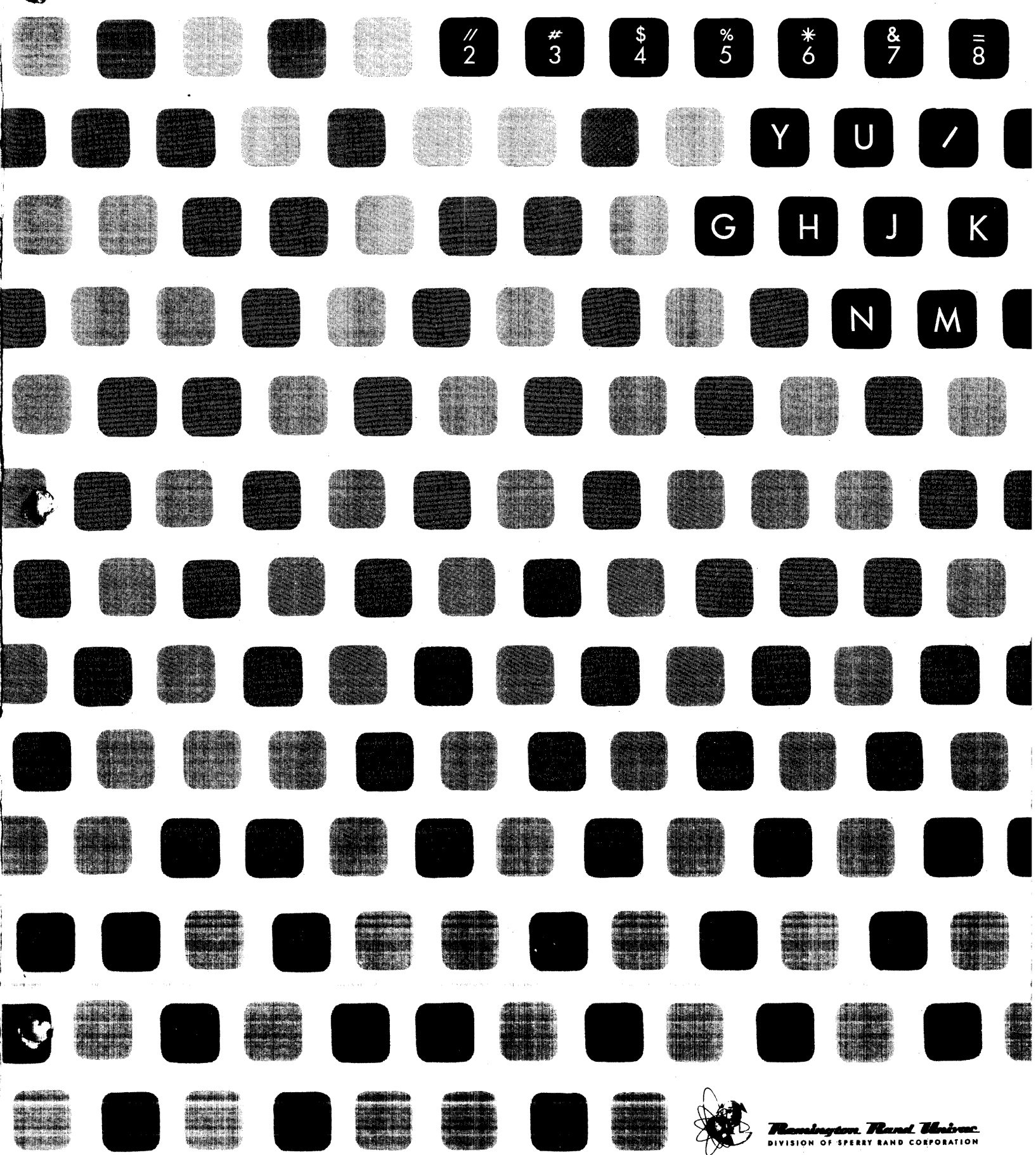


**UNIVAC<sup>®</sup>** File Computer Data Automation System

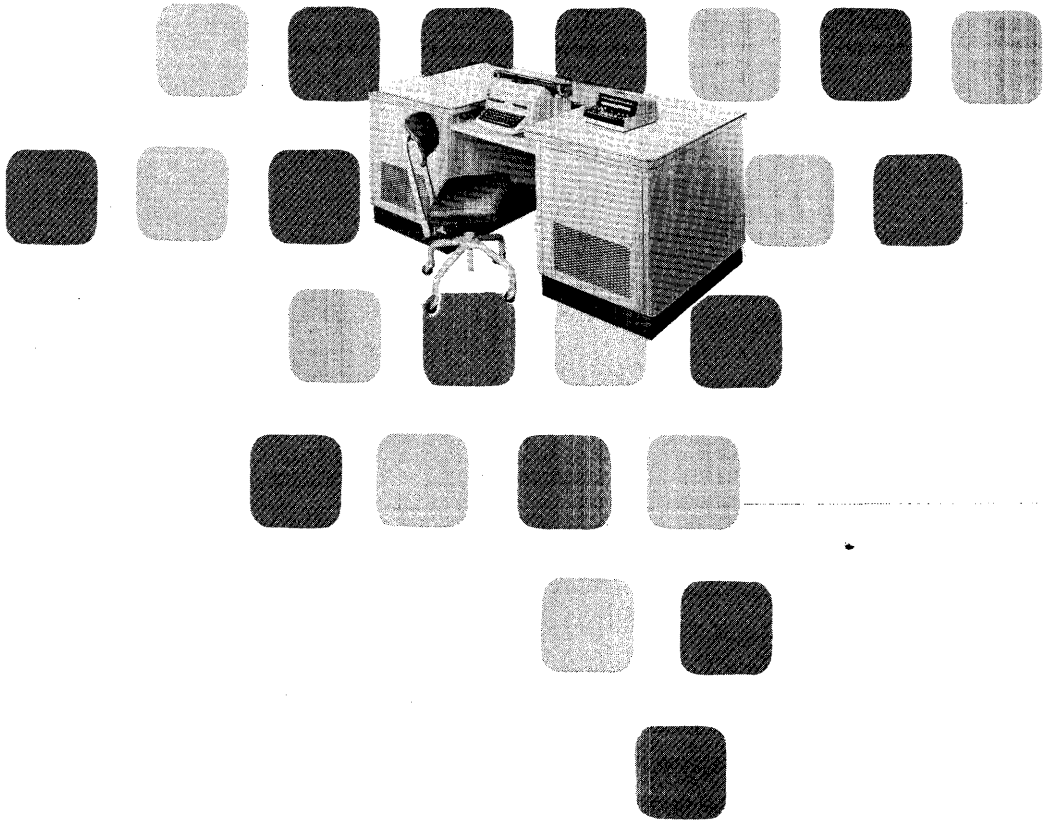
# INQUIRY TYPEWRITER



*Remington Rand Univac*  
DIVISION OF SPERRY RAND CORPORATION

**UNIVAC File Computer Data Automation System**

# INQUIRY TYPEWRITER

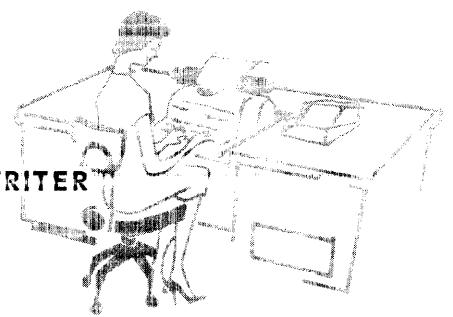


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UNIVAC INQUIRY TYPEWRITER



# Introduction

## The File-Computer

The Univac File-Computer, a medium-sized member of the Remington Rand family of electronic computers, is distinguished by its building-block versatility. A central computer, at the present time, may be combined with 1 to 10 large capacity, random-access storage drums, and from 1 to 10 input/output units.

## Input/Output Devices

Each of the input/output devices is designed for a specific purpose; any one or all of them may be added to the computer to accomplish desired applications. Perhaps the most important feature of the input/output units is their ability to share operating time with the storage drums and the central computer so that all may operate simultaneously under control of a single program. An instruction to an input/output unit or instructions to several input/output units may be initiated without causing delay in the computer's execution of logical or arithmetic operations. A program from any source is therefore available in the operating memory of the computer at any required time, and all data processed by the program is either stored in the central computer or sent to an output device.

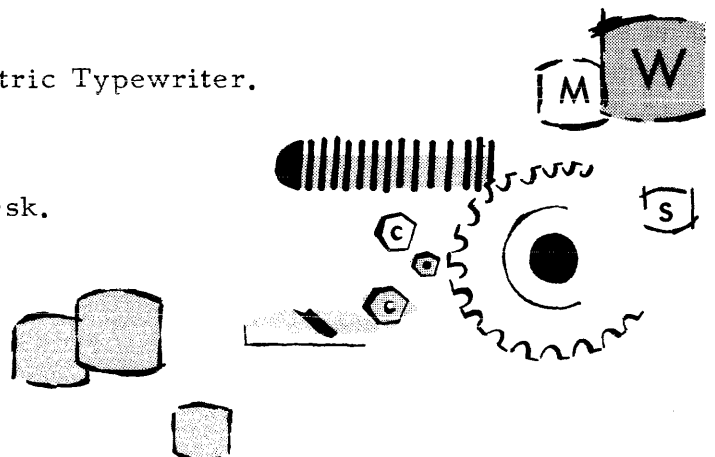
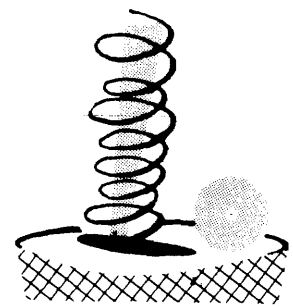
The Inquiry Typewriter is one of the most useful input/output devices available for incorporation in a Univac File-Computer System. It provides a means of entering information and/or instructions as input to the central computer, and it also provides a means of receiving information in a readable form from the central computer. The Inquiry Typewriter may be connected to either the Univac File-Computer Model O or Model 1.

## Physical Characteristics Of The Univac Inquiry Typewriter

### Component Parts

The Inquiry Typewriter is composed of four parts.

1. A special all-steel desk, 6 1/2 ft long x 2 1/2 ft wide x 2 ft high, with built-in air-circulation.
2. A Remington Encoding/Decoding Electric Typewriter.
3. A typewriter control panel.
4. Control circuitry housed inside the desk.



## The Typewriter

The typewriter has a standard 44-character keyboard, so modified that all lower-case letters print in capitals reduced in size. The keyboard is shown in Figure 3.

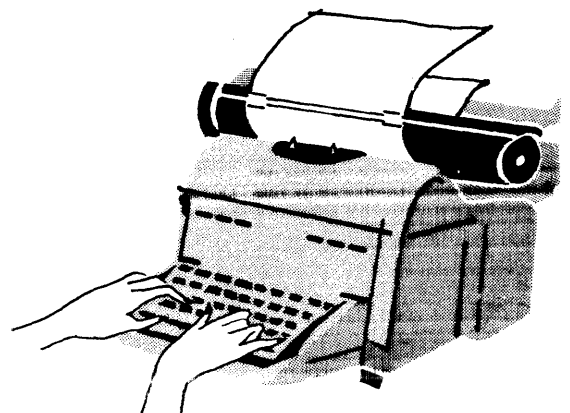
When the right margin is reached while a line is being typed out, carriage return is automatic. This feature is especially useful in an output operation when successive lines of equal length are to be typed out; the left and right margin stops may be set to produce the exact line width that is desired.

During input, the typewriter keys are used to produce a signal to be encoded into the Univac 7-level code. All 64 Univac characters can be encoded for transmission to the computer. Seventeen of the 44 keys encode different characters for upper-case and lower-case positions; the rest of the keys encode the same character for both upper-case and lower-case positions. Codes are also generated for carriage return, space, and tabulation. Figure 2, illustrates the Univac code combinations for all typewriter characters. For input, the printed record of information being entered into the computer is typed in black. The carriage will return and line space when the carriage return key is depressed and the carriage will tabulate to a tabulation stop when the tabulation key is depressed during input.

For output the typewriter will decode 44 characters plus space, tabulate, and carriage return. These 44 characters are the lower-case characters. During output, the keyboard is locked so that no typewriter keys can be depressed except carriage return, space bar, or tabulation. Output information is typed in red.

Input is as fast as an operator can type, and output is recorded at the rate of approximately 8.5 characters per second.

THE COPY WHICH YOU ARE NOW READING WAS TYPED ON  
A REMINGTON ENCODING DECODING ELECTRIC TYPEWRITER WHICH  
IS A COMPONENT OF THE UNIVAC INQUIRY TYPEWRITER. THE  
TYPE FACE HAS BEEN PHOTOGRAPHED IN ACTUAL SIZE.



# Communication With The Computer

## Data Flow

Data transfer between the input/output track of the UFC and the Typewriter is illustrated in Figure 1. For input, a 12-character word of an input/output track is first automatically cleared to space codes. Characters are then entered on the drum one character at a time, beginning with the input word's high order character and ending with the sign. For output, the typewriter reads and interprets a 12-character word, one character at a time, beginning with the high order character.

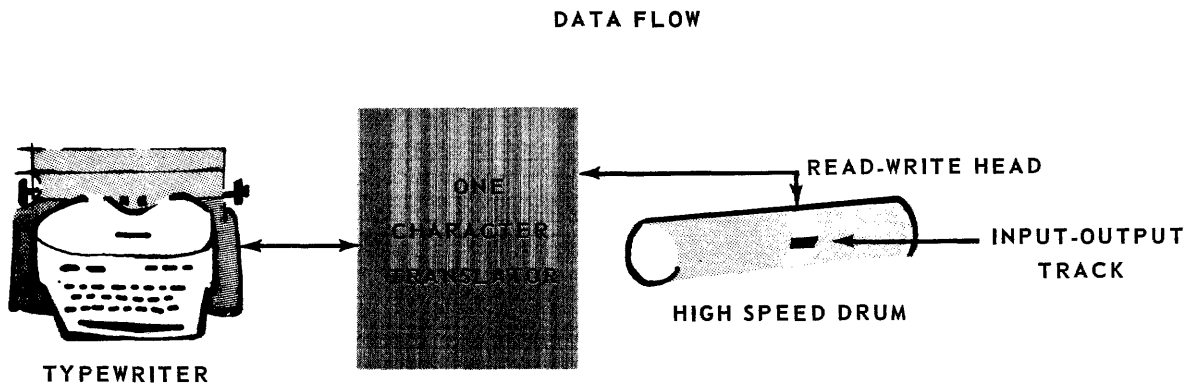


FIGURE 1

The Demand Station is the link between the typewriter and the computer; it channels control signals and data between the two. The computer obtains control of the typewriter or any other input/output unit by sending a "Demand In" signal to the appropriate demand station. Only one input/output unit can be demanded at a time. When the computer demands a new demand station, the demand station formerly "on demand" is then taken "off demand."

## Ready

The typewriter is always in one of two states: "ready" (when it can accept a computer instruction) or "not ready" (when it cannot accept a computer instruction). When the computer program calls for ascertaining the availability of the typewriter, it sends a "Test In" signal. The demand station responds by issuing a Ready or Not Ready signal to the computer depending on the status of the typewriter. If a Ready signal results, the computer may send a Demand In signal to obtain control of the typewriter. If a Not Ready signal results, the computer, according to the program, may wait until the typewriter is "ready," or it may proceed with another portion of its program and send another Test In signal later.

### UNIVAC CODE

| X63<br>ZONE | 0000               | 0001  | 0010 | 0011 | 0100 | 0101 | 0110 | 0111 | 1000 | 1001 | 1010 | 1011 | 1100 | 1101 | 1110 | 1111   |
|-------------|--------------------|-------|------|------|------|------|------|------|------|------|------|------|------|------|------|--------|
| 00          | 0<br>IGNORE        | SPACE | -    | 0    | 1    | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    | '    | &    | (      |
| 01          | CARRIAGE<br>RETURN | ,     | .    | ;    | A    | B    | C    | D    | E    | F    | G    | H    | I    | #    | ¢    | @      |
| 10          | TAB                | //    |      | )    | J    | K    | L    | M    | N    | O    | P    | Q    | R    | \$   | *    | ?      |
| 11          | £                  | !     | :    | +    | /    | S    | T    | U    | V    | W    | X    | Y    | Z    | %    | =    | DELETE |

FIGURE 2

### TYPEWRITER CODE SYMBOL CHART

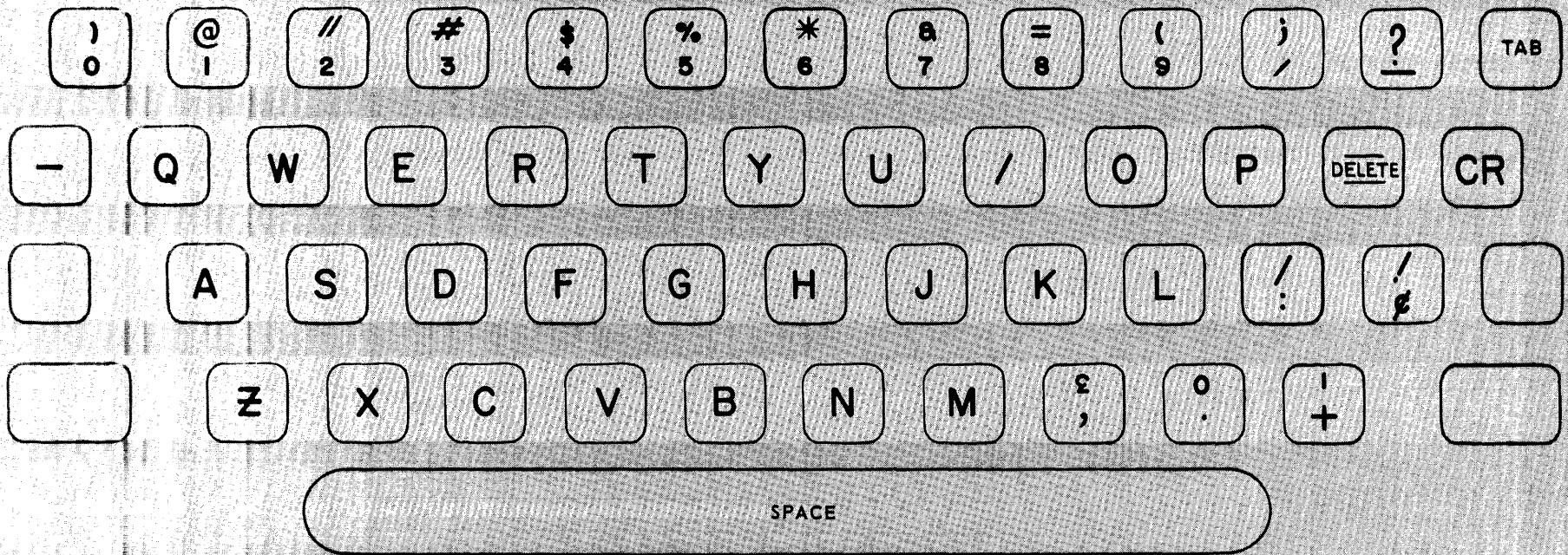


FIGURE 3



The typewriter is placed in a ready condition by the operator when he has finished his input operation, that is, when he wishes to turn control of the typewriter over to the computer program. Pressing the Compute button will set the typewriter "ready."

The typewriter may be placed "not ready" by either the operator or the computer program. A Clear button (below Ready button, Figure 4) on the typewriter control panel may be used to place the typewriter in a not ready condition. This button clears "ready." The typewriter will also be placed in a not ready condition by the computer program via Computer to Input/Output Control Lines. These control lines, discussed later, instruct the typewriter to type out information from the output track of the computer or to prepare for input. Computer to Input/Output Control Line C will place the typewriter in a not ready and then ready condition (see Computer to Input/Output Control Lines below).

#### Demand

The typewriter is put "on demand" by a DemandIn signal which simultaneously takes all other input/output units "off demand." When the typewriter is demanded, the typewriter control lines are connected to the computer. Control lines of other demand stations cannot be used at this time. This is true whether or not the typewriter is "ready."

If the typewriter is "ready" when a Demand In signal places it "on demand," a Demand Out signal is sent to the computer. The Demand Out signal indicates that the typewriter is "ready" and "on demand," and that the computer may signal for the desired typewriter operations over the appropriate control lines and may proceed with its program.

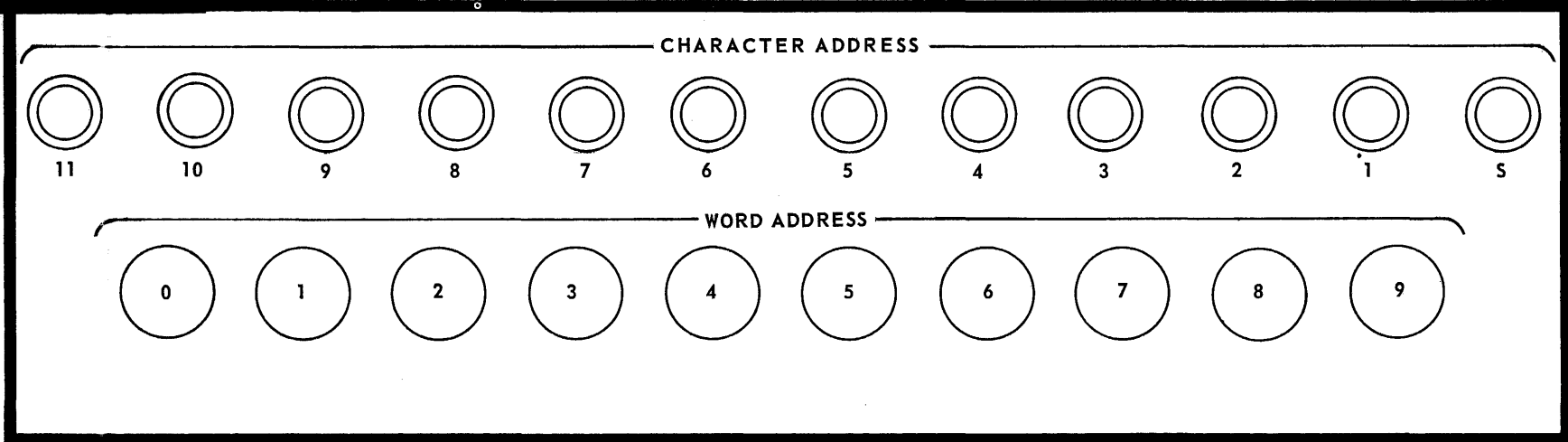
#### Computer to Input/Output Control Lines

With the typewriter "on demand" and "ready," the resulting Demand Out signal may initiate one or more control signals to the typewriter over Computer to Input/Output Control Lines A, B, and C. Signals sent over these lines may call for the following operating conditions: Computer to Input/Output Control Line A calls for the Input operation; Control Line B calls for the Output operation; Control Line C calls for an Automatic operation (see Operating the Inquiry Typewriter).

The Lights labeled A, B, and C, under "Instruction Register" on the typewriter control panel (see Figure 4, B) indicate the mode of operation. Light A indicates an input operation; light B indicates an output operation; light C indicates automatic operation. Light C will only be lit in conjunction with either A or B. When C is lit in conjunction with A, the typewriter is performing an automatic input operation; when lit in conjunction with B, the typewriter is performing an automatic output operation.

# TYPEWRITER CONTROL PANEL

A



B

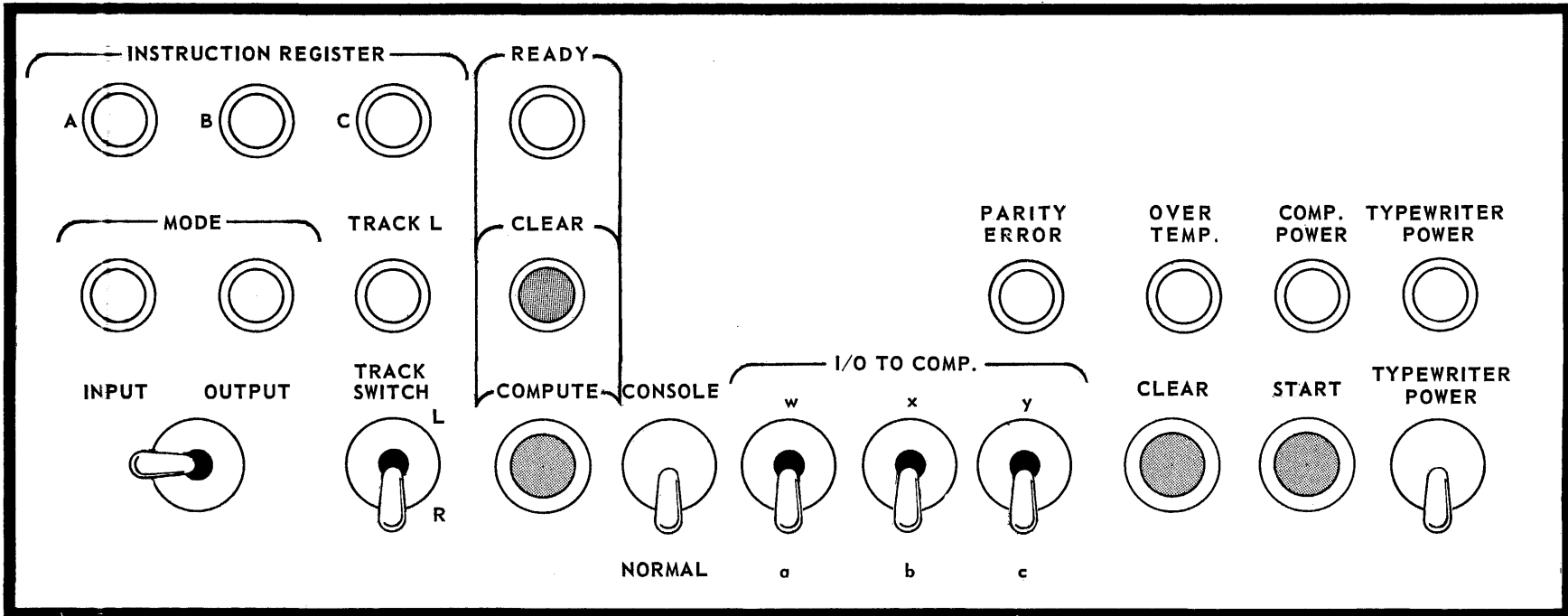


FIGURE 4

7

Normally, a signal over either one of the two lines, A or B, in addition to indicating the mode of typewriter operation, will place the typewriter in a Not Ready condition so that the typewriter is free to proceed with the operation selected by the computer. When the typewriter has completed its cycle of operation, it will remain "not ready" until it is returned to the Ready status by a Compute or Automatic Compute signal. The operator presses the Compute button to generate the Compute signal; the Automatic Compute signal is generated by the computer program via Computer to Input/Output Control Line C activated either with typewriter control line A (for automatic input) or typewriter control line B (for automatic output). The Automatic Compute signal is generated when character "S" is typed by the input or output operation. Therefore, on automatic input or output the typewriter will be "ready" before A and C or B and C signals are received. A or B will cause the typewriter to be "not ready" and to start an input or output operation. C will set a typewriter control that will cause the typewriter to be "ready" immediately after the input or output operation is completed.

| COMPUTER TO INPUT/OUTPUT INSTRUCTIONS |                             |                      |
|---------------------------------------|-----------------------------|----------------------|
| INSTRUCTION                           | ACTIVATING C-TO-I/O LINE(S) | * CODE FOR V ADDRESS |
| INPUT                                 | A                           | 556                  |
| AUTOMATIC INPUT                       | AC                          | 552                  |
| OUTPUT                                | B                           | 557                  |
| AUTOMATIC OUTPUT                      | BC                          | 553                  |

\*CODE WHICH CAN BE USED IN THE V PORTION OF THE "DEMAND" INSTRUCTION TO ACTIVATE THE DESIGNATED C-TO-I/O LINE(S). A COMPLETE DESCRIPTION OF HOW THIS CODE IS DERIVED IS GIVEN IN THE UFC MODEL I PROGRAMMING MANUAL.

#### Input/Output to Computer Control Lines

With the typewriter "on demand" and "ready," Input/Output to Computer Control Lines a, b, and c, and W, X, and Y are connected to the computer.

In Univac File-Computer Model 1 installations, there are three 3-position toggle switches, under "I/O to Comp" on the typewriter control panel (see Figure 4, B) which allow selection by the operator of high-speed Input/Output to Computer Control Lines W, X, and Y or Input/Output to Computer Control Lines a, b, and c. The setting of the toggle switches to the upper positions selects high-speed Input/Output to Computer Control Lines W, X, and Y. These control lines produce a Special Out from the Demand In sequence. The

setting of the switches to the lower positions selects Input/Output to Computer Control Lines a, b, and c, and produces a regular "demand out" in the central computer. When the switches are set to the middle positions, all Input/Output to Computer Control Lines are inoperative. Internally, the W, X, and Y positions are not connected with the UFC-0 which does not use high speed control lines.

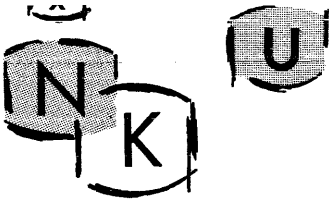
In either the Model 0 or Model 1 installation, the operator may modify the computer program, if he so desires, by setting one or more of the Input/Output to Computer switches on the typewriter control panel. The actual modification of a computer program by the Input/Output to Computer Control Lines a, b, and c is accomplished by the appropriate wiring on the main control plugboard of the central computer.

High Speed Input/Output to Computer Control Lines W, X, and Y take effect internally or on the plugboard after the Special Out pulse of the Demand instruction has been emitted. These control lines are available on only the Univac File-Computer Model 1. Input/Output to Computer Control Lines a, b, and c take effect when the Inquiry Typewriter is demanded, even if the typewriter is "not ready." This means that by placing the Input/Output to Computer toggle switches to the a, b, or c positions, these control lines will take effect to alter the plugboard portion of a computer program by picking up selectors when the typewriter is placed "on demand."

#### Track Switch

In a Model 1 installation, each demand station is connected to a pair of Input/Output tracks on the intermediate storage drum of the computer. At any time, one track is connected to the computer and the other is connected to the typewriter. The track assignment is reversed by a track switch signal from either the computer or the typewriter. Use of the two Input/Output tracks may be time-shared: the computer and typewriter may simultaneously and independently communicate with their currently respective Input/Output tracks. The computer either reads or writes onto its track according to the computer program, and the typewriter reads or writes on its track according to the selected mode of operation.

The Model 0 Univac File-Computer has only one Input/Output track per demand station. For this reason, simultaneous use of Input/Output tracks by the computer and Input/Output unit is not possible in a Model 0 system. Track switching consists of transferring control of the single Input/Output track between the computer and the Input/Output unit; only one can communicate with the track at a time. When the typewriter is "ready," the computer controls the Input/Output track; when it is "not ready," the typewriter controls the track.



## Operating The Inquiry Typewriter

The Inquiry Typewriter can be used to enter information into the computer and to receive information from the computer. Control of the typewriter is basically manual and is provided by switches and buttons on the control panel (see Figure 4). The control panel also provides signal lights to indicate the status of operations.



### Input Operation

Each input message may be as long as ten 12-character words. The operator selects the drum word address for each word of the message by pressing the appropriate Word Address button, 0 through 9, on the typewriter control panel (see Figure 4, A). By using the track switch toggle, the operator is able to use another 120 characters of input. As the 12 characters of a word are typed in, their addresses are selected sequentially by a character address counter (see Figure 4, A) and are displayed by lights on the typewriter control panel. Figure 5 is a flow diagram showing the sequence of events occurring during one complete input operation.

### Setting up the Input Operation

After the operator positions the Normal/Console switch to its appropriate setting, two requirements must be met to set up an input operation: 1) the Input/Output switch must be set to Input, and 2) a signal calling for Input must be received over Computer to Input/Output Control Line A, lighting Instruction Register indicator A (see Figure 4). In the absence of such a signal, the operator may press the Start button with the Input/Output switch set to Input, in order to achieve the same result. The Start button is inoperative when the typewriter is "not ready."

### Selecting the First Word Address

When the Input/Output switch has been set to Input, the operator presses the desired Word Address button (0 - 9) or, if this has already been done, he presses the Start button. Pressing a Word Address button, or pressing the Start button if the desired Word Address button is already depressed, enters space codes in all 12 character positions of the selected word, insuring that no old information will remain on the track if fewer than twelve characters are entered in the word address. After the space codes are entered, Character Address 11 indicator is lit. The first character typed in will be entered in character address 11 of the selected word address. The characters will appear in the selected word address in the same order in which they appear on the typed sheet.

### Loading the First Word Address

After the first word address has been selected and Character Address 11 indicator light has come on, a character can be entered from any of the 44 keys.

# FLOW DIAGRAM FOR INPUT MODE

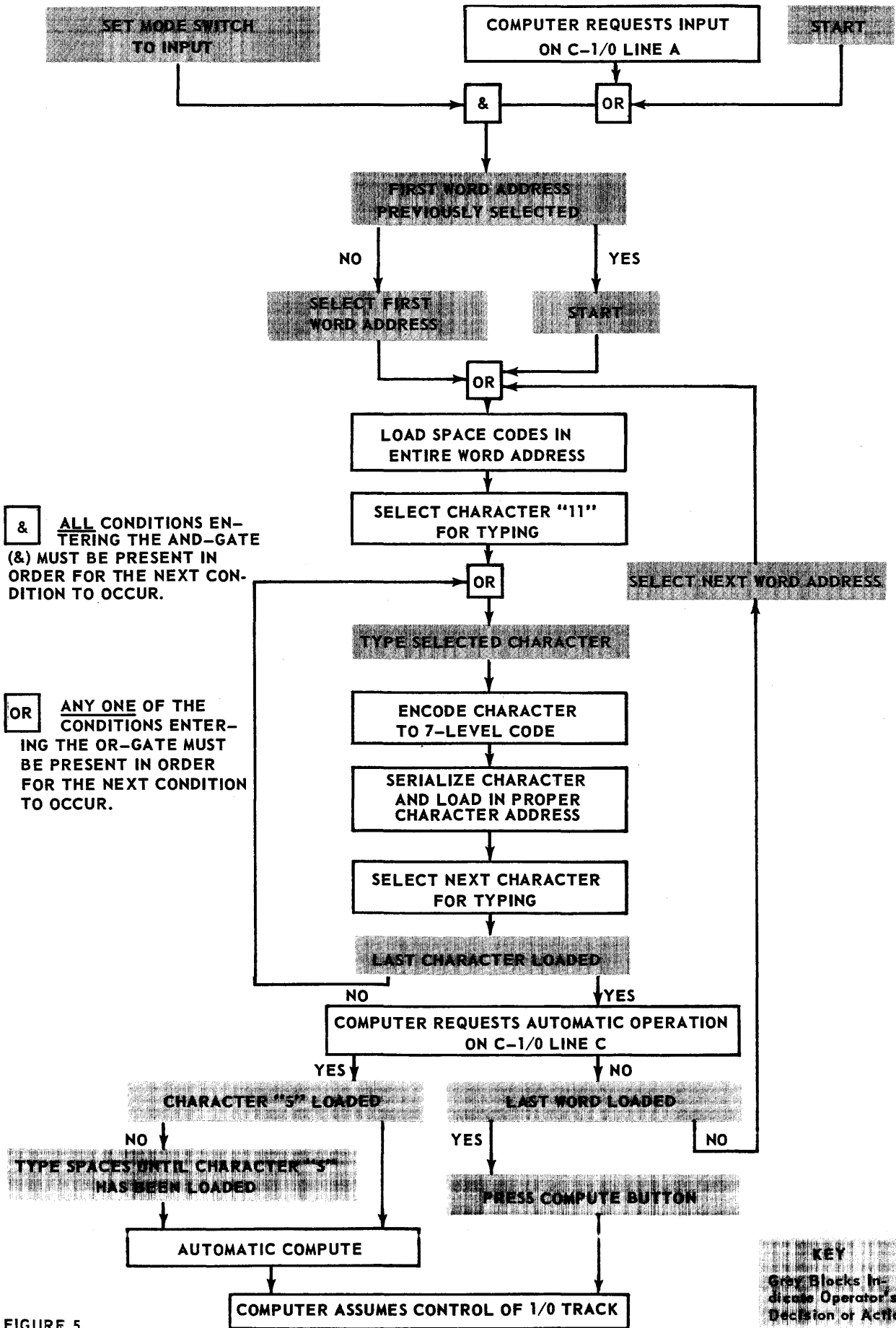


FIGURE 5

The closed key contact generates a signal which is translated into a seven-level Univac-coded character. This character is written onto the Input/Output track at the selected character address. The character address counter then selects character address 10 as the next to be loaded. Pressing another typewriter key will initiate another character-input cycle, storing a character in address 10 of the word address. Character addresses 9, 8, 7, 6 etc., are entered in the same manner until all 12 character addresses for the selected word address have been loaded. If the next word address button is pressed before all 12 characters have been entered, the balance of the word will be space codes. To type only part of a word, the operator must space through the unused characters with the space bar, which enters Univac excess-three space codes. If the operator makes a typing error, he may depress the Start button twice to reset the character address to 11 and retype the word.

The operator may depress the next Word Address button before the Character Address is cleared. The word that was partly entered has space codes in the untyped portion of the word. The new word has space codes in the untyped portion of the word. The new word has space codes in all 12 character positions.

### Special Keys

When pressed for input, the carriage return, tabulation, delete, and space bar keys will enter their respective codes. When the carriage return key is pressed, the typewriter carriage will return to the left margin stop and space the paper vertically one, two, or three spaces according to the line space lever. When the typewriter detects a carriage return code in any part of an output word, the output operation will cease and the typewriter carriage will return to the left margin stop and line space; the output character following the carriage return code will then be interpreted.

A press of the tabulation key will tabulate the typewriter carriage to a manually selected tabulation stop. For output, a tabulation code in any character of an output word will tabulate the typewriter carriage to the next tabulation stop.

The delete code is seven binary excess-three "one" bits in one character. This code will cause a Univac II computer or Univac High-Speed Printer to stop it and therefore must be used with care in information to be used on these machines.

Note here and in the description of the typewriter control panel that the carriage return, tabulation, and space bar keys are the only three keys not locked when the typewriter is in the Ready state or in the output operation.

## Completing the Input Cycle

When the first selected word address has been loaded, the operator presses the next desired Word Address button and proceeds to load that word address. The process of selecting a word address and entering 12 characters is repeated until all ten word addresses, or any number less than ten as desired, have been loaded. The Compute button is pressed to signal the computer that the Input/Output track has been loaded. Because the typewriter is in the Ready status, the computer may assume control of that track.

If less than 10 words are entered on the Input/Output track, the old information that the operator has not deleted by pressing the Word Address buttons will remain on the track. If it is desired to clear the remainder of the track to space codes, the operator successively depresses the unused word address buttons before pressing the Compute button.

## Automatic Input Operation

A computer program may be set up for automatic input which the operator uses to type in successive input words; for example, to make successive changes in general storage inventory balance on hand figures. The computer will call for automatic input and may be programmed to perform other functions while the operator types in an input word.

An automatic typewriter operation is set up by a signal over Computer to Input/Output Control Line C. The Computer to Input/Output Control Line C signal lights Instruction Register indicator C, and causes an automatic Compute signal when character "S" of the selected input word has been typed. The automatic Compute signal is identical to that generated when the Compute button is pressed, placing the Inquiry Typewriter in the Ready status and lighting the Ready light (see Figure 4, B).

During automatic input operation, the operator selects one word address for repetitive input. For the first input word, the operator sets up the input operation by setting the Input/Output switch to Input, depresses the Word Address button, and types in the word. The operator then presses the Compute button, putting the typewriter in the Ready status. When the computer program is ready to accept this word for input, a computer Demand instruction calling for a Track Switch and Automatic Input (by activating Computer to Input/Output Control Lines A and C) is performed. After this Demand instruction has been performed, the typewriter is "not ready," and the Ready light goes out. The operator then types in the second input word. When the last character of this word (character "S") has been typed in, an automatic Compute signal is generated which places the typewriter in the Ready status. For each succeeding input word, the cycle as described for the second input word is repeated.



## Modes of Input Operation

Two modes of Input operation may be used: NORMAL or CONSOLE. The setting of the Normal/Console two-way toggle switch on the typewriter control panel (see Figure 4, B) determines which mode is to be used for input.

### Normal Input Mode

Normal input, selected by setting the Normal/Console switch to NORMAL, (see Figure 4, B) is used when the typewriter is connected to any demand station of either a Model 0 or a Model 1 Univac File-Computer System. The Normal mode allows the entering of data into the computer. The data is processed, under control of the main computer program, in much the same manner as source data from punched cards, paper tape, or magnetic tape. The main computer program provides for periodic testing, with the Test Demand In instruction, the demand station to which the typewriter is connected.

After the operator sets the Normal/Console switch to NORMAL, he types the data in the prescribed manner (see Setting up the Input Operation). Upon completion of the typing process, the operator depresses the Compute button; this causes the Inquiry Typewriter to go "ready." The next time the main computer program tests the Inquiry Typewriter demand station, the typewriter will be in a Ready status, and the computer program instruction which demands the typewriter and causes the track switch will make the data from the typewriter available to the central computer.

### Console Input Mode

The Console Input mode, selected by setting the Normal/Console switch to Console, may be used only when the typewriter is connected to Demand Station 0 of a Model 1 Univac File-Computer System. The Normal/Console switch set to Console will set the typewriter so the Compute button will start the computer program at instruction word 000. The Console Mode is the method by which the operator is able to "force demand," that is, cause the computer to demand input-output unit 0 and start the program at instruction word 000. For example, the Console Mode may be used to change internal program instruction words or constants.

In a typical console input operation, the computer must be in a normal stop condition (with the yellow Ready indicator on the central computer lit). A word is entered into word address 0 of Input/Output track 00; this is an instruction word specifying the initial operation to be performed by the computer. The remaining word addresses may then be loaded, (see Setting up the Input Operation) and at the end of the loading process the Compute button is pressed with the following results.

1. The typewriter is set to "Ready."
2. An automatic track switch transfers to the computer control of the Input/Output track just loaded.
3. The Program Address Counter (PAK) in the computer is set to 000 (the address of Word 0 on Input/Output track 00, which has just been loaded by the typewriter).
4. The Operation Enable/Pulse Distributor (OED) in the computer is set to 0, specifying PAK as the address of the first instruction.
5. A Start signal is generated in the computer. The word entered by the typewriter at word address 0 specifies the first instruction word to be performed by the computer. The remainder of the computer program initiated by word 0 may take one of several forms, depending on the nature of the instruction specified by word 0. For example, the remaining words loaded in track 00 may be used as instructions, constants, or in modifications of an existing internal program. Word 0 may also specify the starting point of an existing stored program or plugboard routine. These are but a few examples of possible uses of the Inquiry Typewriter in manually programming a computer in the Console mode.

#### Output Operation

In an output operation, the typewriter records on paper the contents of the Input/Output track connected to the typewriter. Each output operation may consist of as many as ten 12-character words. The usual output operation consists of the manual selection of each desired Word Address button in sequence.

A flow diagram of the output sequence is shown in Figure 6. In addition to showing the normal output sequence, the flow diagram also traces the automatic output sequence occurring when it is called for by the computer program (see Automatic Output ff.).

#### Setting up the Output Operation

To set up the output operation, two requirements must be met.

1. The Input/Output switch must be set to Output.
2. A signal calling for Output must be received over Computer to Input/Output Control Line B, lighting Instruction Register indicator B. (See Figure 4.) In the absence of such a signal, the Start button may be pressed, with the Input/Output switch set to Output in order to produce the same result. The Start button is inoperative when the typewriter is "ready."

When the output operation is set up, the information stored in the selected word address is typed out. It is desirable, therefore, to select the first word address before setting up the output operation.

### Completing the Output Cycle

After the output operation is set up and the contents of the first word address are printed, successive output word addresses are selected manually. As each Word Address button is pressed, the word is typed out in character sequence from 11 through 5. When all the desired words have been typed, the Compute button is pressed; this lights the Ready indicator, turns off the Instruction Register indicator B, and returns control of the typewriter to the computer.

If the next typewriter operation of the computer program is another output cycle, the computer loads an Input/Output track with new information, then sets up another output operation with a signal over Computer to Input/Output Control Line B. The Instruction Register indicator B lights, the Ready indicator is turned off, and the typewriter assumes control of the loaded Input/Output track and types the contents of the selected word address.

If the next typewriter operation is to be an input operation, the setting of the Input/Output switch must be changed to Input, and the computer must signal for the input operation over Computer to Input/Output Control Line A. Control Line A will set the typewriter "not ready" and prepare it to be used for input.

If the Input/Output switch is inadvertently left on input and the computer sets Computer to Input/Output Control Line B for output, the typewriter will wait until the Input/Output switch is set to output and then finish the output operation.

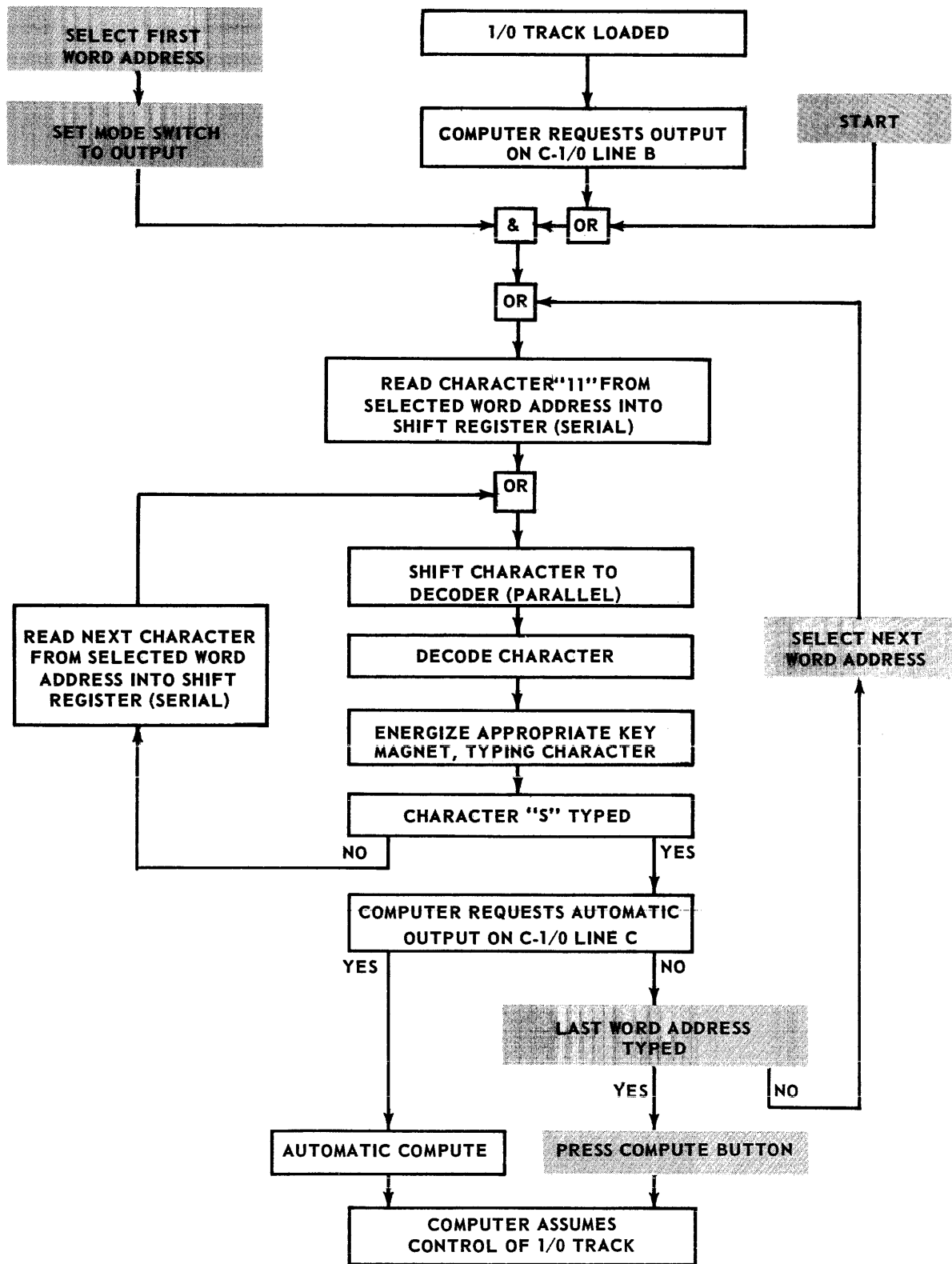
### Automatic Output Operation

Automatic output is used to produce continual output from one word address. During automatic output operation, one word address is selected for repetitive output. When the computer has loaded the selected word address on the Input/Output track, it sets up the output operation over Computer to Input/Output Control Line B and specifies that the output be automatic over Computer to Input/Output Control Line C (see Figure 6). The typewriter types the word then generates an automatic Compute signal which transfers control back to the computer. After completion of the typing the typewriter is in the Ready status.

### Modes of Output Operation

Two modes of Output operation may be used: Normal and Console. The setting of the Normal/Console two-way toggle switch on the typewriter

FLOW DIAGRAM FOR OUTPUT MODE



- &** ALL CONDITIONS ENTERING THE AND-GATE (&) MUST BE PRESENT IN ORDER FOR THE NEXT CONDITION TO OCCUR
- OR** ANY ONE OF THE CONDITIONS ENTERING THE OR-GATE MUST BE PRESENT IN ORDER FOR THE NEXT CONDITION TO OCCUR

**KEY**  
 Grey Blocks Indicate Operator's Decision or Action

FIGURE 6

control panel (see Figure 4, B) determines which mode is to be used for output.

#### Normal Output Mode

Normal output is used when the typewriter is connected to any demand station of either a Model 0 or a Model 1 Univac File-Computer System. The Normal mode allows the typing out of data from the computer without interruption of the computer program in progress.

#### Console Output Mode

The Console Output Mode may be used only when the typewriter is connected to Demand Station 0 of a Univac File-Computer Model 1 System.

When the typewriter is in the Console Output Mode, two types of demand instructions may be used:

1. The demand instruction without a "Z" or breakpoint stop: 100 557 999 DEØ. The computer demands the typewriter, track switches, and activates Computer to Input/Output Control Line B, initiating the output operation. The computer then continues its program. When the Compute button is pressed upon completion of the typewriter output, the typewriter is set to "ready" and switches tracks. The track now connected to the computer is the same track that was loaded with output information.
2. The demand instruction with a "Z" or breakpoint stop: 100 557 999 DEZ. The computer demands the typewriter, track switches, and activates Computer to Input/Output Control Line B, initiating the output operation. The computer is stopped by the subcommand.

When the Compute button is pressed upon completion of the typewriter output:

1. The typewriter is set to ready.
2. There is an automatic track switch.
3. The Program Address Counter (PAK) is set to 000.
4. The Operation Enable/Pulse Distribution (OED) is set to 0.
5. The program is started at the PAK address.

## Automatic Console Output Mode

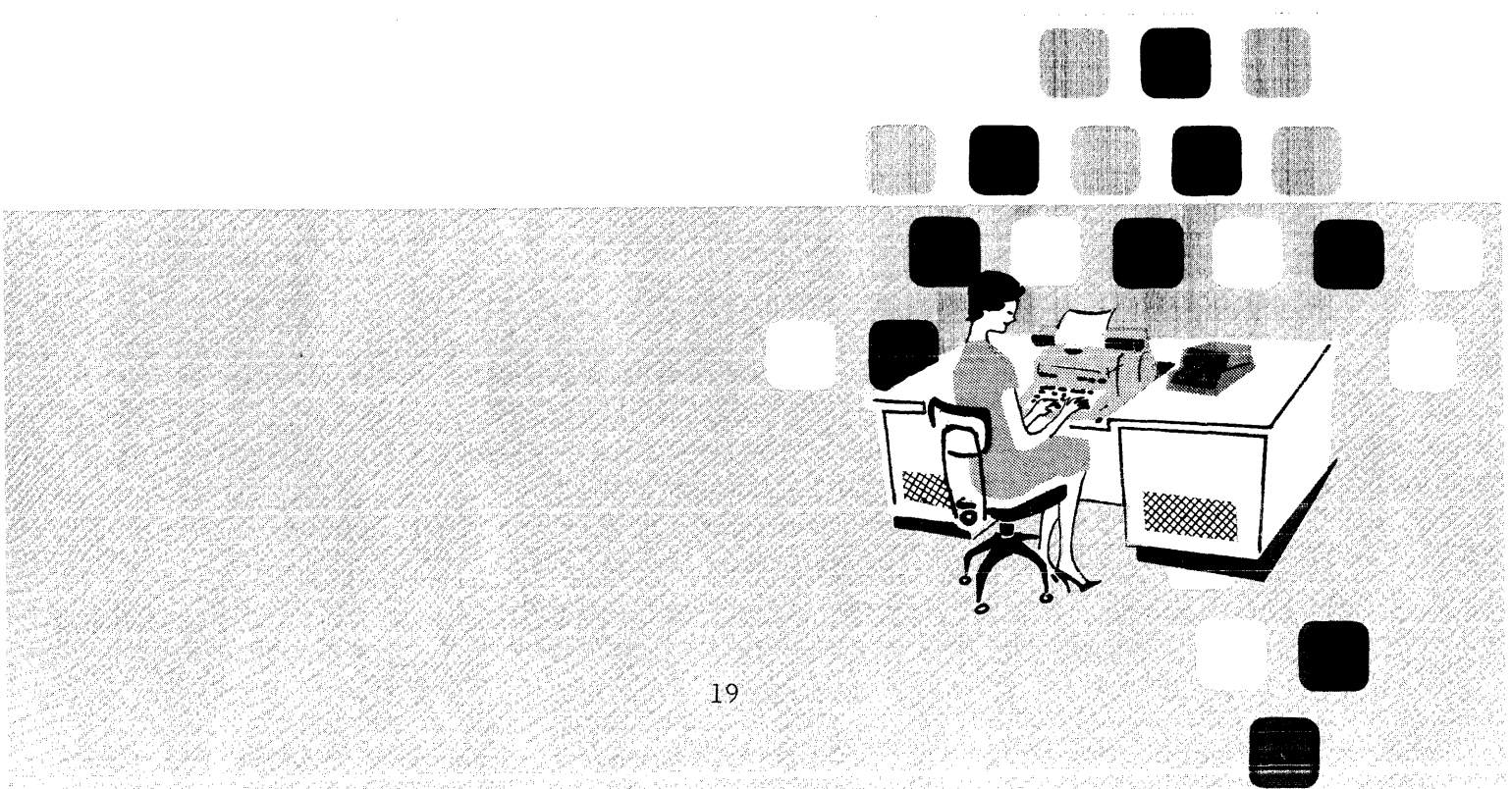
Automatic Console Output is initiated by activating Computer to Input/Output Control Lines B and C. The same events occur in Automatic Console Output as in Console Output with the following exceptions:

1. One word address is selected for all output.
2. The automatic Compute signal, which occurs after completion of the type out, has the same effect as the pressing of the Compute button in Console Output.

## Control Circuitry

The various circuits necessary for the operation of the Inquiry Typewriter are housed in the lower left and lower right hand sections of the desk. The two panels in front of the circuitry should be opened by no one except maintenance engineers.

Each transfer of an input or output character between the typewriter and its Input/Output track is checked to make sure that the character is parity correct before and after the transfer. The parity check ensures errorless transfer of input and output information.



# Control Panel Description

| CONTROL OR INDICATOR   | NECESSARY CONDITIONS   | SETTING | FUNCTION   |
|--|--|---------|--|
| Input/Output switch and indicators                           |  | Center  | <ol style="list-style-type: none"> <li>1. Test for use by maintenance engineers.</li> <li>2. Locks keyboard except space bar, carriage return and tabulation keys.</li> </ol>  |
|  |  | INPUT   | <ol style="list-style-type: none"> <li>1. Prepares typewriter for input operation</li> <li>2. Lights Input Mode indicator.</li> </ol>  |
|  |  | OUTPUT  | <ol style="list-style-type: none"> <li>1. Prepares typewriter for output operation.</li> <li>2. Lights Output Mode Indicator.</li> <li>3. Locks keyboard except space bar, carriage return and tabulation keys.</li> </ol> |
| Track Switch (remains in center position when left untended) |  | Center  | Neutral Position.  |
|  |  | L       | <ol style="list-style-type: none"> <li>1. Connects left I/O track to typewriter.</li> <li>2. Lights Track L indicator.</li> </ol>  |
|  |  | R       | <ol style="list-style-type: none"> <li>1. Connects right I/O track to typewriter</li> <li>2. Turns off Track L indicator</li> </ol>  |
| Track L Indicator  |  | lit     | Indicates that left I/O track is connected to typewriter.  |
|  |  | unlit   | Indicates that right (I/O track is connected to typewriter.  |
| Instruction Register Indicator A                             | <ol style="list-style-type: none"> <li>1. Computer signal on C-to-I/O Line A or</li> <li>2. Start button depressed with Mode switch set to Input and character address cleared.</li> </ol> | lit     | Indicates that input has been requested; the same request transfers control of the I/O track to the typewriter, and turns off the Ready indicator.   |

| CONTROL OR INDICATOR             | NECESSARY CONDITIONS  | SETTING                | FUNCTION   |
|----------------------------------|---|------------------------|--|
| Instruction Register Indicator B | <ol style="list-style-type: none"> <li>1. Computer signal on C-to-I/O Line B or</li> <li>2. Start button depressed with Mode switch set to output and character address counter cleared.</li> </ol> | lit                    | <ol style="list-style-type: none"> <li>1. Indicates that output has been requested; the same request transfers control of the I/O track to the typewriter.</li> <li>2. Turns off the Ready indicator.</li> </ol>   |
| Instruction Register             | Computer signal on C-to-I/O Line C  | lit                    | Indicates that computer has requested automatic operation on C-to-I/O Line C.  |
| Compute button                   | <ol style="list-style-type: none"> <li>1. Character Address cleared and</li> <li>2. Normal/Console switch set to Normal.</li> </ol>   | Depressed and Released | <ol style="list-style-type: none"> <li>1. Sets typewriter to Ready condition, transferring control of the typewriter to the computer.</li> <li>2. Lights Ready indicator.</li> <li>3. Turns off Instruction Register indicators A, B, and C.</li> <li>4. Disables Start and Clear switches.</li> </ol>   |
|                                  | <ol style="list-style-type: none"> <li>1. Character Address counter cleared and</li> <li>2. Normal/Console switch set to Console.</li> </ol>  | Depressed and Released | <ol style="list-style-type: none"> <li>1. Sets typewriter to Ready condition.</li> <li>2. Lights Ready indicator.</li> <li>3. Turns off Instruction Register indicators A, B, and C.</li> <li>4. Disables Start and Clear switches.</li> <li>5. Generates a track switch signal.</li> <li>6. Sets the Program Address Counter (PAK) in the computer to 000.</li> <li>7. Sets the Operation Enable/Pulse Distributor (OED) in the computer to 0.</li> <li>8. Starts the computer program at the PAK address.</li> </ol> |
| Clear Ready Button               |   | Depressed              | <ol style="list-style-type: none"> <li>1. Sets typewriter to Not Ready condition.</li> <li>2. Turns off Ready Indicator.</li> </ol>  |
| Ready indicator                  |   | lit                    | Indicates that the typewriter is in Ready condition.   |



| CONTROL OR INDICATOR                | NECESSARY CONDITIONS   | SETTING              | FUNCTION  |
|-------------------------------------|--|----------------------|---|
| Normal/Console switch               |  | NORMAL               | Connects typewriter for Normal use. Affects operation of compute button as noted in this table.   |
|                                     | Inquiry Typewriter is connected to Demand Station 0 of a Model 1 system.   | CONSOLE              | Affects operation of Compute button as noted in this table.   |
| I/O-to COMP switches                |  | Center               | Neutral position.   |
|                                     |  | W,X,Y                | Each switch enables its associated high-speed I/O-to-C Control Line.  |
|                                     |  | a,b,c                | Each switch enables its associated low-speed I/O-to - C Control Line.   |
| Clear button (next to Start button) |  | Depress              | <ol style="list-style-type: none"> <li>1. Clears the character address.</li> <li>2. Clears Instruction Register indicators A and B.</li> <li>3. Clears parity error.</li> </ol>   |
| Start button                        | <ol style="list-style-type: none"> <li>1. Input/Output switch set to Input and</li> <li>2. Character address counter cleared</li> </ol>                      | Depress              | <ol style="list-style-type: none"> <li>1. Resets character address to 11.</li> <li>2. Lights Instruction Register indicator A.</li> <li>3. Loads selected word address with space codes in all 12 character addresses.</li> </ol> |
|                                     | <ol style="list-style-type: none"> <li>1. Input/Output switch set to Input</li> <li>2. Character address counter not cleared and not reset to 11.</li> </ol> | Depress once.        | Character address reset to 11.  |
|                                     |  | Depress second time. | <ol style="list-style-type: none"> <li>1. Resets character address to 11.</li> <li>2. Lights Instruction Register indicator A.</li> <li>3. Loads selected word address with space codes in all 12 character addresses.</li> </ol> |
|                                     | Input/Output switch set to Output  | Depress              | <ol style="list-style-type: none"> <li>1. Resets character address to 11.</li> <li>2. Lights Instruction register indicator B.</li> </ol>   |

| CONTROL OR INDICATOR       | NECESSARY CONDITIONS   | SETTING   | FUNCTION   |
|----------------------------|--|-----------|--|
| Typewriter Power switch    |  | On        | <ol style="list-style-type: none"> <li>1. Turns on Typewriter power, lighting Typewriter power indicator.</li> <li>2. Lights Computer Power indicator if computer power to typewriter is present.</li> </ol>   |
| Typewriter Power indicator |  | Lit       | Indicates that typewriter power from external source is on.  |
| Computer Power indicator   |  | Lit       | Indicates that typewriter is receiving power from the computer.  |
| Over Temp indicator        |  | Lit       | Indicates that the temperature of the typewriter control circuitry is nearing the danger point.  |
| Parity Error indicator     |  | Lit       | Indicates that parity error has occurred during transfer of information between typewriter and I/O tracks.   |
| Character Address          |  | Lit       | Designates the next character address.   |
| Word Address buttons       | <ol style="list-style-type: none"> <li>1. Input/Output switch on Input.</li> <li>2. Character address not set to 11.</li> </ol>  | Depressed | <ol style="list-style-type: none"> <li>1. Selects I/O track word address.</li> <li>2. Lights indicator in depressed Word Address button.</li> <li>3. Lights Instruction Register indicator A.</li> <li>4. Resets character address to 11.</li> <li>5. Loads selected word address with space codes in all 12 character addresses.</li> </ol> |
|                            | <ol style="list-style-type: none"> <li>1. Input/Output switch on Input</li> <li>2. Character address set to 11.</li> <li>3. Instruction Register indicator A lit.</li> </ol> | Depressed | <ol style="list-style-type: none"> <li>1. Selects I/O track word address.</li> <li>2. Lights indicator in depressed Word Address button.</li> </ol>  |
|                            | <ol style="list-style-type: none"> <li>1. Input/Output switch on output</li> </ol>   | Depressed | <ol style="list-style-type: none"> <li>1. Selects I/O track word address.</li> <li>2. Character address lights come on from 11 through "S" as the word addressed is typed out.</li> <li>3. Instruction Register indicator B is lit during the output and goes out after character "S" is typed.</li> </ol>                                   |

# Programming Examples

Six Inquiry Typewriter programming examples are given below. The typewriter is used in the Normal and Console Modes for both the Input and Output operations. Assume the typewriter is connected to Demand Station O and each procedure starts with the typewriter in a Not Ready condition.

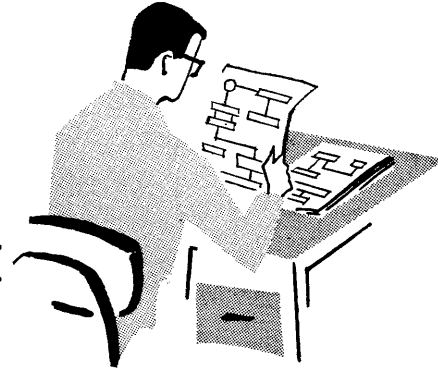
The typewriter may be cleared to "not ready" by depressing and releasing the Clear Ready button (below the Ready indicator) on the typewriter control panel.

## Console Input Mode

### Example 1.

Problem: Start a program at memory location 379.

- Procedure:
1. Normal/Console switch: set to Console.
  2. Input/Output Mode switch: set to Input.
  3. Word Address button O: depress.
  4. Type in the program instruction.
  5. Compute button: depress and release.



Program:

| <u>Memory Location</u> | <u>U</u> | <u>V</u> | <u>W</u> | <u>PRS</u> | <u>Description</u>                          |
|------------------------|----------|----------|----------|------------|---|
| 000                    | 000      | 992      | 379      | UJΔ        | Unconditional Jump to instruction word 379. |

### Example 2.

Problem: Store an instruction word at memory location 486.

- Procedure:
1. Normal/Console switch: set to Console.
  2. Input/Output Mode switch: set to Input.
  3. Word Address button O: depress.
  4. Type in program instruction 000.
  5. Word Address button 1: depress.
  6. Type in program instruction 001.
  7. Compute button: depress and release.

Program:

| <u>Memory Location</u> | <u>U</u> | <u>V</u> | <u>W</u> | <u>PRS</u> | <u>Description</u>  |
|------------------------|----------|----------|----------|------------|---|
| 000                    | 001      | 999      | 486      | ATZ        | Transfer input instruction word (001) to memory(486)and stop. |

| <u>Memory Location</u> | <u>U</u> | <u>V</u> | <u>W</u> | <u>PRS</u> | <u>Description</u>     |
|------------------------|----------|----------|----------|------------|------------------------|
| 001                    | 459      | 470      | 459      | ADΔ        | Input instruction word |

Example 3.

Problem: Store 8764 in Field F of a 120-Character Unit Record Area at General Storage Address 0 01 99 80.

- Procedure:
1. Normal/Console switch: set to Console.
  2. Input/Output switch: set to Input.
  3. Word Address buttons: depress and type in the program instructions.
  4. Compute button: depress and release.

Program:

| <u>Memory Location</u> | <u>U</u> | <u>V</u> | <u>W</u> | <u>PRS</u> | <u>Description</u>                                       |
|------------------------|----------|----------|----------|------------|--|
| 000                    | Δ00      | 199      | 80Δ      | LAL        | Load G S A R. R U R.                                     |
| 001                    | 003      | 999      | 98F      | ATM        | Transfer 8764 (from 003) to G S B, Field F (98F). W U R. |
| 002                    | 002      | 999      | 002      | ATZ        | Dummy step. Stop   |
| 003                    | ΔΔΔ      | ΔΔΔ      | Δ87      | 64Δ        | Input number.  |

Console Input and Normal Output Operation

Example 4.

Problem: Type out the contents of memory location 697.

- Procedure:
1. Normal/Console switch: set to Console.
  2. Input/Output Mode switch: set to Input.
  3. Word Address buttons: depress and type in the program instructions.
  4. Word Address button 2: depress to prepare for Output.
  5. Input/Output Mode switch: set to Output.
  6. Compute button: depress and release.
  7. Normal/Console switch: set to Normal.

Program:

| <u>Memory Location</u> | <u>U</u> | <u>V</u> | <u>W</u> | <u>PRS</u> | <u>Description</u>                                |
|------------------------|----------|----------|----------|------------|---|
| 000                    | 697      | 999      | 002      | ATΔ        | Transfer memory word (697) to output track (002). |

| <u>Memory Location</u> | <u>U</u> | <u>V</u> | <u>W</u> | <u>PRS</u> | <u>Description</u>  |
|------------------------|----------|----------|----------|------------|---|
| 001                    | 100      | 557      | 999      | DEZ        | Dem and typewriter track switch, set C → I/O Control Line A. Stop |

### Normal Input and Output Operation

#### Example 5.

Problem: Type out the balance on hand for inventory item 0 00 72 60

1. Inventory item numbers correspond to the general storage drum addresses.
2. Each unit record area is 120 characters long.
3. Verification digits are stored in Fields G of each unit record area.
4. The inventory balance on hand is in Field F.
5. The general storage drum field pattern is loaded.
6. The High-speed control line W switch is set on the typewriter control panel.
7. The computer program is written to periodically test the typewriter for "ready."

- Procedure:
1. Normal/Console switch: set to Normal.
  2. Input/Output Mode switch: set to Input.
  3. Word Address buttons: depress and type in the program instructions.
  4. Word Address button 3: depress to prepare for Output.
  5. Input/Output Mode switch: set to Output.
  6. Compute button: depress and release.

#### Program:

| <u>Memory Location</u> | <u>U</u> | <u>V</u> | <u>W</u> | <u>PRS</u> | <u>Description</u>                      |
|------------------------|----------|----------|----------|------------|---|
| 000                    | △△△      | △00      | 072      | 60△        | Input item identifier.                  |
| 001                    | △△△      | △△△      | △△△      | 89△        | Input check digits for item identifier. |

# The Main Computer Program

Example 5.

| <u>Memory Location</u> | <u>U</u>              | <u>V</u> | <u>W</u> | <u>PR</u> | <u>S</u> | <u>Description</u>   |
|------------------------|-----------------------|----------|----------|-----------|----------|--|
| 400                    | MAIN COMPUTER PROGRAM |          |          |           |          |  |
| 401                    | 000                   | 600      | 402      | TD        | Δ        | If typewriter is ready, jump to memory location 600.   |
| 402                    | MAIN COMPUTER PROGRAM |          |          |           |          |  |
| 600                    | 101                   | 555      | 610      | DE        | Δ        | Demand typewriter, track switch to make data available to computer. Because "I/O to Comp" toggle switch W was positioned to High Speed Input/Output to Computer Control Line W, a Special Out is produced. |
| 610                    | 00W                   | 999      | 613      | T1        | Δ        | Test incoming control line W. If found, go to program memory location 613.   |
| 613                    | 000                   | 999      | 995      | AT        | L        | Transfer inventory item address to GSAR. RUR.  |
| 614                    | 001                   | 98G      | 999      | CP        | 9        | Compare for verification of item.  |
| 615                    | ΔΔΔ                   | 992      | 619      | JZ        | Δ        | If item is correct, continue program at memory location 619.   |
| 616                    | 618                   | 999      | 003      | AT        | Δ        | If item is not correct, send NO CHECK to output.   |
| 617                    | 101                   | 553      | 999      | DE        | Z        | Demand typewriter Track switch. Send output to typewriter for print out. Stop.   |

| <u>Memory Location</u> | <u>U</u> | <u>V</u> | <u>W</u> | <u>PR S</u> | <u>Description</u>   |
|------------------------|----------|----------|----------|-------------|--|
| 618                    | ΔΔN      | 0ΔC      | HEC      | KΔ Δ        | Constant.  |
| 619                    | 98F      | 999      | 004      | AT Δ        | Inventory balance on hand transferred to Output.   |
| 620                    | 101      | 553      | 402      | DE Δ        | Demand Typewriter. Track switch. Send Automatic Output to typewriter over Computer to Input/Output Control Line B and C. |

### Automatic Output Operation

#### Example 6.

**Problem:** Type out the contents of memory locations 657 through 700. The typewriter is operated in the Console mode during the Input operation and in the Normal mode during the Automatic Output operation.

- Procedure:**
1. Normal/Console switch: set to Console.
  2. Input/Output Mode switch: set to Input.
  3. Word Address buttons: depress and type in the program instructions.
  4. Word Address button 9: depress to prepare for Output.
  5. Input/Output switch: set to Output.
  6. Compute button: depress and release.
  7. Normal/Console switch: set to Normal.

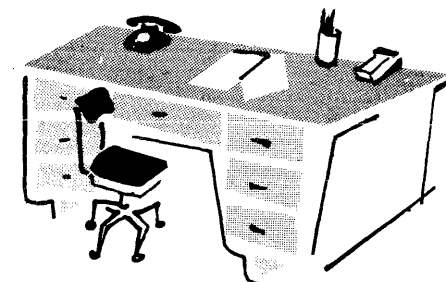
#### Program:

| <u>Memory Location</u> | <u>U</u> | <u>V</u> | <u>W</u> | <u>PR S</u> | <u>Description</u>  |
|------------------------|----------|----------|----------|-------------|---|
| 000                    | 00Z      | 999      | 10Z      | BT Δ        | Send the contents of the typewriter track to the Block Transfer Buffer.   |
| 001                    | ΔΔΔ      | 992      | 102      | UJ Δ        | Jump to Instruction Word 102. (The program at 102 through 109 contains the information that was typed onto the typewriter track.) |

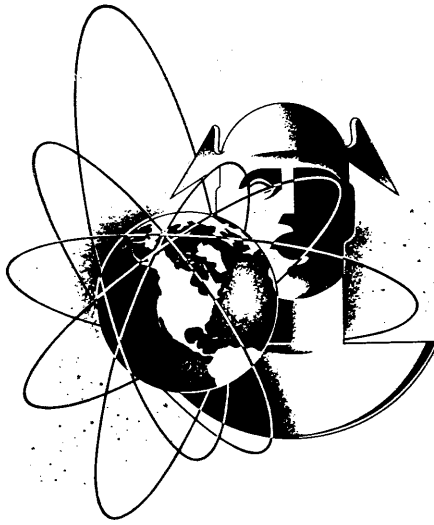
Program:

| <u>Memory Location</u> | <u>U</u> | <u>V</u> | <u>W</u> | <u>PR</u> <u>S</u> | <u>Description</u>  |
|------------------------|----------|----------|----------|--------------------|---|
| 002                    | 657      | 999      | 009      | AT Δ               | Transfer the contents of the memory location to the typewriter Output Word 9.                 |
| 003                    | 100      | 553      | 999      | DE Δ               | Track switch and type out the contents of typewriter Output Word 9.                           |
| 004                    | 102      | 109      | 999      | CP 9               | Check to see if the last address has been unloaded.   |
| 005                    | 102      | 106      | 102      | AD Δ               | Add one to the memory location address in the U portion of 102.                               |
| 006                    | ΔΔ1      | 000      | A+B      | JN Δ               | If the last address has not been unloaded, jump to 102. (A+B is the alpha equivalent of 102.) |
| 107                    | 108      | 999      | 009      | AT Δ               | Send code for "end of routine" to typewriter Output Word 9.                                   |
| 108                    | 100      | 557      | END      | DE Z               | Track switch. Typewriter types out "100557ENDDEZ" and the program stops.                      |
| 109                    | 700      | iii      | iii      | ii i               | A constant. Contains the last address to be unloaded.   |

NOTE: The W address of 006 and the process code of 002 must be coded in alpha because an alpha add is performed.







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