows R110 to dropout. A circuit is then initiated through the 110-1 N/C point to pick the 7600 Error Relay, R32. With R32 picked, a line called Error-Release is activated in 86.03.22 and picks the 7600 Error Relay, R113 in 86.00.08. With R113 and the Char Sel Check relay, R112, picked at the same time, it is possible to pick the Pound Sign type bar magnet in 86.00.25. The ribbon change is accomplished as previously described.

9.0.00 MISCELLANEOUS CIRCUITS

9.1.00 CONTROL WORD ENTRY

Numeric information can be emitted from the format tape into word 1 of the input drum buffer area by using the control word designation (channel 12 punch while in input format). Channels 1-5 of the format tape become a digit emitter while the digit position is designated by channels 6-10.

The control word entry operation is performed as follows:

1. Channel 12 hole sets up control word circuitry and locks up keyboard.
2. Zero numeric and one numeric lines activated for word one designation.
3. Numeric information emitted by tape channels 1-5.
4. Format tape space operation.

Channel 12 Hole Sets Up Control Word Circuitry and Locks Up Keyboard

A format tape space operation advances the format tape into a tape column containing a punch in channel 12. As the tape space operation ends, the sensing of the channel 12 hole picks the Control Word relay, R41 in 86.00.16. The R41-1 point opens the circuit to the Keylock magnet in 86.00.18, locking the keyboard as long as R41 is picked.

Zero Numeric and One Numeric Lines Activated for Word One Designation

With R41 picked, the circuit from channel 1-5 brushes to the 7600 is open and no transmission can take place. Instead, R41 points in 86.00.13 activate the Word Zero and Word One lines which travel to the 7600 and furnish the Word One gating. The digit gating is processed from the channel 6-10 holes in the format tape. The development of the digit gating is done as described in Numeric Input (section 7.0.00) of this manual.

Numeric Information Emitted by Tape Channels 1-5

With processing of the word and digit gating, the 7900 Line Interlock relay, R55, and Line Transfer relay, R44, are dropped (Refer to Figure 7.1-1). As soon as the R44 points are fully dropped, the numeric lines activated by holes in channels 1-5 pick the associated Numeric Select Relays in the 7600 (86.03.20). Also the Three and Six Zone lines are activated by a circuit in 86.00.12, which pick the Zone Character Select Relays in 86.03.20.

Format Tape Space Operation (Refer to Figure 7.1-2)

The format tape space operation is started after the recording and checking of the character is completed. As soon as the 7600 Line Transfer Relay, R97, drops, a circuit from the 7600 to the 7900 through the SCC Line and an R38 point and an R41 point picks the Tape Space Relay, R32, in 86.00.06. The SCC Relay, R38, had previously been pickd in 86.00.05 when the 7900 Interlock relays (R44 and 55) dropped.

9.2.00 ZERO SUPPRESSION

When the 7900 Inquiry Station is operating under output format control, the sensing of a hole in channel 12 suppresses the typing of any zeros until one significant character is typed.

In 86.00.16, the sensing of a channel 12 hole, when in output format (R98 picked), energizes the Zero Suppression Relay, R117. R117 holds through the normally closed Selector Common Contact. In 86.00.24, the circuit to the Zero print magnet is opened by a N/C R117-2 point. In this manner, the circuit to the zero print magnet is kept open until R117 is dropped.

A circuit is completed through the normally open R117-2 point to the Space magnet, initiating a typewriter space operation. During the space operation, the Space Bar Contact close, picking the Space Bar Relay, R20. Through an R20 point in 86.00.05, a circuit is completed to the Tape Space Relay, R32, initiating a format tape space operation.

9.3.00 CARRIAGE RETURN OPERATION

The sensing of a hole in channel 15 of the format tape initiates an automatic carriage return operation by picking Carriage Return Format Relay, R23. An R23 point combines with an Op 1 R56 point to pick the Carriage Return Tab Delay Relay, R25. An R25 point then combines with an R23 point to energize the Carriage Return magnet. The carriage return mechanical linkage performs the operation. As the operation is performed, the carriage return interlock contact closes and picks the Carriage Return Interlock relay, R24. An R24 point picks the Key Escape Interlock relay, R26, which, in turn, causes the drop of R25, the Carriage Return magnet and the Keylock magnet. The carriage return interlock contact opens as the carriage reaches the left hand margin. R24 then drops and combines with R23 and R26 points to pick the Tape Space relay, R32.

9.4.00 TABULATE OPERATION

The sensing of a hole in channel 16 of the format tape initiates an automatic tabulate operation by picking the Tab Format Relay, R21. An R21 point combines with an Op 1 R56 point to pick the Carriage Return Tab Delay Relay, R25. An R25 point then combines with an R21 point to energize the Tab magnet. The tabulate mechanical linkage performs the operation. As the operation is performed, the tab interlock contact closes and picks the Tab Interlock Relay, R22. An R22 point picks the Key Escape Interlock relay, R26, which, in turn, causes the drop of R25, the Tab magnet and the Keylock magnet. The tab interlock contact opens as the carriage reaches the next tab stop. R22 then drops and combines with R21 and R26 points to pick the Tape Space Relay R32.

9.5.00 TYPEWRITER SPACE OPERATION

The sensing of holes in both channels 15 and 16 of the format tape initiates an automatic typewriter space operation and spaces the format tape one tape column.

The sensing of channel holes pick their associated relays (15 hole picks R23, 16 hole picks R21). Either R23 or 21 pick the CR Tab relay, R25. R25 then combines with R21 and R23 to pick the Space magnet. Energizing the space magnet operates the mechanical linkage which performs the space operation. During the spacing operation, the Space Bar Contact and Space Cam Contact close, picking the Space Bar Relay, R20. An R20 point picks the Tape Space Relay, R32, advancing the format tape one column.

9.6.00 SHORT FIELD ENTRY

The short field feature permits the entry of variable length information into a specific length field. If the field is not completely filled, a depression of the Tab key results in (1) the movement of the typewriter carriage to the next tab stop and, (2) the advancement of the format tape to one tape column beyond the first channel 16 hole encountered. The operation is performed in the following steps:

1. Depression of Tab key initiates tab operation and locks up keyboard.

2. Format tape advanced until channel 16 hole is sensed.

3. Format tape advanced one more tape column.

Depression of Tab Key Initiates Tab Operation and Locks Up Keyboard

Depression of the Tab key results in the mechanical linkage performing a tab operation until the next tab stop is encountered. The Tab Interlock Contact closes during the tab operation, picking the Tab Interlock Relay, R22. R22 picks the Key Escape Interlock Relay, R26, which, in turn, drops the keylock magnet and locks the keyboard.

Format Tape Advanced Until Channel 16 Hole is Sensed

As soon as R26 is picked, a circuit is completed to pick the Tape Space relay, R32. The format tape advances until a channel 16 hole is sensed. The sensing of a channel 16 hole picks the Tab Format Relay, R21.

Format Tape Advanced One More Tape Column

R21 points (1) open one of the circuits to pick R32, (2) open the circuit to R22, and (3) combine with R22 in its down condition and R26 to pick the Tape Space relay, R32, and advance the format to the next column.

9.7.00 COLOR CONTROL

If a validity error is detected during a drum output operation, a red pound sign (#) is typed instead of the character in error. Two magnets are used to position the color control mechanism. Energizing the Colro Control Detent magnet causes the ribbon to shift from black to red. To transfer the ribbon back to black, it is necessary to energize both the Color Control Detent magnet and the Color Control Transfer magnet.

The 7900 Error Relay, R113, is picked whenever a validity error is detected. An R113 point picks the Color Control Detent magnet in 86.00.18, shifting the ribbon from black to red.

During the error (#) typing operation, the selector common contact (SCC) closes and picks the SCC relay, R38. R38 then combines with other points to energize the Color Control Transfer magnet. Since the Color Control Detent magnet is still energized, the combination of the two magnets shift the ribbon back from red to black.

Section 8.4.00 also describes a Color Control operation. In this instance, a red pound sign (#) signifies the presence of a valid character, but no corresponding type bar.

9.8.00 LAP SKIP

The end of a punched format tape (where the lap is located) must end with the turn off of the output format relays. In the tape column following the end of the output format punching is Lap Skip channel punching. The punching consists of a channel 12 and 13 hole which (1) drop the output format (Reply) relays, and, (2) cause the format tape to space one tape column. The actual skipping over the lap is done by a depression of one of the format keys.

Sensing the channel 13 hole picks the Input Format Relay, R7, and starts the dropping out of the output format relays. Sensing the channel 12 hole activates a line through an R7 point and picks the Tape Space Relay, R32, in 86.00.06.

9.9.00 INPUT FORMAT END

The sensing of holes in both channels 13 and 14 causes the end of the Input operation, but does not initiate an Output operation.

Sensing the channel 13 hole picks the Input Format Relay, R7; sensing the channel 14 hole picks the Output Format Relay, R8.

Circuitry to Release the typed Input can be picked and the processing can take place. The circuitry normally used to set up the station for a reply operation is not available. The R7-4 N/C point, now open, in 3B keeps the 7600 Reply Interlock circuitry from picking up.

9.10.00 ERROR CONDITIONS

9.10.01 Input Errors

There are eight types of errors which may occur during a drum input operation. The eight areas in which errors may occur are:

1. Drum Error During Development of Proceed Signal
2. Word and Digit Validity Error
3. Typed Character Coding Validity Error
4. Recorded Drum Character Validity Error
5. Type Alphabetic Character While In a Numeric Field
6. Digit Sign Typing Error
7. Depress Release Key Before Output Format is Sensed
8. Additional Typewriter Key Depression After Output Format is Sensed

Drum Error During Development of Proceed Signal

In section 6.4.00 of this manual, the method of developing the Proceed signal was discussed. The Proceed light was turned on if Sector 5 of the drum after being erased,

was completely free of all bits. If any bits were still present, the Error latch was picked in 86.01.54. The ON output of the Error latch then picks the 7600 Error Relay, R32, in 86.03.30. R32, in turn, picks the 7900 Error Relay, R113, in 86.00.08 and R113 turns on the Cancel Key light in 86.00.16.

Word and Digit Validity Error

The word and digit channel punching from the format tape picks the associated word and digit relays in the 7600 relay chassis. In 86.03.61, these word and digit relays are checked to see that two, and only two, of each group of relays are picked. Any condition other than the correct condition picks the 7600 Error relay, R32, the 7900 Error relay, R113, and illuminates the Cancel Key light.

Typed Character Coding Validity Error

The typed character bit lines pick the numeric and zone character select relays in 86.03.20. The validity of the character represented by the picked character select relays is verified in 86.03.62. An invalid condition picks the 7600 Error Relay, R32, the 7900 Error Relay, R113, and illuminates the Cancel Key light.

Recorded Drum Character Validity Error

The typed character recorded on the drum is read off the drum the revolution following its recording and validity checked. The recorded bits are matched against the original bit lines, which are still active (86.01.10). An error condition, called Numeric line, picks the Error latch in 86.01.54. The ON output of the Error latch picks the 7600 Error Relay, R32, the 7900 Error Relay, R113, and illuminates the Cancel Key light.

Type Alphabetic Character While in a Numeric Field

The depression of an alphabetic character typewriter key in a numeric field is detected in the 7600 relay chassis. When a numeric character is typed, the zone portion of its two digit coding is a nine. Therefore, the 7600 three zone and six zone character select relays are picked. The circuit in 86.03.62 through 33-6 N/O, 70-3 N/C, 71-5 N/C in parallel, 59-4 N/C, 61-2 N/C, 36-1 N/C to the hold coil of the 7600 Error Relay R32, is not available. If other than a nine zone coding occurs, the 7600 Error Relay, R32 is picked. R32 picks the 7900 Error Relay, R113, which illuminates the Cancel Key light.

Digit Sign Typing Error

When the digit sign position of a word is specified by the format tape, only a dash key depression or a typewriter space operation will be considered as a valid operation. The depression of any other typewriter character key picks its associated character select relays in the 7600. The picked character select relay points complete a circuit in 86.03.62 which picks the 7600 Error Relay, R32. R32, in turn, picks the 7900 Error Relay, R113, in 86.00.08. R113 illuminates the Cancel Key light in 86.00.16.

Depress Release Key Before Output Format is Sensed

A depression of the Release key before the Output Format relay, R8 (Hole in chan-

nel 14 of Format Tape), is picked,results in the picking of the Error Relay, R113, in 86.00.04 and the illumination of the cancel key light.

Additional Typewriter Key Depresssion After Output Format is Sensed

When a channel 14 hole is sensed in the format tape, the Output Format Relay, R8, is picked in 86.00.16. Another typewriter key depression with R8 energized picks the 7900 Error Relay, R113, in 86.00.04 through the normally open R38-1 point (closed during a typing cycle) and an R8 point in 86.00.16. An R113 point illuminates the cancel key light.

9.10.02 Output Errors

There are five types of errors which may occur during an Output (Reply) operation from the drum. The five areas in which errors may occur are:

1. Station Select Error
2. Word and Digit Validity Error
3. Character Validity Error-Numeric & Zone Character Select Relays
4. Character Validity Error-Numeric & Zone Out Relays
5. Absence of Bits

Station Select Error

The 7600 Station Error Relay, R112, can be picked in 86.03.60 under the following conditions:

1. Station number read from drum is invalid.
2. Station 2, 3, 4 or 5 is programmed but not plugged in.

Word and Digit Validity Error

The word and digit channel punching from the format tape picks the associated word and digit relays in the 7600 relay chassis. In 86.03.61, these word and digit relays are checked to see that two, and only two, of each group of relays are picked. Any condition, other than the correct condition picks the 7600 Error Relay, R32, and the 7900 Error Relay, R113. With R113 picked, R112 can not pick; therefore, any character read from the drum is not typed, but a red asterisk is typed instead.

Character Validity Error - Numeric and Zone Character Select Relay

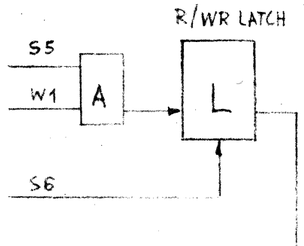
As the coded character enters the 7600 relay chassis, the associated numeric and zone character select relays are picked in 86.03.50. The validity of the picked relays is verified in 86.03.62. An invalid condition picks the 7600 Error Relay, R32, the 7900 Error Relay, R113, and results in the typing of a red asterisk.

Character Validity Error - Numeric and Zone Out Relays

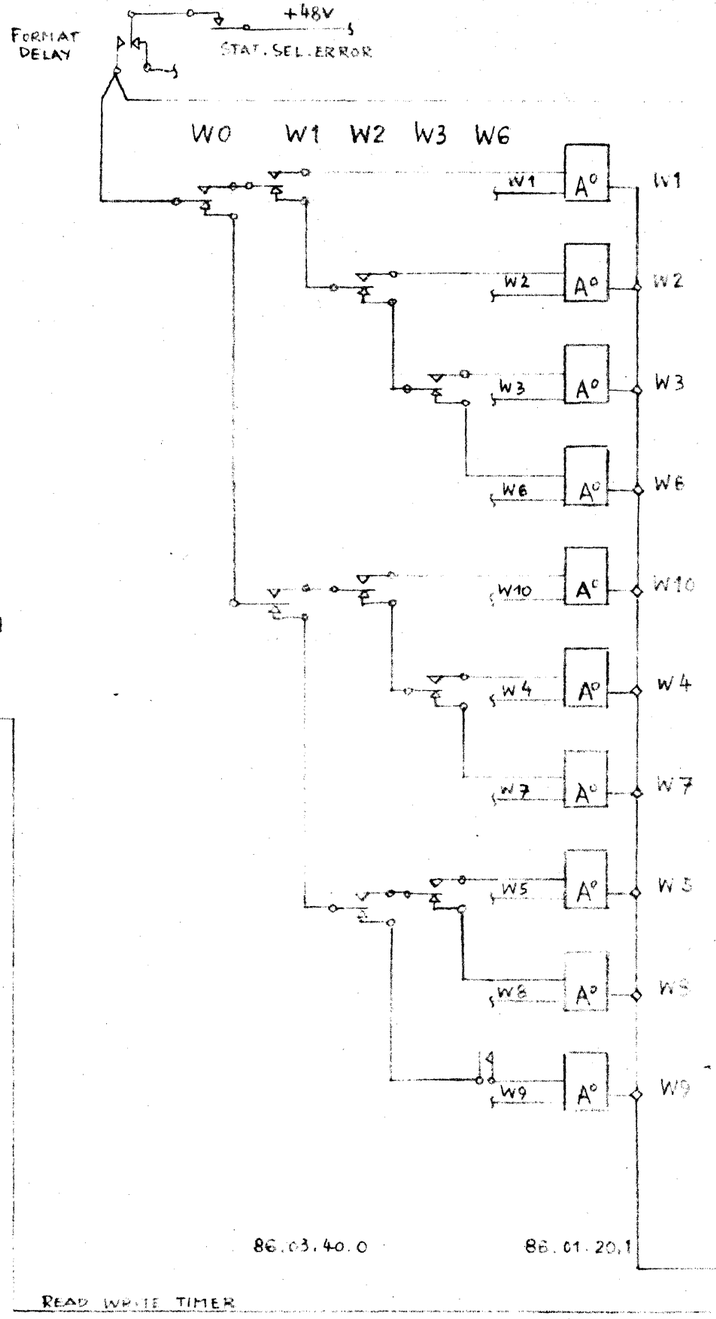
As the coded character enters the 7900 relay chassis, the associated numeric and zone out relays are picked in 86.00.14. The validity of the picked relays is verified in 86.00.20. An invalid condition picks the 7900 Error Relay, R113, and results in the typing of a red asterisk.

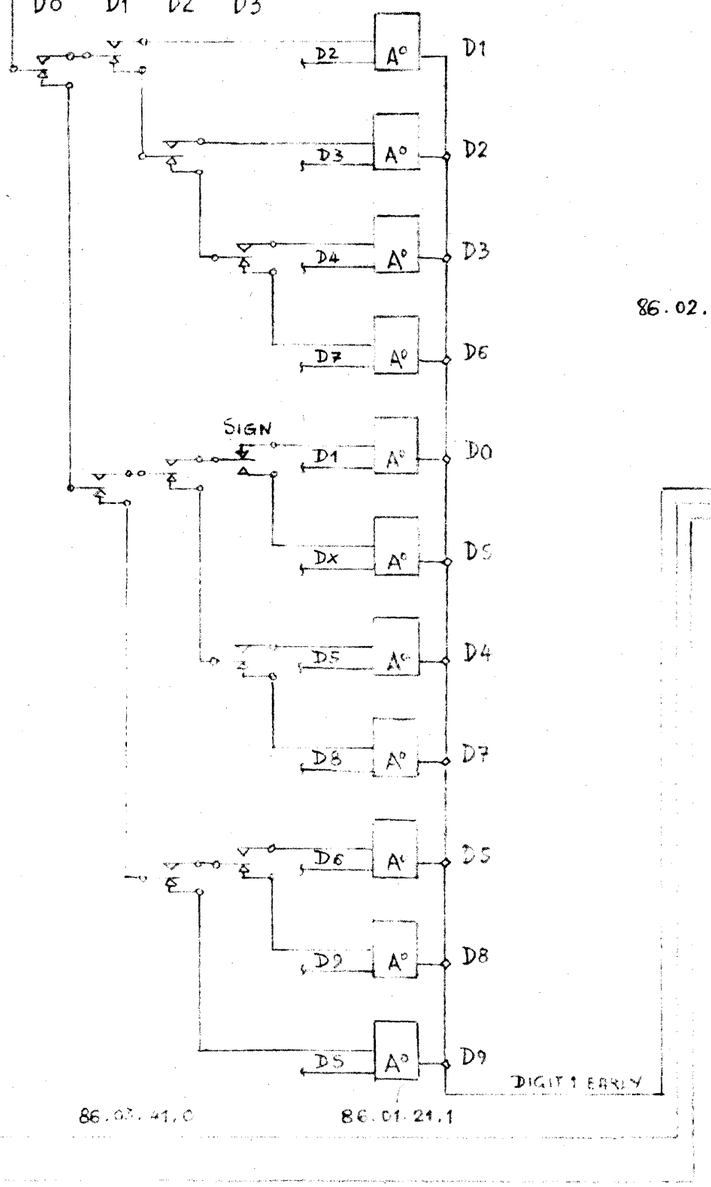
Absence of Bits

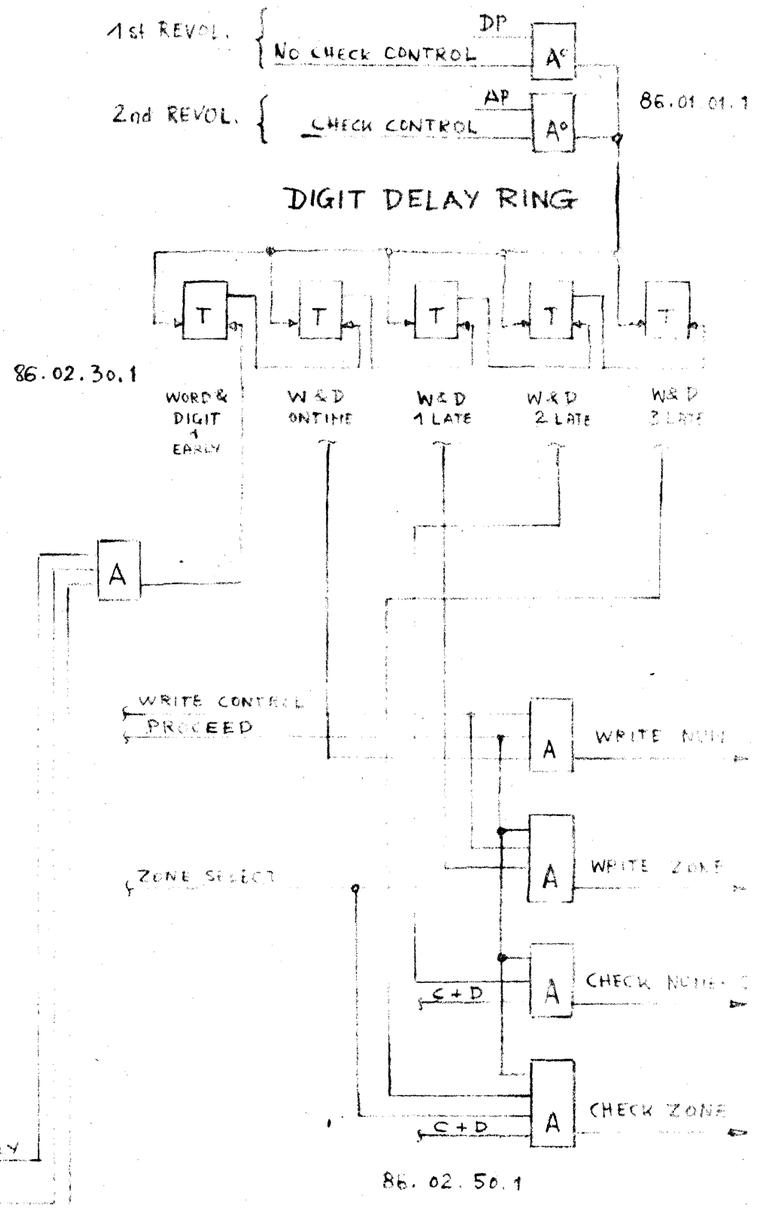
The absence of all bits in a specified digit position causes a red asterisk to print. The absence of bits and the resulting failure to initiate a typing cycle causes the 7600 Character Timer Relay, R110, to drop out. As previously discussed in section 8.4.00 of this manual, the drop out of R110 picks the 7600 Error Relay, R32. R32 then picks the 7900 Error Relay, R113. R113 prevents the pick of the Character Select Check Relay, R112. With R112 down and R113 picked, the Asterisk type bar magnet is energized. R113 points also shift the ribbon, which results in the typing of a red asterisk.



86.01.31.1







INQ. SYNC 1

WORD

DIGIT

LOCATION

7070
INQUIRY STATION 7900
INPUT-SELECTION
8/8/60 spc