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HARDWARE MANUAL

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SERIES 200

EQUIPMENT OPERATORS' MANUAL (MODEL 120)

SUBJECT:

This manual describes the operating procedures for the Type 121 Central Processor and the peripheral devices most commonly associated with the Model 120.

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FOREWORD

This manual describes the operating procedures for the Type 121 Central Processor and the peripheral devices most commonly associated with the Model 120, that is the devices which can be attached to the integrated peripheral control and the Type 103 Magnetic Tape Control. Operating information for other peripheral equipment, which requires the Series 200 Control Unit Adapter (Feature 1015 or 1016), will be found in other Honeywell publications. The operating information for a particular device is presented following the brief description of that unit.

The second section of the manual presents material describing the operator's control panel and how it is used in conjunction with the central processor. Sections III, IV, and V cover punched card equipment. Sections VI and VII pertain to high-speed printing and magnetic tape equipment, respectively. Section VIII covers the two models of the console, which like the control panel allows the operator to communicate directly with the central processor.

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF TABLES

SECTION I

INTRODUCTION

The Model 120, a solid-state, high-speed computer of the Honeywell Series 200 Data Processing System, is oriented toward business data processing applications. Besides functioning as an independent data processor, the Model 120 can also be used effectively as an input/output processor for larger computers.

The basic system consists of a central processor to which a high-speed printer, a card reader, and a card punch can be connected. Since one of the most significant features of the Model 120 is its high degree of internal modularity, a varied complement of peripheral equipment may be added to the basic system configuration to meet growing data processing requirements. This capability enables the Model 120 to satisfy the input/output requirements of virtually any computer application.

The Model 120 main memory is a coincident-current memory consisting of high-speed magnetic cores which are randomly addressed through a binary addressing system. This addressing system greatly simplifies the modular expansion of memory because it eliminates the need for complex machine-language coding schemes to represent addresses in expanded memory configurations. The basic memory complement is 2,048 character locations, which may be expanded in modular increments to 32,768 locations. The first memory module added must be 2,048 characters, after which up to seven modules of 4,096 characters each may be added. The memory cycle time of the Model 120 (i.e., the time required to read and restore one character in main memory) is three microseconds.

Another important feature of the Model 120 is the linear-select control memory which, like the main memory, is a magnetic-core storage unit. The control memory consists of 16 individually addressable registers, each of which is capable of storing one main memory address. Its primary function is to provide storage for the operational registers of the central processor and the various activated peripheral devices. More specifically, it retains the addresses that describe the various transfers of information to and from main memory, plus the addresses of program instructions and operands.

The central processor traffic control unit in the Model 120 consists of three read/write channels, which makes possible the performance of peripheral operations simultaneously with computing.

CENTRAL PROCESSOR

The central processor is the computing and control center of the Model 120; instructions processed within the central processor control the operations of the entire system. The Model 120 processor is functionally divided into three units: storage, control, and arithmetic. The storage unit provides magnetic core storage for both the program instructions and the data to be processed according to these instructions; it is also used to contain the resultant data. The control unit directs the operation of the entire computer by selecting, interpreting, and controlling the execution of all program instructions. It controls not only the flow of information within the central processor, but also the flow of data between the central processor and all peripheral equipment. The arithmetic unit performs such operations as addition, subtraction, multiplication, division, and comparison, as directed by the control unit.

Included as part of the central processor is a control panel (see Section II) which provides for easy communication between the operator and the computer. By using various control switches, the operator can start and stop the machine and can load and interrogate locations in memory.

The addition of an operator's console to a Model 120 makes further monitoring and control facilities available to the operator and increases the scope and power of the associated central processor. The Type 220-1 and 220-3 Consoles perform the same basic functions as a control panel and provide the capability for some important auxiliary operations as well (see Section VIII).

PERIPHERAL DEVICES

The basic Model 120 can be equipped with a card reader, a card punch, and a printer — connected to the central processor by means of integrated peripheral controls. Information is transferred between any one of these devices and the central processor by means of Peripheral Data Transfer (PDT) instructions. By coding various control characters in this instruction, the programmer specifies the direction of data transfer (into or out of the processor), the specific device involved in the transfer, the data path over which information is to be transferred, and any other information necessary to define the input/output operation (e.g., the number of lines to be spaced during printer operations). The actual communication with the central processor is not made by the particular device but by the peripheral control associated with that device.

A peripheral control regulates the transfer of data between a processor and a peripheral device. The control compensates for the difference in the data transfer rates of the processor and the peripheral device by temporarily storing each character of transmitted information until either the processor or the device is ready to receive the character. The control also

converts each character into the code used by the intended recipient; thus, for example, the card reader control converts a character from Hollerith code to the internal six-bit code of the central processor. Finally, as each character is transferred, it is checked for accuracy by the control.

One particularly significant feature of the peripheral control is that it operates independently of the central processor and requires access to the main memory only when information transfers are performed. In particular, all of the previously mentioned activities of the control — temporarily storing, converting, and checking the information — do not involve the central processor in any way. When each character of information is transferred, one main memory cycle is allocated for the transfer.

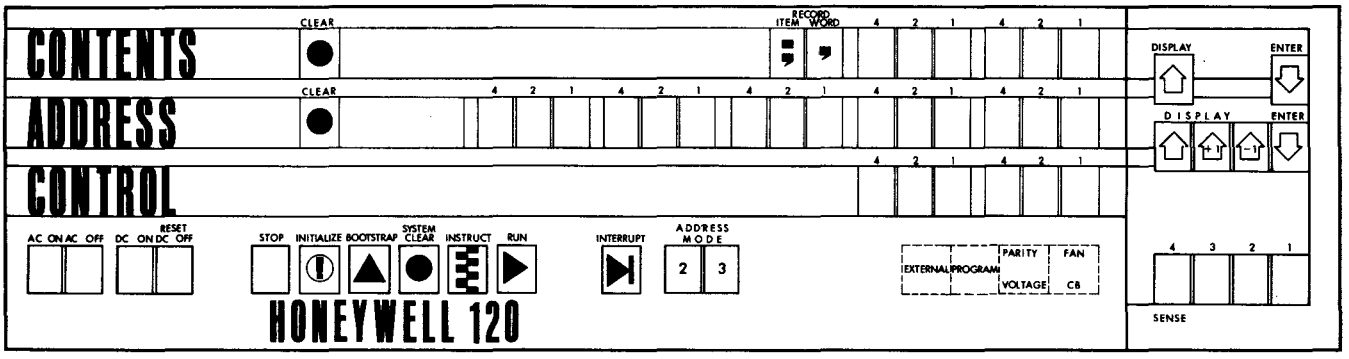
The Model 120 contains two integrated (i.e., "built in") peripheral controls. The integrated printer control directs the operation of a Type 122 Printer, while the integrated card control can handle a Type 214-2 Card Reader/Punch (or a Type 123 Card Reader and a Type 214-1 Card Punch). When the Type 103 Magnetic Tape Control is included, up to four Type 204B-11/-12 Magnetic Tape Units can be attached to the Model 120.

If the Model 120 is equipped with the Series 200 Control Unit Adapter (Feature 1015 or 1016), additional Series 200 peripheral devices may be employed by the system. These devices can be interconnected in many combinations to form a balanced system which meets the requirements of practically any computer application.

SECTION II

OPERATOR'S CONTROL PANEL

The control panel is a rectangular box containing push buttons, indicators, and display lights, which is located atop the central processor power unit. It also includes four SENSE switches which may be set by the operator to change program flow. The use of these switches increases program flexibility by allowing a single program to be used in several different applications.



CONTROL PANEL FUNCTIONS

The control panel shown above provides a visual indication of the status of the entire system and enables the operator to enter binary (or "octal" from an operator's standpoint) information manually into control memory and main memory. The switches and push buttons in the control panel permit the operator to:

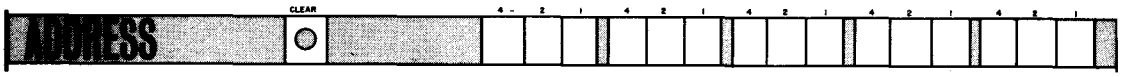
1. Start or stop the execution of a stored program;
2. Turn the power supply on or off;
3. Load information from peripheral units into main memory;
4. Clear all indicators;
5. Execute single instructions;
6. Interrogate and load main memory locations and control memory registers; and
7. Control the execution of programs by means of four SENSE switches.

OPERATOR CONTROLS

ADDRESS Push-Button Indicators

These push-button indicators display the address of a character in main memory. In the STOP mode, the address displayed in the ADDRESS indicators is normally the same as the address contained in the sequence register.

Access to main memory is under control of a memory address register (MAR) which contains the address of the memory location being referenced. In the Type 121 Central Processor, the contents of the memory address register are displayed by the ADDRESS push buttons in five octal groups.



A memory address is displayed as a binary pattern of lights. If a button is illuminated, the corresponding bit is a "1"; if the button is not illuminated, the corresponding bit is a "0". Buttons for which there are no corresponding bits are never illuminated. For example, the high-order button in the fifth octal group is never illuminated unless the system contains more than 16,384 main memory locations.

Any bit in the memory address register can be changed from a 0 to a 1 by depressing the corresponding push button; this action sets the bit and illuminates the button. To change a bit from a 1 to a 0, however, it is necessary to reset all the memory address register bits to 0's by depressing the ADDRESS CLEAR button (or the INITIALIZE button). The desired 1's may then be set by depressing the appropriate push buttons.

The contents of the memory address register can be changed manually only in the STOP mode, since the ADDRESS buttons are interlocked to be effective only when the STOP button is illuminated. The lights in the ADDRESS push buttons are effective at all times, however, and display the instantaneous contents of the memory address register while the program is running.

CONTENTS Push-Button Indicators

The CONTENTS push-button indicators normally display a character in main memory. In the STOP mode, they are not normally illuminated, unless they are manually changed or displayed.

Access to main memory is accomplished via a nine-bit memory local register (MLR) whose contents are displayed in the CONTENTS indicators as a binary pattern of lights. (NOTE: The parity bit is not displayed in the CONTENTS indicators.) The memory local register bits are set and reset and the push buttons are illuminated according to the same rules discussed above for the memory address register, except that the CONTENTS CLEAR (or the INITIALIZE) button resets the register.

Two push buttons, DISPLAY and ENTER, are associated with the CONTENTS push buttons.

CONTENTS DISPLAY  

This button is effective only when the system is in the STOP mode. When the CONTENTS DISPLAY button is depressed, the CONTENTS indicators display the character in the main memory location specified by the memory address register (i.e., the ADDRESS indicators) with any accompanying punctuation bits.

If a parity failure occurs or if the addressed location does not exist, the PARITY indicator is illuminated. The PARITY indicator may be reset prior to performing further manual operations, but all manual operations except BOOTSTRAP, INSTRUCT, and RUN may be performed while the PARITY indicator is illuminated. (See page 2-11 for a complete description of the PARITY indicator.)

CONTENTS ENTER  

This button is effective only when the system is in the STOP mode. When the CONTENTS ENTER button is depressed, the character and the punctuation bits displayed in the CONTENTS indicators are written with correct parity into the main memory location whose address is displayed in the ADDRESS indicators. The previous contents of the main memory location are destroyed, and if that location contained incorrect parity before, it contains correct parity after the ENTER button is depressed. However, depressing the CONTENTS ENTER button does not illuminate or turn off the PARITY indicator.

CONTROL Push-Button Indicators

These four push-button indicators display the octal address of a control memory register as a binary pattern of lights. The display of the push buttons changes only when they are depressed. Their setting can be altered at any time, and each indicator is either illuminated or turned off each time it is depressed.

It should be noted that the CONTROL buttons have no role while the program is running, and their display is not affected by a running program. They are used only by the control panel itself in conjunction with the following associated push buttons.

CONTROL DISPLAY+1  

The CONTROL DISPLAY+1 button is effective only when the system is in the STOP mode. If the CONTENTS indicators are not already illuminated when the CONTROL DISPLAY+1 button is first pressed, the contents of the memory location specified by the memory address register (i.e., the ADDRESS indicators) are displayed in the CONTENTS indicators. If the CONTENTS indicators are already illuminated when the CONTROL DISPLAY+1 button is first pressed, the configuration of the CONTENTS indicators remains the same. Regardless of the initial state of the CONTENTS indicators, each subsequent depression of the CONTROL DISPLAY+1 button (after the initial depression) results in the following conditions:

1. The contents of the control memory register specified by the CONTROL indicators are displayed in the ADDRESS indicators;
2. The character in memory stored at the address displayed in the ADDRESS indicators in "1" above is displayed in the CONTENTS indicators. (If incorrect parity is stored with the character in memory being referenced, or if the addressed location does not exist, the PARITY indicator is illuminated. See page 2-11 for a complete description of the PARITY indicator.)
3. The address displayed in "1" above is incremented by one and returned to the control memory register designated by the CONTROL indicators.

For example, if the CONTROL indicators specify the sequence register (octal 17), whose contents are 3147_8, depressing the CONTROL DISPLAY+1 button twice causes 3147_8 to be displayed in the ADDRESS indicators, the charactor in location 3147_8 to be displayed in the CONTENTS indicators, and the contents of the sequence register to be incremented to 3150_8.

CONTROL DISPLAY-1  

This button is effective only when the system is in the STOP mode. The effect of the first depression of the CONTROL DISPLAY-1 button is the same as that described above for the CONTROL DISPLAY+1 button. When the CONTROL DISPLAY-1 button is depressed a second time, conditions "1" and "2" above result, and the address displayed in "1" above is decremented by one and returned to the control memory register designated by the setting of the CONTROL indicators.

CONTROL DISPLAY  

This button is effective only when the system is in the STOP mode. When it is depressed, conditions "1" and "2" above result, but no incrementation or decrementation takes place.

CONTROL ENTER  

The CONTROL ENTER button is effective only when the system is in the STOP mode. When it is depressed, the octal configuration displayed in the ADDRESS indicators is written into the control memory register designated by the CONTROL indicators. The previous contents of the control memory register are destroyed, and the character in main memory which is stored at the new address is displayed in the CONTENTS indicators. If incorrect parity is stored with the new character, or if the addressed location does not exist, the PARITY indicator is illuminated. (Refer to page 2-11 for a complete description of the PARITY indicator.) It should be noted that pressing the CONTENTS ENTER button does not cause an internal interrupt demand to be set.

STOP Button  

The STOP button is illuminated when the system is in the STOP mode. It is not illuminated when in the RUN mode. In the STOP mode, the system executes no program instructions, and peripheral devices may be actuated only by manual "stepping." In the RUN mode, the system operates automatically. Depressing this push button enables the central processor to be de-energized when the RESET DC OFF button is depressed. If an interrupt signal is received while the system is in the STOP mode, the EXTERNAL indicator (see page 2-12) becomes illuminated when the RUN mode is subsequently entered.

In a normal stop, the instruction under extraction or execution at the time of the stop is fully executed and is the last one performed, regardless of interrupt processing. The STOP mode is not entered nor the STOP button illuminated, however, until all peripheral operations that are in progress have been completed.

The STOP mode can be entered in one of six ways:

1. When a program Halt (H) instruction (with or without branch) is executed (normal stop);
2. When the STOP button is depressed (normal stop);
3. When a parity failure occurs. A parity failure is not a normal stop, and the instruction under execution is stopped at the end of the current memory cycle; however, all peripheral operations are allowed to be completed. While the peripheral operations are completing, neither the STOP indicator nor the RUN indicator is illuminated;
4. When the SYSTEM CLEAR button is depressed after the STOP button has been depressed. This is not a normal stop (see below, "SYSTEM CLEAR Button");
5. When the INITIALIZE button is depressed after the STOP button has been depressed. This is not a normal stop (see below, "INITIALIZE Button"); and

6. When a program check occurs. This is not a normal stop condition (refer to page 2-12 for a description of this condition).

After an abnormal stop, the program generally cannot be resumed successfully by simply depressing the RUN button. The operator may attempt to restart the program at the nearest possible point in the program at which the abnormal stop occurred.

SYSTEM CLEAR Button 

This button is effective only after the STOP button has been depressed. When the SYSTEM CLEAR button is depressed, the following conditions result:

1. Central processor operations terminate at the end of the current memory cycle;
2. The RUN indicator is turned off;
3. The central processor cycle counter is reset;
4. The PARITY indicator is turned off; and
5. The PROGRAM indicator is turned off.

Peripheral operations are allowed to be completed, except in the console and the magnetic tape control. If data is being transferred to the console or tape when the SYSTEM CLEAR button is depressed, the transfer is not completed. If data is being transferred from the console or tape when the SYSTEM CLEAR button is depressed, no further information enters memory. However, tape movement continues until an interrecord gap is sensed. If an instruction is stored in a peripheral device, the STOP indicator does not illuminate after the SYSTEM CLEAR button is depressed.

INITIALIZE Button 

The INITIALIZE button is effective only after the STOP button has been depressed. When held down, this switch causes all control panel lamps, except AC ON, AC OFF, DC ON, RESET DC OFF, VOLTAGE, FAN, and CB to illuminate, thus providing a filament test. When the INITIALIZE button is released, only the CONTROL and SENSE switch indicators remain illuminated in their original states: all other indicators are turned off. Depressing the INITIALIZE button results in the following conditions:

1. The STOP indicator is illuminated, and central processor operations are terminated immediately;
2. Central processor stored instructions and subcommands are reset;
3. The central processor parity, overflow, and zero balance indicators, and other auxiliary storage functions, are cleared;

4. The central processor cycle counter is reset;
5. The memory address register (MAR) and the memory local register (MLR) and their associated displays (i.e., ADDRESS and CONTENTS, respectively) are cleared to zeros;
6. The system is set to the two-character addressing mode;
7. Item-mark trapping is reset;
8. All interrupt demands and peripheral interrupt allow functions are turned off; and
9. An "initialize" signal is sent to all peripheral controls causing them to release read/write channels, to clear stored instructions, to clear error indicators, to inhibit interrupts during initialization, and to assume the following states:

Printer Control	Same response as to local "clear," plus error indicator reset.
Tape Control	Error indicators reset.
Card Reader and/or Punch Control	Stored instruction cleared, error indicators reset, "alphanumeric" mode entered.

The operator should exercise caution in using the INITIALIZE button following machine stop conditions (e.g., error-check conditions, program or machine malfunctions, etc.). It is extremely important that the operator use discretion in clearing error-check conditions and performing restart procedures. If the INITIALIZE button is depressed at any time during the operation of the program or during either a normal or abnormal stop condition, the resulting eight conditions outlined above may destroy pertinent program information. In such an event, it may be necessary to rerun the program from the beginning.

RUN Button  

The RUN button is illuminated when the system is in the RUN mode and turned off when in or waiting to enter the STOP mode. The RUN mode can be entered by depressing the RUN button, unless a parity check or program check is stored. A stored check must be cleared before the RUN button is effective. Depressing the RUN button causes the AC OFF and RESET DC OFF switches to be overridden when the central processor is energized and no check conditions exist.

In the RUN mode, the system executes (without manual intervention) stored program instructions under control of the sequence register.

INSTRUCT Button  

The INSTRUCT button is effective only when the system is in the STOP mode with the PARITY and PROGRAM indicators extinguished. Pressing this button causes the program to execute only the next instruction. While that instruction is being executed, the STOP indicator is turned off, and the RUN indicator is illuminated. If the instruction specifies a peripheral data transfer, the RUN indicator is turned off when the data transfer begins, so that both the RUN and STOP indicators are turned off until data transfer terminates. At the completion of the transfer, the STOP indicator is illuminated.

If the central processor is not in the interrupt mode but is storing an interrupt demand, pressing the INSTRUCT button on the control panel causes the interrupt mode to be entered. When depression of the INSTRUCT button causes the interrupt mode to change, no program instructions are executed.

BOOTSTRAP Button  

The BOOTSTRAP button is effective only when the system is in the STOP mode. When it is depressed, the following conditions result:

1. The address indicated by the setting of the ADDRESS buttons is placed into the sequence register, the A- and B-address registers, and both the starting and current location counters of read/write channel one;

2. A simulated peripheral read or write instruction specifying read/write channel one is generated. The peripheral control addressed is designated by the setting of the low-order six bits of the CONTENTS push-buttons (memory local register). If a tape control is designated by the memory local register bits, tape drive number zero is read.

   NOTE: A write instruction is issued if the CONTENTS buttons designate the address of a printer control or a card punch control; if they designate the address of a tape control, the generated peripheral instruction is always a read.

3. The punctuation bits of each character read into memory during a BOOTSTRAP operation are automatically cleared to zeros. A BOOTSTRAP operation is not terminated by a record mark in memory.

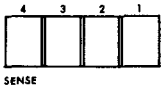
4. The information flow is terminated by the peripheral control.

   NOTE: In the Type 224-1, 2 Card Reader/Punch, data transfer is terminated only by a record mark in memory.

The contents of the memory address register, the memory local register, the sequence register, the A- and B-address registers, and both the starting and current location counters of read/write channel one are altered by the BOOTSTRAP operation. The setting of the ADDRESS MODE buttons at the time the BOOTSTRAP button is pressed has no effect on the BOOTSTRAP

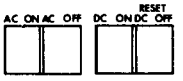
operation itself. If the BOOTSTRAP button is pressed while either the PARITY indicator or the PROGRAM indicator is illuminated, the behavior of the system is unspecified.

SENSE Switches



These four illuminated push buttons, numbered from right to left in ascending order, are used to control program flow, since each can be tested by program instructions which branch conditionally on a particular setting of the switch. The system should be in the STOP mode when the setting of a SENSE switch is altered. Otherwise, the results cannot be specified if the conditional branch instruction is executed within 50 milliseconds after the SENSE switch is altered. (A SENSE switch reverses its state when pressed, but does so several times for 50 milliseconds before finally assuming its new state; the program must be structured accordingly, or the SENSE switches must be altered only in the STOP mode.)

AC ON, AC OFF, DC ON, RESET DC OFF Push-Button Switches



When apply power to the system, the AC ON button must be depressed first. The functions of the power switches are as follows:

1. The AC ON button applies a-c power to the system, illuminates the AC ON indicator, and turns off the AC OFF indicator. The AC ON indicator is not affected by the power checks, viz., VOLTAGE, FAN, or CB (see page 2-12).
2. The DC ON button is effective only after the AC ON button has been depressed. The DC ON button applies d-c power to the system, illuminates the DC ON indicator, and turns off the RESET DC OFF indicator. If the RESET DC OFF indicator is illuminated red, it must be pressed to enable the DC ON button to become effective. The DC ON indicator is turned off by the power checks (see page 2-12).
3. The AC OFF switch removes both a-c and d-c power from the system, illuminates the AC OFF and RESET DC OFF indicators, and turns off the AC ON and DC ON indicators. The AC OFF button is interlocked with the STOP and RUN buttons. Therefore, to remove a-c power, the STOP button must be depressed prior to depressing the AC OFF button. If the RUN button has been depressed, the AC OFF switch is not effective until the STOP button is depressed.
4. The RESET DC OFF switch removes d-c power from the system and illuminates the DC OFF indicator. The RESET DC OFF indicator is illuminated when an undervoltage or overvoltage condition exists in the central processor. This switch is also used to extinguish the RESET DC OFF indicator after a voltage problem has been corrected. This switch must be depressed before any attempt is made to energize the central processor after a voltage problem has been corrected. The RESET DC OFF button is interlocked with the STOP and RUN buttons. Therefore, to remove d-c power, the STOP button must be depressed prior to depressing

the RESET DC OFF button. If the RUN button has been depressed, the RESET DC OFF switch is not effective until the STOP button is depressed. The RESET DC OFF indicator is illuminated by the power checks (see page 2-12) and is turned off when the DC ON switch is depressed. When the RESET DC OFF button is illuminated by a VOLTAGE check, it glows red; in other cases it is white. Following a VOLTAGE check, depressing the RESET DC OFF button resets only the VOLTAGE check indicator. The RESET DC OFF switch has no affect on a-c power.

ADDRESS MODE Buttons

Two separate illuminating ADDRESS MODE push buttons labelled "2" and "3" are provided on the control panel. The "2" button is illuminated when the central processor is in the two-character addressing mode (specifying any one of 4,096 locations). The "3" button is illuminated when in the three-character mode (specifying any one of 32,768 memory locations plus address modification information). The appropriate button is illuminated from instant to instant as the central processor changes addressing modes. The push buttons are effective only when the system is in the STOP mode. However, when the INITIALIZE button is pressed, the two-character mode without item-mark trapping is entered regardless of the previous mode.

INTERRUPT Push-Button Indicator

The Type 121 Central Processor control panel is equipped with an INTERRUPT push button indicator. The INTERRUPT button is effective at all times, even when the system is in the STOP mode. If the INTERRUPT button is pressed while the system is in the STOP mode, the control panel interrupt demand is set, but the INTERRUPT indicator is not illuminated until the system subsequently enters the RUN mode (as a result of pressing the RUN button) and the interrupt signal is actually honored.

For an interrupt signal to be honored, the following conditions must be satisfied:

1. The central processor is in the RUN mode;
2. The central processor is not already in the external interrupt mode;
3. The central processor is about to extract the op code of an instruction; and
4. A memory cycle is allocated to the central processor.

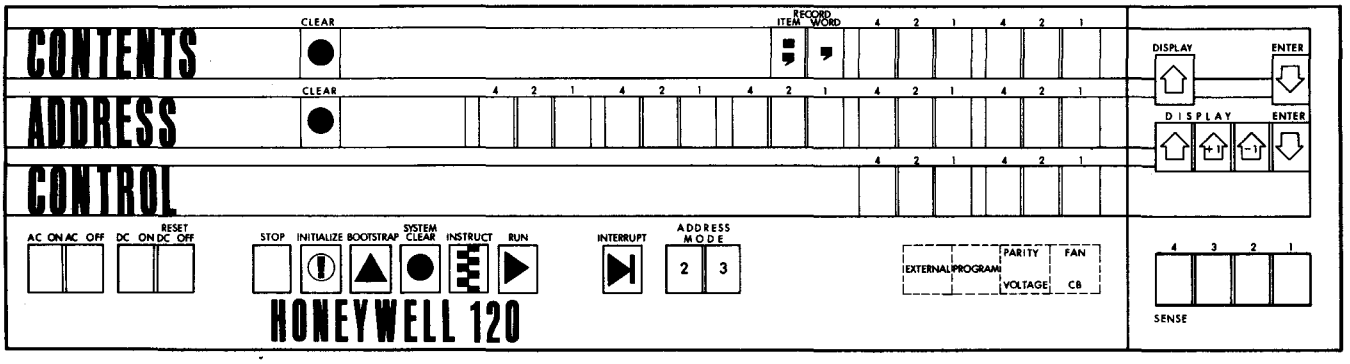
If the external interrupt demand is set and the above conditions are satisfied, the central processor enters the external interrupt mode and the INTERRUPT indicator becomes illuminated and remains so as long as the central processor is in the external interrupt mode. In addition, as the external interrupt mode is entered, the EXTERNAL indicator in the lower right corner of the control panel (see page 2-12) is illuminated and remains so for the duration of the interrupt.

If the central processor is already in the RUN mode when the external interrupt demand is set (as a result of pressing the INTERRUPT button), the central processor enters the external interrupt mode and the INTERRUPT button and the EXTERNAL indicator become illuminated as soon as the four conditions outlined above are satisfied.

During processing, the external interrupt mode is terminated and the associated INTERRUPT and EXTERNAL indicators are reset (extinguished) when the program executes a Resume Normal Mode (RNM) instruction. Similarly, the external interrupt demand and the associated indicators may be reset by pressing the INITIALIZE button. The INITIALIZE button, however, is not effective unless the STOP button has been pressed.

CONTROL PANEL INDICATORS

The control panel indicators are located in the lower right-hand corner of the operator's control panel (see below). They are visible only when illuminated. The INTERRUPT indicator is white, and all other indicators are red.



PARITY Indicator

The PARITY indicator is illuminated when incorrect parity is detected in a main memory location or when the location addressed does not exist. The indicator may be extinguished by pressing either the SYSTEM CLEAR button or the INITIALIZE button prior to performing further manual operations; however, all manual operations except BOOTSTRAP, INSTRUCT, and RUN can be performed while the PARITY indicator is illuminated. It should be noted that if the BOOTSTRAP button is pressed while the PARITY indicator is illuminated, system behavior is unspecified.

A parity check is not a normal stop condition. However, all peripheral operations are allowed to go to completion. After a parity check occurs, the program normally cannot be resumed. It may be possible, however, to go back to the last instruction and attempt to rerun, but any recovery procedure is subject to locally established policy.

VOLTAGE Indicator

If the Model 120 ceases operating due to an undervoltage or an overvoltage of a d-c power supply, the VOLTAGE indicator is illuminated, and the d-c power to the system is removed. The RESET DC OFF indicator is illuminated red, and the DC ON indicator is turned off. The VOLTAGE indicator may be reset by depressing the STOP button and then the RESET DC OFF button.

FAN Indicator

If the Model 120 ceases operating due to a temperature check, the FAN indicator is illuminated, and d-c power to the system is removed. Also, the RESET DC OFF indicator is illuminated, and the DC ON indicator is turned off. When the AC OFF indicator is illuminated, the FAN indicator is normally illuminated also.

CB Indicator

If the Model 120 ceases operating due to a circuit breaker actuation, the CB indicator is illuminated, and d-c power to the system is removed. Also, the RESET DC OFF indicator is illuminated, and the DC ON indicator is turned off.

EXTERNAL Indicator

This indicator operates in conjunction with external interrupt processing. It is illuminated automatically whenever the central processor enters the external interrupt mode. Provided that the four conditions outlined on page 2-10 are satisfied, the external interrupt mode is entered in any one of the following three ways:

1. By receipt of an interrupt signal from a peripheral control;
2. By pressing the control panel INTERRUPT button when the central processor is in the RUN mode or by pressing the INTERRUPT and INSTRUCT buttons when the central processor is in the STOP mode; and
3. By execution of a programmed Monitor Call (MC) instruction.

During processing, the external interrupt mode is terminated and the EXTERNAL indicator is reset (extinguished) when the program executes a Resume Normal Mode (RNM) instruction. Pressing the INITIALIZE button when the system is in the STOP mode also resets the external interrupt mode and extinguishes the EXTERNAL indicator; however, the indicator remains illuminated as long as the INITIALIZE button is held depressed.

PROGRAM Indicator

This indicator is located adjacent to the EXTERNAL indicator in the lower right corner of the control panel (see page 2-11). The PROGRAM indicator is illuminated whenever a program

check occurs. A program check is caused by the use of an illegal op code or a non-installed optional op code.

A PROGRAM indication results in an automatic, unprogrammed halt. All peripheral operations, however, are allowed to go to completion. The sequence register contains the address of the op code of the instruction that is responsible for the program check.

Pressing of either the INITIALIZE button or the SYSTEM CLEAR button resets the program check and extinguishes the PROGRAM indicator.

OPERATING PROCEDURES

The standard operating procedures outlined below can be performed only when the STOP button is illuminated. If depressing the STOP button does not cause the STOP indicator to illuminate, the central processor must be cleared or initialized before proceeding. This is accomplished by depressing either the SYSTEM CLEAR button or the INITIALIZE button.

1. To display a control memory register and the character in main memory it references:
   a. Press the appropriate CONTROL buttons (to specify the desired control memory register, if different from the register presently indicated). The address of the desired control memory register now appears in the illuminated CONTROL indicators.
   b. Press the CONTROL DISPLAY button. The main memory address specified by the setting of the control memory register now appears in the ADDRESS indicators, and the character referenced by the setting of the address indicators is displayed in the CONTENTS indicators.
2. To display characters in successive main memory locations:
   a. If it is desired to display successive main memory locations beginning with the current setting of the program, proceed to step "d" below. If it is desired to display some location(s) beginning with other than the current setting of the program, manually enter (by pressing the appropriate ADDRESS buttons) the desired starting address into the memory address register.
   b. Press the CONTROL buttons to designate the desired unassigned register (octal 16 or 07).
   c. Press the CONTROL ENTER button to set the control memory register selected in step "b" above to the starting address selected in step "a" above.
   d. Press the CONTROL DISPLAY+1 or the CONTROL DISPLAY-1 button, depending on the desired direction of the serial display of characters.

      NOTE: No incrementation or decrementation takes place upon the first depression of either button.

   e. Press the CONTROL DISPLAY+1 or the CONTROL DISPLAY-1 button a second time to display in the CONTENTS indicators the

character referenced by the setting of the ADDRESS indicators and to increment or decrement the controlling register to the next sequential location.

NOTE: If the displaying of the characters is to begin with the current setting of the program, the characters displayed in the CONTENTS indicators begin with the character designated by the current setting of the ADDRESS indicators. Otherwise, the display begins with the character referenced in the address selected by the operator in step "a" above.

f. Press repeatedly the CONTROL DISPLAY+1 or the CONTROL DISPLAY-1 button until the desired successive memory locations have been displayed in the CONTENTS indicators.

3. To write characters into successive main memory locations:

a. If it is desired to enter information into successive main memory locations beginning with the current setting of the program, proceed to step "d" below. If it is desired to enter information into some location(s) beginning with other than the current setting of the program, manually enter (by pressing the appropriate ADDRESS buttons) the desired starting address into the memory address register.

b. Press the CONTROL buttons to designate the desired controlling register (octal 16 or 07).

c. Press the CONTROL ENTER button to set the control memory register selected in step "b" above to the starting address selected in step "a" above.

d. Press the CONTROL DISPLAY+1 or the CONTROL DISPLAY-1 button, depending on the desired direction of character entry into main memory.

NOTE: No incrementation or decrementation takes places upon the first depression of either button.

e. Press the CONTROL DISPLAY+1 or the CONTROL DISPLAY-1 button again to display in the CONTENTS indicators the character referenced by the setting of the ADDRESS indicators and to increment or decrement the controlling register to the next sequential location.

NOTE: If the entering of the characters is to begin with the current setting of the program, the character displayed in the CONTENTS indicators is the one designated by the current setting of the ADDRESS indicators. Otherwise, the character displayed is the one referenced in the address selected by the operator in step "a" above.

f. If a different character from that displayed in step "e" above is to be written into the desired memory location, press the CONTENTS CLEAR button.

g. Press the CONTENTS buttons to create the octal equivalent of the desired character.

h. Press the CONTENTS ENTER button to write the desired character into main memory.

I. Repeat steps "e" through "h" as many times as there are characters to be written into successive memory locations.

4. To trace program flow manually:

   a. Set the CONTROL buttons to designate the sequence register (octal 17), unless this register is already designated.

   b. Press the CONTROL DISPLAY button (to display the current operation code.

   c. Press the INSTRUCT button (to execute the instruction).

   d. Repeat steps "e" and "c" the desired number of times.

5. To perform a BOOTSTRAP and RUN operation:

   a. Press the INITIALIZE button.

   b. Press the ADDRESS buttons (to designate the starting location in main memory, if different from zero).

   c. Press the CONTENTS buttons to designate the desired peripheral control.

   d. Prepare the peripheral device designated in "c" above (i.e., cycle up the device) to accept a PDT instruction which will read in the loading program.

   e. Press the BOOTSTRAP button and wait for the STOP indicator to illuminate.

   f. If the program being loaded is written for other than two-character addressing mode, press the appropriate ADDRESS MODE button to select the proper addressing mode.

      NOTE: It is usually not necessary to manipulate the ADDRESS MODE buttons, since the program usually contains the appropriate instruction for addressing mode control.

   g. Press the RUN button.

Abnormal Stop Procedures

The control panel power indicators (viz., VOLTAGE, FAN, and CB), the PARITY indicator, and the PROGRAM indicator signal abnormal stop conditions. The operating procedures for each of these occurrences is outlined below.

VOLTAGE — If a VOLTAGE indication occurs, the system ordinarily stops operating altogether. In this case, the service engineer should be called.

FAN — The FAN indicator may flicker intermittently at times during normal operations, but if the indicator illuminates and remains constant (in which case the system powers down), a service engineer should be called.

CB — Illumination of the CB indicator denotes a circuit breaker actuation, in which case the system ceases operation. In this event, the service engineer should be called.

PARITY — When a PARITY indication occurs, central processor operations stop and cannot be resumed normally by simply pressing the RUN

PARITY (cont) button. The run requirements of each installation vary, and the handling of error conditions is often a function of the type of run, e.g., production or checkout. How a parity check is to be handled may be defined by the programmer's instructions to the operator or by locally established policy. In general, the operator may reset the PARITY indicator by pressing either the SYSTEM CLEAR or the INITIALIZE button on the control panel and, if necessary, clear memory and restart the run.

NOTE: It may be possible to effect a restart without clearing memory. The operator may also perform any other set of procedures specified locally by the installation.

PROGRAM This check condition is caused by an illegal op code in the program (see page 2-12). Depending on the type of run and the programmer's instructions to the operator, the operator may clear the PROGRAM indicator by pressing either the SYSTEM CLEAR or the INITIALIZE button and attempt to continue the run.

NOTE: Pressing the INITIALIZE button resets all central processor auxiliary storage functions, thus perhaps destroying pertinent program information. The operator should always exercise extreme caution in the use of the INITIALIZE button.

To continue processing, the operator must prevent the re-extraction of the offending op code by changing it to a No Operation (NOP) instruction. Program execution resumes at the next op code identified by a word mark. The operator may also perform any other set of procedures specified locally by the installation for handling a program check.

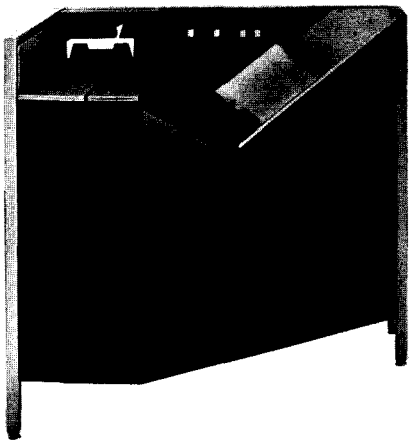
Control Panel Checkpoint Procedures

A "checkpoint" is a programmed condition whereby processing is delayed or stopped to await an operator decision. The operator can easily recognize the existence of a checkpoint by observing the control panel. Any checkpoint is denoted by the control panel lights becoming constant to signify a machine halt.

Depending on the configuration of the control panel lights, the checkpoint (machine halt) may indicate simply the completion of a job or the necessity for a parameter entry by the operator. (The occurrence of a checkpoint implies that no abnormal stop conditions have occurred, e.g., a parity error.) The contents of the pertinent control memory register (usually the A- and/or B-address registers) must be consulted in accordance with the programmer's instructions to the operator. In this way, the operator can determine the nature of the machine halt (by comparing the contents of specified registers with predefined checkpoint codes) and then act accordingly. The actions which may be taken by the operator are those which are normally associated with job completion (e.g., demounting tapes, disposition of output, etc.) or the control panel entry of a previously defined parameter which permits processing to continue according to programmer-specified operating options.

SECTION III

TYPE 123 CARD READER



The Type 123 Card Reader processes cards at the rate of 400 cards per minute on a demand-feed basis. The input medium to the 123 is 80-column cards (standard) or 51-column cards (optional). Starting with column 1, information is read optically by means of 12 photocells; all columns are read serially until column 80 (or 51) has been read. The information contained in each column is decoded (i.e., translated into a six-bit central processor character) by the integrated card control and is transferred by this control to the main memory. Data transfer is terminated when the last column is read or when a record mark is sensed in memory, whichever occurs first.

As shown in Figure 3-1, the basic components of the Type 123 Card Reader are an input hopper, a wait station, a reading station, and an output stacker. The input hopper has a capacity of 3,000 cards; the output stacker has a capacity of 2,500 cards. Cards may be loaded into the input hopper or removed from the output stacker while cards are being read. Selected cards or error cards may be offset-stacked in the output stacker.

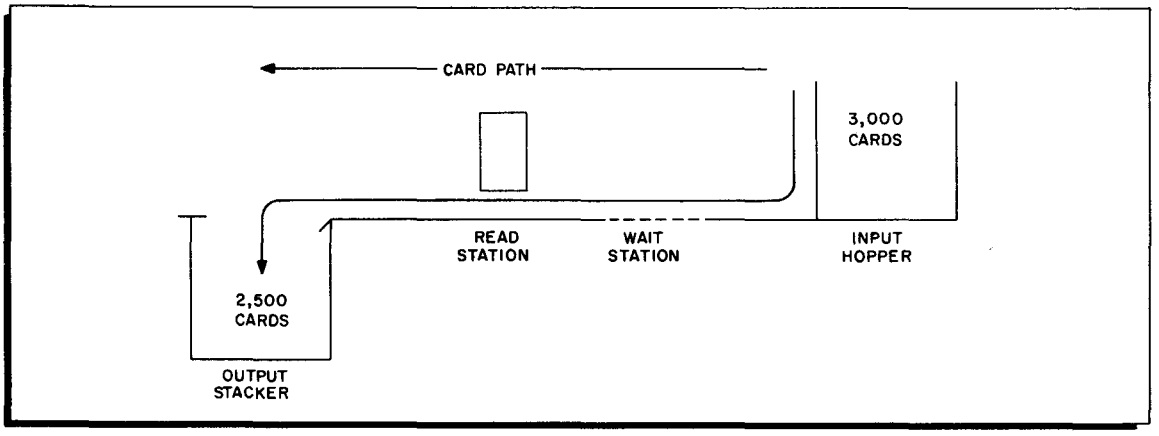
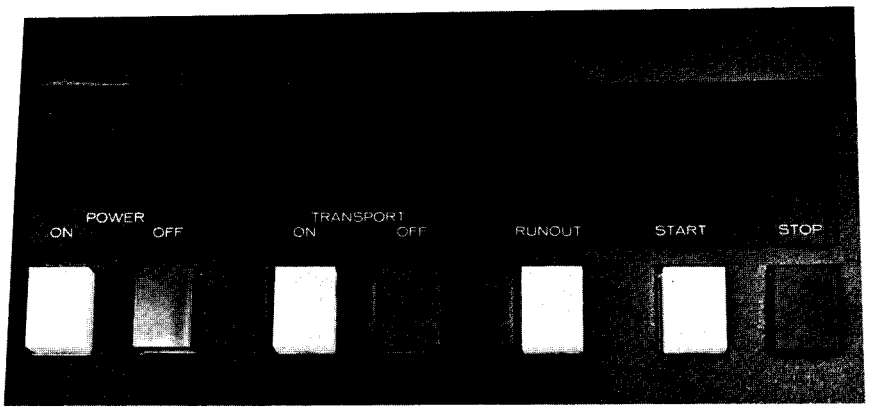


Figure 3-1. Card Path in Type 123 Card Reader

CONTROL PANEL SWITCHES AND INDICATORS

The layout of the switches and indicators on the card reader main control panel is shown below.



Main Control Panel Switches

The switches are momentary-contact MICRO SWITCH push buttons which become effective upon depression. A description of these switches follows.

POWER ON	Pressing this switch turns on primary power in the card reader. The POWER ON indicator is illuminated when power is applied to the card reader.
POWER OFF	Pressing this switch turns off all power in the card reader and extinguishes the POWER ON indicator. If the POWER OFF switch is pressed while a card is being read, the effect upon data transfer is unspecified.
TRANSPORT ON	Pressing the TRANSPORT ON switch starts the transport motors (provided the POWER ON switch has been pressed) or restarts the transport motors if they have been stopped because of a jam condition. Pressing this switch also illuminates the TRANSPORT ON indicator.
TRANSPORT OFF	Pressing this switch stops the transport motors. If the TRANSPORT OFF switch is pressed while a card is being read, the effect upon data transfer is unspecified. Pressing the TRANSPORT OFF switch extinguishes the TRANSPORT ON indicator.
RUNOUT	This switch is effective only when the reader is in the STOP mode. Pressing the RUNOUT switch generates the "clear" signal and causes the card in the wait station to be moved through the read station to the output stacker. The clear signal resets a VALIDITY check and a TRANSPORT check; it also resets a cycle check when the instruction is not stored. If an instruction is stored, the RUNOUT switch clears the stored instruction and sets a cycle check.
START	Pressing the START switch places the reader in a "ready" status and illuminates the START indicator. The START switch moves a card into the wait station (if it is empty) resets the CARDS and INPUT indicators, and deactivates the busy signal to the central processor. If the START switch is pressed before five seconds has elapsed following the starting of the transport motors, or when the STOP indicator is not illuminated, no action results.

STOP — Pressing the STOP switch removes the reader from the ready status and illuminates the STOP indicator. The busy signal to the central processor is activated and remains active until the START switch is pressed. If a read instruction is in process in the card control when the STOP switch is pressed, that instruction is transmitted to the reader and executed.

Main Control Panel Indicators

The indicators described below are visible only when illuminated:

CARDS — The CARDS indicator is illuminated when the output stacker is full, or when both the input hopper and the wait station are empty, or when the cards in the stacker are not pressing against the stacker feed rolls.

INPUT — The INPUT indicator is illuminated when the wait station is either not filled following a START switch depression or not refilled following a read instruction. Corrective action by the operator is required (see page 3-7) and, in most cases, may be performed while the machine covers are in place.

TRANSPORT — The TRANSPORT indicator is illuminated when a jam condition occurs which may require the operator to swing open the rear doors on the device before clearing the jam condition (see page 3-8). The transport motors are turned off automatically when this indicator is illuminated.

NOTE: After a TRANSPORT indication, it becomes necessary to cycle up the device again by pressing the POWER OFF, POWER ON, RUNOUT, and TRANSPORT switches.

CYCLE — The CYCLE indicator is illuminated when the reader control detects a cycle check. The indicator remains illuminated until the next PDT instruction is issued to the integrated card control. A cycle check indicates a failure in the photocell circuit at the reading station. Under program control, the integrated card control may remain busy until corrective action is taken by the operator, offset-stack the error card and continue to process cards, or offset-stack the error card and remain busy until corrective action is taken by the operator.

VALIDITY — The VALIDITY check (illegal punch) indicator is illuminated whenever an illegal combination of holes occur in the card column being read. The indicator remains illuminated until the next PDT instruction is issued to the integrated card control. Under program control, the integrated card control may remain busy until corrective action is taken by the operator, offset-stack the error card and continue to process cards, or offset-stack the error card and remain busy until corrective action is taken by the operator.

READER — The READER indicator is illuminated when a machine failure occurs which the operator does not normally correct. This indicator is also illuminated when the reader is in the TEST mode. The nature of the failure is indicated on the auxiliary control panel, i.e., POWER, PICKER, or HEAT.

READER (cont)

NOTE: A POWER indication can be corrected by the operator by resetting a circuit breaker. Corrective action by a service engineer is required in the case of a PICKER or HEAT indication.

Auxiliary Control Panel Switches

The switches described below are toggle switches which may be in either of two positions.

NOTE: The auxiliary control panel (see Figure 3-2) is not normally used by the operator.

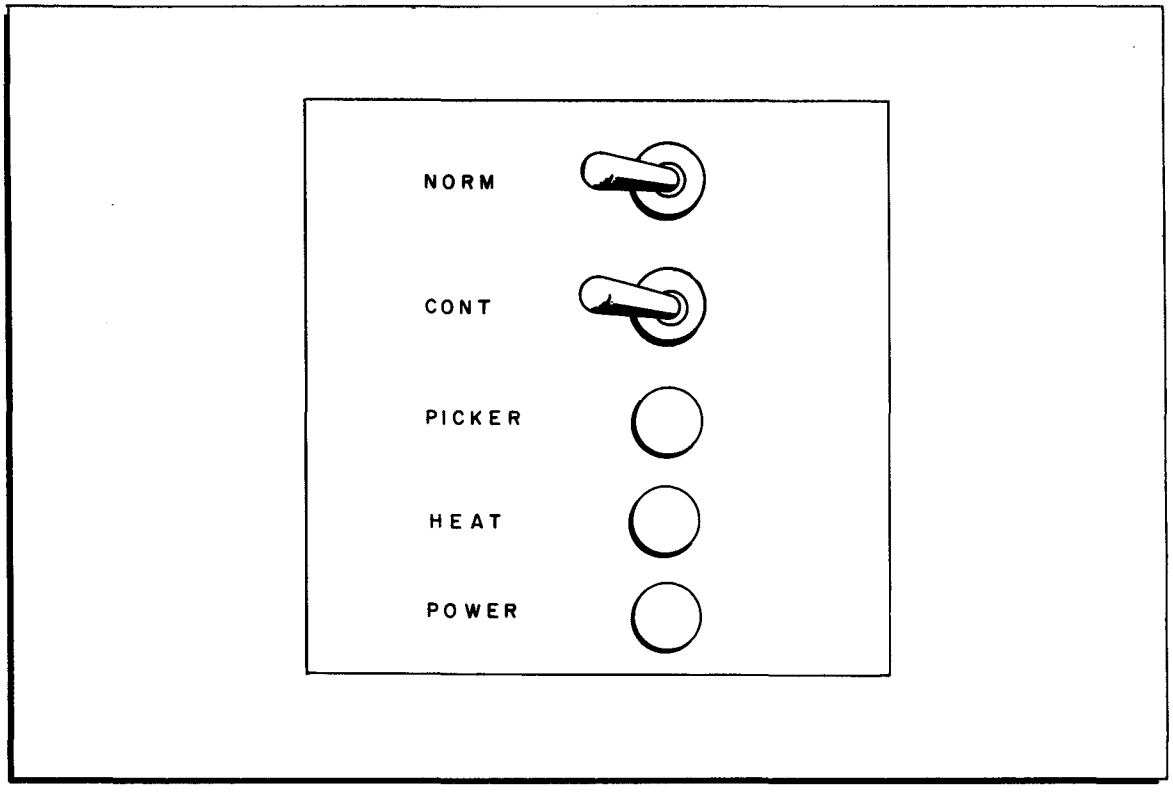


Figure 3-2. Auxiliary Control Panel Controls and Indicators

MODE: NORMAL/TEST — This toggle switch selects either the NORMAL (operational) mode or the TEST mode. The READER indicator on the main control panel of the card reader is illuminated when this switch is in the TEST position.

CARD FEED: SINGLE/CONT — This toggle switch is effective only when the MODE switch is in the TEST position. In the SINGLE position, the wait station is filled when the START switch is pressed, and the card is moved to the output stacker when the RUNOUT switch is pressed. When this switch is in the CONT position, pressing the START switch initiates continuous feeding of cards through the reader at 400 cards per minute. Pressing the STOP switch terminates the action.

Auxiliary Control Panel Indicators

The indicators on the auxiliary control panel are illuminated only when the conditions described below exist.

NOTE: If one of the following indications occurs, it is necessary to press the POWER OFF switch before the POWER ON switch is pressed.

POWER	The POWER indicator is illuminated when a logical voltage fails or when one of the logic power circuit breakers opens. The READER indicator on the main control panel is also illuminated.
PICKER	The PICKER indicator is illuminated when the picker motor drive circuits fail in a manner causing the picker motor to run at a speed that is injurious to the mechanism. The READER indicator on the main control panel is also illuminated. When a PICKER indication occurs, the service engineer should be called.
HEAT	The HEAT indicator is illuminated when one of the cooling fan fails. The READER indicator on the main control panel is also illuminated. When a HEAT indication occurs, a service engineer should be called.

OPERATING PROCEDURES

The Type 123 reader is designed to read standard 80-column cards. The reader may also process 51-column punched cards when the 51-Column Card Capability (Feature 1043) is included. Cards are loaded face down, nines edge first into the input hopper. Cards may be loaded into the input hopper or removed from the output stacker while cards are being processed.

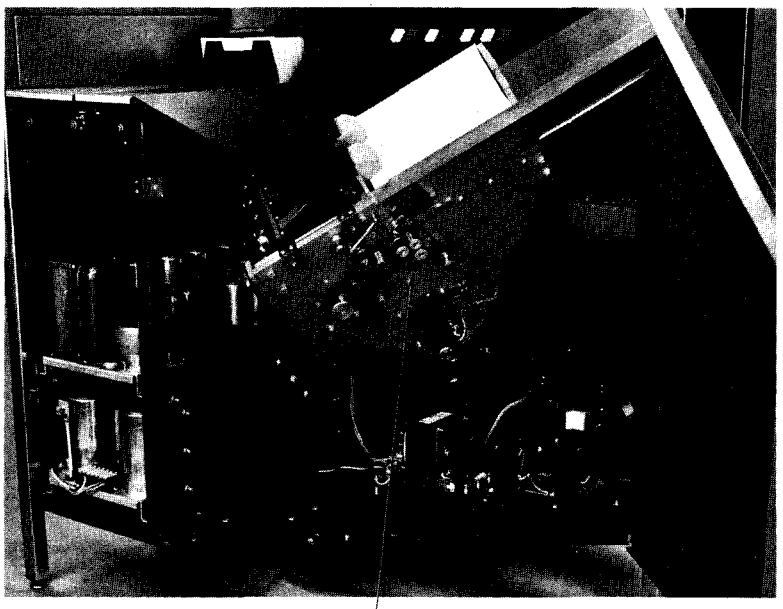
Initial Setup Procedures

If it is necessary to process cards with irregular right-hand edges, the appropriate reference edge selection must be made. The Type 123 is designed to be compatible with cards having a reference edge either between card rows six and seven or betweens rows seven and eight. The reference edge is the trailing edge of the card; i. e., the right-hand edge of the card if it is viewed face up with the nines edge at the bottom.

When processing normal cut cards, either reference edge track may be used by the electronic checking and timing circuits of the card control. When processing cards which have been burst from either longer cards, card sets, or continuous forms (such as those used on a printer), the referenced edge may be somewhat irregular and may require an operator selection of the appropriate reference edge track to permit proper sensing of the trailing edge of the card. The appropriate track is selected by setting the toggle mechansim in the reader to the

proper position (see location below). Inserting a pencil (or other suitable instrument) into the aperture of the mechanism and actuating it to the opposite position is all that is required.

It should be noted that cards having reference edges between rows six and seven only cannot be intermixed with cards having reference edges between rows seven and eight only.



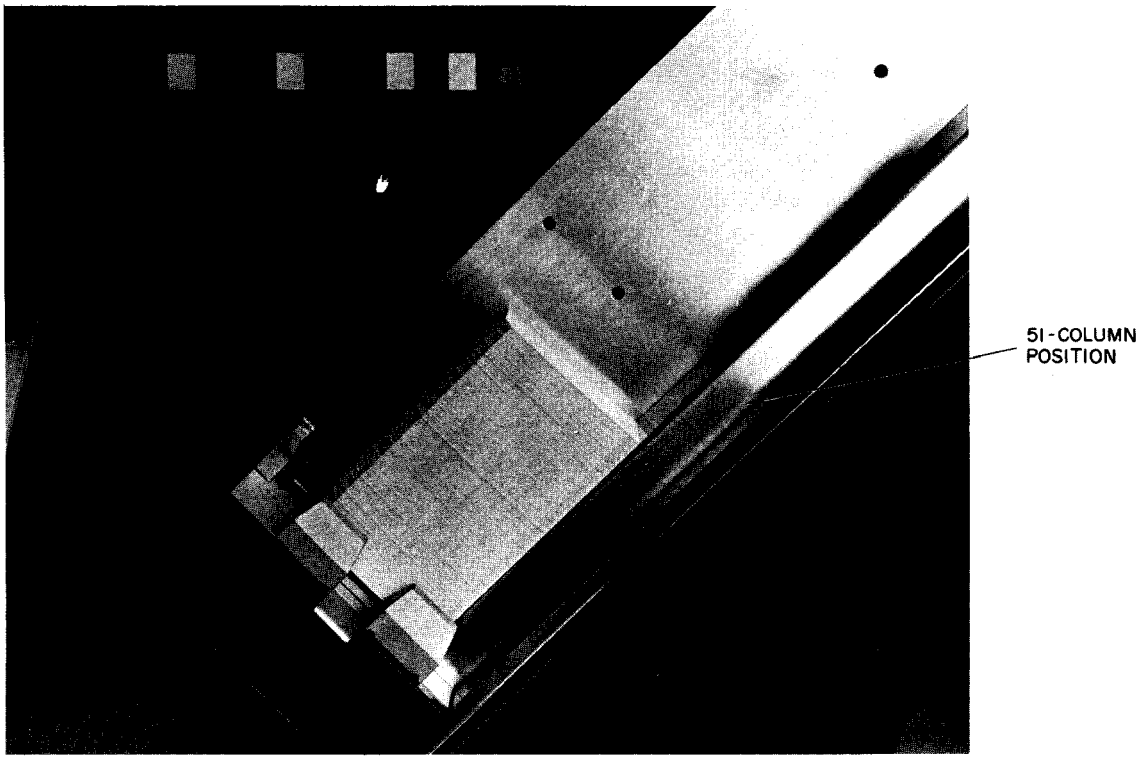
Positioning the input hopper in a Type 123 reader equipped to handle the optional 51-column cards is an operator function. A casework interlock prevents changing the position of the hopper while the device is running. The photograph below shows the input hopper in the 51-column position. To change the position of the hopper, the longitudinal piece (which the trailing edges of the cards rest against while in the input hopper) may be lifted upward and swung in an arc on a mechanical linkage to the opposite (80-column) position. When reading 51-column cards, it is necessary to use a 51-column card weight in the input hopper.

Start Procedures

1. To perform an initial start following a central processor power up:
   a. Press the POWER ON switch.
   b. Press the TRANSPORT ON switch.

      NOTE: If the TRANSPORT indicator is illuminated, the RUNOUT switch must be pressed prior to pressing the TRANSPORT ON switch. This action clears any error conditions and stored instructions in the card reader control.

   c. Place the deck to be read in the input hopper with the nines edge down and towards the throat.



d. Press the START switch. If it is desired to stop the card reader while reading operations are in progress, the STOP switch may be pressed.

Restart Procedures

1. To restart following a STOP switch depression (a normal stop with no error conditions indicated):

   a. Press the START switch.

2. To restart following a stop condition for a CARDS indication:

   a. Refill the empty input hopper or empty the full output stacker as required, and/or insure that cards are pressed against the stacker rolls.

      NOTE: When the reader is running, care should be taken in removing cards from the output stacker to avoid a possible CARDS indication and a subsequent halt.

   b. Press the START switch.

3. To restart following a stop condition for an INPUT indication:

   a. Remove the remaining cards from the input hopper or slide the deck up the hopper. The cards causing the feed failure are nearest the throat (as the deck is removed). These cards may or may not be damaged or bent out of shape.

   b. If the cards are damaged or bent out of shape, place them on a flat surface and, with any suitable instrument, smooth out the rough or bent edges. If the cards cannot be restored to a usable condition, they should be replaced with new cards.

c. Place the restored cards (or the new cards) and the remainder of the deck in the feed hopper so that reading may be resumed from the point in the program at which the stop occurred.

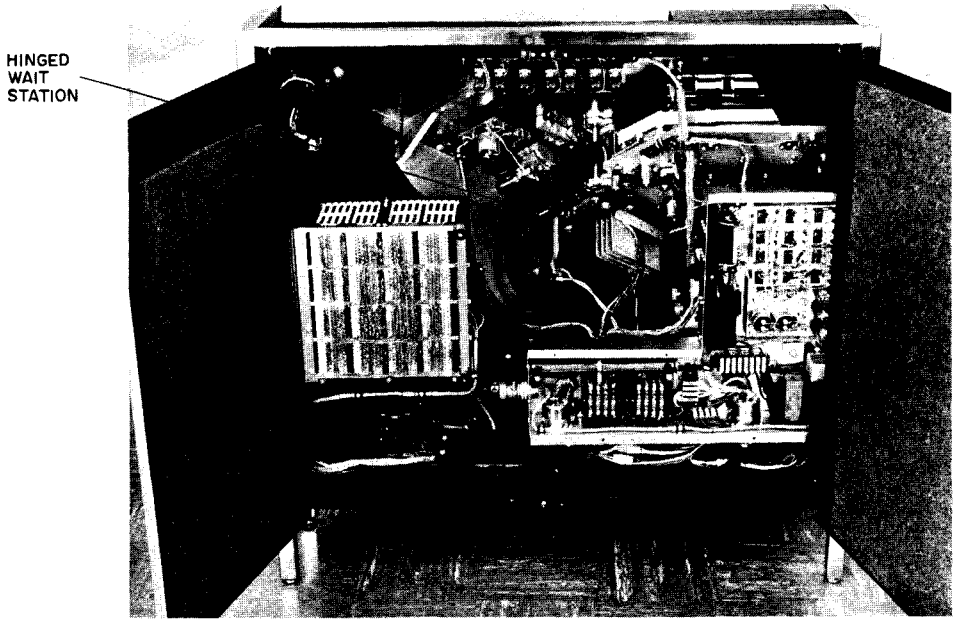
d. Press the START switch.

NOTE: It is usually not necessary for the operator to remove the machine covers when performing corrective action for a feed failure.

4. To restart following a stop condition for a TRANSPORT indication:

a. Swing open the rear doors and clear the jam condition as required. In the case of a wait station jam, the piece which the card locates against is hinged to facilitate jam removal in this area (see photograph below). Replace any damaged cards.

NOTE: It is possible for the card causing the jam to be in a position where it cannot be seen by the operator, e.g., near the output stacker mechanism; care must be exercised to insure that the entire transport mechanism has been cleared.



b. Press the POWER OFF and POWER ON switches.

c. Press the RUNOUT switch. It is likely that a card remains in the wait station after the jam condition has been cleared. Pressing the RUNOUT switch to move the card through the device to the output stacker insures that the device is operable and that the jam condition has been completely cleared. This action prevents further damage to the input deck when reading operations are resumed.

d. If it is possible to determine the point in the program at which the stop occurred, i.e., the last card which was correctly read into memory, reassemble the deck accordingly so that reading can be resumed from the point at

which the stop occurred (to insure that no information is lost), and proceed with "e" below. If it is not possible to determine accurately where the stop occurred, it is necessary to reassemble the deck and read it again from the beginning.

NOTE: When replacing damaged cards, it is generally not necessary to remove the cards from the input hopper to reassemble the deck. In most cases, the cards in the input hopper need only be raised so that the damaged-card replacement can be reinserted in the deck in sequence.

e. Press the TRANSPORT ON switch.

f. Press the START switch.

5. To restart following a stop condition for a VALIDITY indication:

a. The handling of illegally punched cards is program-controlled. If the program specifies corrective action by the operator when a VALIDITY check occurs, reading operations terminate immediately and the error card may or may not be offset-stacked. In either case, the error card must be corrected or replaced before operations can be resumed.

b. Press the STOP switch.

c. Press the RUNOUT switch. This action extinguishes the VALIDITY indicator and also moves the card currently registered at the wait station through the device into the output stacker.

NOTE: This card is not read as it is moved into the output stacker. The next to last card in the output stacker is the card actually in error.

d. Correct or replace the error card, whichever is most appropriate.

e. Reload (with the remainder of the deck) the corrected or replaced card and the last card in the output stacker as the first and second cards, respectively, in the input hopper.

f. Press the START switch.

6. To restart following a stop condition for a CYCLE indication:

a. The handling of a cycle-check error card is program-controlled. If the program specifies corrective action by the operator when a cycle-check indication occurs, reading operations terminate immediately and the error card may or may not be offset-stacked. A cycle check may be caused by skewing of the card during the reading process. When a cycle check occurs, both the error card and the card in the wait station must be reread.

b. Press the STOP switch.

c. Press the RUNOUT switch to extinguish the CYCLE indicator and to move the card currently registered at the wait station through the device into the output stacker.

NOTE: As in procedure 5-c above, the card registered at the wait station is not read upon depression of the RUNOUT switch.

d. Reload (with the remainder of the deck) the error card and the last card in the output stacker, respectively, as the first two cards in the input hopper.

e. Press the START switch. If rereading the cards fails and the cards are in registration, the projector lamp may require replacement by a service engineer.

7. To restart following a stop condition for a POWER, PICKER, or HEAT indication on the auxiliary control panel:

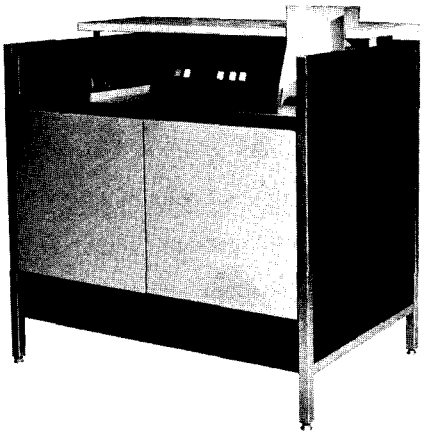
a. Press the POWER OFF switch.

b. Attempt to correct the condition causing the indication. In the case of a POWER indication, one of the logic power supplies has failed or one of the logic power circuit breakers has opened, in which case the operator may reset the circuit breaker. In the case of a PICKER or HEAT indication, the operator may repeat the initial start procedure previously described.

c. If any of the indications persists after performing an initial start procedure, a service engineer should be called.

SECTION IV

TYPE 214-1 CARD PUNCH



The Type 214-1 punches standard 80-column cards at a rate which varies from 100 to 400 cards per minute, depending upon the last column punched. Successive pairs of characters from the main memory punch-image area are translated into card code by the integrated card control and punched simultaneously in two consecutive card columns. Beginning with the first two columns, successive pairs of columns are punched until the last column is punched or until a record mark is sensed in the punch-image area.

As shown in Figure 4-1, the basic components of the Type 214-1 Card Punch are an input hopper, a wait station, a punching station, and an output stacker. The input hopper has a capacity of 1,200 cards; the output stacker has a capacity of 1,300 cards. Cards may be loaded into the input hopper or removed from the output stacker during a punch operation. Selected cards or error cards may be offset-stacked in the output stacker.

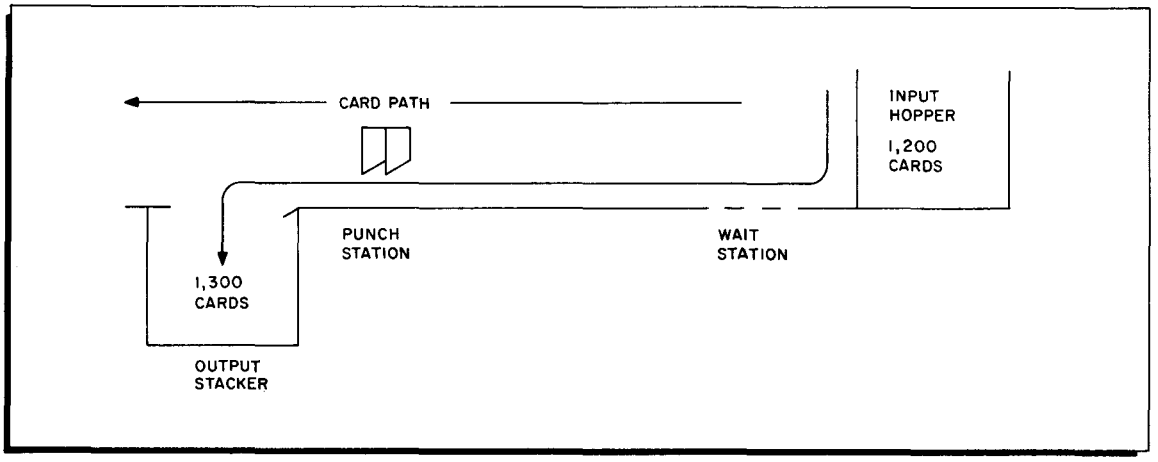
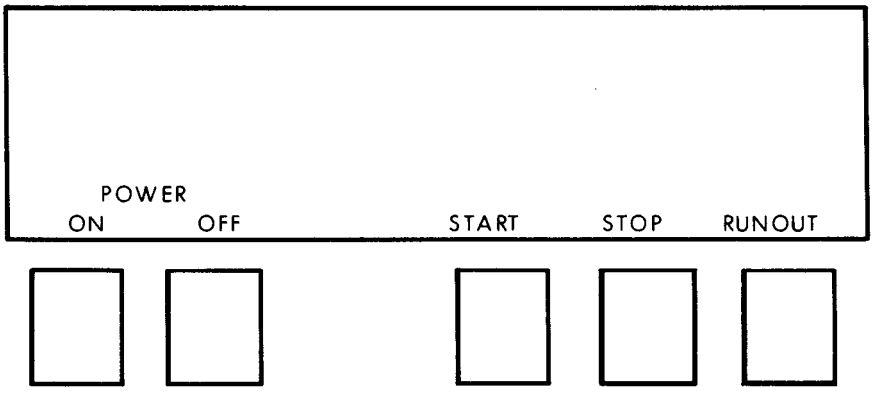


Figure 4-1. Card Path in Type 214-1 Card Punch

CONTROL PANEL SWITCHES AND INDICATORS

The layout of the switches and indicators on the main control panel for the Type 214-1 Card Punch is shown below.



Main Control Panel Switches

The switches on the main control panel of the Type 214-1 are momentary-contact switches which are activated when pressed. A functional description of each switch follows:

POWER ON	Pressing this switch turns on primary power in the card punch and illuminates the POWER ON indicator.
POWER OFF	Pressing this switch turns off all power in the card punch. If the POWER OFF switch is pressed while a card is being processed, the effect upon data transfer is unspecified.
START	Pressing the START switch places the punch in a "ready" status and illuminates the START indicator. The START switch moves a card into the wait station (if it is empty), resets the CARDS and INPUT indicators, and deactivates the busy signal to the central processor. If the START switch is pressed when the STOP indicator is not illuminated, no action results.
STOP	Pressing the STOP switch removes the punch from the ready status and illuminates the STOP indicator. The busy signal to the central processor is activated and remains active until the START switch is pressed. If a punch instruction is in process in the card control when the STOP switch is pressed, that instruction is transmitted to the punch and executed.
RUNOUT	This switch is effective only when the punch is in the STOP mode. Pressing the RUNOUT switch causes cards to be removed from the card path without processing (input hopper need not be emptied). The RUNOUT switch resets a TRANSPORT check. End-of-instruction signals are generated and sent to the central processor. If the punch stops because an error is detected, pressing the RUNOUT switch allows operations to be resumed after a restart procedure has been performed.

Main Control Panel Indicators

The indicators described below are visible only when illuminated:

PUNCH	The PUNCH check indicator is illuminated whenever the punch mechanism does not punch the correct

PUNCH (cont)

combination of holes in a card column. This indicator remains illuminated until the next PDT instruction is issued to the integrated card control.

TRANSPORT

The TRANSPORT indicator is illuminated when a jam condition occurs which may require the operator to raise the top cover on the punch in order to clear the jam condition (see page 4-6). The transport motors are turned off automatically when this indicator is illuminated.

NOTE: After a TRANSPORT indication, it is necessary to cycle up the punch again by pressing the POWER ON, RUNOUT, and START switches.

CARDS

The CARDS indicator is illuminated when the output stacker is full, or when the stacker-pressure switch is released, or when both the input hopper and the wait station are empty.

INPUT

The INPUT indicator is illuminated when the wait station is either not filled following a START switch depression or not refilled following a punch instruction (PDT). Corrective action by the operator is required (see page 4-6) and, in most cases, may be performed while the machine covers are in place.

STOP

The STOP indicator is illuminated whenever the busy signal is active. This indicator is also illuminated whenever a TRANSPORT error occurs.

START

The START indicator is illuminated to signify that the punch is either operating or ready for operation.

POWER ON

The POWER ON indicator is illuminated when main power is applied to the card punch.

AUXILIARY

The AUXILIARY indicator is illuminated when a machine failure occurs which the operator does not normally correct. This indicator is also illuminated when the punch is in a TEST mode. The nature of the failure is indicated on the auxiliary control panel, i.e., FUSE, PICKER, HEAT, or INTERLOCK.

NOTE: An INTERLOCK indication can be corrected by the operator by making certain that all machine covers are in place. Corrective action by a service engineer is required in the case of a POWER, PICKER, or HEAT indication.

Auxiliary Control Panel Switch

The switch described below is a rotary switch which may be in any one of nine positions.

NOTE: The auxiliary control panel (see Figure 4-2) is not normally used by the operator.

MODE: NORMAL/TEST

This switch selects either the NORMAL (operational) mode or one of eight TEST modes. The

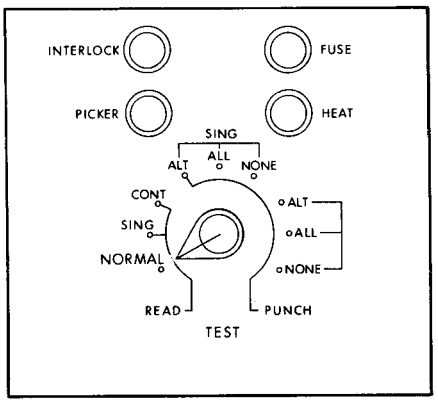


Figure 4-2. Auxiliary Control Panel Controls and Indicators

AUXILIARY indicator on the main control panel of the punch is illuminated when this switch is in one of the TEST positions.

Auxiliary Control Panel Indicators

The indicators on the auxiliary control panel are illuminated only when the conditions described below exist.

NOTE: If one of the following indications occurs, it is necessary to press the POWER OFF switch before the POWER ON switch is pressed.

INTERLOCK — The INTERLOCK indicator is illuminated when one of the machine covers is open. The indicator remains illuminated until the cover is closed. The AUXILIARY indicator on the main control panel is also illuminated.

NOTE: When the top cover is opened to investigate an AUXILIARY indication on the main control panel caused by the picker motor, the INTERLOCK indicator will override the PICKER error indication.

FUSE — The FUSE indicator is illuminated when a power circuit breaker opens. The indicator remains illuminated until the condition is corrected. The AUXILIARY indicator on the main control panel is also illuminated. When a FUSE indication occurs, a service engineer should be called.

PICKER — The PICKER indicator is illuminated when the picker motor drive circuits fail in a manner causing the picker motor to run at a speed injurious to the mechanism. The AUXILIARY indicator on the main control panel is also illuminated. When a PICKER indication occurs, a service engineer should be called.

HEAT — The HEAT indicator is illuminated when one of the cooling fans fails. The AUXILIARY indicator on the main control panel is also illuminated. When a HEAT indication occurs, a service engineer should be called.

OPERATING PROCEDURES

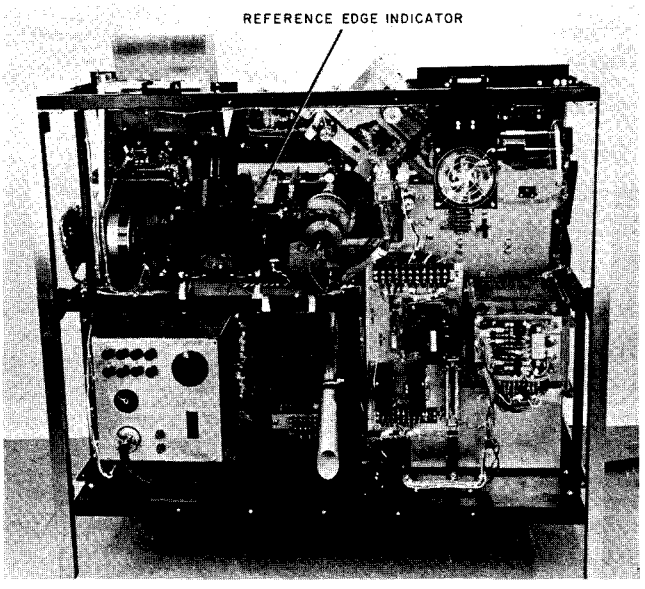
The Type 214-1 Card Punch is designed to punch standard 80-column cards. Cards are loaded face down, nines edge first into the 1,200-card-capacity input hopper. The output stacker has a capacity of 1,300 cards. Cards may be loaded into the input hopper or removed from the output stacker while cards are being processed.

Initial Setup Procedures

If it is necessary to process cards with irregular right-hand edges, the appropriate reference edge selection must be made. The Type 214-1 is designed to be compatible with cards having a reference edge either between card rows six and seven or between rows seven and eight. The reference edge is the trailing edge of the card, i.e., the right-hand edge of the card if it is viewed face up with the nines edge at the bottom.

When processing normal cut cards, either reference edge track may be used by the electronic checking and timing circuits of the card control. When processing cards which have been burst from either longer cards, card sets, or continuous forms (such as those used on a printer), the reference edge may be somewhat irregular and may require an operator selection of the appropriate reference edge track to permit proper sensing of the trailing edge of the card. Selecting the appropriate track is effected by setting the reference edge indicator in the punch to the proper position (see location below). The screw on the indicator must be loosened before the indicator can be moved to the proper position. The reference edge setting is shown on the indicator.

It should be noted that cards having reference edges between rows six and seven only cannot be intermixed with cards having reference edges between rows seven and eight only.



Start Procedures

1. To perform an initial start following a central processor power up:
   a. Press the POWER ON switch.
   b. Press the RUNOUT switch. This action resets error-check conditions and clears the card path.
   c. Load the input deck into the input hopper face down, nines edge first.
   d. Press the START switch. If it is desired to stop the punch while punching operations are in progress, the STOP switch may be pressed.

Restart Procedures

1. To restart following a STOP switch depression (a normal stop with no error conditions indicated):
   a. Press the START switch.
2. To restart following a stop condition for a CARDS indication:
   a. Refill the empty input hopper or empty the full output stacker as required, and/or insure the cards are pressed against the stacker-pressure switch.

      NOTE: When the punch is running, care should be taken in removing cards from the output stacker to avoid a possible CARDS indication and a subsequent halt.

   b. Press the START switch.
3. To restart following a stop condition for an INPUT indication:
   a. Remove the remaining cards from the input hopper. The cards causing the feed failure are nearest the throat (as the deck is removed). These cards may or may not be damaged or bent out of shape.
   b. If the cards are damaged or bent out of shape, they should be replaced with new cards.
   c. Place the deck in the feed hopper and resume punching from the point in the program at which the stop occurred.
   d. Press the START switch.

      NOTE: It is usually not necessary for the operator to remove the top cover when performing corrective action for a feed failure.

4. To restart following a stop condition for a TRANSPORT indication:
   a. Raise the hinged top cover and clear the jam condition as required.

      NOTE: It is possible for the card causing the jam condition to be in a position where it cannot be seen by the operator, e.g., near the output stacker; care must be exercised to insure that the entire transport mechanism has been cleared.

   b. The transport motors are turned off during a TRANSPORT indication. They must be turned on before the RUNOUT switch is

operable. To accomplish this, it is necessary to cycle up the punch unit again by pressing the POWER OFF and POWER ON switches.

c. Press the RUNOUT switch. (It is likely that a card remains in the wait station after the jam condition has been cleared. Pressing the RUNOUT switch to move the card through the punch unit to the output stacker insures that the punch is operable and that the jam condition has been completely cleared. This action prevents further damage to the input deck when punching operations are resumed.)

d. If it is possible to determine the point in the program at which the stop occurred, i.e., the last card that was correctly punched, proceed with "e" below. If it is not possible to determine accurately where the stop occurred, it is necessary to repunch the entire deck.

e. Press the START switch.

5. To restart following a stop condition for a PUNCH check indication:

NOTE: The START indicator remains illuminated following the detection of a punch error.

a. Press the STOP switch.

b. Press the RUNOUT switch to clear the card path.

c. If it is possible to determine the point in the program at which the stop occurred, i.e., the last card that was correctly punched, proceed with "d" below. If it is not possible to determine accurately the last card processed, it is necessary to process the entire deck from the beginning to insure that no program information is lost.

NOTE: The position of the card(s) in the output stacker following the detection of a punch check condition depends on the conditioning of the punch by the program.

d. Press the START switch to prepare the punch to process the first card in the deck.

6. To restart following a stop condition for a INTERLOCK, PICKER, FUSE, or HEAT indication on the auxiliary control panel of the punch:

a. Press the POWER OFF switch.

b. Attempt to correct the condition causing the indication. In the case of an INTERLOCK indication, one of the machine covers may be open, in which case the operator need only close it. In the case of a HEAT, PICKER, or FUSE indication, the operator may repeat the initial start procedure previously described.

c. If any of the indications persists after performing an initial start procedure, a service engineer should be called.

The above procedure for restarting after a PUNCH error would not apply to most Honeywell software. When a programmed halt for a PUNCH error occurs:

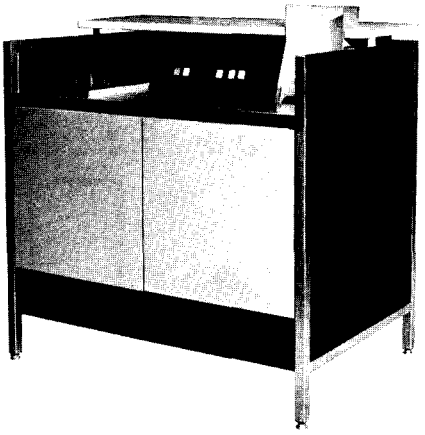
1. If there is a card offset, insert a marker card and continue the run. Later, throw away the cards in front of and in back of the marker card.

2. If there is no card offset, immediately throw away the last card stacked.

Some programs may be specialized to follow other procedures, as specified in the appropriate software manuals.

NOTE: If successive PDT instructions are not issued to the punch within 30-second intervals, then all punch and transport motors turn off, and the punch strobe lamps are reduced to half brilliance. The punch, however, remains in the ready status. A subsequent PDT instruction, after a time delay of one second, causes the motors to turn on and the lamps to be brought to full brilliance.

SECTION V
TYPE 214-2 CARD READER/PUNCH



The Type 214-2 Card Reader/Punch reads standard 80-column cards at the rate of 400 cards per minute and punches 80-column cards at a rate which varies from 100 to 400 cards per minute, depending upon the last column punched. A special operating mode (called the punch-feed read mode) makes it possible to read a card, process the information read, and punch additional information into the same card in a single pass. Type 214-2 card punch operations are identical to those of the Type 214-1 card punch (see Section IV).

For card reading on the Type 214-2, information is read optically by means of 12 photocells, starting with column one. All columns are read serially until column 80 has been read. The information contained in each column is decoded (i.e., translated into a six-bit character) by the integrated card control and is transferred by this control to main memory. Data transfer is terminated when the last column is read or when a record mark is sensed in memory, whichever occurs first.

As shown in Figure 5-1, the basic components of the Type 214-2 Card Reader/Punch are an input hopper, a wait station, a reading station, a punching station, and an output stacker. The input hopper has a capacity of 1,200 cards; the output stacker has a capacity of 1,300 cards. Cards may be loaded into the input hopper or removed from the output stacker during reading or punching. Selected cards or error cards may be offset-stacked in the output stacker.

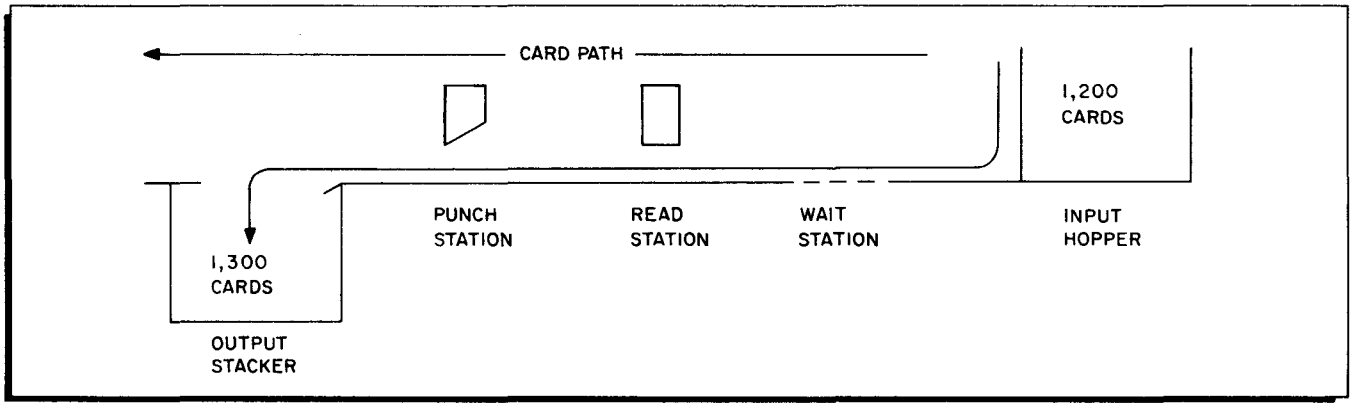
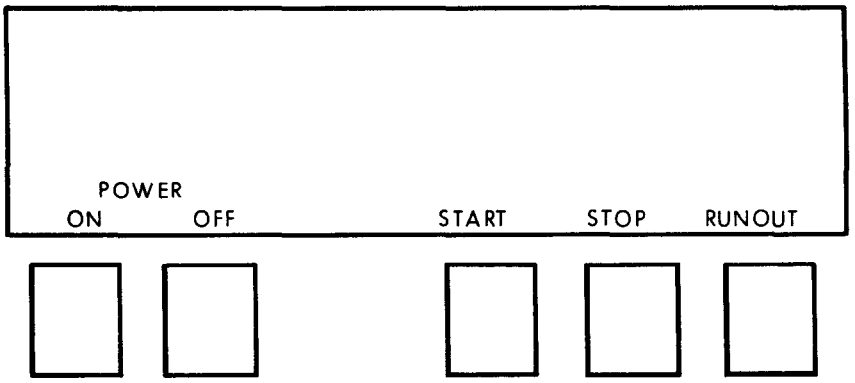


Figure 5-1. Card Path in Type 214-2 Card Reader/Punch

CONTROL PANEL SWITCHES AND INDICATORS

The layout of the switches and indicators on the main control panel for the Type 214-2 Card Reader/Punch is shown below.



Main Control Panel Switches

The switches on the main control panel of the Type 214-2 are momentary-contact switches which are activated when pressed. A functional description of each switch follows:

POWER ON	Pressing this switch turns on primary power in the card reader/punch and illuminates the POWER ON indicator.
POWER OFF	Pressing this switch turns off all power in the reader/punch and extinguishes the POWER ON indicator. If the POWER OFF switch is pressed while a card is being processed, the effect upon data transfer is unspecified.
START	Pressing the START switch places the reader/punch in a "ready" status and illuminates the START indicator. The START switch moves a card into the wait station (if it is empty), resets the CARDS and INPUT indicators, and deactivates the busy signal to the central processor. If the START switch is pressed when the STOP indicator is not illuminated, no action results.
STOP	Pressing the STOP switch removes the reader/punch from the ready status and illuminates the STOP indicator. The busy signal to the central processor is activated and remains active until the START switch is pressed. If a read or punch instruction is in process in the card control when the STOP switch is pressed, that instruction is transmitted to the reader/punch and executed.
RUNOUT	This switch is effective only when the reader/punch is in the STOP mode. Pressing the RUNOUT switch causes cards to be removed from the card path without processing (input hopper need not be emptied). The RUNOUT switch resets a TRANSPORT check. If the reader/punch stops because an error is detected, pressing the RUNOUT switch allows operations to be resumed after a restart procedure has been performed.

Main Control Panel Indicators

The indicators described below are visible only when illuminated.

VALIDITY	The VALIDITY check (illegal punch) indicator is illuminated whenever an illegal combination of holes occur in the card column being read. The indicator remains illuminated until the next PDT instruction is issued to the integrated card control. Under program control, the card control may remain busy until corrective action is taken by the operator, offset-stack the error card and continue to process cards, or offset-stack the error card and remain busy until corrective action is taken by the operator.
CYCLE	The CYCLE indicator is illuminated when the card control detects a cycle check. The indicator remains illuminated until the next PDT instruction is issued to the integrated card control. A cycle check indicates a failure in the photocell circuit in the reading station. Under program control, the card control may remain busy until corrective action is taken by the operator, offset-stack the error card and continue to process cards, or offset-stack the error card and remain busy until corrective action is taken by the operator.
PUNCH	The PUNCH check indicator is illuminated whenever the punch mechanism does not punch the correct combination of holes in a card column. This indicator remains illuminated until the next PDT instruction is issued to the integrated card control.
TRANSPORT	The TRANSPORT indicator is illuminated when a jam condition occurs which may require the operator to raise the top cover on the device in order to clear the jam condition (see page 5-7). The transport motors are turned off automatically when this indicator is illuminated. NOTE: After a TRANSPORT indication, it is necessary to cycle up the reader/punch again by pressing the POWER ON, RUNOUT, and START switches.
CARDS	The CARDS indicator is illuminated when the output stacker is full, or when the stacker-pressure switch is released, or when the input hopper and wait station are empty.
INPUT	The INPUT indicator is illuminated when the wait station is either not filled following a START switch depression or not refilled following a PDT instruction. Corrective action by the operator is required (see page 5-6) and, in most cases, may be performed while the machine covers are in place.
START	The START indicator (located on the START switch) is illuminated to signify that the reader/punch is either operating or ready for operation.
STOP	The STOP indicator (located on the STOP switch) is illuminated whenever the reader/punch is removed from the ready status. This indicator is also illuminated whenever a TRANSPORT error occurs.
POWER ON	The POWER ON indicator (located on the POWER ON switch) is illuminated when main power is applied to the reader/punch.
AUXILIARY	The AUXILIARY indicator is illuminated when a machine failure occurs which the operator does not normally correct. This indicator is also illuminated when the reader/punch is in a

AUXILIARY (cont) — TEST mode. The nature of the failure is indicated on the auxiliary control panel, i.e., FUSE, PICKER, HEAT or INTERLOCK.

NOTE: An INTERLOCK indication may be corrected by the operator by making certain that all machine covers are in place. Corrective action by a service engineer is required in the case of a POWER, PICKER, or HEAT indication.

Auxiliary Control Panel Switch

The switch described below is a rotary switch which may be in any one of nine positions.

NOTE: The auxiliary control panel (see Figure 5-2) is not normally used by the operator.

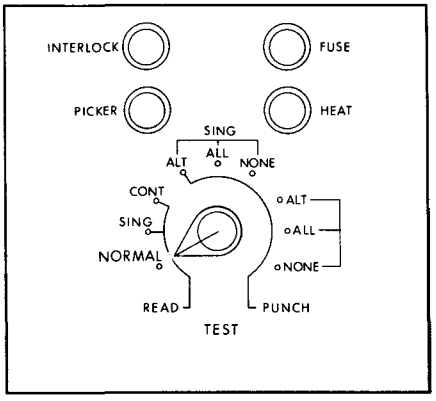


Figure 5-2. Auxiliary Control Panel Controls and Indicators

MODE: NORMAL/TEST — This switch selects either the NORMAL (operational) mode or one of eight TEST modes. The AUXILIARY indicator on the main control panel is illuminated when this switch is in one of the TEST positions.

Auxiliary Control Panel Indicators

The indicators on the auxiliary control panel are illuminated only when the conditions described below exist.

NOTE: If one of the following indications occurs, it is necessary to press the POWER OFF switch before the POWER ON switch is pressed.

INTERLOCK — The INTERLOCK indicator is illuminated when one of the machine covers is open. The indicator remains illuminated until the cover is closed. The AUXILIARY indicator on the main control panel is also illuminated.

NOTE: When the top cover is opened to investigate an AUXILLIARY indication caused by the picker motor, on the main control panel caused by the picker motor, the INTERLOCK indicator will override the PICKER indication.

FUSE — The FUSE indicator is illuminated when a power circuit breaker opens. The indicator remains illuminated until

FUSE (cont)	the condition is corrected. The AUXILIARY indicator on the main control panel is also illuminated. When a FUSE indication occurs, a service engineer should be called.
PICKER	The PICKER indicator is illuminated when the picker motor drive circuits fail in a manner causing the picker motor to run at a speed injurious to the mechanism. The AUXILIARY indicator on the main control panel is also illuminated. When a PICKER indication occurs, a service engineer should be called.
HEAT	The HEAT indicator is illuminated when one of the cooling fans fails. The AUXILIARY indicator on the main control panel is also illuminated. When a HEAT indication occurs, a service engineer should be called.

OPERATING PROCEDURES

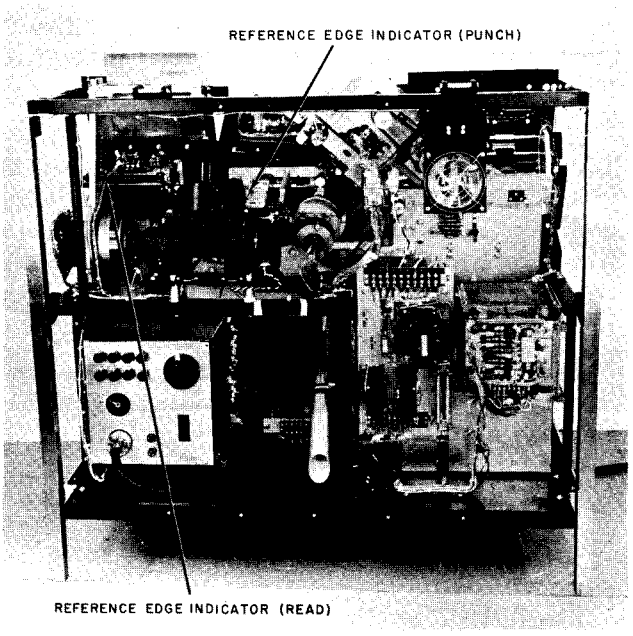
The Type 214-2 Card Reader/Punch is designed to process standard 80-column cards. Cards are loaded face down, nines edge first into the 1,200-card-capacity input hopper. The output stacker has a capacity of 1,300 cards. Cards may be loaded into the input hopper or removed from the output stacker while cards are being processed.

Initial Setup Procedures

If it is necessary to process cards with irregular right-hand edges, the appropriate reference edge selection must be made. The Type 214-2 is designed to be compatible with cards having a reference edge either between card rows six and seven or between rows seven and eight. The reference edge is the trailing edge of the card, i.e., the right-hand edge of the card if it is viewed face up with the nines edge at the bottom.

When processing normal cut cards, either reference edge track may be used by the electronic checking and timing circuits of the card control. When processing cards which have been burst from either longer cards, card sets, or continuous forms (such as those used on a printer), the reference edge may be somewhat irregular and may require an operator selection of the appropriate reference edge track to permit proper sensing of the trailing edge of the card. Selecting the appropriate track is effected by setting the reference edge indicators in the reader/punch to the proper positions (see location below). On the reader side the operator simply turns the reference edge indicator to the correct position. On the punch side, the screw on the indicator must be loosened before the indicator can be moved to the proper position. The reference edge settings (6-7 or 7-8) are shown on the indicators.

It should be noted that cards having reference edges between rows six and seven only cannot be intermixed with cards having reference edges between rows seven and eight only.



Start Procedures

1. To perform an initial start following a central processor power up:
   a. Press the POWER ON switch.
   b. Press the RUNOUT switch. This action resets error-check conditions and clears the card path.
   c. Load the input deck into the input hopper face down, nines edge first.
   d. Press the START switch. If it is desired to stop the reader/punch while read or punch operations are in progress, the STOP switch may be pressed.

Restart Procedures

1. To restart following a STOP switch depression (a normal stop with no error conditions indicated):
   a. Press the START switch.
2. To restart following a stop condition for a CARDS indication:
   a. Refill the empty input hopper or empty the full output stacker as required, and/or insure the cards are pressed against the stacker-pressure switch.

      NOTE: When the reader/punch is running, care should be taken in removing cards from the output stacker to avoid a possible CARDS indication and a subsequent halt.

   b. Press the START switch.
3. To restart following a stop condition for an INPUT indication:
   a. Remove the cards from the input hopper.
   b. Check the device for a card jam condition. The cards causing the feed failure are nearest the throat (as the deck is removed). These cards may or may not be damaged or bent out of shape.

c. When reading - if the cards are damaged or bent out of shape place them on a flat surface and, with any suitable instrument, smooth out the rough or bent edges. If the cards cannot be restored to a usable condition, they should be replaced with new cards. When punching - if the cards are damaged or bent out of shape, replace them with new cards.

d. Place the restored cards (or the new cards) and the remainder of the deck in the input hopper so that reading or punching may be resumed from the point in the program at which the stop occurred.

e. Press the START switch.

NOTE: It is usually not necessary for the operator to remove the machine covers when performing corrective action for a feed failure.

4. To restart following a stop condition for a TRANSPORT indication:

a. Raise the hinged top cover and clear the jam condition as required:

NOTE: It is possible for the card causing the jam condition to be in a position where it cannot be seen by the operator, e.g., near the output stacker; care must be taken to insure that the entire transport mechanism has been cleared.

b. The transport motors are turned off during a TRANSPORT indication. They must be turned on before the RUNOUT switch is operable. To accomplish this, it is necessary to cycle up the device again by pressing the POWER OFF and POWER ON switches.

c. Press the RUNOUT switch. (It is likely that a card remains in the wait station after the jam condition has been cleared. Pressing the RUNOUT switch to move the card through the device to the output stacker insures that the device is operable and that the jam condition has been completely cleared. This action prevents further damage to the input deck when operations are resumed.)

d. Load the input cards in the feed hopper face down, nines edge first.

e. If it is possible to determine the point in the program at which the last card was correctly processed, operations may be resumed from this point by positioning the program accordingly and proceeding with "f" below. If it is not possible to determine accurately the last card processed, it is necessary to process the entire deck from the beginning to insure that no program information is lost.

f. Press the START switch.

5. To restart following a stop condition for a VALIDITY indication:

a. The handling of illegally punched cards is program-controlled. If the program specifies corrective action by the operator when a VALIDITY check occurs, reading operations terminate immediately and the error card may or may not be offset-stacked. In either case, the error card must be replaced or corrected before operations can be resumed.

b. Press the STOP switch.

c. Press the RUNOUT switch. This action extinguishes the VALIDITY indicator and also moves the card currently registered at the wait station through the device to the output stacker.

NOTE: This card is not read as it is moved into the output stacker. The next to last card in the output stacker is the card actually in error.

d. Correct or replace the error card, whichever is most appropriate.

e. Reload (with the remainder of the deck) the corrected or replaced card and the last card in the output stacker as the first and second cards, respectively, in the input hopper.

f. Press the START switch.

6. To restart following a stop condition for a CYCLE indication:

a. The handling of a cycle-check error card is program controlled. If the program specifies corrective action by the operator when a cycle-check error occurs, reading operations terminate immediately and the error card may or may not be offset-stacked. A cycle check may be caused by skewing of the card during the reading process. When a cycle occurs, both the error card and the card in the wait station must be reread.

b. Press the STOP switch.

c. Press the RUNOUT switch to extinguish the CYCLE indicator and to move the card currently registered at the wait station through the device into the output stacker.

NOTE: As in procedure "5. c" above, the card registered at the wait station is not read upon depression of the RUNOUT switch.

d. Reload (with the remainder of the deck) the error card and the last card in the output stacker, respecitvely, as the first two cards in input hopper.

e. Press the START switch. If the above corrective action fails, a service engineer should be called.

7. To restart following a stop condition for a PUNCH check indication:

NOTE: The START indicator remains illuminated following the detection of a punch error.

a. Press the STOP switch.

b. Press the RUNOUT switch to clear the card path.

c. If it is possible to determine the point in the program at which the stop occurred, i.e., the last card that was correctly punched, proceed with "d" below. If it is not possible to determine accurately the last card processed, it is necessary to process the entire deck from the beginning to insure that no program information is lost.

NOTE: The position of the card(s) in the output stacker following the detection of a punch check depends on the conditioning of the punch program.

d. Press the START switch to prepare the punch to process the first card in the deck.

8. To restart following a stop condition for a INTERLOCK, PICKER, FUSE, or HEAT indication on the auxiliary control panel of the reader/punch:

   a. Press the POWER OFF switch.

   b. Attempt to correct the condition causing the indication. In the case of an INTERLOCK indication, one of the machine covers may be open, in which case the operator need only close it. In the case of a HEAT, PICKER, or FUSE indication, the operator may repeat the initial start procedure previously described.

   c. If any of the indications persists after performing an initial start procedure, a service engineer should be called.

The above procedure for restarting after a PUNCH error would not apply to most Honeywell software. When a programmed halt for a PUNCH error occurs:

1. If there is a card offset, insert a marker card and continue the run. Later, throw away the cards in front of and in back of the marker card,

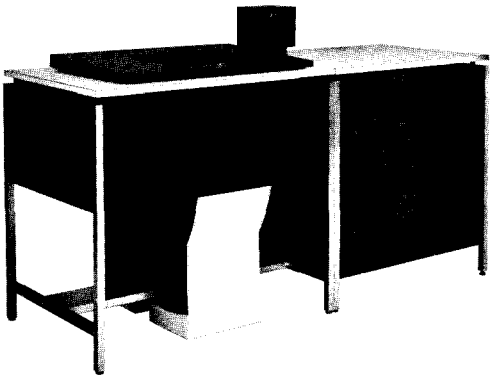
2. If there is no card offset, immediately throw away the last card stacked.

Some programs may be specialized to follow other procedures, as specified in the appropriate software manuals.

NOTE: If successive PDT instructions are not issued to the device within 30-second intervals, then all reader/punch and transport motors turn off, and the device strobe lamps are reduced to half brilliance. The reader/punch, however, remains in the ready status. A subsequent PDT instruction, after a time delay of one second, causes the motors to turn on and the lamps to be brought to full brilliance.

SECTION VI

TYPE 122 PRINTER



The Type 122 Printer prints single-spaced copy at a rate of up to 450 lines a minute. The standard unit record for the printer is a printed line of 120 characters in length. The Extended Print Option (Feature 1034) offers unit records of 132 print positions. For each print position, the printer may use any one of 63 characters - 10 numeric, 26 alphabetic, and 27 special symbols. The printing speed of 450 lines per minute is attained for 120-print-position records when 55 contiguous printer characters are used. When all 63 characters are used, the maximum printing speed is 400 lines per minute. Vertical spacing may be set at either six or eight lines per inch. Depending upon the paper stock used, up to six carbon copies may be produced.

The integrated printer control performs the following operations: (1) print one line and space from 1 to 15 lines (or to the head of the next form); (2) advance paper without printing; and (3) space according to a two-channel paper tape loop. The maximum rate of proper advance (skipping) is 55 inches per second. The integrated control regulates the transfer of data between the main memory print-image area and the printer so as to reconcile the differing mechanical and electronic speeds and to minimize the interruption of central processor activities by data transfer. Data transfer is terminated when a complete line image has been printed or when a record mark is sensed in memory, whichever occurs first.

Operation of the printer is checked automatically to ensure that it responds correctly to printing signals. If the check fails, an automatic halt results.

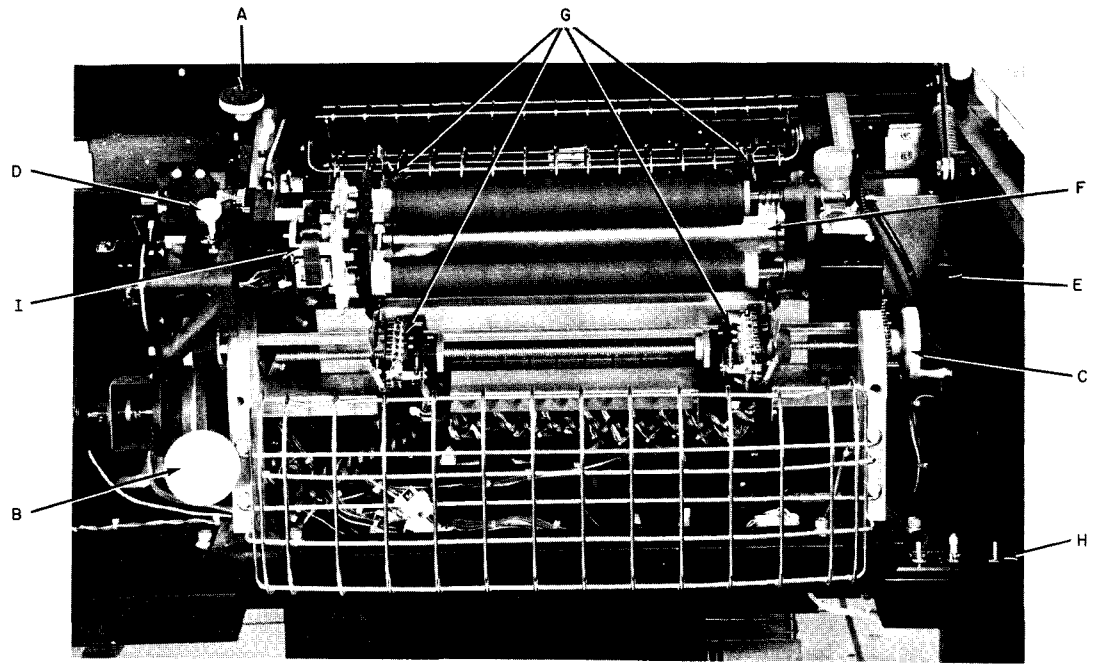
MECHANICAL CONTROLS AND ADJUSTMENTS

There are several mechanical controls and adjustments which are located on the printing mechanism for control of printing and paper feeding, as shown in Figure 6-1.

Head-of-Form Adjustment - An adjusting knob (see Figure 6-1, A) is accessible on the left side of the printing mechanism to position the paper for proper vertical registration so that the first line to be printed coincides with the scribed line on the paper guide. The paper can be positioned while the machine is either running or stopped. Both the paper and the vertical format control tape move together to facilitate accurate positioning of forms.

Paper Tension Adjustment - An adjusting knob (see Figure 6-1, B) for control of paper tension is accessible on the lower left side of the printer mechanism. Proper adjustment of this control prevents tearing of the form and assures smooth movement of the form through the paper feed mechanism.

Tractor Position Adjustment - A single adjustment knob on the right-hand side of the printing mechanism (see Figure 6-1, C) may be used to position all four tractors at one time while the machine is either running or stopped. The two right-hand tractors are individually adjustable and have vernier controls for adjusting the side tension of the paper. A side-tension adjustment can also be performed while the printer is either running or stopped.



A—Head-of-Form Adjustment
D—Character/Index Adjustment
G—Tractor Pin Feeds
B—Paper Tension Adjustment
E—Form Thickness Adjustment
H—Auxiliary Control Panel
C—Tractor Position Adjustment
F—Type Roll
I—Ribbon Feed Unit

Figure 6-1. Printer Mechanical Controls and Adjustments

Character/Index Adjustment - This control is located in the top left area of the printer mechanism (see Figure 6-1, D). This adjustment compensates electronically for the timing shift that occurs when a forms thickness change is made (i.e., when the number of carbons being used is changed). This control advances or retards the print timing to adjust for the

variances in paper thickness. When used in conjunction with the forms thickness adjuster on the right side of the printer mechanism and the PRINT DENSITY switch on the auxiliary control panel, the character/index adjustment provides optimum print quality.

Forms Thickness Adjustment - The forms thickness adjustment is located on the right-hand side of the printing mechanism (see Figure 6-1, E). This lever permits minor adjustments to accommodate forms of different thicknesses, e.g., when the number of carbons being used is changed. The Type 122 is capable of printing up to six carbon copies.

Type Roll - The type roll mechanism (see Figure 6-1, F) pivots upward and to the left to permit changing the ribbon and paper. The printer ribbon is easily accessible when the type roll is pivoted upward. The type roll weighs less than seven pounds and can be changed by the operator in approximately two minutes. The type roll is most easily changed when it is in a horizontal position, i.e., not tilted upward.

Print Column Timing Adjustment - The drawer containing the printer electronics (located at the rear of the printer logic cabinet) can be rotated outward to provide access to the controls for individually adjusting the print hammers for the correct timing.

FORMAT CONTROL

The horizontal formatting (i.e., the spacing between printed characters) is controlled entirely by the programmer. The vertical formatting and the advancing of the paper forms (i.e., the beginning- and end-of-form spacing) is controlled by information included in the print and space instruction in conjunction with the pre-punched vertical format control tape in the printer (see Figure 6-2). The holes punched in the tape are sensed by photo diodes, and the formatting information is sent to the printer control for interpretation and appropriated control action.

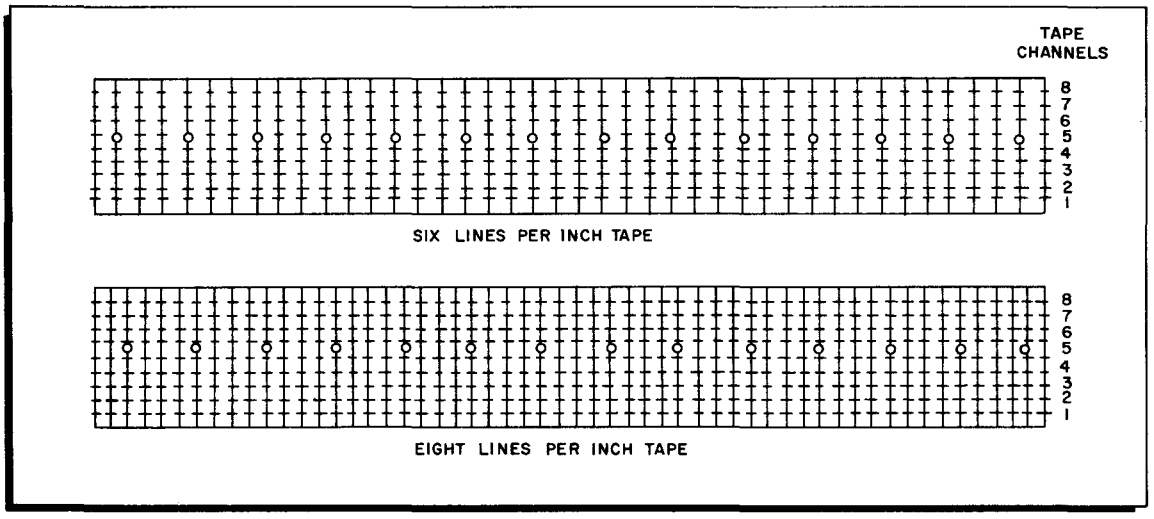
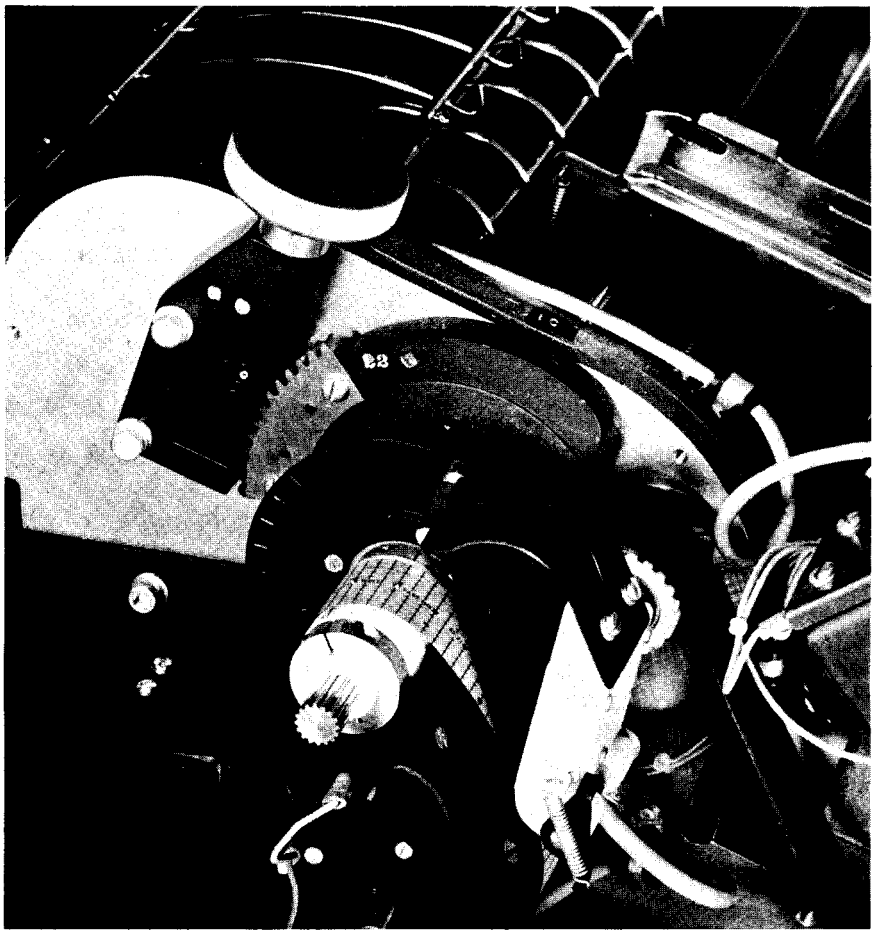


Figure 6-2. Type 122 Printer Vertical Format Control Tape



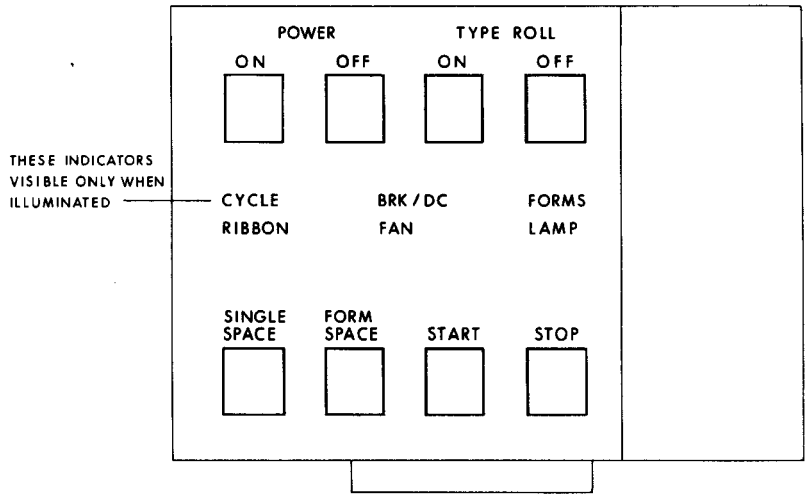
Different tapes must be used for either six- or eight-lines-per-inch printing, with the exception noted in the operating procedures on page 6-15. The vertical format tape in the Type 122 enables the program to print and space, print without spacing, or space without printing until a hole in channel one or two is sensed. The photo above shows the vertical format control assembly in detail.

CONTROL PANEL SWITCHES AND INDICATORS

There are two operator control panels on the Type 122 Printer: a main control panel which contains all controls and indicators necessary for normal printer operation, and an auxiliary control panel which contains additional controls that must be used by the operator in special situations.

Main Control Panel Switches and Indicators

The layout of the main control panel is shown below. A description of the functions performed by these controls follows.



POWER ON

This momentary-contact switch controls the application of power to the printer. The POWER ON indicator of the switch is illuminated when a-c and d-c power are applied to the printer. When depressed, this switch is interlocked so that the printer will not be ready for operation until a certain required start procedure has been performed (see page 6-10).

POWER OFF

Pressing this momentary-contact switch removes power to the printer. the POWER OFF switch is not interlocked; if it is used as an emergency stop control when the printer is operating, the results are unspecified. The POWER OFF indicator of the switch is illuminated when a-c and d-c power (except for the 24-volt d-c indicator power) are turned off.

TYPE ROLL ON

The TYPE ROLL ON switch is used to control the application of power to the type roll (print drum). The TYPE ROLL ON indicator associated with this switch is illuminated when the type roll is rotating at full speed. After pressing this switch, there is an automatic delay of approximately three seconds before the printer can be started. This delay is necessary for the type roll to reach full velocity.

TYPE ROLL OFF

The TYPE ROLL OFF switch is used to turn off the type roll motor. When pressed, it contains no interlocks against possible error conditions. The TYPE ROLL OFF indicator associated with this switch is illuminated when the type roll is off. If only the type roll and paper motion need to be stopped, this switch can be used as an emergency stop control. The TYPE ROLL OFF switch should be pressed (to stop the type roll) before disengaging the type roll assembly for paper, ribbon, or type roll changing. The type roll contains an automatic interlock, however, which turns it off whenever the assembly is disengaged.

START

The START function is controlled by two switches which are physically located in two different places in the printer. The switches are wired in parallel and

START (cont)

perform exactly the same logical functions. One switch is located on the front of the printer main control panel, and the second is located on the back of the main control panel. Having two different START switches in convenient places in the printer permits the operator to activate the START function while performing activities not within easy reach of the front of the main control panel (e.g., attending to paper stacking at the rear of the printer).

This switch is used to start printing when the printer is ready for operations, i.e., cycled up. Pressing this switch clears the check indicators and the printer control busy signal and, if there are no other interlocks active, the printer is ready to receive print instructions from the central processor. The START switch contains an indicator which is illuminated whenever the printer is signalling the printer control that it is able to perform a print instruction.

STOP

Like the START function described above, the STOP function also has two separate switches located in convenient places in the printer. The STOP switches are physically located adjacent to the START switches, thus permitting the operator to perform logical start and stop operations easily during all operating conditions.

Pressing the STOP switches when the printer is running causes the printer to STOP. Activation of this switch causes the printer to signal "printer busy" to the printer control until the START switch is pressed. In addition, pressing the STOP switch causes a "controlled stop" in the printer; i.e., any stored instruction in the printer control is completely processed, including the printing of the present line and/or any paper moving specified. After the printer is stopped, pressing the START switch causes the program to continue as though no interruption has occurred.

The STOP indicator is illuminated whenever the printer is signalling the printer control that it is unable to perform print instructions, either because of previous activation of the STOP switch or presence of other interlock conditions in the printer. This indication can be caused by any one of the following:

1. The STOP switch has been activated, and the START switch has not been pressed since;
2. A printer interlock has occurred, and the START switch has not been pressed since. (The interlock may or may not have been cleared.)
3. A printer control CYCLE check has occurred, and the START switch has not been pressed since; or
4. A FORMS indication (interlock) has occurred, and the START switch has not been pressed

STOP (cont)

since. (The interlock may or may not have been cleared.) The START switch must always be pressed to restart printing when the STOP indicator is illuminated.

SINGLE SPACE

Pressing this switch causes the paper to be advanced one line. If the switch is held down, paper will continue to advance on a single-line basis at the rate of approximately ten lines per second. The moving of paper when this switch is pressed, however, occurs only when the printer is in a normal stop condition (as evidenced by the illumination of the STOP indicator) and after all interlocks associated with the paper moving system are cleared.

FORM SPACE

Pressing the FORM SPACE switch causes paper to be advanced until the head of the form (channel one) is sensed in the format control tape. This switch is effective only when the printer is in a normal stop condition, i.e., with the STOP indicator illuminated and all interlocks associated with the paper moving system cleared. It is also possible to activate this function when the type roll assembly is disengaged (i.e., tilted upward out of the normal printing position) and the type roll is stopped. Pressing the FORM SPACE switch while the type roll assembly is disengaged results in the same paper movement as when the assembly is seated and locked in place.

NOTE: When activating the FORM SPACE switch while the type roll is disengaged, it is necessary to hold the switch depressed until paper movement stops, i.e., until the head of form is reached; otherwise, the advancing of the paper stops short of the head of form.

The indicators described below are visible only when illuminated.

CYCLE

This indicator is illuminated when a check condition occurs that is associated with the printer control circuitry, e.g., parity failure on the optical code disc or failure of one of the ring counters. A CYCLE indication signifies that the last line of print may be incorrect. Pressing the START switch clears a CYCLE indication, although other printer interlock conditions may prevent continuation of printing.

FORMS

This indicator is illuminated when an interlock condition has occurred in the paper feed system, i.e., either paper supply depletion or paper not properly loaded. Pressing the START switch clears the FORMS indicator provided that the interlock condition has been cleared.

LAMP

The LAMP indicator is illuminated when the lamp for either the vertical format control tape or the optical code disc is not operating properly.

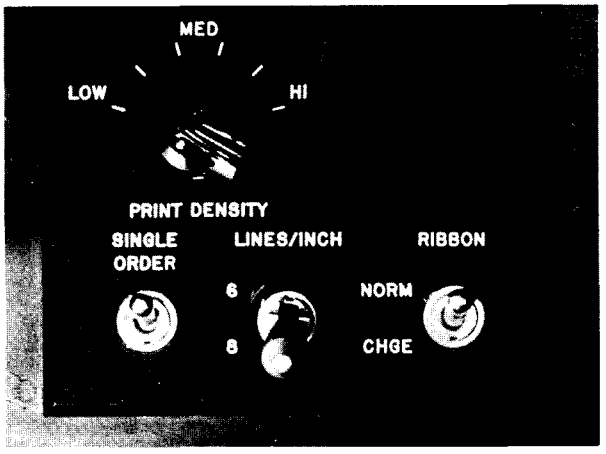
RIBBON — The RIBBON indicator is illuminated when the ribbon has been completely wound on the top mandrel after the RIBBON switch on the auxiliary control panel has been moved to the change (CHGE) position.

FAN — When the temperature control system in the printer is not functioning properly, the FAN indicator is illuminated.

BRK/DC — This indicator is illuminated when a fuse has blown or when a circuit breaker has opened in the power system.

Auxiliary Control Panel Switches

The layout of the auxiliary control panel is shown below. A description of these controls on this panel follows.



PRINT DENSITY — This six-position rotary switch is marked in the LOW, MEDIUM, and HIGH positions. To alter the setting of this switch, it is necessary to raise the top cover of the printer. In the HIGH position, printing up to seven-ply forms is possible. In the LOW position, the impact of the printing slugs is reduced to avoid punching through lesser-ply forms. To obtain the best print quality the setting of the PRINT DENSITY switch should be chosen in accordance with the quality and the ply of the paper being used.

NOTE: Readjusting the character/index control may be necessary when the setting of the PRINT DENSITY switch is changed (see page 6-17).

SINGLE ORDER — To activate this spring-loaded toggle switch, it is necessary to open the top cover of the printer. Before the switch is operative, the following conditions must be met:

1. The central processor RUN switch must have been pressed;
2. The type roll must be rotating;

SINGLE ORDER (cont)

3. The STOP switch on the printer main control panel must have been pressed; and
4. The START switch on the printer must not have been pressed.

Each time this switch is momentarily activated, the printer control accepts one PDT instruction from the central processor for a single line of print. This control allows the operator to print a line for inspection before the program is begun and, during program operation, allows the operator to print down to the end of the form, if desired.

When the last form is reached and the form comes out of the bottom tractor, the printer logically stops and the FORMS indicator on the main control panel is illuminated. If the operator should now desire to print down to the very end of the form, he can activate the SINGLE ORDER toggle switch. The only state under which the single-order function is not operative (besides the four conditions outlined above) is when the out-of-paper condition and the head-of-form location on the vertical format control tape are sensed simultaneously. It is not possible to print to the end of the form using the toggle switch and then advance the tractors to the head-of-form position and continue printing, because the printer is now completely out of paper and synchronization with the program is lost. To avoid this situation, the SINGLE ORDER switch is automatically deactivated when the operator has printed the last line and the tractors are advanced to the head-of-form position.

To reload the printer with paper and continue, it is only necessary to put the form in the proper position in the tractors right where they stopped and perform the necessary restart procedures.

LINES/INCH 6-8

This control is a lever-lock toggle switch which is used to select either six- or eight lines per inch vertical spacing. The setting of this switch should not be changed while the type roll is running; otherwise, a possible malfunction of the printer may result. A change in the format control tape may be required when the setting of this switch is changed.

RIBBON NORM/CHGE

This control is an alternate-action switch which is used in changing the ribbon. When the CHGE position is selected, the ribbon is forced to run in the direction of the end of ribbon (as long as power is applied to the printer) until the end is reached, regardless of whether or not printing is occurring. It should be noted that printing can occur during this period, and the time to reach the end of the ribbon is the same whether or not printing occurs. When the end of ribbon is reached, the RIBBON indicator on the main control panel is illuminated, and the printer comes to a "controlled stop," as described above under the STOP switch.

RIBBON NORM/CHGE (cont)	This interlock condition must be cleared by pressing the START switch. The ribbon may or may not be changed before this interlock is cleared. If the switch is moved to the CHGE position and then returned to the NORM position before the end of ribbon is reached, the printer will continue to function as though the switch had not been moved initially. This switch may be changed during printing without causing any malfunction or error condition to occur.

OPERATING PROCEDURES

The following operating procedures apply to the Type 122 Printer.

Applying and Removing Power to the Printer

1. To perform a standard power-up procedure when the printer is completely shut down, e.g., at the beginning of the day:
   a. Close the printer main a-c circuit breaker on the customer a-c power panel if it has been opened.
   b. Press the POWER ON button on the main control panel of the printer. The POWER ON indicator should illuminate, signalling that all a-c power has been applied to the printer. However, if any a-c interlock condition is violated (i.e., a power-supply failure, an open d-c supply circuit breaker, or a fan failure) the printer will not maintain a-c power for more than ten seconds, after which the POWER ON indicator will be extinguished. If the POWER ON indicator remains illuminated after ten seconds has elapsed, the operator may then perform a normal start procedure.

2. To perform a standard power-down procedure when the printer is in a ready condition to receive a print instruction:
   a. Press the TYPE ROLL OFF button on the main control panel of the printer. This action prepares the printer for the removal of a-c power.

      CAUTION: The TYPE ROLL OFF button must be pressed prior to pressing the POWER OFF button. If it is not, the paper-feed engine may move backwards, thus destroying the vertical format control tape.

   b. Press the POWER OFF button on the main control panel of the printer.
   c. Open the printer main circuit breaker in the customer a-c power panel, if desired. This action leaves the printer in a completely shutdown condition.

3. To perform an emergency shutdown procedure when an immediate removal of power from the printer is required, either of the two following methods may be used, whichever is most convenient:
   a. Press the POWER OFF button on the main control panel of the printer; or
   b. Open the printer main a-c circuit breaker on the customer a-c power panel.

Preparing the Printer for Operation

1. To prepare a vertical format control tape:

The Type 122 Printer may use either a six- or an eight-lines-per-inch tape, depending on the format desired (see Figure 6-2, page 6-3). The physical processes involved in preparing both tapes are identical, except that separate punches for preparing each tape are used.

a. Place the tape in the punch so that the two indexing posts on the punch each mate with a sprocket hole in the tape.

b. Punch the desired head-of-form location in channel one (1) of the tape. Channel one is the outboard tape channel corresponding to the extreme left-hand cell as the operator faces the printer from the front.

c. Punch the desired end-of-form location in channel two (2) of the tape.

d. To form the tape loop, grasp the ends of the tape (as it rests in the punch) and loop them downward to make the joint. Spread a thin coat of glue on each surface to be joined and press firmly together to form the joint. The tape is now ready for installation in the printer.

NOTE: If, and only if, all holes are punched opposite sprocket holes, the tape may be used for either six- or eight-lines-per-inch vertical formatting. However, no more than one hole may be punched opposite any given sprocket hole.

2. To mount a vertical format control tape:

This tape is mounted on the sprocket wheel which is visible below the vertical format head-of-form adjustment knob on the left side of the printing mechansim.

a. Lift the curved control tape retainer clamp above the sprocket wheel so that the control tape may be inserted between the lamp housing and the cells.

b. Place the prepared control tape over the sprocket wheel and between the lamp housing and the cells so that the sprocket holes in the tape mate with the cogs on the wheel. The tape must be mounted so that channel one of the tape (containing the head-of-form punch) is furthest away from the body of the printer. Return the tape retainer clamp to the down position so that the tape is held firmly in place.

c. Depress the STOP button on the printer main control panel to enable the FORM SPACE button to become effective.

d. Depress the FORM SPACE button on the printer main control panel to advance the control tape to the proper head-of-form location.

NOTE: The printer must be in a normal, stopped condition, i.e., with the STOP indicator illuminated, the type roll up to speed, and all other indicators extinguished, before the FORM SPACE button can become effective.

3. To change a printer ribbon:

a. Move the RIBBON switch on the auxiliary control panel of the printer to the CHGE position. The ribbon then rewinds onto the supply mandrel without program interruption until the

aluminum foil at the beginning of the printer ribbon is sensed. At this point, the ribbon is completely rewound onto the disposable upper ribbon supply mandrel, the RIBBON indicator on the printer main control panel is illuminated, and the program is stopped.

b. Depress the TYPE ROLL OFF button.

c. Pull the ribbon cover back.

d. The ribbon leader is secured to the take-up (lower) mandrel by a strip of two-sided adhesive tape. Remove the leader from the take-up mandrel by peeling the adhesive away from the mandrel.

e. Manually wind the remaining leader back through the ribbon feed path onto the supply mandrel. Remove the supply mandrel from the printer by pressing it to the right. The right pulley of the mandrel is spring-loaded, thus allowing it to be moved to the right to disengage the mandrel from the keyed left pulley. Dispose of the used ribbon and supply mandrel.

f. Mount the new disposable mandrel and ribbon on the upper shaft so that the new ribbon will feed from the top side of the roll. Be sure that the new mandrel is keyed properly in the left pulley and that it is mounted securely on the right pulley.

g. Open the type roll housing completely by releasing the toggle clamp bar and pulling the type roll housing upward away from the print hammer base.

h. Unwind a portion of the new ribbon leader and thread it between the two paper standoff bars, making sure that the aluminum foil side of the ribbon is on the outside of the roll as it is unwound. Pull the leader through the ribbon feed path until there is sufficient slack to enable it to be attached to the lower take-up mandrel.

i. Peel the protective covering off the two-sided adhesive tape on the ribbon leader and line up the edge of the adhesive with the scribed guide line on the take-up mandrel. This action ensures that the ribbon is aligned properly, thus helping to prevent ribbon skew during printing operations. Secure the leader to the take-up mandrel by applying pressure to the adhesive tape. Manually wind the take-up mandrel until the ribbon leader is completely wound onto the mandrel.

j. Engage the type roll housing by swinging it downward into place and relatching the toggle clamp bar.

k. Start the type roll by depressing the TYPE ROLL ON button.

l. Move the RIBBON switch on the printer auxiliary control panel to the NORM position. The printer then starts its normal four-second movement cycle.

m. Depress the START button on the printer main control panel. Normal printing operations may now be resumed.

Start Procedures

1. To determine the form specifications and to adjust the printer to accommodate the desired form:

a. Determine the weight of the paper and the number of carbons to be used in the printing run. Set the stock thickness adjuster, i.e., the lever on the right side of the printing mechanism, to one of the five possible positions according to the thickness of the paper and the number of carbons being used in the run. Use higher-numbered settings for thicker forms.

b. Ensure that a sufficient supply of paper is available for printing the run.

c. Start the type roll by depressing the TYPE ROLL ON button on the main control panel of the printer.

d. Depress the FORM SPACE button on the main control panel of the printer.

e. Depress the TYPE ROLL OFF button on the main control panel of the printer, and release the type roll housing by disengaging the toggle clamp bar securing the housing. Raise the type roll housing.

f. Lift the tractor cover plates on the upper and lower tractor pin feeds on the left side of the printer. Align the head of the form with the scribed index mark on the paper guide and insert the marginal punches of the form into the upper tractor. Close the upper tractor cover plate for form retention. In the vicinity of the lower tractor assembly on the left side, grasp the form and gently pull it while mating the form with the pins on the lower left tractor. If the tractor pins and the holes in the form do not match, turn the vertical paper-tension adjustment knob in the lower left corner of the printing mechanism until the paper and the tractor pins mate.

NOTE: Clockwise turning of the paper-tension adjustment knob increases paper tension.

Drop the paper over the pins and close the tractor cover.

Determine whether the upper and lower tractors on the right side of the printer need to be adjusted to accommodate the width of the new form. If a shift is necessary, individually adjust the tractors to the correct position. This adjustment may be accomplished by two controls, permitting either a coarse or a fine adjustment. The quick-disconnect feature of the right-side tractors may be used to obtain a coarse adjustment. This control is a button-like prominence on the handwheel attached to the right-hand side of the tractor body. Simply depressing this button disengages the tractor from the shaft and allows the tractor to be moved freely in either direction on the shaft. When releasing this button, push the tractor slightly to the right or the left to re-engage the button. After obtaining a coarse adjustment, lift the right-side tractor covers and insert the marginal punches of the form into the tractor pin feeds. A fine adjustment may then be obtained by turning the knurled vernier-adjusting handwheel on each of the right-side tractor mechanisms.

g. Horizontally adjust all four tractors jointly with respect to the column scale. This is necessary to establish the desired marginal relationships for printing on the form. The adjustment is accomplished by turning the horizontal tractor-positioning

adjustment control on the right side of the printer body. Turning this cranklike control in a clockwise direction moves all four tractors in unison to the right. Counter-clockwise rotation moves the tractors to the left.

h. Position the form for proper vertical registration of the printed output by turning the head-of-form control knob located in the upper left area of the printing mechanism. Clockwise rotation of the knob moves the printed output up with respect to the form. Adjust the knob so that the first line to be printed coincides with the scribed line on the paper guide.

i. Check that the LINES/INCH switch on the printer auxiliary control panel is set for the desired vertical spacing, i.e., either six or eight lines per inch. The setting of this switch must match the number of lines per inch (six or eight) in the vertical format control tape being used; otherwise, when the first head-of-form formatting instruction is executed, the paper will feed continuously, resulting in a runaway paper condition. A runaway condition is normally stopped by depressing the TYPE ROLL OFF button on the main control panel of the printer. If the runaway paper condition is not stopped by pressing the TYPE ROLL OFF button, the POWER OFF button on the main control panel must be pressed.

NOTE: If all the holes punched in the control tape are opposite sprocket holes, the tape may be used for either six- or eight-lines-per-inch vertical formatting, provided that no more than one hole is punched opposite any given sprocket hole.

j. Check the condition of the printer ribbon. If a ribbon change is required, proceed according to the ribbon change procedure outlined on page 6-11.

2. To perform an initial start procedure after the printer has been prepared for normal operations as outlined in procedure one above:

a. Depress the TYPE ROLL ON button on the main control panel of the printer, if it is not already on. This action energizes the type roll motor. There is an automatic delay of approximately three seconds before the printer logic can be preconditioned. This delay is to allow the type roll motor to reach full velocity.

b. Depress the START button to signal the printer control that the printer is in a "ready" condition to receive a print instruction from the central processor.

c. If the speed of the type roll or the number of carbons in the form have been changed, it is likely that a slight adjustment of the character/index control will be required (see page 6-17).

Restart Procedures

1. To perform a restart operation following a printer stop for a CYCLE indication:

a. Lift the top cover of the printer and note whether or not the code disc lamp is illuminated. If it is not illuminated, replace the lamp.

NOTE: If the code disc lamp is illuminated and all other printer electronics appear to be functioning correctly, a program timing problem may exist. In this case, the operator should consult with the programmer.

b. Attempt to restart the program. It must be assumed that the last line printed is in error. If it is possible to determine the point in the program at which the stop occurred, printing should be resumed at this point to ensure that no loss of information occurs. After determining the restart point, proceed with "c" below. If it is not possible to determine the restart point, the printing run must be restarted from the beginning.

c. To start the printing run, depress the START button on the main control panel of the printer. If the CYCLE check condition has been cleared, the printer should resume the normal printing run. If the CYCLE indication occurs again, it signals that a malfunction has occurred in the printer electronics, in which case the field service engineer should be called.

2. To perform a restart operation following a printer stop for a LAMP, FAN, RIBBON, or BRK/DC indication:

a. Determine the cause of the printer check condition by surveying the indicators on the printer main control panel. Table 6-1 below may also be used in determining the cause of the check condition.

b. Correct the condition that caused the printer check.

c. Check the toggle clamp bar to determine whether the type roll housing is securely engaged. If not, secure the toggle clamp bar.

d. Depress the TYPE ROLL ON button on the main control panel of the printer.

e. Obtain the proper head-of-form spacing by depressing the FORM SPACE button on the main control panel of the printer.

f. Depress the START button. If all the printer check conditions have been cleared, the printer should resume the normal printing run.

Table 6-1. Check Conditions in Type 122 Printer

TYPE OF STOP		
Conditional (Type roll remains on and print instruction is completed.)	Unconditional (Type roll is turned off and print instruction may not be logically completed.)	Complete Shutdown (All power removed.)
1. Interlock in paper-feed system, i.e., form not properly loaded, etc. FORMS indicator illuminated.	1. Depression of TYPE ROLL OFF button. TYPE ROLL OFF indicator illuminated.	*1. Vane switch actuated. FAN indicator illuminated. Five seconds after FAN indicator is illuminated, complete shutdown occurs.

Table 6-1 (cont). Check Conditions in Type 122 Printer

TYPE OF STOP		
Conditional (Type roll remains on and print instruction is completed.)	Unconditional (Type roll is turned off and print instruction may not be logically completed.)	Complete Shutdown (All power removed.)
2. End of ribbon sensed after RIBBON switch is moved to CHGE position. RIBBON indicator illuminated. 3. Ribbon motor fuse open. 4. Vane switch actuated. FAN indicator illuminated; after five seconds elapses, complete shutdown occurs. 5. Depression of the STOP button on the front of the main control panel.	2. Type roll housing not securely engaged by toggle clamp bar. 3. Lamp failure in control tape or optical code disc circuitry. LAMP indicator illuminated.	*2. One of d-c power supply circuit breakers opens, viz., ±15-, +5-, or +60-volt breakers. BRK/DC indicator illuminated. 3. Loss of d-c power supplies, viz., ±15-, +5-, or +60-volt power supplies. BRK/DC indicator illuminated. 4. Failure of 26-volt power supply. 5. Depression of AC OFF button or the button on back of main control panel.
*Indicator circuitry remains energized.		

In the case of a conditional stop, the print instruction is properly executed and then followed by a logical interruption in the program sequence. In the case of an unconditional stop or complete shutdown, the print instruction may not be logically completed; i.e., the line may not be completely printed.

3. To perform a restart operation following a printer stop for a FORMS indication:

   a. Determine the cause of the FORMS indication and make the necessary corrections. This indication is caused by an interlock condition in the paper-feed mechanism resulting from paper supply depletion or skewing of the form in the tractors. Tearing of the form in the tractors or improper loading may also cause an interlock condition, thus yielding a FORMS indication.

   b. Depress the TYPE ROLL ON button on the main control panel of the printer.

   c. Perform a normal head-of-form alignment procedure (see below).

   d. Depress the START button on the main control panel of the printer.

Operator Adjustments to the Printer

1. To perform a head-of-form adjustment.

   a. Correction to line phasing may be made dynamically while printing by adjusting the head-of-form control which is located in the upper left area of the printer mechanism. Clockwise rotation of this control moves the printed output up with respect to the form, and counterclockwise rotation moves the printed output down.

2. To perofrm a character/index adjustment:

   If any "clipping" or "ghosting" of characters occurs during a printing run, the character/index adjustment knob may be used to correct either of these conditions. This knob may also be used to compensate for any clipping or ghosting that may occur when the number of carbons to be printed is changed. This adjustment should be made when the printing run is being set up. Clipping refers to the condition where a printed character is vertically misaligned, thus causing either the top or the bottom of the character to be incompletely printed. Ghosting refers to the condition where a character appears to have a dual image or "shadow." The following procedures should be used when performing a character/index adjustment:

   a. After determining the number of carbons to be used during the run, set the stock-thickness adjuster on the right side of the printer mechanism to the desired position. Use higher-numbered settings for thicker forms.

   b. Examine the printed output and adjust the character/index control until the proper setting is obtained. If clipping or ghosting still occurs, readjust the control until the best print quality is obtained.

3. To perform a hammer timing adjustment:

   Whenever any characters in a line of printed output are misaligned, an electronic adjustment of the print hammer timing for the misaligned print positions (columns) is necessary. The potentiometers for controlling the print hammer timing are numbered to correspond to the printed columns.

   WARNING: It is imperative that the following precautions be observed when performing a print hammer timing adjustment:

   (1) Use only the special, non-conductive tool supplied;

   (2) Do not bear down or use force on the circuit cards or the card guides;

   (3) Keep fingers off the circuit cards; and

   (4) Do not drop any foreign object into the chassis or down between the circuit cards.

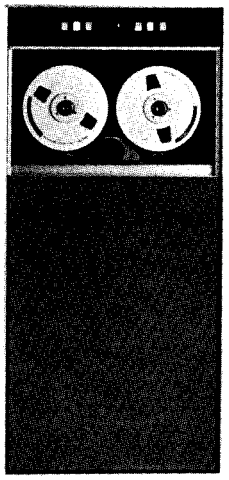
   a. Determine which print columns are misaligned by checking the column scale.

   b. While printing, adjust the appropriate potentiometer in the printer electronics cabinet until the character is properly aligned when printed. If the character is being printed above the line, turn the potentiometer adjustment clockwise. If the character is being printed below the line, turn the potentiometer adjustment counterclockwise.

c. If the range on a potentiometer is exceeded and it becomes impossible to align certain columns, set all the potentiometers near the center of their range and do a complete realignment.

SECTION VII

TYPES 204B-11, 204B-12 MAGNETIC TAPE UNITS



The Type 103 consists of a tape control and a Type 204B-11 primary tape unit. Up to three Type 204B-12 secondary tape units may be added to the tape control. The primary unit contains the vacuum system and read/write circuitry for all four units. The Type 103 processes 1/2-inch magnetic tape having a record density of 556 bits per inch. Tape moves at a speed of 24 inches per second during reading or writing; rewind speed is 144 inches per second. The programmer-defined interrecord gap may be set to a "short" gap of 0.45 inches or a "long" gap of 0.75 inches. The above physical properties define the following Type 204B-11 and 204B-12 tape characteristics:

1. Data transfer rate is 13,344 characters per second.
2. Time required to cross the interrecord gap is 19 milliseconds for the short gap and 31 milliseconds for the long gap.
3. Erase time is 146 milliseconds (an erase command automatically erases 3 1/2 inches of tape).
4. Time to reach the first tape record is 344 milliseconds (a rewound or newly mounted tape must be moved 8 1/4 inches before the first record is reached).

The tape control regulates data transfer between tape units and the central processor and checks for read and write errors. One six-bit character (occupying one tape frame) is transferred at a time. Data transfer terminates when a record mark is sensed in memory or, alternately (for a read operation), when an entire tape record has been read.

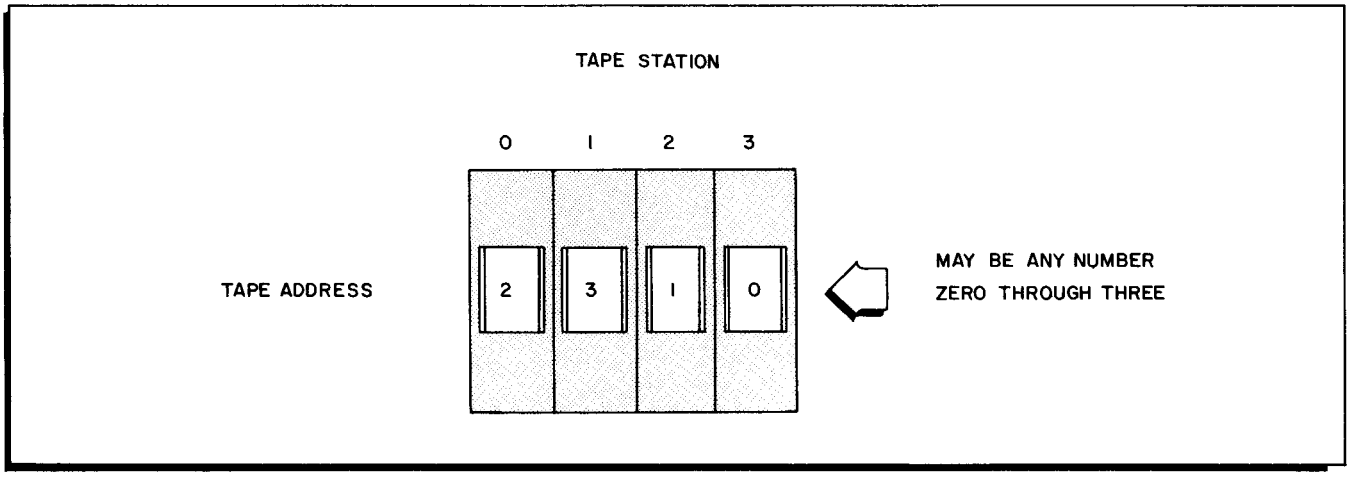


Figure 7-1. Manual Controls for Type 103 Tape Control

MANUAL TAPE CONTROL FUNCTIONS

The manual controls (see Figure 7-1) for the Type 103 Tape Control are located at the top front of the logic drawer which houses the tape control circuitry. All functions (except the tape control clear, which is described below) are located on this panel. The four switches on this panel provide the means for arbitrarily assigning any one of four logical tape addresses to any one of the four tape units (stations zero through three) connected to the tape control.

Tape Address Switches

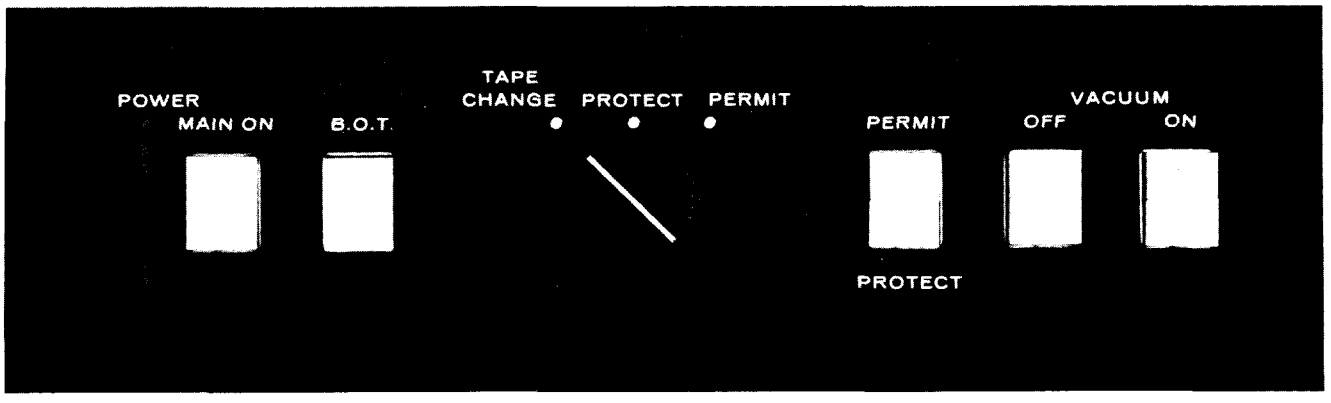
The four rotary thumb wheel TAPE ADDRESS switches are used to assign logical tape addresses to physical tape units. Each switch (one per TAPE STATION) has four positions which are numbered zero through three and one position which is blank. Any one of the logical tape addresses zero through three may be assigned to any one of the physical tape units on-line to the central processor, provided that each logical address is assigned to only one tape unit. System behavior is unspecified if more than one physical tape unit is assigned to the same logical address. When the blank position is used, the tape drive assigned to this position appears "inactive," i.e., not accessible to the program.

Tape Control Unit Clear

This function is activated by pressing the INITIALIZE button on the central processor control panel (see page 2-6). Pressing the INITIALIZE button stops runaway read or write conditions in the tape drive, terminates all operations in progress in the tape control, and prepares the control to receive any new instructions. If the tape control is in a normal stopped state, pressing the INITIALIZE button will reset stored read/write error functions.

TAPE UNIT CONTROLS AND INDICATORS

The controls and indicators on the control panel of a Type 204B-11 or 204B-12 are shown below. A description of these controls and indicators follows:



POWER MAIN ON	Pressing this alternate-action push-button switch applies power to the tape unit and causes the MAIN ON indicator to illuminate. Pressing this push-button when the indicator is illuminated removes power from the tape unit.
BOT	This indicator is illuminated when the BOT/EOT photoelectric sensor detects the beginning-of-tape reflective marker which establishes the beginning of the usable portion of the tape. Pressing this push-button switch initiates a rewind to the beginning-of-tape reflective marker.
PERMIT (Indicator)	When the PERMIT indicator is illuminated, it signals that the tape unit is ready to execute a write instruction. For this indicator to be illuminated, the tape status switch must be in the PERMIT position, both reels must be mounted, the write-enable ring must be installed in the supply reel, the tape drive must be cycled up, the read/write head must be in position to write, and no rewind operation may be in progress.
PROTECT (Indicator)	When the PROTECT indicator is illuminated, the tape drive is unable to write (i. e., one of the conditions outlined above in the description of the PERMIT indicator is absent).
VACUUM OFF	Pressing this push-button indicator switch removes power from the vacuum and pressure supplies and from all components of the tape unit.
VACUUM ON	Pressing this push-button indicator switch turns on the vacuum-pressure pump. The indicator is not illuminated until the vacuum level reaches at least 80% of normal. Pressing the VACUUM ON button also applies power to the loop chamber vacuum blower motor for the easy loading (tape mounting) feature of the tape units.

Tape Status Switch

TAPE CHANGE	Setting the tape status switch to the TAPE CHANGE position starts the rewind sequence to the beginning-of-tape reflective spot, thus permitting removal of the tape reels after the VACUUM OFF switch has been pressed.
PROTECT	Setting the tape status switch to the PROTECT position prevents writing on tape.
PERMIT	Placing the tape status switch in the PERMIT position allows tape to be written upon, provided that the necessary conditions outlined above in the description of the PERMIT indicator are met.

OPERATING PROCEDURES

Mounting and demounting tapes are the basic functions which the operator performs on a

magnetic tape unit. To minimize the possibility of error, it is important that the operator understand the functions of the indicators on the tape unit control panel and how to use the controls associated with them. Any tape unit which is used only for input should be placed in PROTECT status to avoid the possibility of unintentionally writing on a tape on this unit. At the end of a run, all tapes which are not going to be used during the following run should be demounted and filed.

Write-Enable Ring

Two provisions are included in Honeywell tape units to prevent erasing or writing unintentionally over useful information on the tapes. Positive protection is afforded in that the operator must perform two separate actions before a write operation can be initiated:

1. He must insert the write-enable ring in the supply reel containing the tape to be written; and
2. He must place the tape status switch in the PERMIT position.

If either of these actions is not performed, the PROTECT indicator on the tape unit control panel is illuminated, and the tape on that unit cannot be written.

The write-enable ring is installed in the side of the reel that is nearest the tape unit when the reel is mounted. If the tape being mounted is to be written, the write-enable ring must be installed before beginning the tape mounting procedure. This is done simply by orienting the write-enable ring to the correct position and pressing it firmly into place with the fingers. No special tools are required.

Standard Power-Up and Shutdown Procedures

In the following procedure, it is assumed that all electrical cables have been properly connected and secured and that power is applied to the unit.

1. To cycle-up the tape unit in preparation for a standard tape operation:
   a. Set the tape status switch in the TAPE CHANGE position.
   b. Press the power MAIN ON button.
   c. Press the VACUUM ON button.
   d. Mount the tape reel in accordance with the procedure outlined below.
   e. Set the tape status switch in the PERMIT or PROTECT position. The tape drive should then be in a standby condition ready to accept a peripheral instruction, having tape in the loop chambers, and the MAIN ON, PERMIT or PROTECT, and VACUUM ON indicators illuminated.
2. To perform a standard shutdown procedure:
   a. Set the tape status switch in the TAPE CHANGE position. If the tape is not rewound, a rewind sequence will occur. At the end of the rewind sequence, the drive will be in a released condition with the MAIN ON and VACUUM ON indicators illuminated.

b. To complete the shutdown, press the VACUUM OFF and POWER MAIN ON buttons. This action completely removes vacuum and power from the tape drive.

Tape Mounting and Loading

1. To mount a tape reel, the following procedures should be followed:

   a. Place the tape status switch in the TAPE CHANGE position.

   b. Mount the tape reel and press it firmly in place on the reel mount. The stainless steel hub on the reel mount must be pressed while mounting the reel. After securing the reel on the reel mount, release the hub and the reel will be locked in place.

   c. Unwind approximately three feet of tape from the supply reel and thread it through the tape cleaners and under the read/write head. Loop the free end of the tape up over the take-up reel in a clockwise direction (making sure that the tape is not twisted). Insert the forefinger of the left hand through one of the slots in the take-up reel and manually rotate the reel clockwise until at least one complete turn of tape is firmly seated on the reel. After the tape is seated on the reel, remove the finger and continue manually turning the take-up reel for 10 or 15 more turns.

      NOTE: Do not manually rotate the supply reel while turning the take-up reel, since friction provides the necessary windup tension on the take-up reel.

   d. Press the VACUUM ON button. Make sure the tape is aligned properly in the tape feeding guide on each side of the read/write head, then back off both reels approximately one or two turns to provide the tape slack for sucking into the loop chambers.

   e. Set the tape status switch to either the PERMIT or the PROTECT position to activate the tape unit for the desired status. If the tape being mounted is to be written on, the plastic write-enable ring must be in place in the supply reel, and the tape status switch must be set in the PERMIT position. At the completion of the tape mounting procedure, the BOT indicator on the tape unit control panel is illuminated.

Tape Rewinding

1. To perform a rewind operation to the beginning-of-tape reflective marker so that the tape may be demounted:

   a. Place the tape status switch in the TAPE CHANGE position. The read/write head rotates upward out of position, and the tape rewinds onto the supply reel. The rewind proceeds at six times read/write speed until the reel diameter photocell senses light as the rewind nears completion. At this point, the tape decelerates to the normal read/write speed and continues at this rate until the beginning-of-tape reflective marker is sensed. When this occurs, tape motion stops and the tape unit is in a released condition with the MAIN ON and VACUUM ON indicators illuminated.

   b. Press the VACUUM OFF button. This allows the tape unit to cycle down; i.e., all motors are de-energized, and loop chamber and capstan vacuum are vented, etc., so that the supply reel may be removed.

2. To perform a rewind operation to the beginning-of-tape reflective marker so that the tape unit is cycled-up and ready to perform an instruction:

   a. Press the BOT button on the tape unit control panel; or

   b. Momentarily place the tape status switch in the TAPE CHANGE position and then return it to either the PERMIT or PROTECT position. In either case ("a" or "b"), the tape rewinds at six times read/write speed and continues at this rate until light is sensed by the reel diameter photocell. At this point, the tape decelerates to the normal read/write speed and continues at this rate until the beginning-of-tape reflective marker is sensed. Power and vacuum remain on, and the read/write head rotates back into position for reading or writing. Manipulating the tape status switch in this manner affects the tape drive in the same way as does a programmed rewind.

Tape Demounting

1. Set the tape status switch to the TAPE CHANGE position. The tape is then rewound onto the supply reel until the beginning-of-tape marker is sensed (as described above for tape rewinding procedure 1).
2. When tape movement stops, press the VACUUM OFF button. Then manually rotate the supply reel counterclockwise to wind up the remaining tape from the take-up reel and the loop chambers.
3. Remove the supply reel from the reel mount. Grasp the opposite sides of the reel with the fingers while pressing firmly with the thumbs against the reel hub, thus removing the reel.

   NOTE: Always leave the tape status switch in the TAPE CHANGE position if no supply reel is mounted.

OPERATOR CONSIDERATIONS

Program Addressing an Unassigned Logical Tape

When a running program addresses a logical tape which has not been assigned by the operator using the TAPE ADDRESS switches, a central processor "stall" condition occurs. A stall condition exhibits the following characteristics:

1. All central processor and peripheral device activity stops;
2. The RUN indicator remains illuminated; and
3. The CONTENTS and ADDRESS indicators remain constant (i. e., non-fluctuating).

Depending on the operator's familiarity with the run, he may initiate a restart by performing the following steps:

1. Press the STOP button.

   NOTE: The sequence register contains the address of the PDT op code causing the stall condition.

2. Assign the logical tape address designated in control character C3 of the

stalled PDT instruction by turning one of the rotary thumbwheel TAPE ADDRESS switches to the appropriate position.

3. Re-enter the address of the PDT op code into the sequence register.
4. Press the control panel RUN button.

The program should then continue. If the program does not continue and the operator is not familiar with the run, a restart from the beginning of the program or from a logical restart point should be initiated.

Selecting Magnetic Tape Addresses

If a program is reading or writing on a tape and the operator wishes to select another tape by means of the appropriate TAPE ADDRESS switch, he must be aware of the following restriction: If, while a TAPE ADDRESS switch is being manipulated, it momentarily passes through the address of a tape that is being read or written, an error will result. To avoid this situation, the operator should address all tapes prior to starting the program. If a situation should arise later that requires selecting a logical tape assignment during a program run, the operator should first press the STOP button on the central processor control panel, dial the tape assignment in the appropriate TAPE ADDRESS switch, and then press the RUN button to continue.

SECTION VIII

OPERATOR'S CONSOLE

The addition of an operator's console to a Model 120 makes further monitoring and control facilities available to the operator and increases the scope and power of the associated central processor. The Type 220-1 and 220-3 Consoles perform the same basic functions as a control panel and provide the capability for some important auxiliary operations as well.

220-1

220-3

The Type 220-1 Console includes a console cabinet, a typewriter keyboard, a Teletype model 33 paper carriage and typing mechanism, a LOG push-button indicator, a TYPE indicator, and a control unit. The 220-1 must be placed with respect to the power cabinet such that the operator may have convenient access to both the console keyboard and the Model 120 control panel located on the power cabinet.

The Type 220-3 Console consists of a console cabinet, a typewriter keyboard, a Teletype model 33 paper carriage and typing mechanism, a control panel containing various indicators and push-buttons, and a control unit. The Type 220-3 Console, which is designed to be convenient either while sitting or standing, enables all the control panel functions except that of the DISPLAY-1 button to be performed from the keyboard. Note that the Type 220-3 Console replaces the control panel, which is entirely removed.

Both console types require two input/output trunks. Either console may be connected to a Type 121 Central Processor provided the Series 200 Control Unit Adapter (Feature 1015 or 1016) is included.

The following features are common to both consoles:

1. The console typewriter types the character set contained in Table 8-1;
2. A separate desk mounting is provided for the console typewriter; and
3. The consoles normally abut the central processor but may be remotely located up to ten feet from the central processor, subject to the restriction that the Type 220-1 be convenient to the control panel.

Table 8-1. Series 200 Console Character Set

Octal Character*	Typed Graphic	Octal Character*	Typed Graphic
00	0	40	-
01	1	41	J
02	2	42	K
03	3	43	L
04	4	44	M
05	5	45	N
06	6	46	O
07	7	47	P
10	8	50	Q
11	9	51	R
12	'	52	#
13	=	53	$
14	:	54	*
15	space	55	"
16	>	56	≠
17	&	57	!
20	+	60	<
21	A	61	/
22	B	62	S
23	C	63	T
24	D	64	U
25	E	65	V
26	F	66	W
27	G	67	X
30	H	70	Y
31	I	71	Z
32	;	72	@
33	.	73	,
34	)	74	(
35	%	75	c_r
36	■	76	□
37	?	77	¢

*The item and word bits are not typographically represented in the peripheral mode.

The graphics >, ■, ?, ≠, !, < , □, and ¢ in Table 8-1 are selected to agree with the Type 122 Printers. These graphics can be altered easily, even for individual installations.

CONSOLE FUNCTIONS

Type 220-1 Console

The 220-1 console operates in two modes:

1. Peripheral Mode — Functions as a peripheral device which utilizes a read/write channel under program control. The program illuminates the TYPE indicator and causes the keyboard to become effective when data is to be entered. Printouts are under program control only.
2. Logging Mode — Functions as a logging typewriter which is logically disconnected from the central processor to allow the operator to make essential notes about the operation of the program.

The console is switched from one mode to the other by pressing the LOG push-button. This button is illuminated only when the console is in the logging mode. The typewriter keyboard is effective only when either the LOG or the TYPE indicator is illuminated.

PERIPHERAL MODE

When the LOG indicator is turned off, the console typewriter may be operated under program control as a peripheral input/output device. The console control allows the typewriter to be addressed by a program through a read/write channel for typing out messages from the program or for entering parameters into the central processor. In the peripheral mode, the typewriter keyboard (except the Carriage Return key) is not effective unless the TYPE indicator is illuminated.

LOGGING MODE

At the risk of delaying the program, the operator may log while a program is running. In the logging mode, the typewriter operates off-line and appears busy to all central processor instructions. Thus, if the program attempts to address the typewriter while the operator is logging, it will stall. The program can test whether the console typewriter is busy by executing a PCB instruction.

The logging mode is effective only when the LOG indicator is illuminated. This button is either illuminated or turned off each time it is depressed. Illuminating the LOG button does not cause the read/write channel to be released (if one has been assigned).

Type 220-3 Console

The 220-3 console (see Figure 8-1 for illustration of console control panel) operates in three mutually exclusive modes:

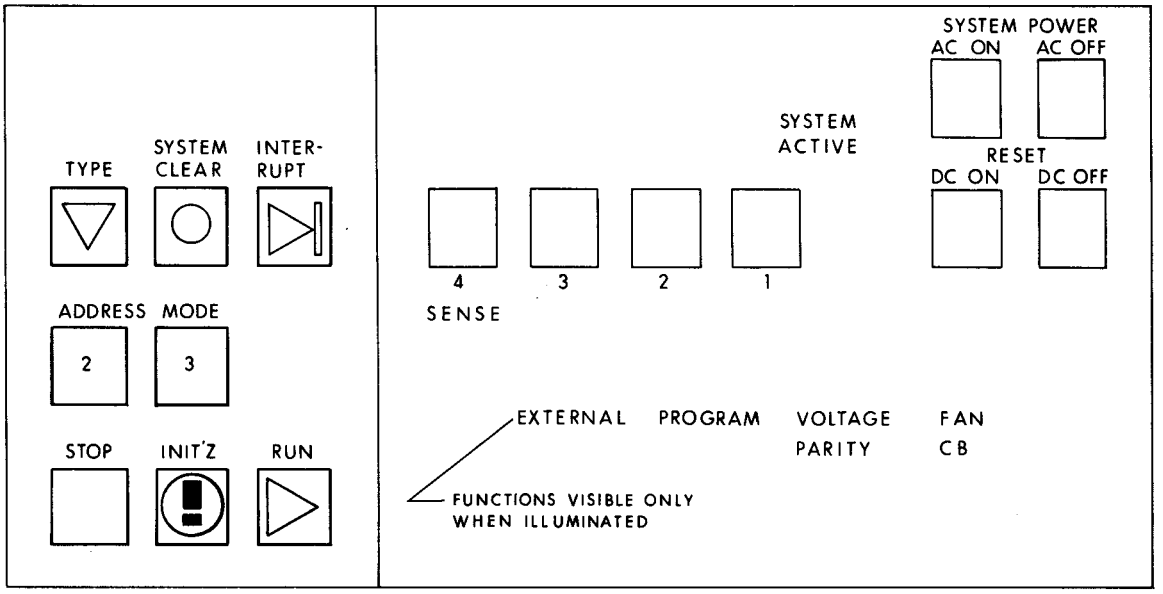
1. Peripheral Mode — If the STOP indicator is not illuminated, the console typewriter operates under program control as a peripheral device utilizing a read/write channel. Except for the L key and the Carriage Return key, the typewriter is not effective unless the TYPE indicator is illuminated.

2. Control Mode — If the STOP indicator is illuminated, the console operates as a control panel which utilizes the typewriter keyboard for direct access to main and control memory. The typewriter produces a printed record of all memory entries and displays.

3. Logging Mode — If the L key is struck with the TYPE indicator extinguished and the carriage returned, the console operates as a logging typewriter under manual control. In this mode, the console is logically disconnected from the central processor.

Operator-initiated manual typeins and typeouts can be performed only when the system is in the STOP mode. However, logging can be performed while the program is running, but only at the risk of delaying the program, since the typewriter is not available to the program while the console is in the logging mode.

In Figure 8-1, the functions of the power controls, SENSE switches, ADDRESS MODE, SYSTEM CLEAR, INITIALIZE, RUN, and STOP buttons are exactly the same as those of the corresponding controls on the central processor control panel. Note that these controls produce no printed record. The functions of the PARITY, VOLTAGE, FAN, EXTERNAL, PROGRAM, and CB indicators are also the same as described on page 2-12 for the central processor control panel. The function of the TYPE indicating push-button is described on page 8-12.



NOTES: 1. SYSTEM CLEAR and INITIALIZE are non-illuminating push-buttons.

2. SYSTEM ACTIVE flashes during PCB and PDT instructions. Illumination is neither fully bright nor fully extinguished, but modulates depending on frequency of peripheral instructions. A continuously dark or illuminated condition indicates program or equipment difficulty.

Figure 8-1. Type 220-3 Console Control Panel

When the central processor is operating in the interrupt mode, the INTERRUPT indicating push-button is illuminated exactly as on the control panel. Pressing the INTERRUPT button interrupts the program, provided the central processor is not already in the interrupt mode. Activation of this control interrupts the program only once per depression, even if it is held down.

PERIPHERAL MODE

When the STOP indicator is extinguished and the console is not in the logging mode, the console control circuitry allows the typewriter to be addressed by a program through a read/write channel. The console may then be used for typing out messages from the program or for entering parameters into the central processor. Except for the L key (see "Control Mode" below) and the Carriage Return key, console keys are not effective in the peripheral mode unless the TYPE indicator is illuminated.

CONTROL MODE

In the control mode, only certain console keys with special significance are effective, and then only if struck in accordance with certain specific requirements. If the STOP indicator is illuminated and the carriage is fully returned, the space (blank), 0 through 7, A, B, P, R, and S keys have special significance. The L key has special significance if the carriage is returned and the TYPE indicator is off.

The keys with special significance and the functions they perform are listed below:

A	Address insertion	P	Printing control memory contents
B	Bootstrapping	R	Performing a register dump
L	Logging	S	Executing one instruction only

After A, or B, or P has been struck in the control mode, only octal keys are effective until a carriage return occurs. After the octal keys or the space bar have been struck in the control mode, no other keys are effective until a carriage return occurs.

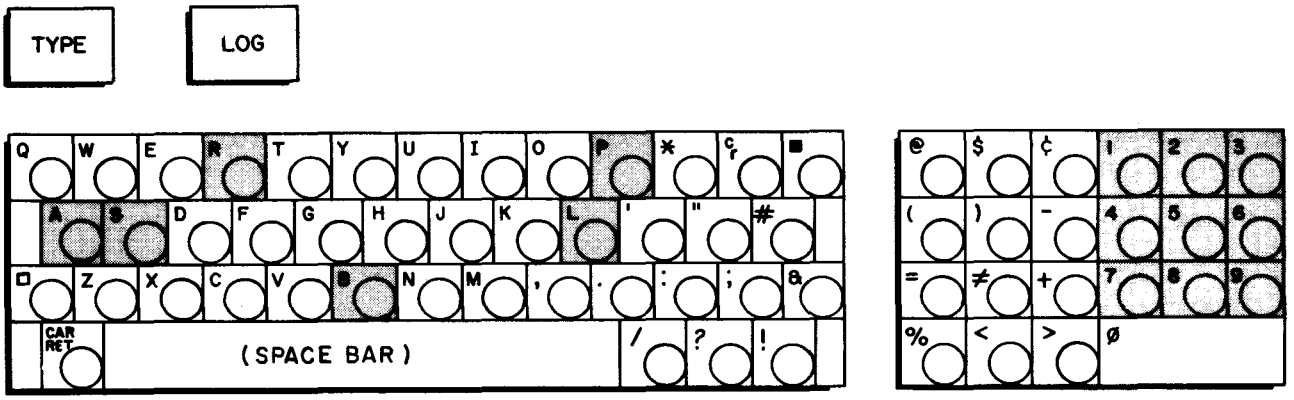
LOGGING MODE

If the TYPE indicator is off and the carriage is returned, striking the L key causes the console to be placed in the logging mode. The graphic "L" is typed out, and the carriage is automatically spaced. The operator may then enter alphanumeric information into the console using any of the keys, including the space bar, for as long as desired. It should be noted, however, that the console appears "busy" to peripheral instructions while logging operations are being performed.

The automatic carriage return after reaching the 64th graphic position in each line does not interrupt the logging operation. Pressing the Carriage Return key, however, terminates the logging operation and returns the console to the control mode or the peripheral mode.

CONSOLE TYPEWRITER OPERATION

Output message typing and parameter entry, which are described in the following paragraphs, apply to both types of console. The keyboard layout for both consoles is shown in Figure 8-2. The alphabetic and some symbol keys are separated from the numeric and arithmetic symbol keys. The digit keys and special function alphabetic keys are distinctly colored.



NOTES: 1. In the Type 220-3 Console, the space, 0 through 7, A, B, L, P, R and S keys have special significance.

2. The TYPE and LOG indicators appear only on the Type 220-1 Console.

Figure 8-2. Console Keyboard Layout

Console Output Message Typing

When an output message is to be written by the console typewriter, the program issues a standard Peripheral Data Transfer (PDT) write instruction. Execution of the PDT instruction causes one record to be typed out starting with the location specified in the A address of the instruction. The appropriate graphics (see Table 8-1) are typed out contiguously ten to the inch. Word marks and item marks by themselves have no effect upon the typing; a record mark terminates the typeout. In the Type 220-3 Console, a record mark likewise terminates typing and, in addition, causes an interrupt signal to be sent to the central processor, provided that console interrupts have been allowed by the program.

Automatic carriage return with line spacing is provided by right-hand margin control after the 64th character position in the line has been reached. Programmed control of the carriage

return is specified by control character C3 of the PDT instruction. Depending on the bit configuration of C3, carriage return may be effected or inhibited when the record mark in memory which terminates the typeout (or parameter entry) is sensed. If, however, the condition specified by C3 is overridden by the right-hand margin control function, the right-hand margin control takes precedence.

The program can effect single-line spacing by means of a PDT instruction which specifies writing a record zero characters in length with carriage return. In addition, the Carriage Return key (which may be used by the operator at any time) also effects vertical movement of the paper as well as carriage return. Paper is moved vertically as long as the Carriage Return key is held down. All carriage return and line spacing operations produce text of three or six lines per inch, depending on the manual adjustment of the typing mechanism itself.

Console Parameter Entry

Parameter entry may be accomplished in four steps:

1. The operator is notified by the program that a parameter entry is required. A PDT read instruction is issued to the console specifying (in the A address) the data input address for the parameter. As the PDT read instruction is issued, the TYPE indicator on the console is illuminated, and the keyboard bell rings once. (If desired, a programmed typeout of the parameter request, i.e., a PDT write instruction, may precede the PDT read instruction.)

2. The operator keys in the required parameter. Each keystroke causes one character to be printed by the console and the same character to be delivered via the assigned read/write channel to the memory address specified in the PDT read instruction in "1" above. The operator continues striking keys until a record mark is encountered in the data input area of memory. When the record mark is sensed or when the Carriage Return key is pressed, data transfer is terminated (in the case of the Type 220-3 Console, an interrupt signal is sent to the central processor if console interrupts have been allowed by the program), the TYPE indicator is extinguished, and the typing mechanism is disabled so that further keystrokes (except the Carriage Return key) are not effective. (The last character typed is placed in the location containing the record mark.) In addition, programmed carriage return may be either effected or inhibited at this point, depending on the bit configuration of control character C3 of the PDT read instruction in "1" above.

3. The program requests verification of the entry. The program sends a second PDT read instruction to the console requesting verification of the parameter entry. The keyboard bell again rings once and the TYPE indicator is illuminated. (If desired, a programmed typeout of the verification request, i.e., a PDT write instruction, may precede the PDT read instruction.)

4. The operator confirms or cancels the entry. The operator may either confirm or cancel the parameter entry by striking an appropriate key. Any desired character key may be designated by the programmer as the "confirm" or "cancel" key.

It should be noted that steps "3" and "4" above may be eliminated by direct program comparison of the parameter entry with a parameter vocabulary of limited size that is stored in memory.

CONSOLE CONTROLS AND OPERATING PROCEDURES

The operating procedures for the control panel when used in conjunction with the Type 220-1 Console are identical to the procedures outlined in Section II. The following paragraphs apply only to the Type 220-3 Console. The spaces between the graphics in the following illustrations of the typeouts and typeins are inserted automatically by the console logic circuitry.

The controls and indicators for the Type 220-3 Console which are not described in the following text are identical to the descriptions in Section II for the same functions in the central processor control panel.

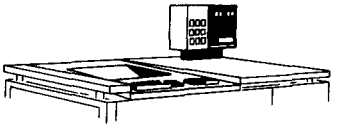
A (Address Insertion) Key

The A key permits insertion of an address into any control memory register. To perform this operation:

1. Strike the A key and two octal keys to specify the control memory register.
2. Strike five octal keys to specify the desired address.

This address is inserted into the memory address register and the designated control memory register. An example follows:

A 16 06143 



After the last keystroke, the carriage returns. Using the address inserted as a reference, the A operation may be followed by manual entries into main memory (see page 8-9) or by manually caused typeouts from main memory (see page 8-12).

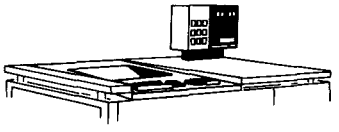
P (Print Control Memory Contents) Key

The P key permits printout of the contents of any control memory register. This operation is performed by:

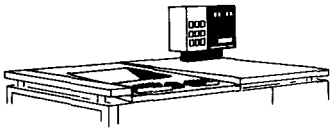
1. Striking the P key and two octal keys to designate the desired control memory register.

The console then types out the contents of the desired control memory register in the form of five octal graphics. An example follows:
The operator performs "1" above;

P 16 



after which the console types out



06143 (Any five octal graphics)

and the carriage returns automatically.

Using the address that is printed out as a starting location, the P operation may be followed by manual entries into main memory (see next paragraph) or by manually caused typeouts from main memory (see page 8-12).

Space Bar and 0-7 Keys

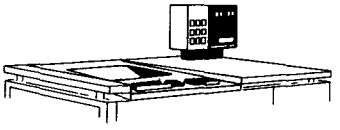
After a carriage return, characters can be written directly into main memory by using the space bar and octal keys 0 through 7. To perform this operation:

1. Strike any three octal keys 0 through 7 for each character desired.

Three keystrokes are required per character, and the console automatically provides a space after the third keystroke. For example, the operator performs "1" above,

314 Δ 16 172

(Up to sixteen characters per line)



and there is an automatic carriage return after the 64th graphic position (16th character) in each line has been typed.

The first keystroke of each character specifies its punctuation bits and can be only one of the following: a space (Δ), 0, 1, 2, or 3 to specify punctuation bits of 00, 00, 01, 10, and 11, respectively, where the word-mark bit is the right bit of the pair, and the item-mark bit is the left bit of the pair. If the carriage is in position to type a punctuation graphic, other keystrokes are not effective.

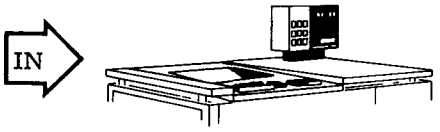
The sequence can be broken at any time by pushing the Carriage Return key. If the Carriage Return key is pressed after the first or second graphic of a character has been typed but before the third graphic has been typed, the partial character is not written into memory.

The main memory locations into which characters are written depend on the previous usage of control memory. Generally, the address cannot be predicted; therefore, writing characters into main memory should be performed only immediately after performing an A or P operation.

(Note, however, that if the space bar or one of the keys 0, 1, 2, or 3 is accidentally struck, no harm results unless two additional octal keys are struck; the accident can be negated by pressing the Carriage Return key.)

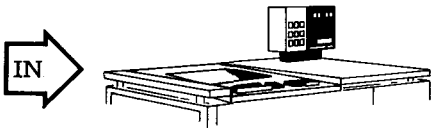
Following an A or P operation, the characters are guaranteed to be written into sequential locations, starting with the address inserted into control memory in the A operation or printed out from control memory in the P operation. As previously noted, there is no console equivalent to the control panel DISPLAY-1 button. In addition, the contents of the control memory register specified in the A or P operation are incremented by as many characters as are written into main memory. For example, the following operations

A 16 06143



(Carriage returns automatically)

117 Δ 62 123 25



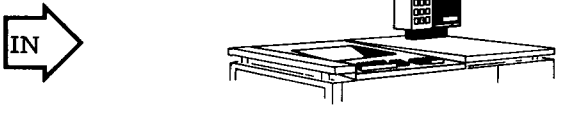
(Carriage Return button pressed after octal 5 key is struck)

leave the contents of the control memory register octal 16 standing at address 06146, since only three complete characters are written into memory. (Note that the partial character represented by 25 above is not written into memory.) A carriage return (manual or automatic) which interrupts a sequence of character entries can be followed safely by a continuation of the sequence provided that a complete character (i.e., depression of three octal keys) is entered. In the example above, if 351 is struck after the carriage is returned, this character is written into control memory address 06146, and the contents of control memory register octal 16 are incremented to 06147.

R (Register Dump) Key

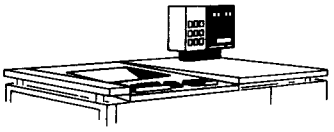
The R key is used to perform a register dump. For example, when R is struck, the

R



console loads the memory address register with the contents of the control memory register designated by the last A or P operation. The console then loads the memory local register with the contents of the main memory location referenced by the memory address register. Finally,

the console types out the contents of both registers and returns the carriage. Thus, no change is made in control or main memory.



L (Logging) Key

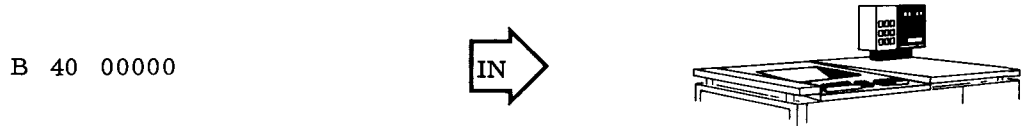
If the TYPE indicator is extinguished and the carriage is returned, the console may be placed in the logging mode (see page 8-5, "Logging Mode") by striking the L key.

B (Bootstrap) Key

To perform a bootstrap operation:

1. Strike the B key.
2. Strike two octal keys to define the peripheral device.
3. Strike five octal keys to define the starting address into which information is to be transferred.

The graphics are printed in the following format:



When the second peripheral unit key is struck, the six bits defining the peripheral device are inserted (with zero punctuation) into the memory local register. When the fifth starting address key is struck, the following operations occur:

1. The specified starting address is inserted into the memory address register, the sequence register, the A-address register, the B-address register, and both the starting and current location counters of read/write channel one.
2. A simulated PDT (read) instruction specifying read/write channel one (with interlock) is generated. The peripheral control is designated by the low-order six bits of the memory local register. If a tape control is designated by the memory local register bits, the tape drive addressed as logical zero is read.
3. The console carriage is returned.
4. The punctuation bits of each memory location loaded during the bootstrap operation are automatically cleared to zeros.
5. A bootstrap operation is not terminated by a record mark in memory; instead, the information flow is terminated by the appropriate peripheral control.

S (Execute One Instruction) Key

Striking the S key is exactly equivalent to pressing the INSTRUCT button on the control panel. After the character S is typed out, the carriage returns and the next instruction is performed. It should be noted that if the instruction performed is a PCB instruction which tests the console for a busy condition, the instruction finds the console "not busy."

If the last A or P operation designated the sequence register, striking the R key after the S key causes the console to type out the address and the op code of the next instruction to be performed. Therefore, the operator can trace program flow by alternately striking the S and the R keys.

SYSTEM CLEAR Button

The SYSTEM CLEAR button is effective only if the STOP button has been pressed and the console is not in the logging mode. The carriage need not be returned, however, to perform a system clear operation. Pressing the SYSTEM CLEAR button results in the following:

1. The console releases its read/write channel, if any is assigned;
2. Central processor operations terminate at the end of the current memory cycle, and the RUN indicator is turned off;
3. The central processor cycle counter is reset;
4. The PARITY indicator is turned off;
5. The carriage is returned; and
6. The PROGRAM indicator is turned off.

Peripheral operations (except typing and magnetic tape operations) are allowed to be completed. If the STOP indicator does not illuminate after the carriage has been returned, a peripheral device must contain a stored instruction.

INITIALIZE Button

The INITIALIZE button is effective only if the STOP button has been pressed and the console is not in the logging mode. The carriage need not be returned to perform an initialize operation. When held down, this button illuminates the lamps in the SENSE, STOP, RUN, TYPE, ADDRESS MODE, PARITY, and INTERRUPT indicators to provide a filament test. Pressing the INITIALIZE button results in the same set of conditions as those described on page 2-6, "INITIALIZE Button," and also returns the carriage.

TYPE Button

The indicator in the TYPE button is not illuminated when the console is in the control mode. It is illuminated only when the program executes a PDT read instruction to the typewriter in the peripheral mode.

In the peripheral mode, if the STOP indicator is illuminated and the carriage is returned, holding down the TYPE button causes a sequence of characters to be typed out from memory. Characters are typed out 16 to a line as long as the button is depressed. If the button is released and then pressed again, the sequence will be continued without an intervening carriage return. If the button is released before a character is completely typed out, the character is completed by the console before the carriage comes to rest. If the TYPE button is released and the Carriage Return key is pressed, pressing the TYPE button anew causes the sequence to be continued at the beginning of the next line.

The starting address of the sequence is the address specified in the A or P operation which should immediately precede the TYPE button depression. The contents of the control memory register designated by the A or P operation are incremented by as many characters as are typed out.

If the TYPE button depression is not immediately preceded by an A or P operation, the locations addressed and the effect on control memory cannot be specified. The TYPE button is physically located so as to avoid accidental depression.

Carriage Return Key

This key is effective at all times except during programmed typeouts. Except while logging, pressing the Carriage Return key does not in itself cause any change in the logical behavior of the console. It does, however, cause the carriage to return to the beginning of the next line. The carriage return condition is a logical prerequisite for the following operations: A, B, L, P, R, and S manual entries, and manually caused typeouts. Pressing the Carriage Return key also cancels a partially keyed-in character when operating in the control mode. In the logging mode, pressing the Carriage Return key terminates the logging operation. The console typing paper continues to be vertically spaced as long as the Carriage Return key is held down.

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USERS' REMARKS FORM

TITLE: SERIES 200
EQUIPMENT OPERATORS' MANUAL
(MODEL 120)
HARDWARE MANUAL

DATED: MARCH, 1966

FILE NO: 113.0006.0000.0-278

ERRORS NOTED:

Fold

SUGGESTIONS FOR IMPROVEMENT:

Fold

FROM: NAME _____ DATE _____

COMPANY _____

TITLE _____

ADDRESS _____

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