Burroughs B 5500 ELECTRONIC INFORMATION PROCESSING SYSTEM DISK SYSTEM OPERATION MANUAL

Equipment and Systems Marketing Division
Sales Technical Services
Systems Documentation

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Burroughs B 5500 Electronic Information Processing System

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INTRODUCTION

The productivity of a computer facility is largely dependent on an operator's experience and knowledge of the hardware. When the programs produced for the installation have been refined, and are ready for use, the results obtained are largely controlled by the operator. Therefore, some concept of the B 5500 system logic, and a thorough knowledge of the hardware are important in order for the operator to utilize the equipment effectively.

In preparing this manual for the B 5500 Information Processing System, it was necessary to make some assumptions which affect its content. A presumption was made that the reader is familiar with the components of the system and has some perception of their functions. Without this presumption, it would be difficult to prepare a manual and still remain within reasonable limitations.

This manual is divided into the following five sections, and provides a complete reference and operating guide, thus enabling personnel to perform their duties efficiently on the B 5500 system.

SYSTEM DESCRIPTION Describes the B 5500 system configuration and its functional capabilities.

SYSTEM EQUIPMENT Depicts the units of peripheral equipment that make up a B 5500 system and the necessary procedures for placing them in operation.

LOADING AND MAINTAINING
THE SYSTEM Presents the procedures for starting the system

and introducing jobs both for initial start-up

and in-process conditions.

CONTROL INFORMATION Describes in detail the various types of cards

which supply control information to the B 5500

system.

UTILITY ROUTINES Presents and explains the routines in the Programming System that are designed to facilitate the job of the programmer and operator.

It should be understood that the information in this manual has been acquired by Sales Technical Services from actual operating experience. Each installation may encounter unique conditions in its operations which may not be covered in this manual. Therefore, the assistance of Burroughs Corporation is provided for any phase of the operation by the District Sales Technical and Field Engineering staffs.

SECTION 1

SYSTEM DESCRIPTION

GENERAL.

1-1. Data processing is the performance of a series of operations on specific data for the purpose of achieving desired results. To perform these operations, a data processing system requires five basic functions: input, control, storage, arithmetic, and output (figure 1-1).

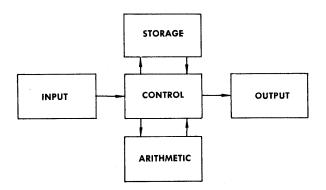


Figure 1-1. Functions of a Data Processing System

- 1-2. The input function transmits data to the system by means of several devices, depending on the desired input media.
- 1-3. The storage section retains the data received from the input device until it is required for operation by other sections of the system.
- 1-4. The arithmetic function handles the actual processing, or manipulation of data. This is the computing unit of the system that accomplishes all mathematical aspects of problem solving.

- 1-5. The output function transfers processed results from storage to the output device(s).
- 1-6. The control function directs the flow of data from input to storage, storage to arithmetic, arithmetic to storage, and from storage to output.

FUNCTIONAL DESCRIPTION.

- 1-7. The Burroughs B 5500 Information Processing System is a progressive departure from the conventional computer system concept, in that it is a language-oriented system rather than a hardware-oriented system.
- 1-8. Because it is language-oriented, the B 5500 system permits the efficient compilation and execution of programs coded as problem statements. In fact, programs which are prepared independently may be processed simultaneously.
- 1-9. The B 5500 is a modular, high performance, solid state system, designed to permit users to use efficiently advanced problem-oriented programing languages. The system consists of truly modular components that provide flexibility in tailoring the system to a wide range of applications.

SYSTEM DESIGN.

1-10. Figure 1-2 illustrates a typical B 5500 system configuration consisting of the following components:

NOTE

Figure 1-2 illustrates an average system; it does not necessarily provide a user's basic requirements.

- B 5280 Processor Module A
- B 5283 Input/Output Channel (2)
- B 5470 Disk File Control Unit (up to 960 million alphanumeric characters)
- B 460 Memory Module (4,096 words, 4 required)
- B 122, B 123 or B 124 Card Reader
- B 320 or B 321 Line Printer
- B 422 or B 423 Magnetic Tape Units (1 required)



Figure 1-2. Typical B 5500 Systems Configuration

1-11. The flexibility of the B 5500 allows it to be expanded at the system site, in any configuration, up to the specified maximum indicated in table 1-1.

DATA COMMUNICATION SYSTEMS.

- 1-12. As mentioned, the B 5500 system may be expanded to handle a wide range of applications. For example, the Burroughs Data Communications Systems can be incorporated with the B 5500.
- 1-13. The data communication system, when integrated with the B 5500 provides the ability to handle a wide range of inquiry traffic requirements.

Table 1-1
B 5500 Configuration Chart

Unit Number	Description	Max.	Ability of One Unit	Notes
в 5280	Processor A	1		
B 5281	Processor B	1		
в 460	Memory Module	8	4096 words 6 us cycle time	B 460 and B 461 modules cannot be mixed on any
в 461	Memory Module	8	4096 words 4 us cycle time	one system.
B 430	Storage Drum	2	32,768 words	
в 5283	Input/Output Channels	4		16 T
B 422	Magnetic Tape Unit	16	24-66кс	16 Tape units maximum B 422 and B 423 units cannot
B 423	Magnetic Tape Unit	16	24KC	be mixed. B 422 and B 424 can be mixed if the B 422
в 424	Magnetic Tape Unit	16	66кс	operates at 120 inches per second.
B 425*	Magnetic Tape Unit	16	18-50-72KC	
В 320	Line Printer	2	475LPM,120chr.	
B 321	Line Printer	2	700LPM,120chr.	
B 325	Line Printer	2	700LPM,132chr.	Two Line Printers Maximum
в 328	Line Printer	2	1040LPM,120chr.	
В 329	Line Printer	2	1040LPM,132chr.	·
B 122	Card Reader	2	200CPM	
B 123	Card Reader	2	475CPM	To Cond Book 1
в 124	Card Reader	2	800СРМ	Two Card Readers Maximum
B 129	Card Reader	2	1400СРМ	

^{*} Requires Feature 872 Extended Magnetic Tape Capability.

Table 1-1 (cont)
B 5500 Configuration Chart

Unit Number	Description	Max.	Ability of One Unit	Notes
В 303	Card Punch	1	100C PM	
В 304	Card Punch	1	300CPM	One Card Punch Maximum
B 141	Paper Tape Reader*	2		TI D T II
B 341	Paper Tape Punch*	2		Three Paper Tape Units Maximum
в 450	Disk File/Data Com- munications Basic Control	2		If system has two B 5470's and one B 5480, then two B 450's are needed.
в 452	Disk File/Data Transmission Basic Control	8	Can hold 2 B 487 DTTU's	Required for B 487 DTTU's.
В 5470	Disk File Control (DFC) Unit	2		
в 5480	Data Communication Control (DCC) Unit	1	Can service up to 15 Terminal Units in any combination	B 487 DTTU's not allowed
в 249	Data Transmission Control Unit	1	Can service up to 15 Terminal Units	All types of Terminal Units
B 451	Disk File Expanded Control	4	Service up to 5 DFE Units	Two per each B 5470
B 471	Disk File Electronics (DFE) Unit	20		10 DFE Units Max. per each B 5 470 DFC Unit
в 475	Disk File Storage (DFS) Module	100	9,600,000 BCL Characters	5 DFS Modules Max. per each B 471 DFE Unit

^{*} Feature 920 is available for code translation.

Table 1-1 (cont)

B 5500 Configuration Chart

Unit Number	Description	Max.	Ability of One Unit	Notes
B 481	Teletype (TTY) Terminal Unit	15	Can service up to 399 teletype units	
в 483	Typewriter (TYP) Terminal Unit	15	Can service up to 8 B 493 TIS stations simul- taneously	15 Terminal Units Maximum
в 484	TWX (TWX) Terminal Unit	15	Can service up to 8 AT&T Data- sets simulta- neously	
в 487	Data Transmission Terminal Unit (DTTU)	15	Can service up to 16 adapters	
980 981 982 983 984 985	TYP/TWX Adapter TTY Adapter Data Speed II Adapter 801 Auto Call Unit U1004 Adapter IBM 1050 Adapter		1-TIS or 1-TWX network 1-TTY network 1-1004 Station 25-1050 Stations	
в 493	Typewriter Inquiry Station (TIS)	120		Only 8 TIS per each B 483 TYP Unit

SECTION 2

SYSTEM EQUIPMENT

GENERAL.

- 2-1. This section describes the operators console and the various peripheral units used in a B 5500 system. Included in this description are the operating characteristics, controls, and indicators. Also, procedures for placing the peripheral units in operation are provided. The following units are discussed:
 - a. B 5310 Operator Console with Smith Corona-Marchant Electric Type-writer (Message Printer).
 - b. B 122, B 123, B 124 and B 129 Card Reader.
 - c. B 303 and B 304 Card Punch.
 - d. B 320, B 321, B 325, B 328 and B 329 Line Printer.
 - e. B 141 Paper Tape Reader.
 - f. B 341 Paper Tape Punch.
 - g. B 421, B 422, B 423, B 424 and B 425 Magnetic Tape Units.

OPERATOR CONSOLE.

2-2. The operator console contains the message printer as well as the switches and indicators necessary for directing normal operation of the central units of the B 5500 system (figure 2-1). The console provides suitable work space for one operator and includes sufficient surface for the use of operating manuals and the preparation of system logs, etc.

2-3. The POWER ON and POWER OFF switches on the console govern the power supply to all central units of the 8 5500. The central units controlled by these switche include the processors, central control unit, memory modules, storage drums, I/O control units, display and distribution unit, the operator console, and message printer and keyboard.

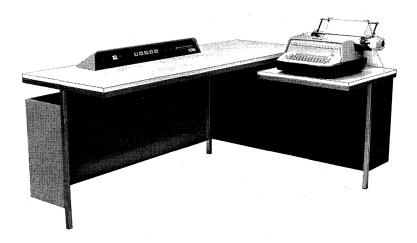


Figure 2-1. Operator Console

CONTROL PANEL.

2-4. The operator console contains switches and indicators (figure 2-2) to control the system. The functions of these switches and indicators are described in table 2-1.

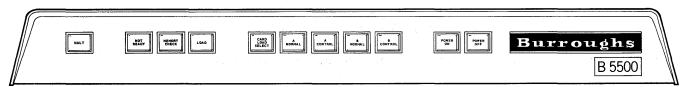


Figure 2-2. Operator Console Control Panel

Table 2-1
Operator Console Switches and Indicators

Switch/Indicator	Function
HALT	This switch, when pressed, halts processors A and B
	after completion of syllables currently in process,
	and then lights. It will remain lit until the LOAD switch
	is pressed and a load operation is initiated.
NOT READY	When this indicator lights, it notifies the operator
	that one or more units that are part of the system,
	and that do not have local Not Ready indicators, have
	become available for normal use by the system. The
	following units are included in this check: core memory
	units, I/O control units, magnetic drum storage units,
	and message printer keyboard. Other input/output units
	are not included. The indicator is not lit by signals
	indicating nonavailability because of current use with
	the system.
MEMORY CHECK	This indicator lights whenever the Control State
	Processor detects a memory parity error when accessing
	core memory.
LOAD	The LOAD switch is pressed to initially load part of
20,10	the Master Control Program into core memory and to
	start Processor 1, processing the program or to read

Table 2-1 (cont)
Operator Console Switches and Indicators

Switch/Indicator	Function
	one binary card and to start Processor 1, depending upon the setting of the CARD LOAD SELECT switch. If Processor 1 is not idle when this switch is pressed, the switch will have no effect.
CARD LOAD SELECT	If Processor 1 is idle and the CARD LOAD SELECT switch
	is in the drum position (indicator not lit), pressing the LOAD switch loads 512 words from band 0 of the drum unit number 1 into core memory starting with cell
	16. Control of Processor 1 is then transferred to the program word in cell 16. If Processor 1 is idle and the CARD LOAD SELECT switch is in the card position
	(indicator lit), one binary card is read into core memory locations 16 through 35. Processor 1 then
	accesses cell 16 and transfers control to this program word. Card Reader 1 is used.
A NORMAL	This indicator lights when Processor A is in the Normal State.
A CONTROL	This indicator lights when Processor A is in the Control State.

Table 2-1 (cont)
Operator Console Switches and Indicators

Switch/Indicator	Function
B NORMAL	This indicator lights when Processor B is in the Normal State.
B CONTROL	This indicator lights when Processor B is in the Control State.
POWER ON	This switch, when pressed, initiates the process of cycling power on. Power is applied to all units of the system except the peripheral units. Both processors are left idle.
POWER OFF	This switch, when pressed, initiates the process of cycling power off.

MESSAGE PRINTER.

2-5. The message printer and keyboard (figure 2-3) provides the necessary communication with the central units and the Master Control Program (MCP). Information regarding the MCP and the user's program (FORTRAN, ALGOL or COBOL) is transferred through the I/O control unit and translated to the message printer character or from the keyboard character.



Figure 2-3. Message Printer

- 2-6. FUNCTIONAL CHARACTERISTICS. The character set on the message printer is similar to the character set used on the B 320 and B 321 Line Printers. One character, the left pointing arrow (+), is excluded from the message printer character set. The code associated with this symbol is used to indicate the end-of-information and must follow the last desired print character. This end-of-information code, or group mark as it is often referred to, causes termination of the print operation on the message printer. This code also initiates an automatic carriage return and line advance. The END-OF-MESSAGE key must be pressed after each keyboard message entry.
- 2-7. The characters are printed horizontally at ten-per-inch. Seventy-two characters are printed per line. Line spacing is selected by the operator and may be either single or double spacing.
- 2-8. The character set on the keyboard is arranged as nearly as possible to standard typewriter format. If an operator error occurs during a keyboard entry, pressing the ERROR key will allow the correction to be made.

2-9. CONTROL PANEL. The message printer and keyboard contains switches and indicators for controlling the operation of the unit (figure 2-4). The function of these controls and indicators are described in table 2-2.



Figure 2-4. Message Printer and Keyboard Controls

Table 2-2
Message Printer Switches and Indicators

Switch/Indicator	Function
INPUT REQUEST	A momentary contact switch that places the message printer in a Ready status to allow typing in a message.
READY	This indicator lights when the B 5500 is ready to accept keyboard input directly from the keyboard.

Table 2-2 (cont)
Message Printer Switches and Indicators

Switch/Indicator	Function
REMOTE	This switch places the keyboard in a remote status, thus
	allowing messages to be typed out under control of the MCP.
POWER	This indicator lights when power is applied to the unit.
	Power is turned on and off by the POWER ON and POWER OFF
	switches located on the operator console.
ERROR	This switch, when pressed, sets a bit in the result des-
	criptor flagging the MCP that an error occurred during
	the typing of the message.
LOCAL	This switch unlocks the keyboard for normal typing. No
	communication can occur with the I/O control unit.
END OF MESSAGE	This switch, when pressed, terminates the input message,
	thus causing a group mark to be transferred as the last
	character of the message.
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B 122 CARD READER.

2-10. The B 122 Card Reader (figure 2-5) is capable of reading 80-column punched cards at a speed of 200 cards-per-minute. The B 122 is controlled by the Input/Output control unit, and transfers one 80-column card into memory in a total time of 300 milliseconds (ms).



Figure 2-5. B 122 Card Reader

FUNCTIONAL CHARACTERISTICS.

2-11. The information punched in an 80-column card is read parallel by bit and serially by card column. The columns are transferred into an I/O channel until one word of eight characters (alpha mode) or forty-eight bits (binary mode) is accumulated. When a complete word is accumulated, it is transferred from the I/O channel into core memory. This process is repeated until all columns of a card have been read. Upon completion of a card read, the I/O channel is released to perform the next input/output operation as designated by the Master Control Program (MCP) priority assignment.

- 2-12. When reading in alpha mode, the B 122 performs a validity check for each character punched in the card. If an error is detected, the VALIDITY CHECK indicator will light, a signal is transferred to the B 5500, the error condition is interrogated by the Master Control Program, and appropriate action is taken by the system. The VALIDITY CHECK indicator is automatically cleared prior to execution of a Card Read command. The format of information is controlled by the card layout and the FORTRAN, ALGOL or COBOL program.
- 2-13. The card hopper has a capacity of 450 cards, and cards may be placed into the hopper while the unit is operating as long as approximately 150 cards are still in the hopper. During loading, the cards in the hopper remain in proper position for continuous feeding without manual assistance from the operator. The card stacker also holds a capacity of 450 cards and the cards are stacked in the stacker in the same sequence as they are fed. Cards should not be removed from the stacker while the unit is operating.
- 2-14. The stacker contains an actuator arm that rises as the cards enter the stacker. When the stacker is at capacity, the arm will be raised sufficiently to close a switch that will stop the reader. The cards should be removed at this time.

CONTROL PANEL.

2-15. The B 122 Card Reader control panel (figure 2-6) contains the switches and indicators for operation of the unit and to indicate error conditions. The function of each of these elements is provided in table 2-3.

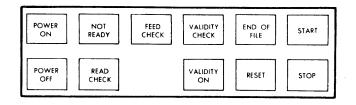


Figure 2-6. B 122 Card Reader Control Panel

Table 2-3

B 122 Card Reader Control Panel
Switches and Indicators

Switch/Indicator	Function
POWER ON	This switch applies power to the B 122 and lights when pressed.
NOT READY	This indicator lights when any of the following conditions exist: card jam, stacker full, cover not in place, empty hopper, STOP switch pressed, read error, or VALIDITY CHECK indicator lit. The condition causing the NOT READY indicator to light must be corrected before processing can be resumed.
FEED CHECK	This indicator lights when a card jam or a failure to feed or stack a card properly occurs.
VALIDITY CHECK	This indicator lights when an invalid character is read by the B 122. The VALIDITY CHECK indicator and its associated circuitry are always operative on a B 5500 system.

Table 2-3 (cont)

B 122 Card Reader Control Panel Switches and Indicators

Switch/Indicator	Function
END OF FILE	This switch is not used on a B 5500 system.
START	This switch serves two purposes. First, it is used to
	condition the B 122 (turn the NOT READY indicator off)
	for feeding cards under program control. Second, it
	is used to restart the B 122 after an empty hopper has
	been reloaded.
STOP	This switch is used to stop the B 122 from feeding cards.
	When this switch is pressed, the program will halt upon
	encountering the next Card Read command until the START
	switch is again pressed.
RESET	This switch clears all error indicators on the B 122.
	However, the NOT READY indicator is not turned off by
	pressing this switch.
VALIDITY ON	This switch-indicator provides a means of performing a
	validity check. Validity checking is always done on a
	B 5500 system.
READ CHECK	This indicator lights when the read check circuitry
	detects an operational failure. The B 122 is placed
	in a Not Ready state and the program will halt to
	allow the card to be read again or skipped.

Table 2-3 (cont)

B 122 Card Reader Control Panel Switches and Indicators

Switch/Indicator	Function
POWER OFF	This switch removes power from the B 122.

OPERATING PROCEDURES.

- 2-16. To place the B 122 Card Reader in operation for reading punched cards, perform the following procedures:
 - a. Press the POWER ON switch.
 - b. Remove all cards from both the hopper and the stacker.
 - c. Joggle the cards so that all four edges are smooth.
 - d. Place the joggled cards in the hopper face down, 12 edge toward the operator with column one of the cards on the left.
 - e. Press the RESET switch, then the START switch. This will ready the card reader so that it may begin reading cards when a request is received from the B 5500 system.
 - f. As the file is read, cards may be added to the hopper without stopping the B 122 providing at least 150 cards remain in the hopper. The hopper can hold at least 450 cards.

2-17. To unload the cards from the B 122 stacker, press the STOP switch, remove the cards, and press the START switch. The exception to this occurs when the stacker is full or End-of-File has been reached and no cards remain in the hopper.

NOT READY CONDITIONS.

2-18. A not-ready condition can occur for several reasons. The # CR* NOT READY system message on the message printer may indicate that the unit's power has not been turned on. In addition to this possibility, the conditions which will cause a # CR* NOT READY system message and will also cause the NOT READY indicator on the unit to be lit are:

- a. Card jammed.
- b. Stacker full.
- c. Cover not in place.
- d. Hopper empty.
- e. STOP switch pressed.
- f. FEED CHECK indicator on (see paragraph 2-20).
- q. READ CHECK indicator on (see paragraph 2-19).
- h. START switch not pressed.

All not-ready conditions on the unit must be corrected and the RESET switch, then the START switch must be pressed before the B 5500 can perform another command using the B 122.

- 2-19. A read-check condition is handled in conjunction with the # CR* READ CHECK message for operator intervention. The READ CHECK indicator is lit and the operator must perform the following:
 - a. Remove all cards from the B 122 hopper.

- b. Remove the top card in the stacker and make a visual check of the card.

 If the card does not appear to be in satisfactory condition, a new

 one should be created.
- c. Place the card which was removed from the stacker, or its replacement, in front of the cards which were removed from the hopper.
- d. Place all of these cards that were removed from the hopper, with the card which was removed from the stacker, in the hopper.
- e. Press the RESET switch to clear the READ CHECK indicator.
- f. Press the START switch.
- g. If the read-check condition persists, refer to the operator's instructions for the specific program which is affected and/or call the field engineer.
- 2-20. A feed-check error can be present when a # CR* NOT READY message is printed due to a card jam or failure to feed. If this condition prevails, the NOT READY and FEED CHECK indicators are lit and the operator must perform the instructions in the paragraphs that follow.
- 2-21. CARD JAM. If a card jam should occur in the B 122 Card Reader because of cards having a damaged leading edge or sides, the jam is most likely to occur as a card enters the read station. To clear the jam, perform the following procedures:
 - a. Remove the cover of the card reader control panel. This will shut down the power supply.

b. Remove the read head by squeezing the two prongs and lifting the head (see figures 2-7 and 2-8).

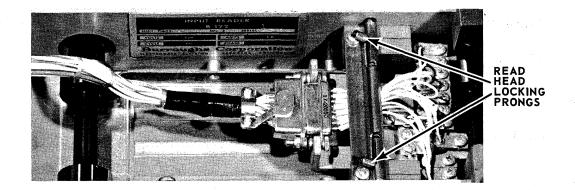


Figure 2-7. B 122 Card Reader Read Mechanism

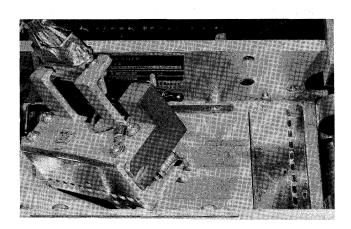


Figure 2-8. B 122 Card Reader Read Head Removed

- c. Remove the jammed card(s).
- d. Replace the read head, making certain that the prongs are released so that the head locks in place.
- e. Replace the control panel cover. Power will turn on automatically.

- f. Duplicate the damaged card(s) on a key punch.
- g. Remove the cards from the hopper and place the duplicated cards in front of them.
- h. Place the data cards in the hopper.
- i. Press RESET, then START on the card reader to continue reading.
- 2-22. There is a remote possibility that a card may jam after passing the read head, just before going into the stacker. If this should occur, raise the control panel cover, remove the jammed card, and replace the cover. The read head does not have to be touched for this type of jam. A card that is jammed at this point would have been read into the buffer; therefore, the card must not be replaced in the hopper to be re-read.
- 2-23. STACKER FULL. If the NOT READY indicator lights because of a full stacker, remove the cards from the stacker. Press RESET, then START on the card reader to continue reading.
- 2-24. COVER NOT IN PLACE. To correct this situation, reset the cover until it snaps in place. Press RESET, then START on the card reader.
- 2-25. EMPTY HOPPER. If the NOT READY indicator lights because of an empty hopper, reload the hopper and press RESET, then START on the card reader.
- 2-26. STOP SWITCH PRESSED. If the STOP switch is pressed to stop the card reader, the NOT READY indicator will light. To restart the card reader, press RESET, then START.

- 2-27. FEED CHECK INDICATOR LIT. The NOT READY indicator will light when a card fails to feed and the FEED CHECK indicator is lit. To correct this situation, remove the cards from the hopper and examine the bottom card. If the card is damaged, duplicate the card on a key punch. Place the duplicated card, along with the other unread cards back into the hopper and press RESET, then START to resume operation.
- 2-28. READ CHECK INDICATOR LIT. The NOT READY indicator will light if a read check condition occurs and the READ CHECK indicator is lit. To correct this situation, remove the last card from the stacker and place it back in the hopper, in front of all cards still in the hopper. Press RESET, then START on the card reader and operation will resume.
- 2-29. VALIDITY CHECK INDICATOR LIT. The NOT READY indicator will light if the VALIDITY CHECK indicator lights because of an invalid character. If this occurs, and the card is not a control card, the system will cause a # CR* INV CHR IN COL M message to be typed out. To correct this situation, remove the last card from the stacker and check it to determine if the punching is correct. If it is, place the card back in the hopper, in front of all cards still in the hopper. Press the RESET switch then the START switch and the card will be read again. If there are errors in the card that is checked, replace it with a corrected card and proceed as described above.

OPERATOR MAINTENANCE.

- 2-30. Among other operational duties, the operator is responsible for:
 - a. Inspecting cards for acceptable condition before loading the hopper and after removal from the stacker.
 - b. Loading and unloading cards in an acceptable manner.

- c. Removing occasional card jams (the operator should clear a jam within two minutes).
- d. Assuring that cards have been stored in a manner consistent with specifications.
- e. Making up missing or damaged cards.
- f. Keeping records of all card reader failures.
- g. Checking cards against a standard commercial gauge for punch registration when errors occur with a card.
- h. Analyzing all stoppages to a point where side panels must be removed.
- i. Removing foreign material from the card path once every eight-hour shift.
- j. The following should be cleaned by the operator every eight hour shift:
 - 1) Remove the exciter lamp assembly and clean the solar cell apertures, the feed bed, and the hopper area with a soft bristle brush (camel hair or similar).
 - 2) Freon is the only cleaning agent that should be used on the solar cell assembly. It should be applied with a soft cloth or came! hair brush. Alcohol or other cleaning agents may cause damage to the potting in the assembly.
- k. Notifying the field engineer of improper operation.

B 123/B 124/B 129 CARD READERS.

2-31. The B 123, B 124, and B 129 Card Readers are physically identical and differ only in their operating speeds. That is, the B 123 is designed to operate at speeds up to 475 cards-per-minute. The B 124 operates at 800 cards-per-minute, while the B 129 operates at a speed of 1400 cards-per-minute. Since the difference between the three card readers is only one of operating speed, only the B 124 will be described in detail in this manual.

B 124 CARD READER.

2-32. The B 124 Card Reader (figure 2-9) has the capacity of reading 80-column punched cards at a rate of 800 cards-per-minute. Fifty-one, sixty, and sixty-six column cards may also be read. The B 124 is controlled by the B 5500 system I/O control unit and transfers one 80-column card into memory every 75 milliseconds.



Figure 2-9. B 124 Card Reader

2-33. The punched cards used on the B 124 Card Reader must be 3.25 inches wide and between 0.007 and 0.009 inch thick. Any file of cards read on the B 124 must be consistent in thickness and length. For example, all cards in a particular file must be 80 columns (7.375 inches), or 66 columns (6.157 inches), or 60 columns (5.635 inches), or 51 columns (4.852 inches) in length. Cards of variable lengths or thicknesses must not be intermingled in a file that will be processed on the B 124.

FUNCTIONAL CHARACTERISTICS.

- 2-34. The information punched in the card is read by the B 124 serially column-by-column. The information is moved a column at a time until eight characters or 48 binary bits are accumulated; the information is then transferred from the I/O control unit into core memory.
- 2-35. The accumulation process by the I/0 control unit is repeated until all columns have been read and transferred to core memory. When a card has been read, the I/0 control unit is free to execute the next assigned input/output function.
- 2-36. During a read operation, a validity check is performed as each character is read. The VALIDITY CHECK indicator lights on the control panel of the B 124 and a signal is transferred to the B 5500 system when this is detected. The condition is sensed by the Master Control Program and if the card is not a control card, the #CR* INV CHR IN COL n message is typed out. After the card is corrected, the card will be re-read and processing resumed. All formatting of information is controlled by the card layout and the ALGOL, FORTRAN or COBOL program.

2-37. The card hopper has a capacity of 3600 cards and can be loaded by the operator while the unit is operating. The operator does not have to hold those cards already in the hopper in position when loading additional cards. Cards are conveyed from the hopper to the card stacker by means of a card transport mechanism. Failure to feed a card will cause a missing card condition. The B 124 will be placed in a Not Ready state and the #CR* NOT READY message will be typed out. A card jam will not cause mechanical damage. The unit will stop when no more than two cards are jammed (perhaps three in the B 129). The cards are stacked in the card stacker in the same sequence and manner in which they were fed. The stacker will hold a maximum of 3000 cards. Cards may be removed from the stacker during operation without holding the remaining cards in position.

CONTROL PANEL.

2-38. The B 124 Card Reader contains a control panel (figure 2-10) for operating the unit and to indicate error conditions. The function of each switch and indicator on the control panel is provided in table 2-4.

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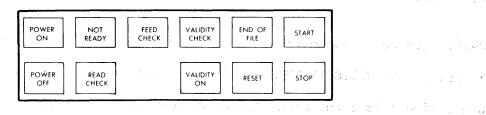


Figure 2-10. B 124 Card Reader Control Panel Control Panel

Table 2-4

B 124 Card Reader Control Panel
Switches and Indicators

Switch/Indicator	Function Advantage of the second seco
POWER ON	This is a switch-indicator that applies power to the
	B 124, lighting when pressed.
NOT READY	This indicator lights when any one of the following
	conditions exists: card jam, stacker full, cover not
	in place, empty hopper, STOP switch pressed, START
	switch not pressed, read error, VALIDITY CHECK indi-
	cator lit, or FEED CHECK indicator lit. The condition
	causing the NOT READY indicator to light must be
	corrected before processing can be resumed.
FEED CHECK	This indicator lights as a result of a card jam or a
	failure to feed or stack a card properly.
VALIDITY CHECK	This indicator lights when an invalid character is
	read by the B 124. The VALIDITY CHECK indicator and
	its associated circuitry are always operative on a
	B 5500 system.
START	This switch serves two purposes. First, it is used to
	condition the B 124 card reader (turn the NOT READY
	indicator off) for feeding cards under program control.
	Second, it is used to restart the B 124 after an
	empty hopper has been reloaded.

Table 2-4 (cont)

B 124 Card Reader Control Panel Switches and Indicators

Switch/Indicator	Function
STOP	This switch stops the B 124 from feeding cards. When
	the switch is pressed, the #CR* NOT READY message is
	printed out.
RESET	This switch clears all error indicators on the B 124.
	However, the NOT READY indicator is not turned off
	by pressing this switch.
VALIDITY ON	This switch-indicator provides the means of performing
	a validity check. Validity checking is always per-
	formed on a B 5500 system.
READ CHECK	This indicator lights when the read check circuitry
	detects an operational failure. The B 124 is placed in a Not Ready state and the #CR* READ CHECK message
	is printed out.
POWER OFF	This switch removes power from the B 124.

OPERATING PROCEDURES.

2-39. Before cards can be processed by the B 124 Card Reader, it is necessary to prepare the feeder hopper and the stacker to handle the size card desired.

The width of the hopper and the stacker is adjustable to accommodate either 51-, 60-, 66-, or 80-column cards. This adjustment is performed by altering the position of the front wall of each area. In addition, it is also necessary to adjust the position of the stacker tire and bumper assembly and the stacker follow block. For example, if 80-column cards are to be processed, the operator would perform the following procedure:

- a. Press the stacker follow block latch release and move the block up or down to the line marked 80.
- b. Press the release button on the stacker tire and bumper assembly and position it to 80 on the card size marker provided on the end plate of the assembly (see figure 2-11).

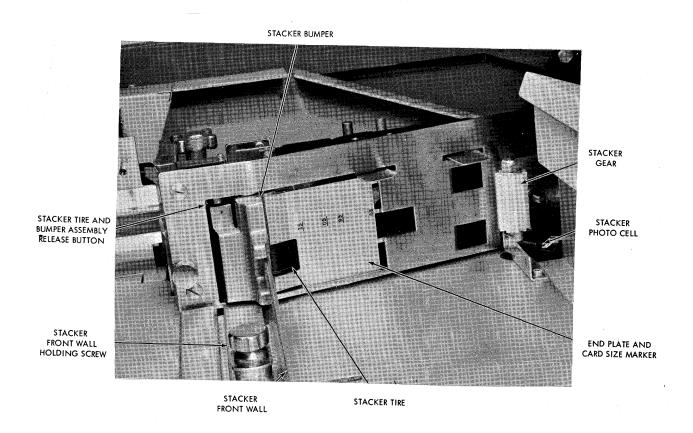


Figure 2-11. Stacker End Plate Assembly

- c. Loosen the two holding screws on the stacker front wall.
- d. Press down on the two screws simultaneously and move the wall to the 80 position indicated by the card size marker in the floor of the stacker (see figure 2-12).

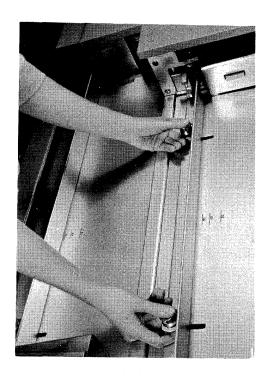


Figure 2-12. Adjusting Stacker Front Wall

- e. Release the two holding screws and tighten them.
- f. Steps c and d can be followed when adjusting the feeder hopper front wall.

2-40. The B 129 has a slightly different construction in the stacker bumper area. This bumper assembly can be moved by pulling up on the assembly and disengaging it from the stacker guide assembly. The key-hole type slots in the guide will match 66-, 60-, and 51-column card respectively. Insert the shoulder screws through the appropriate holes and press the assembly to the left and downward.

- 2-41. If 51-, 60-, or 66-column cards are to read, the removable stacker gear should be removed from the stacker. This is accomplished by pressing down on the gear, turning it counterclockwise, and then pulling up. To replace the gear, insert it in the hole, press down, and then turn it clockwise.
- 2-42. When the above procedures have been completed, the card reader is ready for loading and reading of punched cards. At the start of an operation, the feeder hopper flag will be at the extreme left of the hopper. To load and read punched cards, proceed as follows:
 - a. If the entire system is off, press the operator console POWER ON switch.

 This will apply power to the system. If only the card reader is off,

 press the card reader POWER ON switch.
 - b. Grasp the follow block, pulling it to the right and up and out of the hopper.
 - c. With the left hand, place the deck of punched cards in the hopper,
 Column 1 at the top, holding them loosely to allow the vibrating base to joggle them so that all four corners are even.
 - d. Hold the cards against the feeder belt with the left hand and lower the follow block into the hopper, allowing it to move to the left and press against the card deck (figure 2-13).

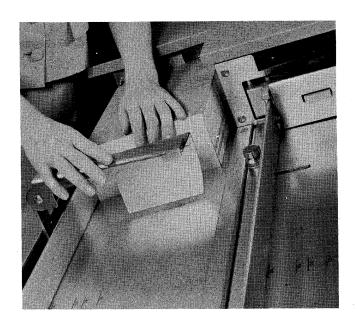


Figure 2-13. Loading Cards

NOTE

When inserting the follow block into the hopper, always maintain a grip on it until it is flush against the card deck.

- e. Press RESET, then START on the card reader. This will ready the card reader so that it may read cards when a command is received from the B 5500 system.
- 2-43. To load additional cards into the hopper while the unit is operating, proceed as follows:
 - a. Place the punched cards in the hopper (column 1 at the top), holding them loosely to allow the vibrating base plate to joggle them so that all four corners are even.

- b. Slide the cards to the left until they are against the back of the hopper follow block. Hold the cards in this position with the left hand.
- c. With the right hand, raise the follow block up and out of the hopper and move it to the right until it is past the last card in the deck.
- d. Lower the follow block back into the hopper and allow it to move to the left until it is pressed against the card deck.

NOTE

When loading additional card decks into the hopper, always maintain a slight amount of pressure on the cards, especially when removing the follow block from between both groups of cards. Otherwise, misfeeding may occur.

- 2-44. Improper feeding of cards can result from improper adjustment of the separator block. To correct this condition, proceed as follows:
 - a. Press POWER OFF switch.
 - b. Raise the cover of the transport system.
 - c. Remove any cards that are in the feeder hopper.
 - d. Loosen the knurled thumb screw.
 - e. Place a card between the feeder belt and the separator block.

- f. Adjust the knurled adjustment knob at the right side of the assembly until the card fits snugly between the feeder belt and the separator block. (This is a judgement adjustment by the operator and will become quite easy with experience.)
- g. Tighten the knurled thumb screw.
- h. Close the cover of the transport system.
- i. Press the POWER ON switch.
- 2-45. When the last card has been read from the feeder hopper and more cards are to be processed, #CR* NOT READY message will be printed out. Insert the cards into the hopper as outlined in paragraph 2-40. Pressing the START switch will resume operation.
- 2-46. The cards that have been read can be removed from the stacker at any time the operator so wishes. To remove cards while the unit is operating, proceed as follows:
 - a. Grasp the stacker follow block with the right hand.
 - b. With the left hand, grasp a group of cards.
 - c. Raise the cards out of the hopper, while at the same time, maintain a slight amount of pressure against the remaining cards in the stacker with the cards being removed.
 - d. Move the follow block to the left so that it will press against the cards in the stacker as soon as the cards being removed have cleared the stacker.

2-47. Cards can also be removed by pressing the STOP switch, removing the cards in the manner described above, and pressing the START switch.

NOT READY CONDITIONS.

2-48. As stated previously, there are several conditions that may cause a Not Ready condition. Each of these conditions, and the manner of correcting them, is discussed in the paragraphs to follow. The #CR* NOT READY system message on the message printer may indicate that the power has not been turned on. In addition to this possibility, the conditions which will cause a #CR* NOT READY system message and will also cause the NOT READY indicator on the unit to light are:

- a. Card jammed.
- b. Stacker full.
- c. Cover not in place.
- d. Hopper empty.
- e. STOP switch pressed.
- f. READ CHECK indicator on.
- FEED CHECK indicator on.
- START switch not pressed.
- 2-49. All Not Ready conditions must be corrected and the START switch must be pressed before another command can be executed.
- 2-50. READ CHECK CONDITION. A read check condition is handled in conjunction with the #CR* READ CHECK system message. When the READ CHECK indicator is lit, and the operator must perform the following:

- card. If the card does not appear to be in satisfactory condition, a new card should be created.
- b. Place the card which was removed from the stacker, or its replacement, in front of the cards in the hopper.
- c. Press the RESET switch to clear the READ CHECK indicator.
- d. Press the START switch.
- for the specific program which is affected and discontinue the program or call the field engineer.
- 2-51. A feed check error can be present when a #CR* NOT READY system message is printed. A feed check condition results from such things as a card jam or failure to feed. If this condition prevails, the NOT READY and FEED CHECK indicators will be lit and the operator must perform the instructions in the paragraphs that follow.
- 2-52. CARD JAM. There is a possibility that a card jam will occur in the B 124 Card Reader due to cards having a damaged leading edge or sides. If such a card, or cards, happen to be in the hopper, the jam is most likely to occur as the card enters the read station. The procedure for correcting the jammed condition is as follows:
 - a. Press the POWER OFF switch.
 - b. Move all cards in the hopper away from the feed mechanism.

- c. Raise the cover that encloses the read mechanism.
- d. If the card is jammed at the entrance to the read station, it can be removed by manually backing up the feeder belt. If the card is jammed somewhere other than the entrance to the read station, refer to paragraph 2-54.
- e. After the card has been removed, create a new card on a key punch.
- f. Place the new card as the first card in the hopper and press the RESET and START buttons to resume card reader operation.
- 2-53. It is quite possible that a jam will occur in the guide plate area of the transport system. If such a jam occurs, proceed as follows:
 - a. Move the transport pressure rollers away from the guide plates by compressing the two knobs at the rear of the rollers.
 - b. Grasp the exposed edge of the card and pull it out of the guide plates.
 - c. If the card is jammed to such an extent that it tears when pulled and part of it remains jammed in the guide plates, a field engineer must be notified.
- 2-54. In the B 129, a quick release transport level is provided to permit easy access to the guide plate area (see figure 2-14). Access is gained by pulling forward on the handle. This will move the mechanism to the left, permitting the removal of most jams in this area without the use of any tools.

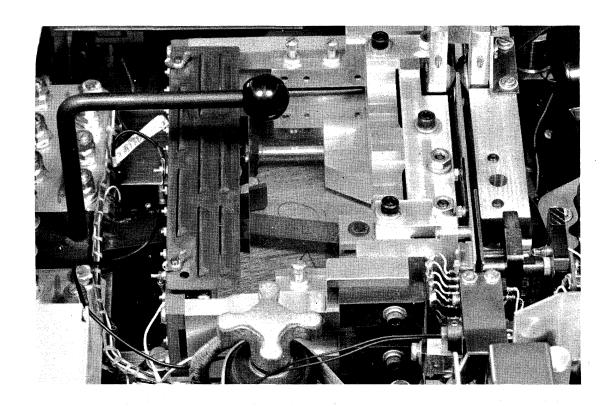


Figure 2-14. B 129 Card Reader Guide Plate Area

2-55. Card jams or card shuffling may occur at the entrance to the stacker. This is especially true when cards are being removed from the stacker while the unit is operating and the follow block is allowed to bang against the remaining cards in the stacker. If this occurs, the card entering the stacker will not be moved away from the entrance in time to permit the card following to enter the stacker properly. This card will run into the previous card and either get crumpled or pushed in front of the previous card. Therefore, the operator should be very careful when removing cards so that this condition does not occur.

2-56. STACKER FULL. If the NOT READY indicator lights because of a full stacker, remove the cards from the stacker. Press RESET, then START to resume card reading.

- 2-57. COVER NOT IN PLACE. If the transport mechanism cover is raised for any reason, the NOT READY indicator will light. To clear this condition, lower the cover and press RESET, then START on the card reader.
- 2-58. EMPTY HOPPER. If the NOT READY indicator lights because of an empty hopper, more cards may be placed in the hopper. Press RESET, then START on the card reader and reading will resume.
- 2-59. STOP SWITCH PRESSED. If the STOP switch was pressed to stop the card reader, the NOT READY indicator will light. To restart the reader, press RESET, then START.
- 2-60. READ CHECK INDICATOR LIT. The NOT READY indicator will light and the #CR* READ CHECK message will be printed out if a read check condition occurs. To correct this situation, remove the last card in the stacker and place it back in the hopper, in front of any cards still in the hopper. Press RESET, then START on the card reader to resume operation. If the condition persists, check the cards for misregistration. If the cards check, call the field engineer.
- 2-61. FEED CHECK INDICATOR LIT. The NOT READY indicator will light if a feed check condition occurs. If this condition arises, proceed as follows:
 - a. Press the POWER OFF switch.
 - b. Move all cards in the hopper away from the feed mechanism.
 - c. Raise the cover that encloses the read mechanism.
 - d. Inspect the feed edges of the cards to determine if any are damaged.

 If any cards are damaged, recreate them on a key punch.

- e. Check the separator block for proper adjustment.
- f. Inspect the read mechanism for damaged or mutilated cards and remove them if there are any.
- g. Inspect the cards removed from the read station to determine if they can be used or if replacements must be created.
- h. Place the cards that were removed from the read station (or any recreated cards) in front of the cards which were moved away from the feed mechanism in step.
- i. Move the cards in the hopper to the left until they are against the feed mechanism.
- j. Lower the cover.
- k. Press the POWER ON switch.
- 1. Press the RESET switch to clear the FEED CHECK indicator.
- m. Press the START switch to resume operation.
- n. If the feed check condition persists, call the field engineer.
- 2-62. It is quite possible to receive both a read check and feed check error indicator at the same time. This could occur for different reasons. If the card did not feed at the prescribed time, but did feed nevertheless, the card would be read improperly, giving a read check indication, as well as a feed check indication. The same condition could exist if the card was fed at the right time, but did not travel to the read station at the proper speed. It is

also possible for two cards to be fed at one time (piggyback). This condition would cause a feed check and a read check since the double document would appear as a card containing 80 columns to the read circuitry.

2-63. During operation of the system, it is impossible to tell which condition caused the feed and reach checks. To determine the cause, the operator will have to remove the last card from the stacker and place it in the hopper.

Pressing RESET and START will resume operation.

2-64. VALIDITY CHECK INDICATOR LIT. The NOT READY indicator will light if the VALIDITY CHECK indicator lights because of an invalid character. If this occurs, the system will print out the #CR* INV CHR IN COL n message. To correct this situation, remove the last card from the stacker and check it to determine if the punching is correct. If it is, place the card back in the hopper, in front of any cards still in the hopper. Press the RESET switch, then the START switch on the card reader to resume operation. If there are punch errors in the card that is checked, replace it with a corrected card and proceed as described above.

OPERATOR MAINTENANCE.

- 2-65. Among other operational duties, the operator is responsible for the following:
 - a. Inspecting cards for acceptable conditions before loading the hopper and after removal from the stacker.
 - b. Loading and unloading cards acceptably.
 - c. Removing occasional card jams (the operator should clear a jam in about two minutes).

- d. Assuring that cards have been stored in a manner consistent with specifications.
- e. Making up missing or damaged cards.
- f. Vacuum cleaning the entire transport area daily.
- g. Dusting off the vertical lamps and solar cells in the transport track.
- h. Dusting off the horizontal plexiglass.
- i. Keeping records of failures.
- j. Checking cards against a standard commerical gauge for punch registration when reading errors occur with a card.
- k. Analyzing all stoppages to a point where side panels must be removed.
- 1. Notifying the field engineer of improper operation.

B 303 CARD PUNCH.

2-66. The B 303 Card Punch (figure 2-15) is designed to punch 80-column cards at a rate of 100 cards per minute. The B 303 is controlled by the I/O control unit. The B 303 punches one 80-column card every 600 ms.



Figure 2-15. B 303 Card Punch

FUNCTIONAL CHARACTERISTICS.

2-67. Information to be punched in a card is transferred from B 5500 memory, through the I/O channel, then to the B 303 Card Punch. The B 303 punches one horizontal row of eighty columns simultaneously in a standard (0.007 inch) punch card. Sixty columns may be punched in one row of postcard thickness (0.009 inch) stock. Each card contains twelve rows. A punch-error condition is detected at the post-punch read station if the modulo-8 count does not agree with the original information received from the B 5500 system.

2-68. When a punch error is detected, a signal is sent to the B 5500 system for appropriate interrogation. In addition, the PUNCH CHECK indicator is lit and must be manually reset prior to punching another card. Punch checking on the B 303 Card Punch is a hole count check. Binary cards may not be punched on the B 303.

- 2-69. The I/O control unit is released for other component operations when the last row of information has been transferred to the 80-bit row buffer on the B 303 Card Punch. Rows of bits are punched from the twelve row through the nine row, thus cards are placed in the hopper twelve-edge forward and face down.
- 2-70. The stacker holds 800 cards and can be unloaded while the unit is punching. The B 303 is capable of idling with cards in the feed mechanism. Card movement is controlled by I/O control unit signals, and card registration is not adversely affected. The format of information that is punched on the B 303 Card Punch is controlled by the ALGOL, FORTRAN or COBOL program.

CONTROL PANEL.

2-71. The B 303 Card Punch control panel (figure 2-16) contains switches and indicators for operation of the unit and indication of error conditions. The function of each of these elements is provided in table 2-5.

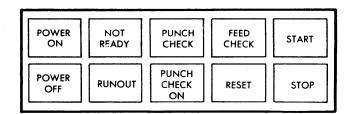


Figure 2-16. B 303 Card Punch Control Panel

Table 2-5

B 303 Card Punch Control Panel Switches and Indicators

Switch/Indicator	Function
POWER ON	This switch/indicator applies power to the B 303 when pressed. The indicator lights when power is on.
NOT READY	This indicator lights when any one of the following conditions exists: FEED CHECK indicator on, STOP switch is pressed, empty hopper, card not at ready station,
	improperly registered card, punch die not in place, card line mechanism not locked, chip box not in place, full stacker and punching error. The condition causing the Not Ready state must be corrected and the START
PUNCH CHECK	switch pressed before operation can resume. This indicator lights if fewer than 80 data bits are received for each row, or if more or fewer than 12 row cycles are counted (punch station check). It will
	also light if the number of punched holes does not agree with the number of holes which were supposed to be punched (modulo-8).
FEED CHECK	This indicator lights when either a failure to feed or a jammed condition exists.

Table 2-5 (cont)

B 303 Card Punch Control Panel Switches and Indicators

Switch/Indicator	Function
START	Pressing this switch causes one card to move from the hopper to the ready station, provided that all Not
	Ready conditions have been corrected.
STOP	This switch stops card feeding, lights the NOT READY
	indicator, and sets the B 303 in a Not Ready state.
	When pressed, cards that are in motion will be pro-
	cessed completely through the duration of the cycle.
RESET	This switch clears the Feed Check and Punch Check conditions.
PUNCH CHECK ON	This switch/indicator selects between full punch
	checking and partial punch checking. This switch
	includes a mechanical toggle which reverses its
	choice each time it is pressed. When the switch is
	pressed and the indicator lights, a check is made
	of both punch station error conditions and post-punch
	read station error conditions. When the indicator is
	not lit, a check is only made on punch station error
	conditions. This feature allows the use of pre-punched
	and certain prescribed cards.

Table 2-5 (cont)

B 303 Card Punch Control Panel Switches and Indicators

Switch/Indicator	Function
RUNOUT	As long as this switch is pressed, cards will pass
	through the unit without being punched. The switch
	is only effective when the unit is in a Not Ready state.
	Error conditions, if any, are not cleared.
POWER OFF	This switch removes power from the B 303.

OPERATING PROCEDURES.

- 2-72. The procedures for punching cards with the B 303 Card Punch is as follows:
 - a. Press the POWER ON switch.
 - b. Fan the blank cards so that the cards do not stick together and cause misfeedings.
 - c. Press the STOP switch, then the RUNOUT switch to clear any cards that may have remained in the punch.
 - d. Load the blank cards into the hopper, face down, 12 edge toward the card slot (figure 2-17).
 - e. Place the card weight on top of the blank cards.

- f. Press RESET, then START on the card punch. This will move a card into the ready station for punching.
- g. If it is desirable to stop the punch unit while a run is in process, press the STOP switch.



Figure 2-17. Loading Blank Cards

UNLOADING CARDS.

2-73. Cards can be removed from the stacker (see figure 2-18) while the unit is operating, or by pressing the STOP switch, removing the cards, and pressing the START switch to continue operation.

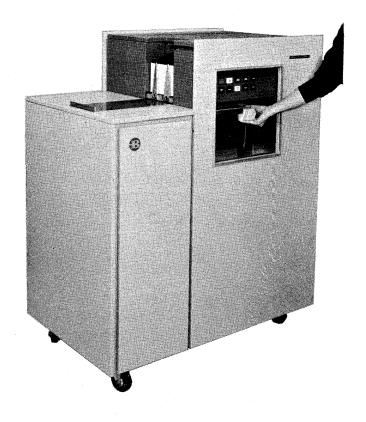


Figure 2-18. Unloading Punched Cards

NOT READY CONDITIONS.

- 2-74. As stated previously, there are several conditions that may cause the NOT READY indicator to light. In the paragraphs that follow, each of these conditions and the manner of correcting them, is discussed.
- 2-75. When a punch error is detected, the card in error and one subsequent card have already been punched. The MCP will type out a CPA PUNCH CHECK system message on the message printer. The operator must then perform the following:
 - a. Remove the top two cards from the stacker.
 - b. Press the RESET switch.
 - c. Press the START switch.

- 2-76. FEED CHECK INDICATOR LIT. The FEED CHECK and NOT READY indicators will light when a card fails to feed from the hopper or a card-jam condition exists. If a failure to feed is suspected, proceed as follows:
 - a. Remove the cards from the punch hopper.
 - b. Inspect the first few cards for damage to the feed edge. If cards are damaged and entirely blank card stock is being use, throw away the damaged cards and replace them with new ones. If pre-punched cards are being used, any damaged ones will have to be recreated before continuing.
 - c. Place the new blank (or recreated) cards in the hopper.
 - d. Press RESET, then START to resume operation.
- 2-77. If a jam condition is suspected, proceed as follows:
 - a. Raise the cover of the punch unit (see figure 2-19). This cover is interlocked and will cause the punch unit to shut down when it is raised.

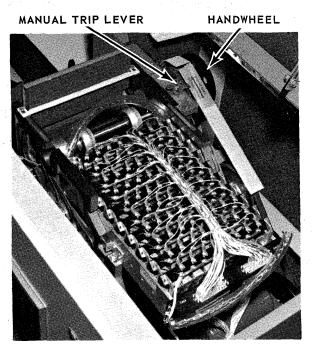


Figure 2-19. Card Punch Assembly, Top View

- b. Check the first feed rolls to determine if a card is jammed in this area.
- c. If a card is jammed in the first feed rolls, attempt to remove it by pulling up on the card.
- of the transport manually by pressing down on the manual trip lever (see figure 2-19 and turning the handwheel.
- e. After the jammed card(s) has been removed, close the cover.
- 2-78. If the jammed card is too far into the punch dies, proceed as follows:
 - a. Press the POWER OFF switch on the punch.
 - b. Lower the chip box door and remove the chip box (see figure 2-20).

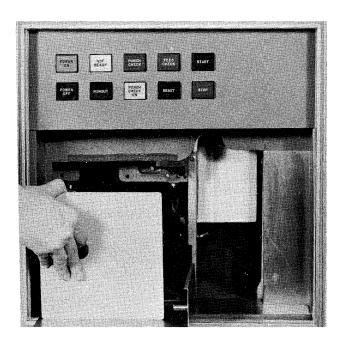


Figure 2-20. Removing the Chip Box

c. Grasp the two handles that extend down into the chip box area (figure 2-21) and compress them.

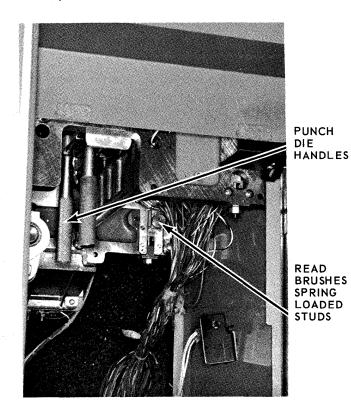


Figure 2-21. Chip Box Area

- d. While holding the handles compressed, pull straight downward with an even amount of pressure. Extreme pressure to the front or rear will cause the dies to bind, in which case it will be necessary to push the dies back up to straighten them before they can be removed.
- e. Once the dies have been removed, any jammed card in this area can be removed quite easily.
- 2-79. After the jammed card(s) has been removed from the punch die area, the dies can be replaced. To accomplish this, proceed as follows:

- a. Engage the trigger mounted at the rear of the die assembly. When this trigger is engaged, it allows the slide lock mechanism to be retarded with sufficient clearance to permit installation of the die.
- b. With the trigger engaged and the handles held firmly, insert the die straight up until the guide studs enter the stripper.
- c. A firm upward force will seat the die.
- d. The handles can then be spread to lock the die in place and to release the trigger.
- e. Press the POWER ON switch.
- 2-80. If a jam occurs in the read brush area, proceed as follows:
 - a. Press the POWER OFF switch.
 - b. Grasp the two spring-loaded studs (see figure 2-21), one in each hand, and pull toward the center, at the same time exerting a straight downward force. Should the brush slide assembly become cocked, it will jam and must be pushed upward and straightened to allow removal.
 - when the brush holder drops clear of the anchor slide, remove the brush holder from the unit. Care should be taken not to damage the brushes when the holder is removed. Inspect the brushes for bent or damaged strands. If any are detected, notify the field engineer.
 - d. Any card(s) jammed in this area can now be removed.

- 2-81. After the jammed card(s) has been removed from the read brush area, proceed as follows:
 - a. Start the brush slide assembly into the anchor slide.
 - b. Holding the spring-loaded studs to the center, apply a straight upward force to the assembly.
 - c. When the slide assembly is completely in the slide, release the springloaded studs and continue to push upward until the studs lock in place.
 - d. Press the POWER ON switch.
- 2-82. If a jam condition involves a card(s) that has been punched, the card(s) must be checked to determine if it is usable. If it is damaged to any great extent, the card(s) will have to be recreated on a key punch. However, if the jam occurred near the beginning of the job, it may be more advisable to restart the entire job. If the jammed card(s) is usable or is going to be recreated, press RESET, then START to resume processing.
- 2-83. STOP SWITCH PRESSED. If the STOP switch is pressed to stop the card punch, the NOT READY indicator will light. If a card is being processed when the switch is pressed, the processing of the card will be completed before the punch is placed in a Not Ready condition. To resume operation, press RESET, then START.
- 2-84. EMPTY HOPPER. When the hopper of the B 303 Card Punch becomes empty, the punch will stop and the NOT READY indicator will light. To correct this situation, load additional cards in the hopper and press START to resume processing.

- 2-85. COVER OPENED. When the cover of the B 303 Card Punch is raised, the unit goes into a Not Ready condition and the NOT READY indicator will light. To correct this condition, lower the cover and press RESET, then START.
- 2-86. CARD NOT AT READY STATION. If a card is not detected by the card ready switch, the NOT READY indicator will light. To correct this situation, refer to paragraph 2-74.
- 2-87. PUNCH DIE NOT IN PLACE. If the punch die is not replaced properly after removing it to clear a jam, the NOT READY indicator will be lit. This is caused by a switch not being engaged properly by the improperly seated punch die. To correct this condition, re-insert the punch die in the proper manner (refer to paragraph 2-79). Press RESET, then START to resume operation.
- 2-88. CARD NOT AT READ STATION. If a card is not detected by the read card switch, the NOT READY indicator will light. This condition will most likely be caused by a jam condition. To correct the situation, refer to paragraph 2-77.
- 2-89. PUNCH CHECK INDICATOR LIT. This indicator will light, along with the NOT READY indicator, when fewer than 80 bits of data are received for each row of the card, or if more or less than 12 row cycles are counted (punch station check). The indicator will also light if the number of punched holes does not agree with the number of holes required to be punched from the original data received from the B 5500 system. To correct this situation proceed as follows:
 - a. If the PUNCH CHECK indicator lights during a punching operation, the operator has various courses of action, depending upon the job being run. The MCP will print out the CPA PUNCH CHECK message.

- b. The operator may ignore the punch check and continue by pressing the RESET switch, then the START switch.
- c. The operator may chose to discontinue the job.

2-90. STACKER FULL. When the stacker of the B 303 Card Punch becomes full, it sets a spring-loaded toggle switch that causes the unit to stop and the NOT READY indicator to light. To remove this condition, empty the cards from the stacker and press RESET, then START to continue processing.

OPERATOR MAINTENANCE.

- 2-91. Among other operational duties, the operator is responsible for:
 - a. Inspecting cards for acceptable conditions before loading the hopper and after emptying the stacker.
 - b. Loading and unloading cards in an acceptable manner.
 - c. Removing occasional jams.
 - d. Making certain that cards have been stored in a manner consistent with specifications.
 - e. Making up missing or damaged cards.
 - f. Emptying the chip box.
 - q. Removing the punch assembly and brushing it clean.
 - h. Removing the read brush assembly and brushing it clean.
 - i. Brushing and vacuuming the feed hopper, chip box area, and stacker.
 - j. Keeping records of failure.

- k. Checking output cards against a standard card gauge for punch registration when an error is detected.
- 1. Analyzing all stoppages to the point where cabinets must be opened.
- m. Notifying the field engineer of improper operation.

B 304 CARD PUNCH.

2-92. The B 304 Card Punch (figure 2-22) is capable of punching 80-column cards at a speed of 300 cards per minute. One 80-column card can be punched in 200 milliseconds. The operation of the B 304 is controlled through the I/O control unit of the B 5500 system.



Figure 2-22. B 304 Card Punch

FUNCTIONAL CHARACTERISTICS.

- 2-93. Information that is designated by an object program for punched card output is transferred from memory through an I/O channel to the B 304. A horizontal row of eighty columns can be punched for each of the twelve (12, 11, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9) levels contained in a punched card. Punch error conditions are detected at the post-punch read station if the modulo-8 read count is not equal to the original information count transferred from the B 5500 system.
- 2-94. The detection of a punch error on the B 304 produces a signal which is transferred to the B 5500 system for appropriate action. When a punch error condition is realized, the PUNCH CHECK indicator lights and the suspect error card and the one following it are ejected to the error stacker on the B 304. Both the PUNCH CHECK and the signal which was transferred to the B 5500 system are automatically cleared by the next card punch command in the program. Binary cards may not be punched on the B 304 Card Punch. When the last row of information has been transferred to the 80-bit row buffer of the B 304 Card Punch, the I/O control unit is released for the next input/output operation.
- 2-95. Cards are fed face-down, 12-edge forward, and are placed in the feed hopper that has a capacity of 500 cards. A feed ramp can be attached to the B 304 Card Punch which may contain an additional supply of 3000 cards.
- 2-96. The B 304 Card Punch has the three stackers: primary, auxiliary, and error. As previously mentioned, a punch error causes the suspected card and the following card to be automatically ejected to the error stacker. Normal distribution of cards is to the primary stacker. Use of the error and auxiliary stackers is controlled by the system; they cannot be selected programmatically.

2-97. The primary stacker is of the ramp-type. This stacker can hold 3000 standard (0.007 inch thickness) cards and may be unloaded while the B 304 is operating. Both the auxiliary stacker and the error stacker can contain 750 cards. When any stacker is full, the NOT READY indicator will light and no further punch operations are permitted until the cards are removed from the full stacker. Information that is punched by the B 304 Card Punch is formatted by the ALGOL, FORTRAN, or COBOL program.

CONTROL PANEL.

2-98. The B 304 Card Punch control panel (figure 2-23) is located to the right of the card hopper and contains the switches and indicators for operation of the unit and for error indication. The function of these elements is contained in table 2-6.

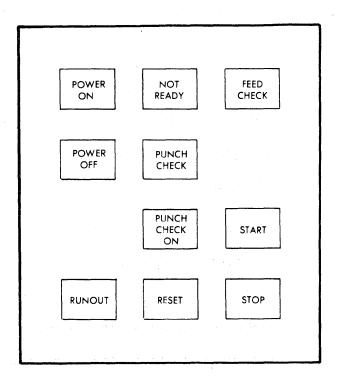


Figure 2-23. B 304 Card Punch Control Panel

Table 2-6

B 304 Card Punch Control Panel
Switches and Indicators

Switch/Indicator	Function
POWER ON	This switch/indicator applies power to the B 304 and
	lights when pressed.
NOT READY	This indicator lights when one of the following condition
	exists: no card at the punch station; STOP switch pressed
	feed check condition; empty hopper; card transport
	mechanism open; punch error; and primary, auxiliary,
	or error stacker full. The Not Ready conditions must
	be cleared before processing can begin.
FEED CHECK	This indicator lights when there is no card present at
	the punch station because of either a failure to feed
	or a card jam (except when automatically ejected because
	of delayed punching).
PUNCH CHECK	This indicator lights if fewer than 80 bits of data are
	received for each row, or if more or less than 12 row
	cycles are counted (punch station check). It will also
	light if the number of punched holes does not agree with
	the number of holes that were supposed to be punched
	(modulo-8).
POWER OFF	This switch removes power from the B 304.

B 304 Card Punch Control Panel Switches and Indicators

Switch/Indicator	Function Function
START	This switch conditions the machine to accept start feed
	signals, and causes cards to enter and follow the trans-
ing the state of t	port system to the proper card positions.
PUNCH CHECK ON	This switch/indicator selects between full punch checking
	and partial punch checking. The switch includes a
	mechanical toggle that reverses its choice each time
nen in in Nord in de Nord in de Stade (en en e	it is pressed. When the switch is pressed and the
	indicator lights, a check is made of both punch station
and the state of the state of	error conditions and post-punch read station error
	conditions. When the indicator is not lit, a check is only made on punch station error conditions. This
n de seu de la companya de la compa La companya de la co	
	scribed cards.
RUNOUT	This switch causes the cards in the feed line to pass
	through the machine without being punched and No
	additional cards are fed from the hopper. The switch
	is only effective when the unit is in the Not Ready
	state. Runout cards are directed to the error stacker.
A transport of the second	Error conditions, if any, are not reset.
Jag.	of salampakki move of the known with browns are the common of the common

B 304 Card Punch Control Panel Switches and Indicators

Switch/1	ndicator	Function Particle Value
RESET		This switch clears the FEED CHECK and PUNCH CHECK error
		conditions.
		and the state of the second services of the second
STOP		This switch causes the punch operation to stop after
	en la viene la comprese de la compre	completing the punching of the card in the dies, and
tue f	The second of th	then places the unit in the Not Ready state.
		en e

OPERATING PROCEDURES.

- 2-99. The procedure for punching cards with the B 304 Card Punch is as follows:
 - a. Press the POWER ON switch.
 - b. Press STOP, then RUNOUT to clear any previous cards that may have remained in the punch.
 - c. Turn the switch located below the hopper clockwise to withdraw the card level sensers and vertical aligners.
 - d. Fan the blank cards so that the cards do not stick together and cause misfeeding.

기술 시민 원. 생생 기둥의 사후 시작을 사고 사람이 있다.

e. Loading approximately 500 cards (4 inch stack) into the normal hopper face down, 12 edge toward the card slot (see figure 2-24).

B 304 Card Punch Control Panel Switches and Indicators

Switch/Indicator	Function
START	This switch conditions the machine to accept start feed
	signals, and causes cards to enter and follow the trans
	port system to the proper card positions.
अनुसरिक्षा क्षत्रीय कर्ष किर्मात्रीय	en december en och de stiller stiller æfdT
PUNCH CHECK ON	This switch/indicator selects between full punch checking
্রার প্রতিষ্ঠান প্রতিষ্ঠান ক্ষেত্র করে । ব্যবহার	and partial punch checking. The switch includes a
The second of th	mechanical toggle that reverses its choice each time
भेक्षा भीति । विकास का विकास का अपने क अपने भीति का अपने का अ	it is pressed. When the switch is pressed and the
	indicator lights, a check is made of both punch station
The state of the s	error conditions and post-punch read station error
	conditions. When the indicator is not lit, a check is
	only made on punch station error conditions. This
and the second second second second second	feature allows the use of prepunched and certain pre-
	scribed cards.
RUNOÙT	This switch causes the cards in the feed line to pass
	through the machine without being punched. No
e de la composition	additional cards are fed from the hopper. The switch
	is only effective when the unit is in the Not Ready ಇತ್ತಿಸಿಕೊಳ್ಳಿದ
	state. Runout cards are directed to the error stacker.

The second secon

count 12 edge toward the card size (see figure 2-20).

B 304 Card Punch Control Panel Switches and Indicators

Switch/Indicator	Function
RESET	This switch clears the FEED CHECK and PUNCH CHECK error
	conditions.
STOP	This switch causes the punch operation to stop after
	completing the punching of the card in the dies, and
	then places the unit in the Not Ready state.
	(1,2,3,3) . The second of $(1,2,3)$ is $(1,2,3)$. The second of $(1,2,3)$ is $(1,2,3)$. The second of $(1,2,3)$ is $(1,2,3)$.

OPERATING PROCEDURES.

- 2-99. The procedure for punching cards with the B 304 Card Punch is as follows:
 - a. Press the POWER ON switch.
 - b. Press STOP, then RUNOUT to clear any previous cards that may have remained in the punch.
 - c. Turn the switch located below the hopper clockwise to withdraw the card level sensers and vertical aligners.
 - d. Fan the blank cards so that the cards do not stick together and cause misfeeding.
 - e. Loading approximately 500 cards (4 inch stack) into the normal hopper face down, 12 edge toward the card slot (see figure 2-24).

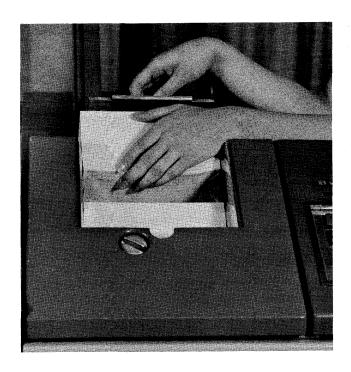


Figure 2-24. Loading Cards

- f. If less than 500 cards are to be punched, place the card weight on top of the cards. If more than 500 cards are to be punched, place additional cards in the reserve hopper and then place the card weight on top of these cards.
- Turn the switch located below the hopper counterclockwise to return the card level sensors and vertical aligners to their normal operating positions.
- Check PUNCH CHECK ON for desired setting.
- i. Press RESET, then START on the card punch. This will move four cards into the transport, the first of which will be positioned at the ready station for punching upon command from the B 5500 system.
- j. 'If it is desirable to stop the punch unit while a run is in process, press the STOP switch.

UNLOADING CARDS.

2-100. When unloading cards, the operation should check all stackers to make certain that all cards for a particular program have been removed. Cards can be removed from any one of the three stackers (refer to figures 2-25 and 2-26) while the unit is in operation, or by pressing the STOP switch, removing the cards, and then pressing the START switch.

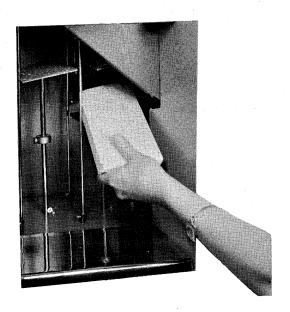


Figure 2-25. Removing Cards from Error Stacker

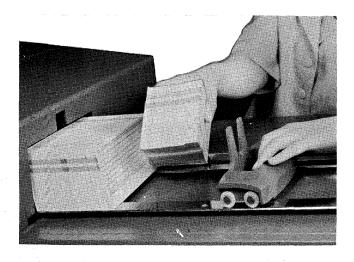


Figure 2-26. Removing Cards from Normal Stacker

NOT READY CONDITIONS.

2-101. Any Not Ready condition will be indicated by a # CPA NOT READY system message on the system message printer. These conditions can be caused by the following:

- a. FEED CHECK indicator on.
- b. STOP switch pressed.
- c. Hopper empty.
- d. Punch die not in proper position.
- e. Read brush mechanism not locked.
- f. Full stacker.
- q. Cards not at ready station.
- h. Covers not closed properly.
- i. Card jam.
- 2-102. After correcting the cause of the Not Ready condition, the operator must press the START switch.
- 2-103. When a punch error is detected, the card in error and one subsequent card have already been punched. For this situation, a CPA PUNCH CHECK system message is typed on the message printer. The operator must then restart the punch or type in the DS message depending upon whether the program is to be continued or discontinued. Also, the PUNCH CHECK indicator is lit on the B 304. Pressing the RESET switch clears this indicator. The START switch must then be pressed to resume operation.
- 2-104. As stated previously, there are several conditions that may cause the NOT READY indicator to light. In the paragraphs that follow, each of these conditions and the manner of correcting them, is discussed.

- 2-105. FEED CHECK INDICATOR LIT. The FEED CHECK and NOT READY indicators will light when a card fails to feed from the hopper or a card-jam condition exists. If a failure to feed is suspected, proceed as follows:
 - a. Remove the first few cards from the hopper.
 - b. Inspect these removed cards for damage to the feed edge. If the cards are damaged and entirely unpunched card stock is being used, throw away the damaged cards. If partially punched cards are being used, any damaged cards must be recreated.
 - c. Place new unpunched (or recreated) cards in the hopper.
 - d. Press RESET, then START to resume operation.
- 2-106. If a jam condition is suspected, proceed as follows:
 - a. Open the hinged doors on the left side of the unit (figure 2-27).

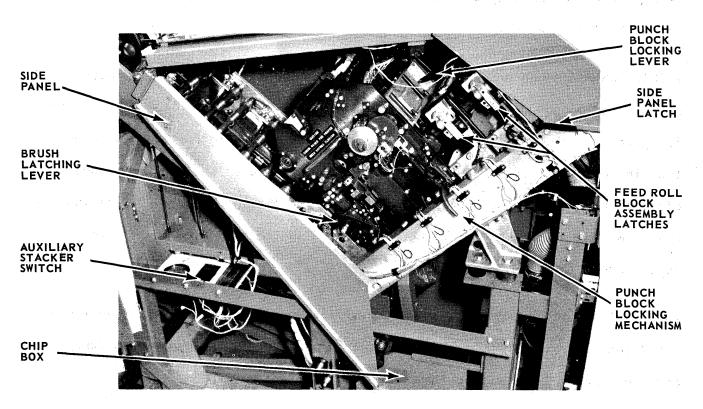


Figure 2-27. B 304 Card Punch, Left Side Open

- b. Remove the triangular shaped side panel by sliding the latch, located on the right side of the panel, to the right and pulling out on the panel. This panel is hinged and can be allowed to hang free.
- c. Press in on the feed roll block assembly latches and lift up.
- d. If a card is jammed in this area, remove it. If there are no jams, lower the assemblies and lock them in place.
- e. Pull up on the punch block locking mechanism handle and raise the top section of the block.
- f. If any cards are jammed in this area, remove them. If there are no jams, press down on the lever to the right of the block; lower the top section back into place, and lock it. When closing the punch block, care should be taken to ensure that the upper feed roll gears mesh properly with the lower feed roll gears.
- allowed to pivot downward to prevent damage to the brush strands. After the block is lowered and locked, press down on the brush latching lever to return the brush assembly to its normal place. Failure to do this will cause punch check errors to occur.
- h. Inspect the ejection transport for jammed cards.
- i. If there are jammed cards in the transport, remove them with extreme caution.

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If cards are stuck in the ejection transport, but not jammed to the point of being mutilated, it is advisable to attempt to run the cards out by use of the hand wheel located below the transport (see figure 2-28). This wheel can be reached by opening the hinged doors on the right side.



Figure 2-28. B 304 Card Punch, Right Side Open

- j. After the jam condition has been corrected, replace all covers.
- k. If a jam condition involves a card that is punched, the card must be checked to determine if it is usable. If it is damaged to any great extent, the card will have to be recreated on a key punch. However, if the jam occurred near the beginning of the job, it may be more advisable to restart the entire job.

- If the jammed card is usable or is going to be recreated, press RESET, then START to resume processing.
- 2-107. STOP SWITCH PRESSED. If the STOP switch is pressed to stop the card reader, the NOT READY indicator will light. To restart the card reader press RESET, then START.
- 2-108. EMPTY HOPPER. When the hopper of the card punch becomes empty, the NOT READY indicator will light. To correct this situation, load additional cards into the hopper and press RESET, then START to resume operation.
- 2-109. FEED ROLL BLOCK NOT LOCKED. If the operator does not lock the feed roll block after checking for a jam condition in this area, the NOT READY indicator will be lit. To correct this situation, proceed as follows:
 - a. Open the hinged doors on the left side of the unit.
 - b. Remove the triangular shaped side panel by sliding the latch, located on the lower right side of the panel, to the right and pulling out on the panel. This panel is hinged and can be allowed to hang free.
 - c. Inspect both feed roll block assemblies, making certain they are locked properly.
 - d. Replace the side panels.
 - e. Press RESET, then START to clear the NOT READY indicator.
- 2-110. PUNCH BLOCK NOT LOCKED. The punch block locking mechanism contains a microswitch that places the card punch in a Not Ready condition when the mechanism is open. If the operator fails to close the lock properly, the NOT READY indicator will light. To correct this situation, proceed as follows:

- a. Open the hinged doors on the left side of the unit.
- b. Check the punch block locking mechanism, making certain it is closed properly and the handle is pushed down completely.
- c. Replace the side panels.
- d. Press RESET, then START to clear the NOT READY indicator.
- 2-111. CARD NOT AT PRE-PUNCH STATION. The NOT READY indicator will light if a card is not at the pre-punch station when the punch unit checks for its presence. This condition will be caused by either a misfeed from the hopper, or a jam prior to the pre-punch station. If a failure to feed is suspected, proceed as follows:
 - a. Remove the cards in the hopper and check the first few for damage to the feed edge. If the cards are damaged and entirely unpunched stock is being used, throw away the damaged cards. When partially punched cards are being used, damaged cards should be recreated.
 - b. Place new unpunched (or recreated) cards in the hopper.
 - c. Press RESET, then START to resume operation.
- 2-112. If a jam condition is suspected, proceed as follows:
 - a. Open the hinged doors on the left side of the unit.
 - b. Remove the triangular shaped side panel by sliding the latch, located on the lower right side of the panel, to the right and pulling out on the panel. This panel is hinged and can be allowed to hang free.
 - c. Press in on the feed roll block assembly latches and lift up.

- d. If a card is jammed in this area, remove it. If there are no jams, lower the assemblies and lock them in place.
- e. Pull up on the block locking mechanism handle and raise the top section of the block.
- f. If any cards are jammed in this area, remove them. If there are no jams, press down on the lever to the right of the block, lower the top section back into place, and lock it. When closing the punch block, care should be taken to ensure that the upper feed roll gears mesh properly with the lower feed roll gears.
- to pivot downward to prevent damage to the brush strands. After the block is lowered and locked, press down on the brush latching lever to return the brush assembly to its normal position.
- h. After the missing card condition has been corrected, replace all covers.
- i. Press RESET, then START to resume operation.
- 2-113. PRIMARY, ERROR, OR AUXILIARY STACKER FULL. The NOT READY indicator will light when any one of the three stackers of the B 304 Card Punch is full. To correct this condition, remove the cards from the filled stacker and press RESET, then START.
- 2-114. COVERS NOT IN PLACE. If any one of the B 304 Card Punch covers is not replaced properly, the unit will be placed in a Not Ready condition. To correct this condition, check all covers to make certain they are seated properly, then press RESET and START.

2-115. PUNCH CHECK INDICATOR LIT. The PUNCH CHECK indicator will light when fewer than 80 bits of data are received for each row of the card, or if more than 12 row cycles are counted (punch station check).

OPERATOR MAINTENANCE.

- 2-116. Among other operational duties, the operator is responsible for:
 - a. Inspecting cards for acceptable conditions before loading the hopper and after removal from the stacker.
 - b. Loading and unloading cards acceptably.
 - c. Removing occasional card jams.
 - d. Assuring that cards have been stored in a manner consistent with specifications.
 - e. Recreating missing or damaged cards.
 - f. Emptying the chip box.
 - g. Brushing and vacuuming the entire transport area and feed hopper, taking care not to damage the read brushes.
 - h. Removing any apparent dust accumulation on the transport rollers.
 - i. Cleaning out the auxiliary and error stackers.
 - i. Keeping records of punch unit failures.
 - k. Checking output cards against specification requirements for dimensions and punch registration using a standard card gauge, when errors are detected.

- 1. Analyzing all stoppages to the point where side panels must be removed.
- m. Notifying the field engineer of improper operation.

B 320/B 321/B 325/B 328/B 329 LINE PRINTERS.

2-117. The Burroughs Line Printers provide high quality, high speed, alphanumeric output. Currently, five individual line printer models are provided, varying in operating speeds from 475 lines-per-minute to a maximum of 1040 lines-per-minute. These models are available in either 120 or 132 print positions. The functional characteristics of the five line printers listed above are the same, and they are physically identical in appearance. Since the five models differ only in their operating speeds, only the B 321 Line Printer will be described in detail in this manual.

B 321 LINE PRINTER.

2-118. The B 321 Line Printer (figure 2-29), is a drum-type printer capable of printing 700 lines per minute when single spacing or 650 lines per minute when double spacing. One doubled spaced line can be printed in 92 ms. and each single spaced line can be printed in 85 ms.

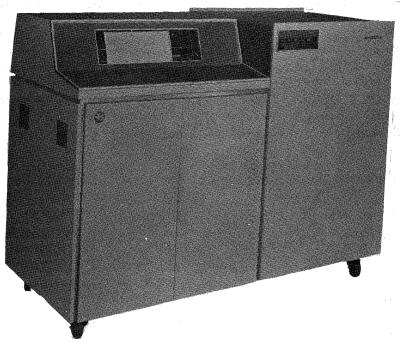


Figure 2-29. B 321 Line Printer

FUNCTIONAL CHARACTERISTICS.

2-119. A 120-character buffer is contained in the B 321 Line Printer. It requires 1.5 milliseconds to transfer a line of print from the B 5500 to the B 321 buffer. Upon completion of the transfer, the I/O control unit is released for the next input/output operation which is designated to be performed.

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- 2-120. Arrangement of a printed line is accomplished by the object program prior to transferring the information to the B 321 Line Printer. The B 321 does not have a plugboard and consequently cannot perform any formatting. The number of lines-per-inch, six or eight, is manually selected by the operator. A twelve-channel, vertical format carriage tape is used to control the movement of continuous paper forms. Eleven of these channels provide for skips as specified by the B 5500 program. The twelfth channel of the carriage-control tape is used as a signal to designate end-of-page. The carriage-control tape, as commanded by the object program, can skip from 1 to 132 lines and will stop the paper slew when the specified channel is sensed. Carriage control tapes are easily changed by the operator (see paragraph 2-132).
- 2-121. Continuous forms, which may be 5 to 20 inches in width and up to 22 inches (at 6 lines-per-inch) or 16-1/2 inches (at 8 lines-per-inch) in length, are pinfed. The weight and number of parts of paper to produce legible copy is variable up to 0.020 inch in over-all thickness. The thinnest form which may be used should not be less than 0.0025 inch.
- 2-122. The character set printed by the B 321 Line Printer consists of 26 alphabetic, 10 numeric, and 28 special characters (see Appendix A). Characters are printed horizontally at ten to an inch with 120 characters-per-line.

CONTROL PANEL.

2-123. The B 321 Line Printer control panel (figure 2-30) contains switches and indicators for operation of the equipment and for error indications. The control panel is located at the front of the unit, to the right of the print section.

The function of the switches and indicators is provided in table 2-7.

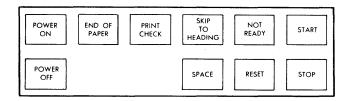


Figure 2-30. B 321 Line Printer Control Panel

Table 2-7

B 321 Line Printer Control Panel
Switches and Indicators

Switch/Indicator	Function
POWER ON	This switch/indicator applies power to the B 321 and lights when pressed.
END OF PAPER	This switch/indicator signals nearing an end-of-paper condition. Pressing this switch removes the end-of-paper condition and extinguishes the light. One line can then be printed; thereafter, the unit returns to the end-of-paper condition. Successive depressions of this switch enable printing successive lines.

B 321 Line Printer Control Panel Switches and Indicators

Switch/Indicator	Function
PRINT CHECK	This indicator lights when a print check error is sensed,
	or when the print drum is not properly synchronized. If
	a print check occurs, the MCP will print out the LP*
	PRINT CHECK message. Processing of the program using
	the line printer is continued after the operator has
	made the printer ready.
SKIP TO HEADING	Pressing this switch causes the carriage to skip to the
	first punch in channel 1 of the carriage control tape.
NOT READY	This indicator lights when any one of the following con-
	ditions exists: the END OF PAPER indicator is lit, the
	6/8 lines-per-inch switch is in position N, the unit
	slews paper for more than one second, or the START
	switch is not pressed.
START	This switch signals that the B 321 is ready for use.
	It is also used to restart system operations halted by
	a B 321 Not Ready condition.
STOP	Pressing this switch will stop the B 321 prior to the
	execution of the next print instruction. The print
	buffer will not be loaded after the switch has been
and the second s	pressed, and the system will halt on the next print
	instruction.

B 321 Line Printer Control Panel Switches and Indicators

Switch/Indicator	Function
RESET	Pressing this switch resets the PRINT CHECK indicator.
SPACE	Pressing this switch causes the forms to be single spaced.
POWER OFF	This switch removes power from the B 321.

FORMS HANDLING.

2-124. The printer form tractors accept only forms with marginal-punched strips that meet the required specifications. Initial set-up time for loading forms should not take more than two minutes. Reloading similar forms requires no more than 30 seconds. Once installed, the forms can be shifted left or right by the operator by means of a single continuous adjustment. If forms width is 19 inches or 6 inches, this horizontal adjustment is at least ± 0.5 inch. Forms of intermediate width can be continuously adjusted until a center or extreme tractor position is reached. The maximum horizontal tractor positions are 9-3/4 inches each from the center line of the tractor feed pins to machine center line to accept a 20-inch form. The minimum horizontal tractor positions are 2-1/4 inches each from the center line of the tractor feed pins to the machine center line to accept 5-inch forms.

- 2-125. Tractors can be adjusted horizontally toward or away from each other to adjust for forms width. In the form width adjustment, if any one tractor reaches a minimum or a maximum centerline distance before the other, the unobstructed tractor will continue to move until the desired width is reached. A secondary adjustment is the forms positioning to the left or right. Positioning limit is reached when any tractor reaches minimum or maximum center distances.
- 2-126. Left or right adjustment of the form can be made while the printer is operating and requires no tools. Vertical adjustments of at least one-half space (1/2 inch) can be made in both directions during operation.

TAPE PUNCHING.

- 2-127. A compact tape punch (figure 2-31) is used to punch carriage control tapes. The recommended procedure for punching the tape is as follows:
 - a. Lay the tape beside or on the form with the top line even with the top edge of the form.
 - b. Mark the first desired line of print in channel position 1.
 - c. Make additional marks in their appropriate channel positions as required for any skip stops.
 - d. Mark the last desired print line in channel position 12. This position creates an automatic overflow condition.
 - e. When possible the appropriate channel positions (1, 12, and any other required) should be repeated as many times as possible for the length of the vertical format tape. This will increase the life of the tape by controlling several forms with one revolution.

f. The line which corresponds to the bottom edge of the last form should be marked for cutting.

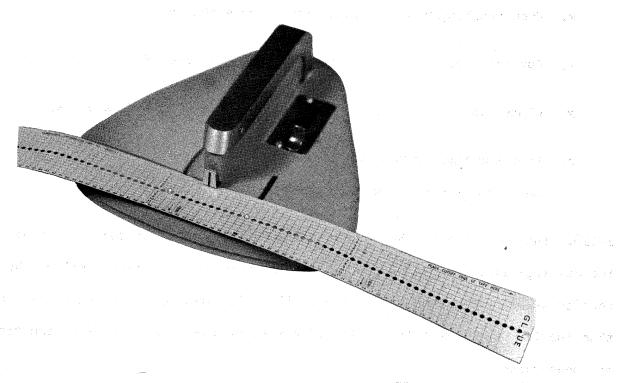


Figure 2-31. Carriage Control Tape Punch

- g. Insert the tape in the vertical format tape punch with the pre-punched holes positioned over the pins so that the channel position to be punched is properly centered.
- h. Turn the dial on the right side of the punch until the arrow points to the desired channel position.
- i. Press the top rear of the punch to cut a rectangular hole where the channel and the line positions intersect. The tape may be punched in more than one channel position for one line if required. In some cases, when more than one skip is directed to the same stop position, this may be desirable.

- j. Repeat steps g through i until all marked channel positions have been punched.
- k. When punching has been completed, remove the tape.
- 1. Cut the tape on the line that was marked in step f.
- m. Place glue on the top of the tape where the word GLUE appears.
- n. Loop the tape so that the bottom line is aligned with the top line (the one immediately below GLUE) and press the ends together.
- 2-128. The last hole punched in the tape should not be less than four lines from the cut edge since approximately the last half-inch of the tape overlaps the GLUE section when the two ends are spliced. If it is necessary to punch a hole lower than the four lines from the bottom of the form, punch the hole after the tape has been glued.

OPERATING PROCEDURES.

- 2-129. The procedure for loading forms into the B 321 Line Printer is as follows:
 - a. If power is not on, press the POWER ON switch-indicator. The indicator will light when the switch is pressed. However, if the unit has just been turned off, the operator will have to wait a moment until the power supply cycles down before the switch can be pressed to turn the power on.
 - b. Lift the cover that houses the print drum, carriage-control tape, and upper pin-feed tractors (see figure 2-32).
 - c. Open the doors on the front of the unit.

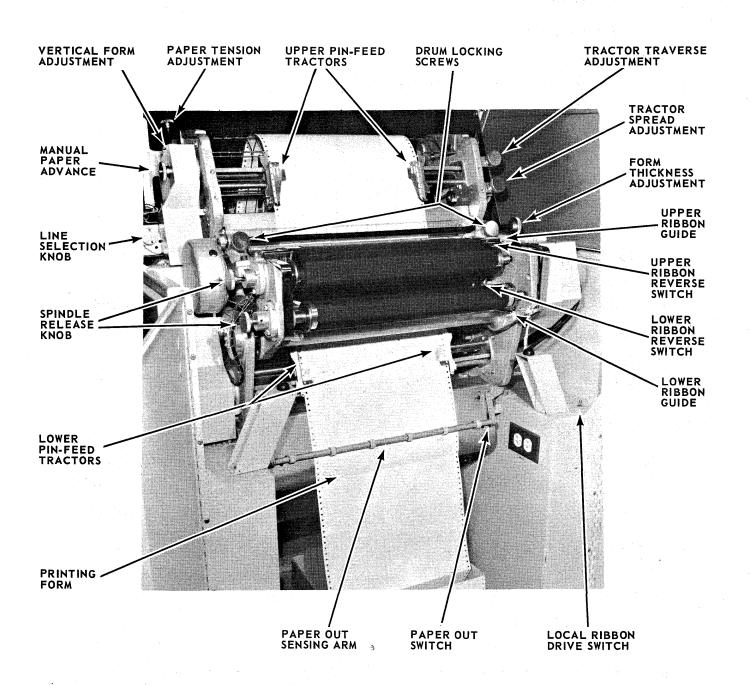


Figure 2-32. B 321 Line Printer Component Layout

- d. Remove the ribbon cover to determine if the ribbon is mounted or if it has reached minimum inking requirements. If either condition exists, refer to paragraph 2-131.
- e. Mount the required carriage-control tape (refer to paragraph 2-132).
- f. Set the line selection knob to either the 6 or 8 line position as required.
- g. Press the SKIP TO HEADING switch to position the carriage-control tape.
- h. Remove the forms from the previous job unless the same form is desired for the current run.
- i. Loosen the drum-locking screws and tilt the print mechanism down and to the front.
- j. Open the pin feed guides.
- k. Place the required forms in the bottom of the printer.
- Manually thread the form under the paper-out sensing arm, past the lower pin-feed tractors, progressing upward between the print mechanism and hammers, to the upper pin-feed tractors.
- m. Adjust the pin-feed tractors by means of the tractor spread adjustment to fit the form size.
- n. Position the form vertically so that the print hammers are aligned with the first line of print.
- o. Place the pin-feed holes of the form over the pins in the upper tractor and close the guides.

- p. Straighten the form from the bottom and place the pin-feed holes over the pins in the lower tractor, closing the guides when finished. (The tractor spread adjustment may have to be used once more to attain proper fit.)
- q. Set the line selector knob to the N (neutral) position and manually align the form for the first line of print with the manual paper advance knob.
- r. Set the form thickness adjustment for the number of copies being fed.
- s. Ease the print mechanism back into position.
- t. Before tightening the drum-locking screws, position the form horizontally with the tractor traverse knob for the particular job being run.
- u. Tighten the drum-locking screws and close the doors on the front of the unit.
- v. Set the line selection knob to either the 6 or 8 line position, as required (same as step f).
- w. Press the SKIP TO HEADING switch to move paper up and over the paper guide (see figure 2-33).
- x. Push (<u>DO NOT PULL</u>) the paper eject release lever and feed the form under the paper eject rollers. The SKIP TO HEADING switch may have to be pressed a few times to allow the form to feed into the rollers.
- y. Release the paper eject release lever.

NOTE

On B 328 and B 329 Line Printers, the cover can be lowered without releasing the cover latch.

z. Release the cover latch and lower the cover.

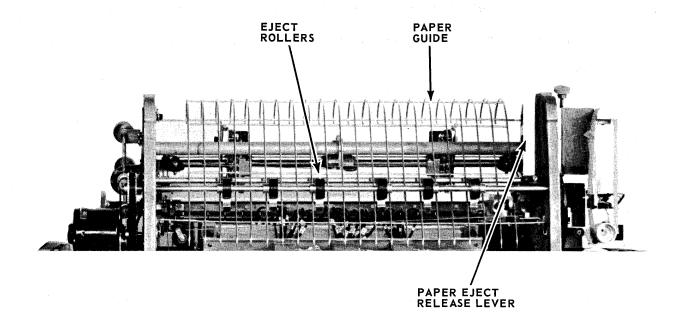


Figure 2-33. Line Printer Paper Guide, Rear View

aa. Press RESET, then START to place the unit in a Ready condition.

2-130. If the printed lines are too far above or too far below the line on the form, the vertical form adjustment knob may be turned to the right or left for compensation. When the forms are set off-center for the column lines, the tractor traverse adjustment knobs (L to R or R to L) may be used for corrective alignment. In either situation, the cover may be lifted and the adjustment made while the printer is in operation.

CHANGING THE RIBBON.

2-131. Ribbon life at 75 per cent duty cycle is a minimum of six hours and an average of eight hours with all positions printing at 650 lines per minute, double spaced on 15 lb., single part forms. The time for changing the ribbon will be best determined by the operator. This determination is usually based on the quality of print being obtained. However, when printing is performed repeatedly in the same print position, the ribbon is likely to develop a hole in that area. In this case, the ribbon will have to be changed, even though the remainder of the ribbon meets minimum inking requirements. The procedure for changing the ribbon is as follows:

- a. Press the POWER OFF switch.
- b. Lift the cover that houses the print drum and paper feed mechanism.
- c. Open the doors on the front of the unit.
- d. Loosen the drum-locking screws.
- e. Swing the print drum mechanism down and toward the front.
- f. Lift the cover of the ribbon from the form thickness bar and lower it.

 (This cover is hinged and will hang into the form supply area.)
- q. Open the new ribbon box to obtain plastic gloves.
- h. After donning the plastic gloves, turn the upper spindle manually to take up the ribbon from the lower spindle.

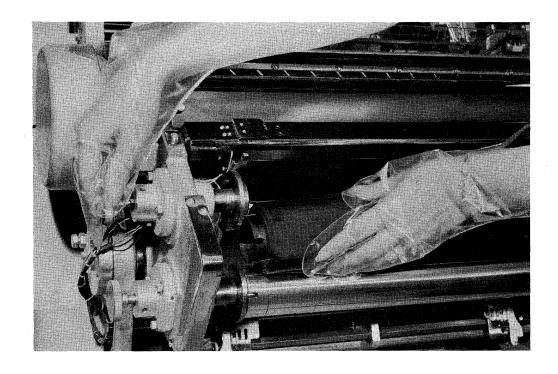
NOTE

There are two ribbon guides below the lower ribbon spindle. When winding the ribbon onto the upper spindle, the ribbon will have to be taken out of the guides to permit the protruding metal bars in the ribbon to pass the guides. The same is true for the guides above the upper ribbon spindle.

i. Remove the upper spindle by pressing in on the knob (about 1/4 inch) and turning clockwise (toward the operator). The knob is spring-loaded and will move to the left, allowing the spindle to be removed (see figure 2-34). The spindle and ribbon can be discarded.

NOTE

After the ribbon is removed, and time permits, it is advisable to clean the print drum. The procedure for this operation is outlined in paragraph 2-142, step f.



2-82

Figure 2-34. Removing the Printer Ribbon

- j. Place the new ribbon on the upper ribbon roll (the ribbon should feed off the backs of the spindle).
- k. Align the pins on the roll with the slots in the spindle and push in on the knob.
- When the spindle and ribbon roll are properly aligned and the knob is pushed in all the way, turn the knob counterclockwise to lock the assembly.
- m. Remove the cellophane cover from the ribbon.
- n. Thread the ribbon from the upper spindle, up through the upper paper tension spring, past the print drum, and down under the lower paper tension spring (see figure 2-35).

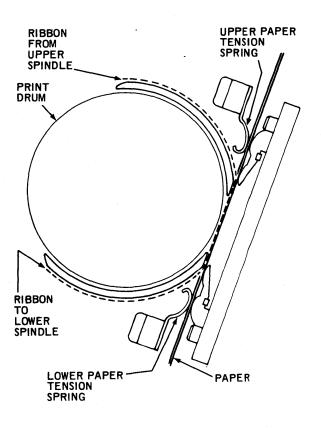


Figure 2-35. Side View of Print Mechanism

- o. Place the protruding metal bar (at the end of the ribbon) into the slot of the lower ribbon spindle.
- p. Turn the lower spindle until the protruding metal bars are past the lower ribbon guides.
- q. Place the ribbon under the upper and lower ribbon guides (see figure 2-36).
- r. Press the POWER ON switch.
- s. Press the local ribbon drive switch (refer to figure 2-32) to determine that the ribbon moves properly.

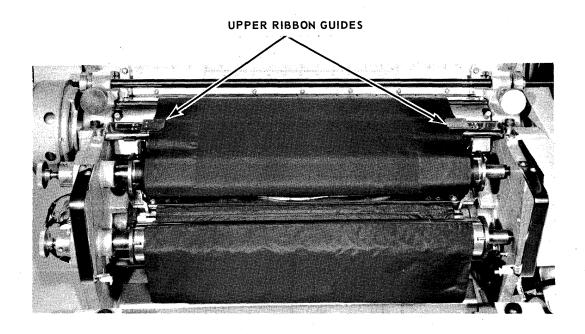


Figure 2-36. Ribbon in Proper Position

t. Close the protective ribbon cover and make certain that both side clips are pushed down on the cross rod.

- u. Raise the print drum mechanism into position and tighten the lock screws.
- v. Close the doors that conceal the forms supply.
- w. Release the cover latch and lower the cover into place.
- x. Press RESET, then START to ready the printer for operation.

NOTE

On B 328 and B 329 Line Printers, a ribbon tracking device is included to sense and limit the mistracking of the ribbon. To change the ribbon, push the lever down, thus opening the clamp. This allows the ribbon to be removed from the tracking device as shown in figure 2-37.

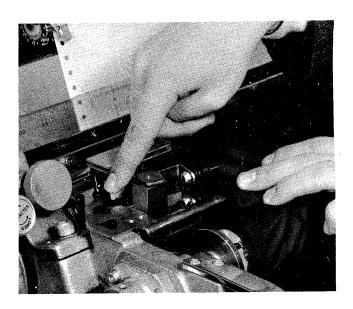


Figure 2-37. Removing Ribbon from Tracking Device

INSERTING THE CARRIAGE CONTROL TAPE.

- 2-132. The following steps must be taken to insert the carriage control tape (figure 2-38).
 - a. Raise the cover that houses the print drum mechanism. (The carriage control tape drive is located on the upper left rear of this mechanism.)
 - b. Set the line selection knob to the neutral (N) position.
 - c. If a carriage control tape is mounted, release and slide the tape guide down to remove the tape.

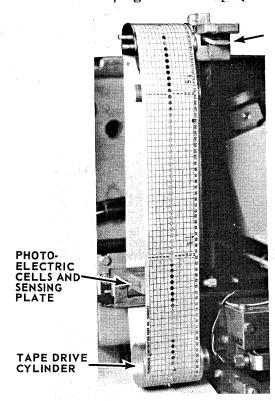


Figure 2-38. Carriage Control Tape Mechanism

d. Mount the required carriage control tape so that the pin holes are properly fitted on the pins of the tape drive cylinder.

- e. Guide the tape between the photo-electric cells and the sensing plate.
- f. Release the tape guide and slide it up until the tape has a reasonable amount of tension before locking the guide into position.
- g. Set the line-selection knob to either the 6 or 8 position, as required.
- the first line of print and align the forms so that the first line is positioned at the print station (refer to paragraph 2-130).

TAPE AND FORMS REGISTRATION.

2-133. When the format tape and the forms are correctly registered, the print position of the heading of the form and the heading hole of the tape are reached at the same time. If they are slightly out of registration, the vertical form adjustment can be used to bring them into correct relative position. If the adjustment required is outside the range of the vertical form adjustment (as in the case of new forms), the printer is stopped and the operator registers the forms and format tape in the following manner:

- a. Press the SKIP TO HEADING switch.
- b. Set the 6/8 line-per-inch knob to position N.
- c. Position the form to the desired location with the manual paper advance knob. The form can be positioned to an infinite number of locations in either direction to register it with the tape.
- d. Set the 6/8 line-per-inch knob to the desired setting.

NOT READY CONDITIONS.

- 2-134. If the B 321 is in a Not Ready condition, press both the RESET switch and the START switch.
- 2-135. If the LP* PRINT CHECK system message is typed on the message printer, a print error has been detected on the previous line of print. Processing of the program using the line printer is continued only after the operator makes the printer ready.
- 2-136. As stated previously, there are several conditions that will cause the NOT READY indicator to light. These conditions, and the methods of correcting them, are discussed in the paragraphs that follow.
- 2-137. END OF PAPER INDICATOR LIT. If the END OF PAPER indicator lights, the printer will be placed in a Not Ready condition and the NOT READY indicator will light. When this condition arises, a few unprinted forms remain in the printer. These forms can be used up by pressing the END OF PAPER switch which will permit one line to be printed each time the switch is pressed. After the forms are exhausted, the operator should refer to paragraph 2-129 for the procedure on loading forms. After the forms are loaded, press RESET, then START to resume operation.
- 2-138. PRINT DRUM NOT IN POSITION. If the print drum is not placed in position and its locking screws tightened, the NOT READY indicator will light. To correct this condition, make certain the drum is in position and that both locking screws are tightened. After these actions are performed, press RESET, then START to resume operation.

2-139. LINE SELECTION KNOB IN N POSITION. If the line selection knob is left in the N position after forms are loaded, the NOT READY indicator will be lit. To correct this condition, place the knob in the desired position (6 or 8) press RESET, and then START.

2-140. PAPER SLEWS FOR MORE THAN ONE SECOND. The NOT READY indicator will light if paper slews for more than one second. To restart the operation, press RESET, then START.

2-141. STOP SWITCH PRESSED. If the STOP switch is pressed to stop the printer operation, the NOT READY indicator will light. To resume operation, press RESET, then START.

OPERATOR MAINTENANCE.

2-142. Among other operational duties, the operator is responsible for the following:

- a. Adjusting clearance when thickness of forms changes (no tools are required). This adjustment can be made within 30 seconds.
- b. Changing ribbons when required.
- c. Loading paper and adjusting tractors acceptably so that forms are held firmly in position.
- d. Preparing, loading, aligning vertical format tapes.
- e. Keeping height of forms in stacker to less than 15 inches.
- f. Cleaning the print drum in the following manner:

- 1) Remove the form supply from the printer.
- 2) Remove the ribbon from the printer (refer to paragraph 2-131, steps a through i).
- 3) Loosen the two knurled locking screws on the ends of the drum cover plate and remove the plate.
- 4) Use a typewriter brush to clean the print characters, turning the drum manually.
- 5) Using a vacuum cleaner, remove all dust from the print drum area.
- 6) Replace the print drum cover plate and tighten the two knurled locking screws.
- 7) Replace the ribbon as outlined in paragraph 2-131, steps j through x.
- 8) Insert the form back into the printer.
- g. Cleaning foreign material from any areas which might affect printer performance.
- h. Analyzing all stoppages to the point when maintenance panels must be opened.
- i. Notifying the field engineer of improper operation.

B 141 PAPER TAPE READER.

2-143. The B 141 Paper Tape Reader (figure 2-39) is capable of reading punched paper tape at speeds of 1000 characters-per-second. If metalized Mylar* or fan-

^{*} Registered trademark DuPont Corporation.

fold tape is to be read, the maximum rate is 500 characters-per-second. The B 141 can accommodate 5, 6, 7, or 8 channel tape, as selected by the operator. Optional code translation facilities are available if required. Tape guides provide positive detent action to handle 11/16, 7/8, and 1-inch tape interchangeably. Beginning and end-of-tape are detected by adhesive opaque strips on the tape being read. Tape reels can be either 5.5 or 7 inches in diameter storing a maximum of approximately 38, 500 or 77,000 BCL characters respectively. The continuously read contents of a full 7-inch reel (700 ft.) may be read in approximately 80 seconds.

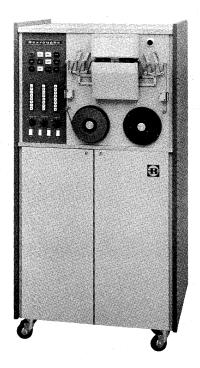


Figure 2-39. B 141 Paper Tape Reader

NOTE

Each B 141 is delivered with eight seven-inch reels, two five and one-half inch reels, ten five-inch wires, and ten bottle (Jack) plugs for use with the Channel Select Plugboard.

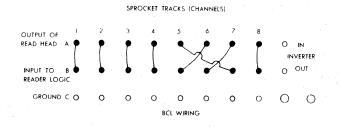
2-144. The B 141 is also capable of checking a tape for parity errors as an on-line of off-line operation. In the off-line mode, the B 141 will stop upon detection of a parity error.

FUNCTIONAL CHARACTERISTICS.

2-145. Start time for the paper tape reader is 5 ms. or less. Start time (when using 19 character-per-inch tape) is defined as the duration from the moment a start signal is received until the next character is read. The paper tape reader requires 20 ms. stop stabilization time prior to executing another instruction. When reading paper tape or Mylar tape punched 10 characters- per-inch at speeds up to 1000 characters-per-second, the B 141 will stop in position to read the next character. A minimum of four feet of tape leader is required with reeling. For strip reading, a one-foot leader is required. If a broken tape condition occurs, the tape reel motors are shut off automatically.

CHANNEL SELECT PLUGBOARD.

2-146. A channel select plugboard is provided for interchanging channels to any format required. This action changes the bit configuration from paper tape to an interchanged bit configuration in memory. (All codes other than BCL will be converted to internal code as though it were BCL code. A direct image is not placed in memory). Paper tape with even parity can be accommodated by inverting one channel. All unused channels must be connected to the corresponding C channel. Figure 2-40 illustrates the channel select plugboard BCL teletype wiring configuration. The Output read-head hub is wired to the Inverter "In" hub and the Inverted "Out" hub is wired to the Input Reader Logic.



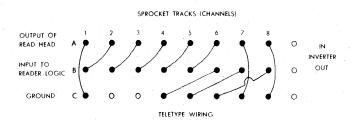


Figure 2-40. Channel Selector Plugboard Wiring

B 142 INPUT CODE TRANSLATOR.

2-147. The B 142 Input Code Translator, which is an optional feature, permits translation of 5, 6, 7, or 8-level codes to BCL. Any one of 256 possible paper tape codes can be translated to any one of the 64 BCL characters. The code translator is located in the paper tape reader cabinet. The following describes the plugboard layout (figure 2-41).

a. Exits 1. The exit hubs represent data as received from the paper tape channel select plugboard and consists of 256 possible configurations. Column numbers are the decimal equivalent of the binary numbers represented by the input to reader logic hubs (B) 1 to 4 of the channel select plugboard. An example of this would be:

Channel 1 2 3 4

Binary Equivalent (1) (2) (4) (8)

Input to Reader Logic (B) 0 1 0 1 = column 10

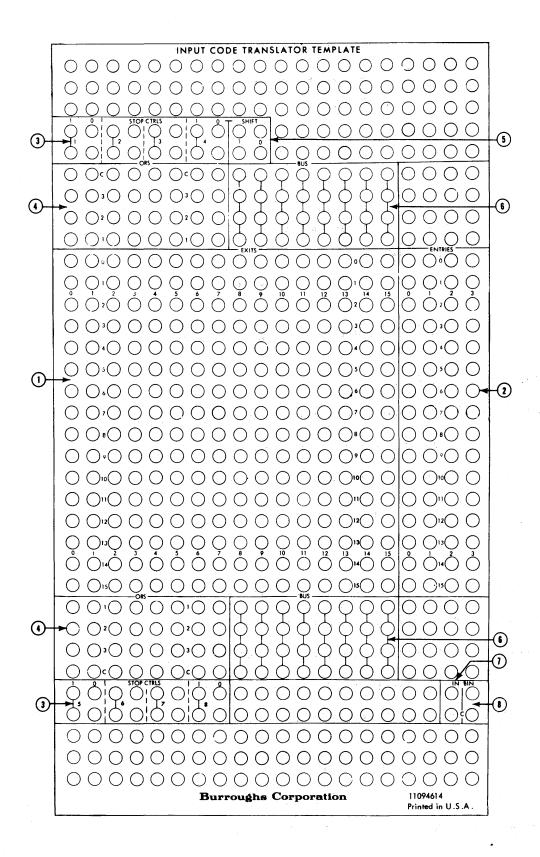


Figure 2-41. Plugboard Layout

Row numbers are the decimal equivalent of the binary numbers represented by the input-to-reader logic hubs (b) 5 to 8 of the channel select plugboard. An example of this would be:

Channel 5 6 7 8

Binary Equivalent (1) (2) (4) (8)

Input to Reader Logic (B) 0 1 1 1 = row 14

- b. Entries 2 . The entry hubs represent data consisting of the possible 64 BCL combinations. Column numbers are the decimal equivalents of the binary numbers represented by the A and B bits of the BCL code (AB = 0, 1, 2, and 3). An A and B bit would represent column 3. To illustrate:
- - c. Stop Controls 3. There are eight sets of stop control hubs. To designate a stop code, an exit hub is wired to the input of a stop control. Only one exit can be wired to an entry hub. Any exit code not wired is deleted from the input data stream.
 - d. Shift Codes 5. The shift code is designated by wiring an exit to the upper shift code input. An unshift code is designated by wiring an exit hub to the lower shift code input. The shift code is made functional by connecting two shift output hubs together. When in the shift case, channel 8 (channel select plugboard) is set to one. When in the unshift case, channel 8 is set to zero.

Teletype code can be converted to a single case code via the teletype switch (no translation).

- e. BCL/Binary Input (7) and (8). To enable the translator, the two enable hubs must be connected together. If they are not connected, the translator is bypassed and normal BCL paper tape code to BCL code conversion takes place. When the binary hubs are connected together to internal code translation a BCL will be performed from the image sent from the channel select plugboard.
- f. OR Hubs 4. The OR hubs permit up to three different codes, designated by the exit hubs, to initiate one common code or action. The following combinations of OR hubs and BUS hubs are permitted:
 - 1) Up to nine exits can be connected to a single entry by using three OR elements and one BUS element.
 - 2) Up to nine exits can be connected to a single stop control by using three OR elements and one BUS element.
 - 3) Up to six exits can be connected to a single stop control by using two OR elements (no BUS required).
- g. BUS Hubs (6). There are eight sets of BUS hubs. Each set permits multiple connections to a single hub. The permissible combinations of BUS hubs and OR hubs are the same as those outlined in step f above.

CONTROL PANEL.

2-148. The B 141 Paper Tape Reader control panel (figure 2-42) contains switches and indicators for operation of the unit and for the indication of errors. The function of each of these elements is contained in table 2-8.

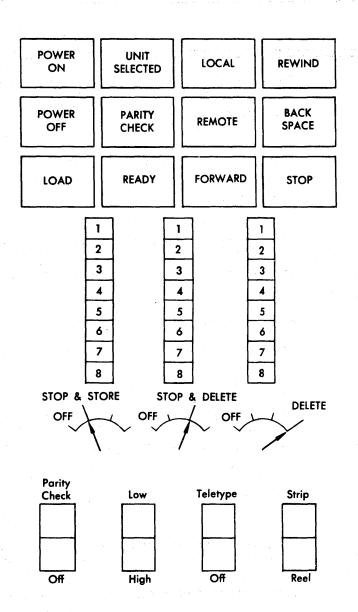


Figure 2-42. B 141 Paper Tape Reader Control Panel

Table 2-8

B 141 Paper Tape Reader Control Panel Switches and Indicators

Switch/Indicator	Function	
POWER ON	This switch/indicator lights when pressed, indicating	
	that power is applied to the unit.	
UNIT SELECTED	This indicator lights when the B 141 is selected by the	
	operator.	
LOCAL	This switch places the B 141 in a local condition and	
	the LOCAL indicator will also light.	
REWIND	When pressed, the paper tape moves in the reverse direc-	
	tion until a beginning-of-tape condition is detected.	
	The tape will then stop. This switch is active only	
	when the unit is in a local state and the STRIP/REEL	
	switch is in the REEL position.	
POWER OFF	When pressed, this switch removes power from the unit.	
PARITY CHECK	This indicator lights when a parity error is detected.	
REMOTE	This switch/indicator lights when pressed indicating	
	that the unit is under control of the input/output	
	control unit.	

Table 2-8 (cont)

B 141 Paper Tape Reader Control Panel Switches and Indicators

Switch/Indicator	Function		
BACKSPACE	This switch moves the tape in a reverse direction to		
	the next control code, or beginning of tape. This		
	switch is active only when the unit is in a local		
	condition. The switch may also be used to check parity		
	off-line while rewinding tape.		
LOAD	This switch releases the brakes, allowing loading of		
	the paper tape. This switch is active only when the		
	unit is in the local condition.		
READY	When pressed, this switch sets the brakes and starts		
	the capstan rollers. The servos are also activated		
	when the STRIP/REEL switch is in the REEL position		
	and the tape properly positioned.		
FORWARD	This switch moves the tape forward to the next control		
	code or to the end-of-tape.		
STOP	The operation of the B 141 will stop when this switch		
	is pressed.		
CONTROL CODE	A set of three switches that provide manual selection		
	of three different control codes. Any combination of		

Table 2-8 (cont)

B 141 Paper Tape Reader Control Panel Switches and Indicators

Switch/Indicator	Function State Control Control
	control codes may be used concurrently. The control code
the second second second	characters may be stored or not stored, as selected. The
	button positions correspond to the B row of the channel
	select plugboard. A four position switch for each code
	set determines the action taken when the control code
	is detected. The Control Code switches are active in either the local or remote condition. The four positions
	of the switch are: OFF, STOP & STORE, STOP & DELETE, and DELETE.
PARITY ON-OFF	When in the ON position, parity checking is enabled.
	The parity error level is reset when in the OFF position.
HIGH-LOW	In the HIGH position, high speed operation is selected
	(1000 CPS); in the LOW position, low speed operation is selected (500 CPS).
TELETYPE ON-OFF	When in the ON position, a 6th level is added to the teletype code.
STRIP/REEL	In the STRIP position, the reel motors are deactivated and the NO TAPE switch is bypassed. In the REEL position,
and the second s	the reel motors are activated and the NO TAPE switch
	is activated.

Table 2-8 (cont)

B 141 Paper Tape Reader Control Panel Switches and Indicators

Switch/Indicator	Function	
NO TAPE	This switch is activated when the STRIP-REEL switch is in the REEL position and there is no tape loaded or the tape breaks. Activation of this switch deactivates the reel motors.	
GUIDE SELECTION SWITCH	This switch is located to the right of the read mech- anism. The switch adjusts the paper guiding to the width of the tape being used.	

OPERATING PROCEDURES.

2-149. Paper tape on reels, in strips, or fanfolded may be read by the B i41
Paper Tape Reader. The reel tape leader must be long enough (approximately four feet) to reach from one reel to the other and still allow adequate slack for full release of the arm assemblies. To prepare the B 141 for operation, proceed as follows:

- a. Press POWER ON.
- b. Press LOCAL.
- c. Set the HIGH-LOW switch to the desired speed. (LOW might be preferred for moving tape less than its full length under LOCAL control. LOW must be used for Mylar or fanfold tape.)

- d. Lift both arm assemblies until they latch into position.
- e. Pull all four adjustable tape guides out to the full one inch width.
- f. Mount the reel of tape to be read on the left hub with the reel flange toward the reader and the tape coming off the lower left of the reel.

 When the grooves on the reel are lined up with the detents on the hub, the reel can be pressed firmly onto the hub as far as it will go.

NOTE

Steps g through 1 can be bypassed when using strip or fanfold tape.

- q. Mount an empty reel on the right hub.
- h. Thread the tape around the outside of the left guidepost, through the E.O.T. sensing device, horizontally between the tape guide rollers on the left, through the read mechanism, between the tape guide rollers on the right, through the B.O.T. sensing device, and around the right guidepost (see figure 2-43).
- i. The tape then goes to the lower right of the right tape reel where the end can be crimped for insertion into the reel slot. The left reel may be turned by hand to provide sufficient slack tape.

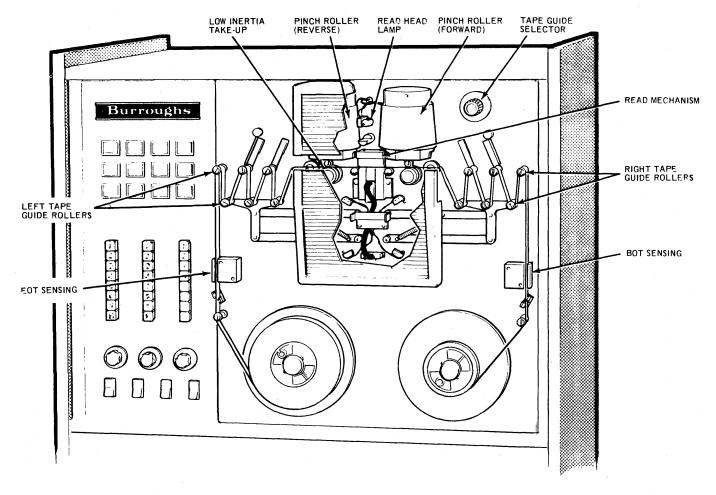


Figure 2-43. Threaded Paper Tape

- j. Before proceeding any further, the tape should be checked for proper mounting. The sprocket holes divide the tape into two unequal parts. The wide side of the tape, except when using teletype tape, should be toward the operator when the tape is mounted.
- k. Turn the right reel clockwise by hand approximately four revolutions to take up about two feet of tape (the beginning-of-tape marker must be below the B.O.T. sensing device).

- Press the right and left arm latch release buttons to release the arms.
 The arms will drop part way.
- m. If strip or fanfold tape is being used, it must be threaded between the left spools, the read assembly, and the right spools. Make certain that all information to be read is to the left of the read assembly.
- n. Set the tape guide selection switch to the desired position.
- o. Set the four adjustable tape guides to their proper position (see figure 2-44) and press READY. (When using reels and the loading operation is performed properly, the arms will drop into operating position.)
- p. Set the proper control code buttons and select the desired switch setting.
- q. Check the channel select plugboard wiring.
- r. The reader is now ready for operation from the control panel.

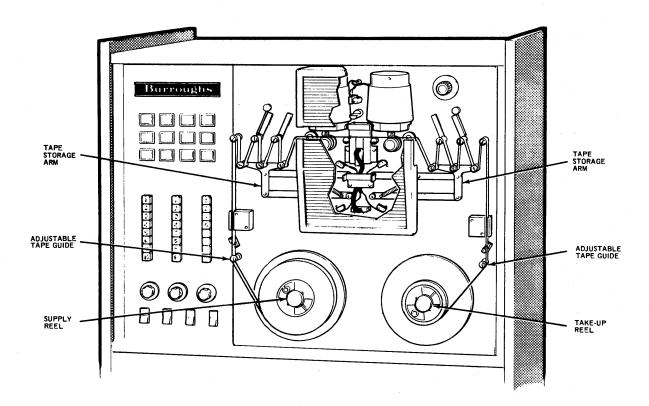


Figure 2-44. Paper Tape in Operating Position

STOPPING TAPE MOVEMENT.

2-150. With the reader in a local condition, the tape can be moved forward, backward, or rewound if desired. Pressing the STOP switch will discontinue tape movement in either direction when the unit is in a local status.

UNLOADING PAPER TAPE.

- 2-151. After a reel of paper tape has been read, it can be removed from the B 141 in the following manner:
 - a. Press the LOCAL switch.
 - b. If necessary to rewind, press REWIND and the tape will rewind until the B.O.T. marker is sensed or until tape runs off the right-hand reel.
 - c. Raise and latch the right and left arm assemblies.

- d. Press the LOAD switch to release the brake.
- e. Manually wind the remaining tape onto the supply reel.
- f. Remove the supply reel from the hub.

APPLYING ADHESIVE OPAQUE STRIPS.

- 2-152. For programmatic rewind sensing, a 12-inch opaque strip must be attached at least 24 inches from the end of information on the tape. The strip may be placed on the tape prior to mounting, or in the following manner if the tape is mounted:
 - a. Read the tape with the unit in a local condition.
 - b. When the end of the information is reached, press the STOP switch.
 - c. Place the opaque strip on the top side of the tape, between the E.O.T. sensing device and the supply reel. This spot should be at least 18 inches from the last row of data punches in the tape.
- 2-153. For an automatic stop of a manual or programed rewind, a 12-inch opaque strip must be attached at least 24 inches from the beginning of information on the tape. This strip can be placed on the tape prior to mounting the tape, or in the following manner if the tape is mounted:
 - a. Press the POWER ON switch.
 - b. Press the READY switch.
 - c. Make certain that the first bit of information is to the left of the read assembly housing.

d. Place a strip of opaque adhesive tape at least 12 inches long below and as close as possible to the B.O.T. sensing device. The opaque strip must be placed on the top side of the tape.

NOTE

Care must be observed when placing the opaque strip on the tape so that the data channels are not partially covered. The end of the opaque strip (either beginning or end of tape) must be between the holes as illustrated in figure 2-45.

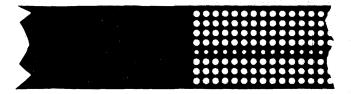


Figure 2-45. Location of Opaque Strip on Paper Tape

2-154. Paper tape with adhesive opaque strips on both ends can be wound from the take-up reel to the supply reel as an on-line or off-line operation.

OPERATOR MAINTENANCE.

- 2-155. In addition to his direct operating responsibility, the operator is required to perform the following maintenance:
 - a. Inspect tape reels for acceptability prior to loading.
 - b. Load and unload tapes in an acceptable manner.
 - c. Analyzes all equipment stops and takes corrective action to the point of improper unit operation.

- d. On an error, take corrective action to the point of improper unit operation.
- e. Splice paper tape when needed.
- f. Assure that paper tape reels are stored in a proper and consistent manner.
- g. Assure cleanliness of the unit between periods of preventive maintenance by the field engineer. To keep the paper tape reader within performance specifications, the operator must wipe off the following areas with a lint-free cloth and an acceptable solvent on a daily basis, paying particular attention to film deposited by oiled paper:
 - 1) Pinch rollers and capstan.
 - 2) Read head lamps.
 - 3) Entire tape path (guides, rollers, etc.).
 - 4) End-of-Tape and Beginning-of-Tape sensors.

NOTE

Prior to mounting each reel of tape, it is a good practice to manually lift the head brake (flat plate under which the tape passes) and blow away any particles which may have gathered from previous reels.

- h. Maintain a record (or log) of all unit malfunctions.
- i. Notify the field engineer of improper operation.

B 341 PAPER TAPE PUNCH.

2-156. The B 341 Paper Tape Punch (figure 2-46) is basically a teletype paper tape punch which is capable of punching standard paper tape format in BCL code. The B 341 will punch 5, 6, 7, or 8-level tape at a minimum rate of 100 characters-persecond, ten characters-per-inch. Standard tape widths of 11/16, 7/8 and 1-inch may be punched, as selected by the operator. Either oiled paper tape, vulcanized fiber, dry paper tape, metalized or laminated Mylar paper tape may be used on the B 341 for punching information.

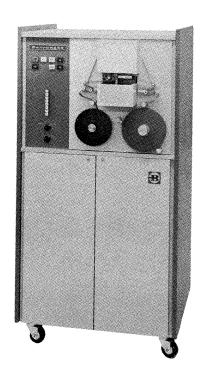


Figure 2-46. B 341 Paper Tape Punch

2-157. The maximum size supply reel that can be placed on the B 341 is eight inches in diameter. The reel hub measures two inches in diameter. The punched tape is wound onto a five and one-half or seven-inch diameter take-up reel. It is not necessary to have the take-up reel when punching tape. The end-of-tape is indicated by the LOW TAPE indicator when approximately 35 feet of tape remain on the supply reel.

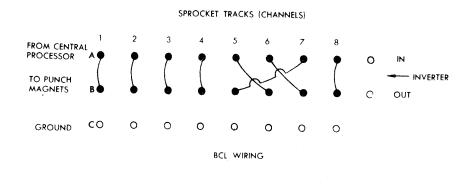
FUNCTIONAL CHARACTERISTICS.

- 2-158. A method is provided for the operator, through the channel select plugboard wiring, to interchange any of the 5, 6, 7, or 8 channels that might be desired. Undesignated channels in the channel select plugboard must be wired to the ground hubs so that they are not punched or sensed as controls for the B 341. Up to 64 different alphanumeric characters and special characters can be punched.
- 2-159. The output record length of alpha information is determined by a specific control code in the data stream which is manually designated by a switch setting on the B 341 control panel or the wiring of the output code translator. The code can be punched or suppressed as indicated by the control code switch. BCL codes are transferred from the B 5500 to the Input/Output channel one character at a time, until eight characters are accumulated and then the information is transferred to the B 341. The length of a write in binary is determined by the number of words specified in the B 5500 program.
- 2-160. The code translator permits the translation of BCL to any single frame code by means of a removable plugboard. Teletype codes can also be translated. Teletype is a double case code (figure/letters shift) with several special requirements. To accommodate the shift used by teletype code, each of the allowable characters is designated as a figure or a letter code. Whenever a character is of a different case (figure/letter) than its predecessor, the appropriate shift code must be punched prior to the character. The two shift codes used for teletype tape can be designated by code translator plugboard wiring. The special requirements used for teletype codes are:
 - a. Automatic generation of codes for the Figures shift after SPACE, TAB, LINE FEED, and CARRIAGE RETURN.

b. Automatic generation of codes for the Carriage Return and Line Feed only must be generated immediately following all end-of-line codes.

CHANNEL SELECT PLUGBOARD.

2-161. This plugboard is provided mainly for purposes not requiring a translator. It is possible for the operator to select any of the 6 BCL internal code levels and interchange them to any of the 8 possible paper tape channels. Paper tape with even parity can be accommodated by inverting one channel. All unused channels must be connected to the corresponding C channel. Figure 2-47 illustrates the channel select plugboard BCL and teletype wiring configuration.



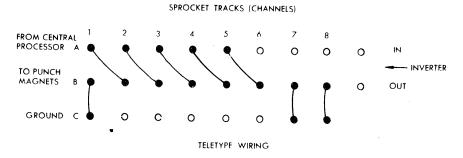


Figure 2-47. Channel Selector Plugboard

CODE TRANSLATOR.

2-162. The code translator, which is an optional feature, permits translation of BCL code to any 5, 6, 7, or 8 channel code. Up to 64 codes can be translated. The code translator is located in the paper tape punch cabinet. Character (code) flow is from the input/output control unit to the translator, to the channel select plugboard, then to the paper tape punch. The following describes the plugboard layout (figure 2-48).

a. Exits 1. The exit hubs represent data sent from the B 5500 program to the translator plugboard in any of the 64 BCL characters. Assume the following bit configuration:

Binary Equivalent 1 2 4 8 A B

Bits 0 1 1 0 1 1 = BCL character W

Bits A and B identify the exit columns 0-3. The example above shows column 3.

Bits 1, 2, 4, and 8 identify the exit rows 0-15. The example above shows row 6.

Therefore, the BCL character W would be represented by the hub located in column 3, row 6.

b. Entries 2. The entry hubs, when impulsed, generate the selected 5-, 6-, 7-, or 8-channel output character to be punched via the channel select plugboard. There are 256 possible combinations. The code that is punched is determined by column and row. The decimal value of the column and row is converted to a binary value and emitted from channel A or the channel select plugboard as follows:

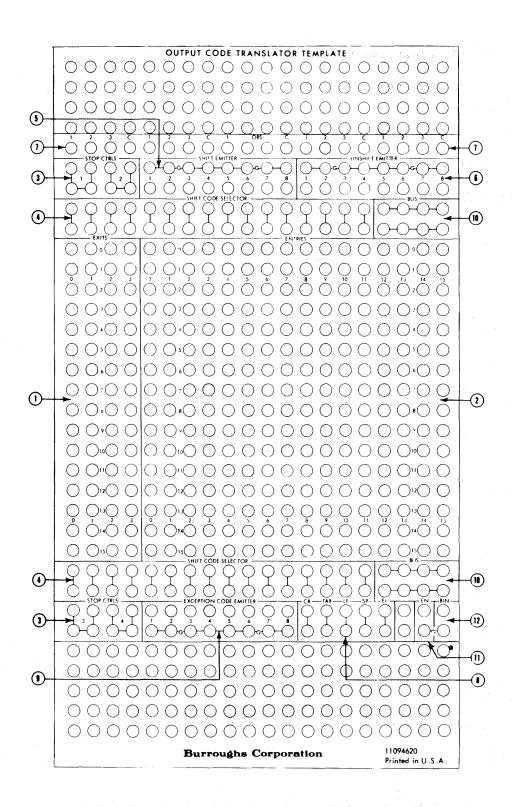


Figure 2-48. Plugboard Layout

Channe 1	2	-4 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -
Binary Equivalent	(1) (2) (4)	(8)
Output from Translator (A)	0 1 0	

2) The binary value of the row is emitted from A channels 5-8 of the channel select plugboard. For example, row 7 would punch:

1) The binary value of the column is emitted from A channels 1-4 of

the channel select plugboard. For example, column 10 would punch:

Channel 5 6 7 8

Binary Equivalent (1) (2) (4) (8)

Output from Translator (A) 1 1 0

3) Therefore, if a column 10 of row 7 was impulsed, the following code would be emitted from the A channels.

 Channel
 1
 2
 3
 4
 5
 6
 7
 8

 Output from Translator (A)
 0
 1
 0
 1
 1
 1
 1
 0

- c. Stop Controls 3. There are four sets of stop control hubs. To designate a stop code, an exit hub is wired to a stop control hub.

 If the stop code is to be stored, a stop control hub, impulsed by a connected exit hub, is connected to the desired entry hub. If an entry hub is not connected to the stop control hub, the stop code will not be punched.
- d. Shift Codes (4). These hubs are required when the output data requires shift and unshift codes. These hubs are connected to exit hubs to deter-

mine which codes require a shift code (maximum 32). Whenever a change is required from an unshift code to a shift code or visa versa, as selected on these hubs, the appropriate shift or unshift code is first punched and then the character is punched.

e. Shift Emitter 5 and 6. Any 5-, 6-, 7-, or 8-bit code can be selected as the shift code by connecting the channel requiring a bit to the hub located directly above the designated channel. All channels unconnected will be considered as a zero (no bit). This code will be punched when required, as designated by the shift code selection.

Unshift Emitter -- Any 5-, 6-, 7-, or 8-bit code can be selected as the unshift code by selecting the channel requiring a bit to the hub located directly above the designated channel. All channels unconnected will be considered as a zero (no bit). This code will be punched when required, as designated by the unselected codes; that is, those not connected to the shift code selector hubs.

- f. OR Hubs 7. The OR hubs permit up to three different codes, designated by the exit hubs, to initiate one common code or action. The following combinations of OR hubs and BUS hubs are permitted:
 - Up to nine exits can be connected to a single entry by using three
 OR elements and one BUS element.
 - 2) Up to nine exits can be connected to a single stop control by using three OR elements and one BUS element.
 - 3) Up to nine exits can be connected to a single stop control by using three OR elements (no BUS required).

- g. Exception Codes 8. These hubs are provided to handle special teletype code set problems. These codes are CR, TAB, LF, SP, and EL. These codes are connected from the exit hubs and to the selected entry hubs. Since these codes will not be selected as shift codes, they will be considered as unshift codes. The EL or end-of-line will initiate the punching of the exception code before the actual code is punched. The exception codes are set up in the exception code emitter.
- h. Exception Code Emitter 9. Any 5-, 6-, 7-, or 8-bit code can be selected as this code by connecting the channel requiring a bit to the hub located directly above the designated channel. All channels unconnected will be considered as a zero (no bit). This code will be punched when required by the designated EL code.
- i. BUS Hubs 10 . There are two sets of BUS hubs. Each set permits connection to a single hub. The permissible combination of BUS hubs and OR hubs are the same as those outlined in step f above.
- j. Enable Hubs (11) . These hubs must be connected to activate the translator. If not connected, the normal translation of BCL code to BCL paper tape code will take place.
- k. Binary Hubs (12). When these hubs are connected together, only an internal to BCL code conversion will take place. All other translation in the B 341 will be bypassed.

CONTROL PANEL.

2-163. The B 341 Paper Tape Punch control panel (figure 2-49), contains the switches and indicators for operation of the unit and for error indication. The function of each element is provided in table 2-9.

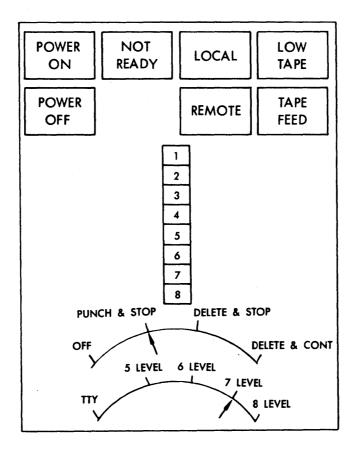


Figure 2-49. B 341 Paper Tape Punch Control Panel

Table 2-9

B 341 Paper Tape Punch Control Panel
Switches and Indicators

Switch/Indicator	Function	
POWER ON	This switch/indicator lights when pressed, indicating that power is applied to the unit.	
LOCAL	This switch/indicator places the B 341 in a local condition and is not available to the input/output control unit.	

Table 2-9 (cont) B 341 Paper Tape Punch Control Panel Switches and Indicators

Switch/Indicator	Function
LOW TAPE	This indicator will light when 35 feet of tape, or less, remains on the supply reel.
POWER OFF	This switch removes power from the unit.
TAPE FEED	This switch feeds tape with all holes punched. The switch is active when the LOCAL switch is activated. Tape feed rate is 100 characters per second.
REMOTE	This switch/indicator lights when pressed, indicating that the unit is under control of the input/output control unit.
CONTROL CODE	This switch allows the operator to designate a control code. The code may or may not be punched. The switch
	is active in REMOTE or LOCAL and has four positions which determine the action taken when a control code is detected. The four positions of the switch are: OFF, PUNCH & STOP, DELETE & STOP, and DELETE & CONT.
LEVEL DESIGNATION	This switch is used to select the number of channels and type of paper tape to be used.

NOTE

Each B 341 Paper Tape Punch is delivered with one 1000-foot roll of paper tape; eight seven-inch reels, two five and one-half inch reels, ten five-inch wires and ten bottle (Jack) plugs.

LOADING PAPER TAPE.

- 2-164. To load the punch unit with paper tape, proceed as follows:
 - a. Press the POWER OFF switch.
 - b. If there is still a small amount of tape remaining on the supply reel,
 lift the feed punch guide and remove the tape from the punch mechanism.
 - c. Remove the remaining tape by sliding it off the supply reel.
 - d. Slip a new roll of tape over the hub so that the tape feeds off the top of the reel from the left side.
 - e. Tear off and discard the first few inches of tape that contain any remnants of dried glue.
 - f. Mount an empty reel on the left hub, with the flanges toward the panel.

 The reel will slide on the hub with a moderate amount of pressure when
 the grooves on the reel are aligned with the detents on the hub.
 - q. Press the POWER ON switch.
 - h. Press the LOCAL switch.
 - i. Unwind enough tape by turning the supply reel by hand.

- j. Set the Level Designation switch to the required position.
- k. Lead the tape below and to the right of the guidepost above the supply reel, to the right and past the lower right-hand guide of the arm assembly, around and to the left of the center left guide and under the uppermost right-hand guidepost (refer to figure 2-50).

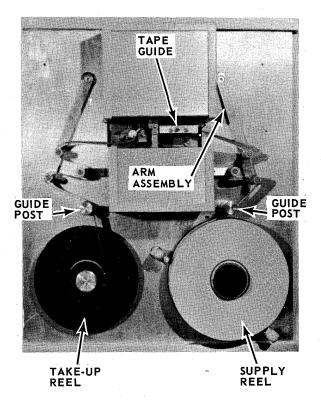


Figure 2-50. B 341 Paper Tape Punch Transport

- 1. Insert the end of the tape into the tape guide as far as it will go.
- m. Lower the guide over the pin feed and hold down the TAPE FEED switch.
- n. Continue feeding tape manually into the tape guide until the tape, with holes punched, feeds out of the left side of the punch assembly. The tape will advance as long as the TAPE FEED switch is held down. (Four feet of tape is needed for use of the reeling facilities and one foot for strip reading on the B 141 Paper Tape Reader.)

- o. When enough tape has been fed to reach the take-up reel, release the TAPE FEED switch.
- and over the top of the center guidepost, to the left and over the top of the lower guidepost of the arm assembly, and then to the right and over the top of the top of the lower most guidepost.
- q. If the take-up reel is to be used, lead the tape around the right side of the take-up reel.
- r. Fold the end of the tape and slide it into the reel slot.
- s. Turn the reel in a clockwise direction until the excess slack is taken up.
- t. Press the TAPE FEED switch for approximately four seconds to obtain the necessary amount of leader.
- u. Set up the desired control code designation and set the switch to the proper position.
- v. Provide or verify the channel select plugboard wiring.

UNLOADING TAPE.

- 2-165. To remove punched tape, proceed as follows:
 - a. Press the LOCAL switch.
 - b. Press the TAPE FEED switch to run out about four feet of tape for reeling, or one foot for strip feeding.

- c. Press the POWER OFF switch.
- d. Cut the tape on the left-hand side of the punch assembly, leaving a leader long enough for easy re-threading.
- e. Remove the take-up reel from the hub.

REWINDING TAPE.

2-166. Normally, the punched tape must be wound onto another reel before it can be used. This is necessary prior to the first time the tape is to be read. To rewind, the loaded reel may be placed on the right-hand side of the B 141 Paper Tape Reader and rewound onto the left-hand side as an off-line function. At the end of this operation, the tape will be in proper position to be read, and will have been checked for parity errors.

- 2-167. The paper tape punch is in a Not Ready condition when:
 - a. The LOCAL switch has been pressed.
 - b. Power is off.

CHAD RECEPTACLE.

2-168. The chad receptacle drawer, located below the punch assembly, catches the punched-out chads of paper. It should be emptied regularly to prevent jamming of the punch. To remove the receptacle, lift it gently and pull out. Never use force.

SPLICING PAPER TAPE.

2-169. Paper tape may be spliced with a good self-adhesive plastic base tape when it is necessary to add leaders, repair tears, etc. The recommended procedure is as follows:

- a. Overlap the two pieces of tape and cut through both pieces diagonally rather than straight.
- b. While holding both pieces of tape together, apply the adhesive tape to both surfaces. The adhesive tape should be applied diagonally since the punch brake has a "floating tension" which will allow it to accommodate a thicknesses of tape slightly above the normal paper tape thickness plus two thicknesses of plastic base adhesive tape. If the adhesive tape is applied straight across the tape, the splice will encounter the brake at its widest part; while if the adhesive tape is applied diagonally, the leading edge will allow the brake to adjust to the additional thickness before the full width is encountered.
- c. Trim the excess splicing tape from the edges of the paper tape. It is suggested that slightly more than the excess be cut off, leaving a slight concave effect on each side of the paper tape. Difficulty may be experienced with paper tape jumping out of the tape guides if it is not trimmed properly.
- 2-170. Using this method should not cause difficulty when splicing an area of paper tape that does not contain relevant information. For those areas that do contain relevant information, the following general procedures for splicing are suggested:
 - a. If splicing must be performed, extreme care should be taken to ensure that the splicing procedure is performed properly. The slightest space between splice ends, or failure to completely punch out the information area, can cause parity checks or erroneous information to be read.

- necessary to make more than one pass, it is advisable that a new tape be created.
- c. When a pass is made after splicing, the spliced information area should not be stopped on the feed rollers. Stopping the splice on the feed rollers could cause subsequent read errors.
- 2-171. From the preceding, it is evident that precautions must be taken if splicing is required, and that splicing should only be done when absolutely necessary.

OPERATOR MAINTENANCE.

- 2-172. In addition to his direct operating responsibilities, the operator is required to perform the following maintenance on the B 341 Paper Tape Punch:
 - a. Inspect tape reels for acceptability prior to loading.
 - b. Load and unload tapes in an acceptable manner.
 - c. Analyze all equipment stops and take corrective action to the point of improper unit operation.
 - d. On an error, take corrective action to the point of improper unit operation.
 - e. Splice paper tape and leaders when required.
 - f. Assure that paper tape reels are stored in a proper and consistent manner.

- g. Assure the cleanliness of the unit between periods of preventive maintenance by the field engineer. To keep the paper tape punch within performance specifications, the operator must wipe off the following areas with a lint-free cloth and acceptable solvent on a daily basis, paying particular attention to film deposited by oiled paper tape:
 - 1) Punch head area.
 - 2) Entire tape path (quides, rollers, etc.).
 - 3) Low tape detection photo cell and light source.
- h. Empty the chad box.
- i. Keep a record (or log) of all unit malfunctions.
- j. Notify the field engineer of improper operation.

B 421/B 422/B 423/B 424/B 425 MAGNETIC TAPE UNITS.

2-173. The B 421/B 422/B 423/B 424 and the B 425 Magnetic Tape Units are physically the same and with the exception of different tape densities, they are functionally identical. However, they cannot be intermixed on a B 5500 system. Since the five units differ only in available densities, the B 422 Magnetic Tape Unit only will be described in this manual.

B 422 MAGNETIC TAPE UNIT.

2-174. The B 5500 system may contain up to sixteen B 422 Magnetic Tape Units (figure 2-51) that are capable of reading, writing, backspacing, rewinding, and erasing magnetic tape. All operations of the tape unit are controlled by the B 5500 system I/O control unit. Magnetic tape used on the B 422 is one-half inch wide, two mils (0.002 inch) thick, and approximately 2400 feet in length. The base material of the tape is Mylar.

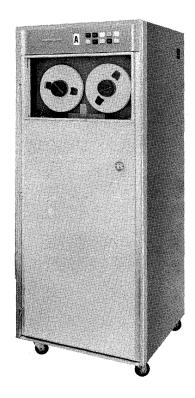


Figure 2-51. B 422 Magnetic Tape Unit

2-175. Each B 422 Magnetic Tape Unit can read in a forward or backward direction, but can write in a forward direction only. Each tape reel can contain up to 2400 feet of magnetic tape and can store over 15,000,000 characters when high density is selected. The related speed and density capabilities of magnetic tape read or write on the B 422 are:

- a. 66,660 characters per second at a high density of 555.5 characters per inch (66 KC/sec).
- b. 24,000 characters per second at a low density of 200 characters per in (24 KC/sec).

FUNCTIONAL CHARACTERISTICS.

2-176. The packing density is selected manually by the operator via a switch-indicator for HIGH (66 KC) and an indicator for LOW (24 KC) which are located on

each B 422 Magnetic Tape Unit control panel. Regardless of the recording density, information recorded on magnetic tape is transferred under control of the B 5500 system through an I/O control unit to and from each magnetic tape unit. This transfer of information through an I/O control unit occurs until a specified number of words are passed, a group mark is encountered in memory, or an interrecord gap on tape creates an end-of-information signal. This signal is used by the B 5500 system to terminate the operation. When a magnetic tape read or write is completed, the I/O control unit is released to perform the next input/output operation that is designated in the Master Control Program (MCP).

- 2-177. Magnetic tape may be read or written in alpha or binary mode as specified in the B 5500 program. Alpha (BCL) information has an even parity for each character and binary data has an odd parity for each digit. An even-parity longitudinal check is automatically written for each track of an entire record.
- 2-178. Aluminized plastic strips are used to specify the physical beginning and ending of each magnetic tape. These reflective strips are used for automatic positioning at the beginning-of-tape and provide a physical end-of-tape signal to the Master Control Program (MCP).
- 2-179. Mylar latch-leaders are used to provide easier loading and unloading of the tape reels. In addition, a write ring is used on the reel when records are to be written. This write ring is removed as a file protection device for magnetic tape records that should not be destroyed.
- 2-180. Start time for the B 422 Magnetic Tape Unit requires not more than 6.6 milliseconds to reach and maintain the velocity of 120 inches-per-second. Coin-

cidental with the start time, the required distance for acceleration and stabilization is not more than 0.342 inch of magnetic tape. Stop time to completely decelerate the tape velocity is not more than 6.0 milliseconds and the maximum tape travel distance is not more than 0.433 inch.

CONTROL PANEL.

2-181. The B 422 Magnetic Tape Unit control panel (figure 2-52) contains switches and indicators for operation of the equipment. The function of these switches and indicators is contained in table 2-10.

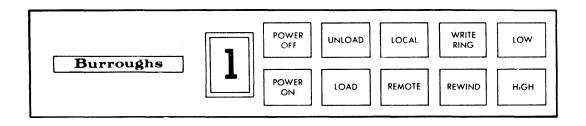


Figure 2-52. B 422 Magnetic Tape Unit Control Panel

Table 2-10

B 422 Magnetic Tape Unit Control Panel
Switches and Indicators

Switch/Indicator	Function	
POWER OFF	Remove power from the B 422.	
UNLOAD	Positions tape to the point where the latch leader is on the file reel-side of the tape latch, thereby permitting the operator to unload the tape.	

Table 2-10 (cont)

B 422 Magnetic Tape Unit Control Panel Switches and Indicators

Switch/Indicator	Function
LOCAL	Removes the tape unit from control of the input/output
	control unit. The switch lights when pressed.
WRITE RING	Signals that the file reel has a write ring installed
	and that writing can be performed on the tape.
LOW	Selects the 24,000 character-per-second reading and
	writing rate (200 character-per-inch density) when
	lit. Pressing this switch causes the density to
	alternate between low and high.
HIGH	Selects the 66,660 character-per-second reading and
	writing rate (555.5 character-per-inch density) when
	lit.
REWIND	Rewinds the tape to the beginning-of-tape mark. Rewind
	speed is 320 inches-per-second. This switch is active
	only when the unit is in a LOCAL condition.
REMOTE	Places the tape unit under control of the Input/Output
	control unit. The switch lights when pressed.
LOAD	Causes tape to be drawn into the vacuum columns and
	moves the tape so that the beginning-of-tape is at the
	read-write head.

Table 2-10 (cont)

B 422 Magnetic Tape Unit Control Panel Switches and Indicators

Switch/Indicator	Fu	unction ••••••••••••••••••••••••••••••••••••
POWER ON	Applies power to the unit.	The switch lights when
	pressed.	

LOADING THE SUPPLY REEL.

2-182. The procedure for loading the supply reel is as follows:

- If the tape unit power supply is not on, press the POWER ON switch.
- b. Lower the glass door of the tape compartment.
- and that the latch leader, with its female connector, is located above and locked by the tape latch (or tape clamp, figure 2-53). (If the take-up reel is not mounted, or the leader is not threaded, refer to paragraph 2-184 for these loading procedures.)

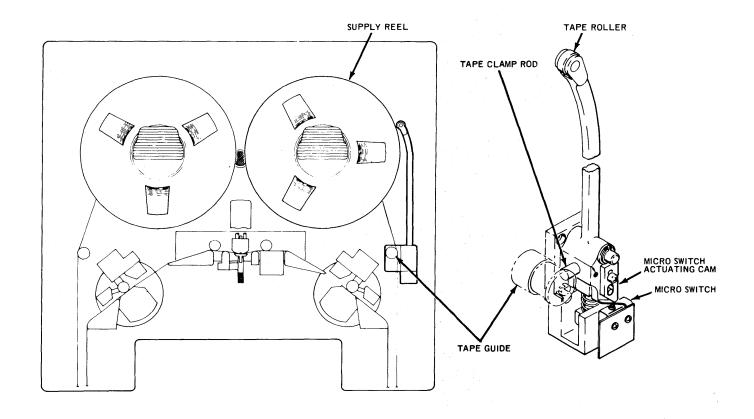


Figure 2-53. Tape Follower Arm and Clamp

d. Before mounting the supply reel on the right hand hub, check it for a write ring (figure 2-54). If the reel contains an input file, it should not contain a write ring. If the reel is for an output file, a write ring must be inserted in the reel to permit information to be written on the tape.

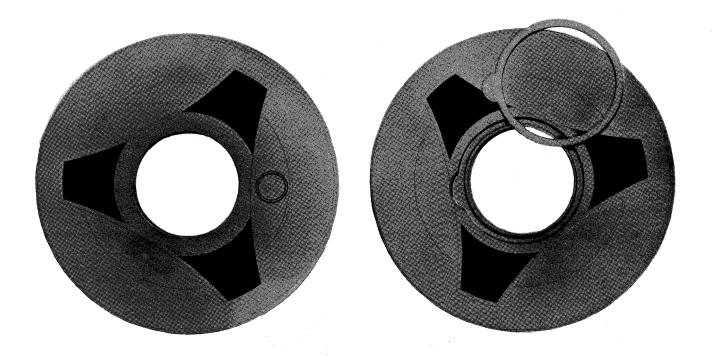


Figure 2-54. Magnetic Tape Reel with Write Ring

- e. Mount the reel with the male leader in a position to feed off the top and to the right in a clockwise direction.
- f. Press the reel solidly onto the hub with even pressure on opposite sides of the reel and close the reel hub pressure lock (figure 2-55).

 If the reel is not mounted properly, damage to the tape may result, or read/write errors may occur.

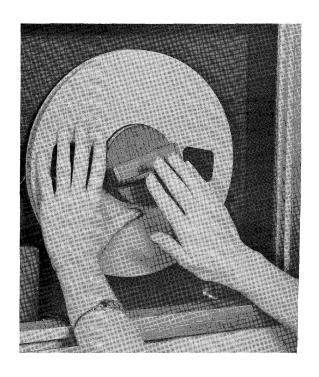


Figure 2-55. Mounting the Supply Reel

g. Connect the tape leaders (figure 2-56) and release the tape-leader latch (or tape clamp). (If the tape on the reel does not have a leader attached, refer to paragraph 2-188.)

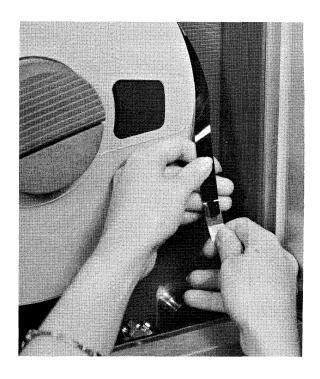


Figure 2-56. Connecting the Tape Leader

- h. Raise (close) the tape compartment door.
- i. Press the LOAD switch which draws the tape into the vacuum columns and positions the tape at the beginning-of-tape marker. If the tape reel on the supply hub contains a write ring, the WRITE RING indicator is lit.

NOTE

Observe the supply reel at this time to determine if it is mounted properly. If it is not, it will wobble when it rotates.

- j. Check the indicators to verify that the correct packing density (high or low) is selected. If the wrong density is selected, press the HIGH switch-indicator and the correct density will be selected. (Depression of the HIGH switch-indicator automatically changes low to high or high to low density.)
- k. With the tape properly loaded, with or without a write ring, and the correct density selected, the unit is now ready for use. To accomplish this, the operator presses the REMOTE switch-indicator.

UNLOADING THE SUPPLY REEL.

- 2-183. The procedure for unloading the supply reel is as follows:
 - a. Press the LOCAL switch to remove the unit from control of the B 5500 system.
 - b. Press the REWIND switch to rewind the tape onto the supply reel. The beginning-of-tape marker will automatically stop the rewind operation.

- c. When the rewind is completed, press the UNLOAD switch to position the tape to the proper unload point.
- d. Lower the tape compartment door when motion has stopped.
- e. Close the tape-load latch (or tape clamp) to hold the latch leader in the proper position.
- f. Disconnect the latch leader.
- g. Release the reel hub pressure lock and remove the reel of tape from the hub. (If a reel of magnetic tape is to be retained for later use, or as a historical record, the write ring should be removed immediately after the tape is removed from the hub.)
- h. Place an external label on the reel if one has not yet been attached.
 (This is desirable to prevent confusion and to provide for proper control of tape files.)
- i. Close the tape compartment door (after closing the reel hub pressure locks) or load another tape.

LOADING THE TAKE-UP REEL.

- 2-184. The procedure for loading a take-up reel is as follows:
 - a. Open the door of the tape unit.
 - b. Mount the take-up reel to allow the leader to unwind in a counterclockwise direction.
 - c. Press the reel solidly onto the hub with even pressure on opposite sides of the reel and close the reel-hub pressure lock.

- d. Open the left and right gates located next to the vacuum columns.
- e. Push down the lever located at the bottom of the read/write head cover.
- f. Loosen the thumb screws on read/write head cover.
- q. Remove the read/write head cover.
- h. Thread the tape as follows:
 - 1) Place the tape through the left gate.
 - 2) Close the gate.
 - 3) Thread the tape through the read/write head.
 - 4) Carefully replace the read/write head cover, tighten the thumb screws, and pull up the lever.
 - 5) Place the tape through the right gate.
 - 6) Close the gate.
 - 7) Lock the tape with the female leader located above the tape-load latch.
 - 8) Leave slack in the tape for left and right vacuum columns.
- i. Close the door of the tape unit.

UNLOADING THE TAKE-UP REEL.

- 2-185. The procedure for unloading the take-up reel is:
 - a. Open the door of the tape unit.

- b. Unlock the latch leader by releasing the tape-leader latch (or tape clamp).
- c. Open the left and right gates located next to the vacuum columns.
- d. Push down the lever located at the bottom of the read/write head cover.
- e. Loosen the thumb screws on the read/write head cover.
- f. Remove the read/write head cover.
- q. Remove the tape from the gates, read/write head, and vacuum columns.
- h. Rotate the take-up reel in a clockwise direction.
- i. Release the hub pressure lock and remove the tape reel.

REWINDING.

- 2-186. The procedure for rewinding is as follows:
 - a. Press the LOCAL switch to remove the unit from control of the B 5500 system.
 - b. Press the REWIND switch to rewind the tape onto the supply reel. The beginning-of-tape marker will automatically stop the rewind operation.
 - c. Press the REMOTE switch to make the unit available to the system.

ATTACHING LEADERS.

2-187. To attach the magnetic tape leader, proceed as follows:

- a. Place either the leader or the magnetic tape in the splicing jig so that the end overlaps the vertical slot in the jig.
- b. Place the clamp on the jig to hold this piece in place.
- c. Place the second piece in the jig so that it overlaps the first piece at the vertical slot. Both pieces of tape should have the glossy side facing up.
- d. Place the other clamp on the jig to hold the second piece in place.
- e. Cut through both pieces of tape with a razor blade, along the vertical slot in the jig (see figure 2-57).

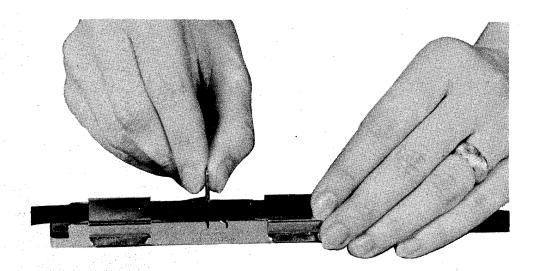


Figure 2-57. Cutting Ends of Magnetic Tape

- f. Remove the top piece of cut-away tape.
- g. Use an adhesive splicing tape to fasten the two pieces of tape (see figure 2-58). Burnish the adhesive tape to the magnetic tape.



Figure 2-58. Applying Adhesive Tape to Magnetic Tape Ends

h. Trim the excessive splicing tape from each edge of the magnetic tape by running the razor blade down the horizontal slots on both sides of the jig. If the jig does not have horizontal slots, remove the tape from the jig and then trim the excessive splicing tape from the edges.

SPLICING MAGNETIC TAPE.

2-188. The procedure for splicing two pieces of magnetic tape is the same as for attaching tape leaders. After the tape has been spliced, the operator must check to determine if the beginning-of-tape marker and the end-of-tape marker are located at the following points (see figure 2-59):

- a. The beginning-of-tape marker should be 10 to 11 feet from the physical beginning of tape.
- b. The end-of-tape marker should be 14 to 15 feet from the trailing end of the tape.

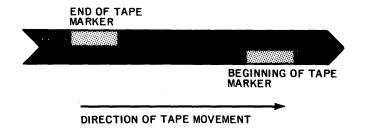


Figure 2-59. Location of BOT and EOT Markers

2-189. If, after the tape has been spliced, these markers are no longer at the prescribed locations, they must be placed there. The markers, which are one inch by 3/16-inch strips of aluminized plastic, must be fastened to the glossy side of the tape. The BOT marker must be placed on the edge of the tape that is closer to the operator when the reel is mounted on the unit. The EOT marker must be placed on the edge of the tape that is closer to the main panel of the tape drive.

NOTE

Splicing broken tape may be required to recover the data on the tape; however, it is not recommended as a permanent fix.

OPERATOR MAINTENANCE.

- 2-190. In addition to his direct operating responsibility, the operator is required to perform the following duties:
 - a. Inspects magnetic tape reels for the condition of leaders and inserts write rings when required.
 - b. Loads and unloads magnetic tape reels in an acceptable manner.
 - c. Analyzes all equipment stops and takes corrective action to the point of improper unit operation.

- d. On an error (i.e., wrong high or low-density setting, attempting to write with no write ring on the reel, etc.), takes corrective action to the point of improper unit operation.
- e. Splices magnetic tape and leaders when required.
- f. Assures that magnetic tape reels are stored in a proper and consistent manner.
- g. Assures cleanliness of the units between periods of preventive maintenance by the field engineer. To keep the magnetic tape unit within performance specifications, the operator must wipe off the following areas with a lint-free cloth and acceptable solvent on a daily basis.

CAUTION

Do not use FREON T. A. on the head assembly.

- 1) Tape guides.
- 2) Capstan and pinch rollers.
- 3) Acceleration buffers.
- 4) Tape cleaners.
- 5) Vacuum columns.
- 6) Head assembly.
- 7) Face of the BOT/EOT sensor.
- 8) Vacuum column buffers.
- 9) Inside of tape compartment glass door.

NOTE

Areas which are difficult to dust may be blown out with a stream of clean air prior to wiping the other surfaces.

- h. Keeps a record (or log) of all unit malfunctions.
- i. Notifies the field engineer of improper operation.

MAGNETIC TAPE CARE.

2-191. The care and handling of magnetic tape is important since it is a sensitive medium of data storage and since it usually contains important data. Therefore, certain rules should be observed in its storage, handling, and use to obtain maximum use of magnetic tapes.

2-192. MAGNETIC TAPE STORAGE. When storing magnetic tape, the following should be adhered to:

- a. Magnetic tape should be stored in the computer operational environment. Too large a variation in temperature will cause a change in the size of the reel (especially if it is plastic). The environment conditions should be $60-80^{\circ}F$ and 40-60% relative humidity.
- b. The tapes should be stored in dust proof containers in a vertical position.
- and radiation. A metal cabinet with doors is recommended. (The tape should never come in contact with or be within three feet of the B 100 Series Sorter.)

- 2-193. MAGNETIC TAPE HANDLING. The following rules should be followed when handling magnetic tape:
 - a. Do not depress the reel side-flanges against the tape or in any way damage the edges of the tape.
 - b. Do not expose the tape to a contaminated atmosphere.
 - c. Do not allow the tape to contact unclean or damage-inflicting surfaces.
 - d. Do not allow the tape to come in contact with or be within three feet of the B 100 Series Sorter.
 - e. Do not leave magnetic tape outside of its case except when it is loaded on the tape unit.
 - f. Do not allow the tape to fall on the floor or any dirty surface.
- 2-194. MAGNETIC TAPE LOADING. When loading magnetic tape, the following should be observed for better wear and use of the tape:
 - a. The transport unit should be kept clean. The tape unit should be cleaned at least every four hours (more often for better tape usage). This involves cleaning all of the surfaces with which the tape comes in contact.
 - b. The reel of tape should be straight on the hub and the tape should be properly threaded.
 - the tension is set. (Turning the reel regulates the tension of the lock.) Too much tension will stretch a plastic reel. Not enough tension will allow the reel to slip.

d. Tape may be spliced, but only to retrieve information.

2-195. MAGNETIC TAPE LIBRARY PROCEDURES. In addition to storing and handling magnetic tape properly, it is important that library procedures be developed for a magnetic tape library. All tapes should be marked as to use, and a record should be made of each time that a tape is used and the tape unit on which it was loaded. This information is necessary to discover the reasons for a tape error and/or excessive wear on a tape. Whenever a tape error occurs, it should be reported to the field engineers.

DISK FILE SYSTEM.

2-196. The Burroughs On-Line Disk File is an extremely high speed, large capacity, information processing system that provides unmatched applications power for both large and small business. This system contrasts sharply with conventional magnetic disk files and is the first to combine random access speeds and reliability heretofore available only on magnetic drums. The key to this departure is a unique method of accessing data stored on disks. A read/write head for every track of information allows any record in the file to be accessed in an average time of 20 milliseconds, or one-fiftieth of a second. The positioning of an arm mechanism is not necessary, thus access time involves only a factor called "latency." This is the time required for the disk to revolve to the point where the selected read/write head is located directly above the beginning of the record specified by the read/write instructions. Maximum latency time is 40 milliseconds, or one complete revolution. In addition, high density recording allows a four disk basic unit, capable of storing 9.6 million characters, to be expanded to a maximum of 960 million positions simply by installing additional 9.6 million character modules.

FUNCTIONAL DESCRIPTION.

- 2-197. The Burroughs Disk File is composed of the following four basic components:
 - a. B 450 Disk File/Data Communication Basic Control.
 - b. B 5470 Disk File Control Unit.
 - c. B 471 Disk File Electronics Unit.
 - d. B 475 Disk File Storage Module.

B 450 DISK FILE/DATA COMMUNICATION BASIC CONTROL.

2-198. The B 450 (figure 2-60) houses the disk file control and data communication control assemblies (B 5470 and B 5480). In addition, a B 451 (see paragraph 2-199) may be included with the B 450 for disk file expansion. The B 450 may contain two control assemblies (either disk file or data communication) and one or two B 451's. If more than two controls (either disk file or data communication) are required, a second B 450 must be used.

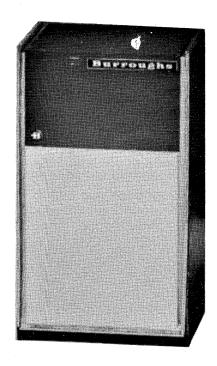


Figure 2-60. B 450 Disk File/Data Communication Basic Control

B 451 DISK FILE EXPANDED CONTROL.

2-199. The B 451 Disk File Expanded Control Unit contains the necessary circuitry for controlling disk storage systems requiring more than one B 471 Electronics Unit, or two disk file control units. An additional B 451 is required as expansion occurs from six to ten B 471 Storage Units. A system will require a B 451 for each additional five B 471 Storage Units, and the B 451 would be added to the second B 5470 Disk File Control Unit in a second B 450 Basic Control Unit.

B 5470 DISK FILE CONTROL UNIT.

2-200. Two B 5470 Disk File Control Units may be attached to a B 5500 system. One B 5470 contains the power supply, control, and checking circuitry to accommodate a maximum of 10 disk file storage units (48 million alphanumeric characters per storage unit) to provide 480,000,000 alphanumeric characters of on-line storage. All information transfer and addressing for the storage units is controlled by the B 5470.

2-201. Because independent checking features are incorporated in the unit, the processor is free to execute other commands or input/output operations when the control unit is performing a check operation. Checking of each disk file address, as it is transferred from the central processor, is provided and, if an error occurs, the transfer operation stops and no data will be transferred. Also, an address parity indicator will be set. For each segment of data written during a write operation, a multiple character check code is developed and written. This code is regenerated and compared against the written check code during a read operation. If the comparison is unequal, an information error indicator is set. When a non-existent address is referenced, the operation is terminated, and an

invalid indicator is set. Attempting to write on a disk which is locked out will set a write lockout indicator. Reading or writing is prevented while the control unit is in a Busy or Not Ready status. The control unit is in a Not Ready status if either of the power switches (AC-DC) are OFF, or if the REMOTE/LOCAL switch is set to the LOCAL position. These switches are not accessible to the operator.

B 471 DISK FILE ELECTRONICS UNIT.

2-202. The B 471 Disk File Electronics Unit (figure 2-61), incorporates all of the disk file system electronics for controlling a maximum of 48,000,000 alphanumeric characters of information in addressable segments of 240 characters. The unit contains the main air pressure system starting controls, basic head switching logic, and read/write amplifiers for a maximum of five storage modules (20 disks). Lockout switches for the unit and for individual disks are provided on a concealed control panel. The unit lockout switch prevents writing on the entire unit. Individual disk lockout switches allow disks to be individually locked out. Whenever the unit or disk is placed in a write lockout state, it is still possible to read from the unit and/or disk.



Figure 2-61. B 471 Electronics Unit

B 471 CONTROL PANEL.

2-203. The switches and indicators used for operation of the B 471 Disk File Electronics Unit are contained on the control at the front of the unit (figure 2-62), and another control panel which is located under a hinged cover, directly above the front control panel. The function of the switches and indicators is described in table 2-11.

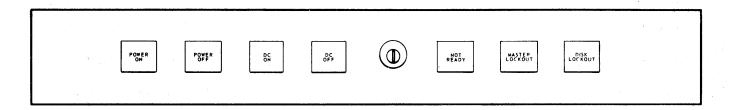


Figure 2-62. B 471 Electronics Unit Control Panel

Table 2-11

B 471 Disk File Electronics Unit Control Panel
Switches and Indicators

Function
This switch applies AC power to the storage unit and the
storage modules connected to it.
This switch removes AC power from the storage unit and
from the storage modules connected to it.
This indicator will light when one of the following
conditions exist:

Table 2-11

B 471 Disk File Electronics Unit Control Panel
Switches and Indicators

Switch/Indicator	Function	
	a. REMOTE/LOCAL switch is in the LOCAL position.	
	b. All disks in the storage modules are not up to speed.	
	c. Air pressure is low.	
DC ON	This switch applies DC power to the electronics unit and to the storage modules attached to it.	
DC OFF	This switch removes DC power from the storage unit and the storage modules connected to it.	
MASTER LOCKOUT	This indicator lights when the master lockout switch (located under a hinged cover) is pressed to lock out all of the disks connected to the particular disk file storage unit.	
DISK LOCKOUT	This indicator lights when one or more of the disk lockout switches (located under the hinged cover) are pressed to lock out the disks connected to the particular disk file control unit.	

DISK LOCKOUT SWITCHES.

2-204. Above the front control panel of the disk file storage unit is a hinged cover that conceals the disk lockout switches (see figure 2-63). This cover is provided with a lock to prevent anyone but the Burroughs Field Engineer and the Data Processing Manager to gain access to these switches. There are 20 individual disk lockout switches (one for each of the possible 20 disks that can be connected to the storage unit) and one master lockout switch for locking out all of the disks that are connected to the storage unit. When one or more of the individual lockout switches is set to the ON position, the DISK LOCKOUT indicator will light. When the master switch is set to the ON position, the MASTER LOCKOUT indicator will light.

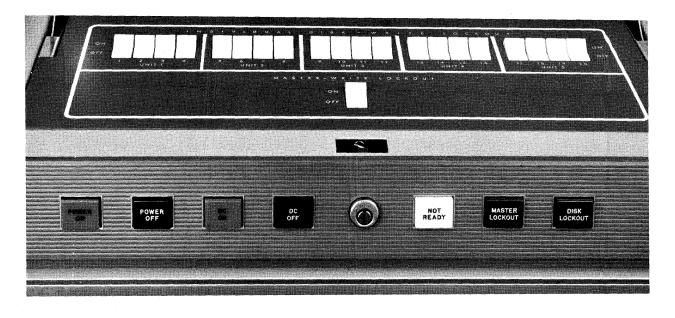


Figure 2-63. Disk Lockout Switches

B 475 DISK FILE STORAGE MODULE.

2-205. The B 475 Disk File Storage Module must be used in conjunction with the B 471 Disk File Electronics Unit (see figure 2-64). Four B 475 Storage Modules and one B 471 Disk File Electronics Unit (which also contains one storage module of four disks) constitute a complete disk file storage unit with a total capacity of 48 million characters. One hundred B 475 Storage Modules may be attached to a B 5500 System (through the use of twenty B 471 Electronic Units) to provide these systems a storage capacity of 960 million characters.

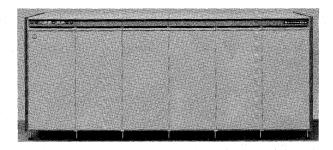


Figure 2-64. B 475 Disk File Storage Module (Four Shown with a B 471)

2-206. The B 475 Disk File Storage Module consists of four vertically mounted magnetic disks comprising a storage capacity of 9.6 million alphanumeric characters. Each disk surface has 50 data tracks which are divided into addressable segment sizes. The data tracks contain one-hundred 240-character segments. Every data track is equipped with its own read/write head and, by means of electronic switching, the heads can rapidly access data from the track. A fail-safe mechanism within each storage module prevents the read/write heads from contacting or damaging the magnetic disk surface.

2-207. The magnetic disks rotate at 1500 revolutions per minute (RPM) and, with the head-per-track design incorporated for reading and writing data, the average time required to access data from disk storage is one-half disk revolution or 20 ms. regardless of file size or organization of records. All data recorded on the disks will remain on the disks until replaced with new information. Transfer of information to and from the file is at a rate of 100,000 charactersper-second.

2-208. The controls for operating the B 475 Disk Storage Modules are located on the B 471 Disk File Electronics Unit. This unit contains individual lockout switches for each disk connected to the storage unit, and a master lockout switch for locking out all disks connected to the storage unit. For a complete description of the switches and indicators contained on the electronics unit control panel, refer to paragraph 2-203.

DATA COMMUNICATION SYSTEM.

2-209. The Burroughs Data Communication System is a powerful and versatile inquiry network which, when coupled to a B 5500 Disk File System, provides efficient, flexible, and direct interrogation to disk file storage, shrinking time and distance for management decision-making. This network supplements the disk file system by providing a modular means of handling an extremely wide range of inquiry traffic requirements. All operations between any of the various types of inquiry stations and the processor are buffered and independent.

- 2-210. The data communication system includes the following features:
 - a. Provides up to 5,985 standard teletype stations, up to 120 electric typewriter stations, and up to 120 TWX networks.

- b. Teletype inquiry stations can be located as far away from the computer as teletype lines permit (standard teletypes and TWX). Typewriter inquiry stations allow remote "in-house" interrogators up to 1 mile from the computers.
- c. Teletype operation is completely buffered to and from the computer, with buffer capacity up to 240 characters. Typewriter operation is completely buffered to and from the computer with a separate input buffer for each typewriter station on the network. Buffer size is up to 480 characters depending upon the number of stations per terminal unit.
- d. Dial TWX operation is completely buffered with buffer capacity up to 480 characters depending on the number of stations per terminal unit.
- e. The typewriter network can accept and/or transmit eight inquiries simultaneously.
- f. When not used for interrogation to the computer, teletype stations may be used for normal teletype network operation.

FUNCTIONAL DESCRIPTION.

- 2-211. The Burroughs Data Communication System is composed of the following basic components:
 - a. B 450 Disk File/Data Communication Basic Control
 - b. B 5480 Data Communication Control Unit
 - c. B 481 Teletype Terminal Unit
 - d. Standard Model 28 Teletype Send-Receive Page Printers with Keyboard
 - e. B 483 Typewriter Terminal Unit

- est F. B 493 Typewriters To a second and the specific of the second of t
- 2-212. The B 450 Disk File/Data Communication Basic Control houses the B 5480 Data Communication Control Unit and the B 5470 Disk File Control unit when attached to a B 5500 system.

B 5480 DATA COMMUNICATION CONTROL UNIT.

- 2-213. The B 5480 Data Communication Control Unit provides the interface between the I/O control unit and various terminal units. Only one B 5480 may be connected to a B 5500 system and it can serve from one to fifteen terminal units of any combination. The B 5480 may have a cable length of up to 50 feet from its associated I/O control unit and is under control of the I/O control unit only when loading or unloading a terminal unit buffer to or from core storage.
- 2-214. The B 5480 provides code translation facilities for conversion between Burroughs Common Language (BCL) and Baudot Code or ASCII. In a system where different types of terminal units are used, BCL to Baudot Conversion takes place only when the scanner in the B 5480 is addressing a TTY terminal unit, while BCL to ASCII occurs when addressing TYP or TWX terminal units. The B 5480 can recognize that any terminal is in one of six possible states: Idle, Busy, Input Ready, Multiple Output Ready, or Not Ready.
- 2-215. When a designated terminal unit is in the Busy state, the associated B 5480 cannot communicate with that terminal unit. A Busy state occurs when there is a call on the network of a TTY terminal unit.
- 2-216. A terminal unit that has received a complete message from an inquiry station is in the Input Ready state. The completing of an input message is recognized by an End-of-Message character which is transmitted to the associated

I/O control unit as a group mark (BCL 011 1111).

2-217. A terminal unit is in the Multiple Output Ready state after it has completed transferring the contents of its buffer to an inquiry station and has not detected an End-of-Reply (group mark) character.

2-218. The B 5480 also provides an interrupt to the I/0 control unit. This interrupt is set when any terminal unit is in the Input Ready or Multiple Output Ready state, and the terminal unit is being addressed by the scanner.

2-219. The character transfer rate through the B 5480 is a maximum of 30,000 characters-per-second. Transfer is serial-by-character, parallel-by-bit, and in all cases of inquiry reply, the message must be terminated by a group mark character.

2-220. The scanner in the B 5480 has the facility to connect any of the terminal units to the I/0 control unit. The time required for the scanner to examine adjacent channels for Ready status is a maximum of 220 microseconds and the B 5480 gives priority, in undirectional sequence, to terminal units that are in the Multiple Output Ready state.

B 481 TELETYPE TERMINAL UNIT.

2-221. The B 481 Teletype Terminal Unit provides the interface between the B 5480 and the teletype stations on a met. Up to 399 teletype station sets may be serviced by a single B 481 Teletype Terminal allowing a possible 5,985 teletype stations in 15 networks if only teletype terminals are used (1 to 15 terminal units per B 5480). The B 481 may have a cable length of up to 50 feet from the B 5480 and, as an optional device, may have a teletype page printer included as part of the terminal unit to function as a monitor.

- 2-222. The B 481 Teletype Terminal Unit provides serial-parallel code conversion, special teletype character deletion and insertion, and buffer storage capability. Control and timing levels are generated and sensed so that the B 481 is compatible with the B 5480.
- 2-223. Physically, the B 481 is a model 28 Sequential Selector with selective calling features. Character-control is provided for the insertion and deletion of special teletype characters such as Line Feed or Carriage Return. The character control also provides the end-of-reply and the station disconnect signals for the teletype net. Character-control further inserts change of print mode signals in the data being sent to the teletype stations when there is a change from either figures (FIGS) to letters (LTRS).
- 2-224. The B 481 Teletype Terminal Unit incorporates a buffer which stores six-bit characters. Buffer size may be 120 or 240 characters and the access time for the terminal buffer is 20 microseconds. An inquiry message may be entered via the keyboard of any station on the net by selectively calling the B 481. The B 481 Teletype Terminal Unit can service only one call at a time.
- 2-225. A teletype page printer may be included as part of the B 481 Teletype Terminal Unit. This printer can be used for monitoring all messages which include the B 481 Teletype Terminal Unit.

B 483 TYPEWRITER TERMINAL UNIT.

2-226. The B 483 Typewriter Terminal Unit provides the interface between the B 5480 and typewriter inquiry stations. The B 483 provides facilities for one to eight typewriter inquiry stations and includes the input station selection circuitry. A 60 to 480 character buffer is provided for input and output

operation. Control and timing levels are generated and sensed so that it will be compatible with the B 5480. The typewriter terminal unit may have a cable length of up to 50 feet from the B 5480.

- 2-227. The buffer has one to eight segments, varying in length, each of which is reserved for a specific typewriter inquiry station.
- 2-228. The B 483 Typewriter Terminal Unit also provides input scanning facilities to accept data from any of the eight possible typewriter inquiry stations. This data is picked off and stored as it is available, a character at a time, and is directed to the proper buffer.
- 2-229. In addition, the unit provides an input latch facility which interrupts the scanner and holds a station buffer while data is transferred through the B 5480 to the I/O control unit. The latch is initiated when the end-of-message input character is stored from the station.
- 2-230. When the buffer is used as an output buffer, it will store a reply message from the processor when latched to the B 5480. The buffer will unload a reply message when latched to the typewriter inquiry station and the flow of data from the buffer is governed by timing levels generated in the B 483.

B 493 TYPEWRITER INQUIRY STATION.

- 2-231. The B 493 Typewriter Inquiry Station utilizes a Send-Receive Page Printer set. The alphanumeric keyboard is provided with contacts suitable for keying of alphanumeric input data.
- 2-232. The B 493 Typewriter Inquiry Station communicates with the B 483 Typewriter Terminal Unit via a twisted pair cable. The typewriter stations may be

up to 1 mile from the B 483. The station set operates at a standard rate of 10 characters per second by selectively depressing the keys and space bar of the keyboard in the same manner as typing.

B 484 TWX TERMINAL UNIT AND STATION.

2-233. The B 484 TWX Terminal Unit provides the facilities required to use stations of the TWX network as inquiry devices. The B 484 provides a buffer memory to store simultaneous messages from up to 8 stations of the TWX network. Buffer sizes are available with the terminal unit from 60 to 480 characters.

TWX NETWORK EQUIPMENT.

2-234. A Dataset 103 (Telephone Company equipment) modem is required for each connection to the TWX complex which can be serviced simultaneously (1 per channel). These modems can be located up to 50 feet from the terminal unit.

2-235. A sequential calling device (telephone company equipment) is available which allows all of up to 8 modems to be called by the same telephone number. The caller is connected to the next available buffer section. With this arrangement, if no buffer section is available, the caller receives a busy signal.

2-236. If the terminal unit is Not Ready or if automatic answer is not enabled at the Dataset, an attempted call will only ring with no response.

STATION CHARACTER SET.

2-237. The BCL character set is used for the typewriters or TWX stations with the following exceptions:

- a. BCL x is replaced by \setminus .
- b. On output message, the left arrow (group mark) is used to terminate the message and is not printed.

- c. On output, BCL \neq is translated to line feed.
- d. On output, BCL \leq is translated to carriage return.
- e. On input, line feed is deleted and not transferred to the associated data processor.
- f. On input, X3.2! is translated to BCL a.
- g. On output, BCL \geq is used as a station disconnect code and is not printed.

OPERATING PROCEDURES.

- 2-238. The operator dials the TWX Terminal Unit by following normal dialing procedures. When a connection is established, the operator types an input message via the TWX Station keyboard. (From this point the operation is identical to that of the typewriter station.) The message is printed and loaded to the buffer memory as it is keyed in. The operator completes the message, visually checks for accuracy, and terminates the input via the End of Message key (left arrow). In the case of an input error (i.e., key stroke error, sending a message greater than buffer capacity) the operator keys the "station reset" (FORM and CTRL) and repeats the input message. The Terminal Unit recognizes the end of message signal. This places the Terminal Unit in the Input Ready state.
- 2-239. The input message is unloaded from the buffer memory to the system. The output message is loaded into the buffer memory from the system.
- 2-240. When the End-of-Reply character is detected in the output loading from the system, the next station which has a complete message is then serviced. When several stations have complete input messages, each is serviced in numerical

sequence. When a station disconnect code is detected in the reply message, the buffer memory is unlatched from the Inquiry Station and the station is disconnected. If a Station Disconnect code is not present in the output message, the station is still connected after the complete reply has been sent to the station. The Group Mark defines the End of Reply and is not printed. At this time, the station operator can initiate another inquiry.

2-241. When the Terminal Unit buffer memory is fully loaded without detecting a Group Mark, the I/O control unit is released and the next terminal unit is serviced. The Terminal Unit must receive the Group Mark code in the output from the system prior to servicing other terminal unit buffers.

MONITOR STATION.

2-242. The input and output messages of the number one buffer section can be monitored by attaching a typewriter inquiry station to the TWX Terminal Unit. All input/output data is printed. When the monitor station is in Local, no messages are printed. When in Local, the typewriter may be used in its normal manner.

2-243. If desired, the operator can verify that an inquiry may be entered by sending "who are you" (WRU key) in conjunction with the CTRL key. If the Terminal Unit is Ready (power on, remote mode), it will respond by transmitting "T.U.". If the Terminal Unit is Not Ready (power off, local mode), there is no response.

DATA TRANSMISSION SYSTEM.

2-244. The Burroughs Data Transmission System is even more powerful and versatile than the Communication System. The Communication System which could be more appropriately called an "Inquiry" system because an inquiry must be "Asked" before a reply can be given; i.e., the computer system is unable to transmit a message without

first receiving an inquiry with the exception of the teletype network.

2-245. All operations between any of the various types of stations and the computer system are completely buffered and independent. Transfer rate between the buffers and the computer system in 100KC. The Data Transmission System has a much greater capacity to handle various types of transmission devices in any combination:

- a. typewriter (240 stations)
- b. TWX networks (240)
- c. teletype (95,760 stations)
- d. 801 automatic calling units
- e. Data Speed II
- f. Univac 1004
- q. IBM 1050

FUNCTIONAL DESCRIPTION.

2-246. The Data Transmission System is composed of the following components:

- a. B 452 Disk File Data Transmission Basic Control (power supply)
- b. B 249 Data Transmission Control Unit (DTCU)
- c. B 487 Data Transmission Terminal Unit (DTTU)
- d. Line Adaptors

2-247. The B 452 houses the B 249 and also houses the Disk File Control Unit if it is used. The Terminal Units and Adapters are not free standing boxes, but are in fact, gates which are mounted inside the B 452 cabinet. For this reason, the B 452 has increased power requirements over its predecessor, the B 450.

B 249 DATA TRANSMISSION CONTROL UNIT.

2-248. The DTCU serves as a multiplexing device which allows the computing system

to handle up to 15 Transmission Terminal Units. If only one terminal unit is on the system, the DTCU is not required.

2-249. One of the major functions of the DTCU is to provide code translation between the computing system and the transmission device. For example, type-writers and TWX networks both function in ASCII code, and therefore, the DTCU must provide translation both ways between BCL and ASCII or ASCII and BCL. In the case of teletype networks, they function in Baudot code, and therefore, the DTCU must provide translation between this code and BCL again, both on input and output.

NOTE

If a DTCU is not used, then it is the object program's function to provide the correct translation on both input and output.

B 487 DATA TRANSMISSION TERMINAL UNIT (DTTU).

2-250. A DTTU contains a message area of 448 characters of core memory which is divided into 16 28-character sub-sections numbered 0 through 15. An "adaptor" is assigned a number of these sub-sections according to user requirements. The division of the storage area into "buffers" is accomplished by placing line adaptors at line adaptor connection points. Each buffer area is then defined to start at the point where its line adaptor is connected and to extend to the next line adaptor or the end of storage, whichever occurs first. The "buffer address" (or sometimes called "station address") is actually composed of two quantities: the terminal unit number followed by the section number. When communicating with any transmission device, both of these quantities are required. The combination of both quantities shall henceforth be referred to as the "buffer address".

2-251. For example, assume a terminal unit were assigned a number 2 (this is

accomplished by its physical connection), and it had three adaptors. If the line adaptors were attached to the connection points at sub-sections 0, 3 and 7, the entire storage area would be divided into three message or information areas. The first area would have a "buffer address" of 20 and would be 84 characters in length. The second area would have a "buffer address" of 23 and would be 112 characters in length. The third area would have a "buffer address" of 27 and would be 252 characters in length.

2-252. When a message or group of characters is received from a transmission device, the information passes through a line adaptor into the adaptor's terminal unit information area. When the end-of-information is sensed, an interrupt level is produced by the terminal unit and sent either through the control unit, if it is present, to the computer system or directly to the computer system without a control unit, which subsequently causes the computer system to be interrupted. At this time, an "Interrogate" is performed in order to determine the "buffer address" of the information.

2-253. At the completion of a data transmission operation, either input or output, a buffer address can be flagged either "Normal" or "Abnormal". This flag of normal or abnormal in conjunction with an input or output operation can indicate a large number of combinations reflecting errors, special attention, etc.

BUFFER CONDITIONS.

2-254. A buffer may be in any one of a number of conditions depending on its adaptor. These conditions are:

a. "idle". This condition indicates that the buffer is not presently receiving a message from a transmission device nor is it transmitting information to that device.

b. "read ready". This condition indicates that an entire message has been received from a transmission device and the computer system should now process that information.

NOTE

When the computer system does read that information out of the buffer, the buffer is then returned to a "idle" condition.

It should also be noted that a computer initiated message to a buffer is allowed any time a buffer is in a idle condition. Thus at the completion of a read, the transmission device may continue sending information or the computer may send a reply concerning the information just read in from the buffer. In most cases of operator transmission device like a typewriter or teletype, it would be advisable to send a reply, if only a carriage return and line feed, to indicate that the operator may continue with the input. When a message is transmitted to an idle buffer, complete with group mark, an interrupt is produced when the transmission device has fully accepted the output message, and an "idle" interrupt is produced to the computer system.

2-255. If, however, the output message sent to the buffer does not contain a group mark or end-of-message character, a "write ready" interrupt is produced when the buffer has fully transmitted the information to the transmission device. A "write ready" condition indicates that the buffer is now ready for the next portion of the total message. This "write ready" condition in previous terminal units caused a temporary lock-out of all other transmission devices during the time that multiple groups of information were being transmitted to the transmission device, however, in the B 487 this condition does not effect any device, other

than itself.

NOTE

Whenever any interrupt of any type has been interrogated, that interrupt has been removed and will
not cause another interrupt under any circumstances.

2-256. All of the above conditions can be flagged either "normal" or "abnormal". For example, an operator typing the left arrow (end of message) key causes a read-ready normal interrupt. If, however, for some reason, the operator keys in the exclamation point (end of transmission) character, a read-ready abnormal interrupt is produced. On output, when the left arrow is encountered upon retrieval from the buffer to be sent to the adaptor, the buffer assumes an idle normal condition with an interrupt. If during the time that a message is being sent out of the buffer to the adaptor and this adaptor is TWX and the operator should press "BREAK" key, the buffer terminates the output of the message and immediately assumes a read-ready abnormal condition with an interrupt. These are but a few of the numerous combinations and conditions of input and output with errors, end of transmission, loss of carrier, buffer overflow, etc., that can occur and subsequently flag the operation as normal or abnormal. The handling of these conditions is totally left up to the object program.

NOTE

There is hardware priority available that causes selection of the lowest numbered buffer within a terminal unit for system attention.

LINE ADAPTORS.

2-257. There is a specially designed line adaptor for each type of transmission

device, which serves to interface that device with the DTTU. With the appropriate line adaptor, it is possible to interface any device to a DTTU and thus achieve information exchange with the computer system.

TYPEWRITER.

2-258. A single typewriter station connects with a typewriter line adaptor. A maximum of 16 typewriters can be connected with the 16 adaptors to a single DTTU. However, the buffer size of each would then be restricted to 28 characters. Each typewriter is entirely independent of all the other adaptors regardless of what type they might be. If the buffer associated with a typewriter station is not "busy", the computer system can initiate at any time a message to be typed out on that station just as if it were a Supervisory Printer.

2-259. If while typing a message in from the remote station, the operator notes a mistake, the operator can perform a "backspace" and thereby erase one character. This backspace may be performed as often as required. Another function is the ability to handle paper tape from a model 33 or 35 ASR typewriter station. Messages may be stacked on paper tape as shown in figure 2-65.

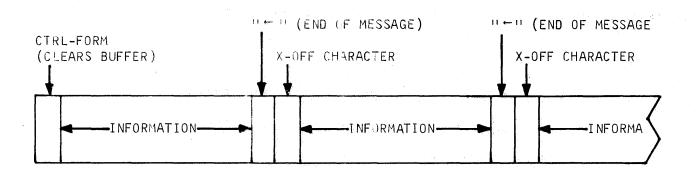


Figure 2-65. Possible Paper Tape Format

2-260. The computer system can exercise control over the paper tape by performing a start paper tape function (this is a reserved character) and then the paper tape will continue sending until a character on the paper tape indicates "stop paper tape." The paper tape will stop, the computer system will read the message, process it, and either send a reply back to the station which will be typed out or simply send a control character to resume reading from the paper tape.

NOTE

The buffer size will usually dictate format or length of the entries from the paper tape.

2-261. The dataset is, for all practical purposes, a telephone and has a dialable number. The operator at a remote TWX typewriter station dials the number of the dataset connected to the adaptor and when the connection is made, the TWX station functions exactly like a typewriter station as previously described, with this exception: the data set is continuously monitoring the quality of the data carrier, and if the quality drops below a certain threshold value, the dataset performs a "loss of carrier disconnect". This can occur on either input or output. In both cases however, an abnormal condition is flagged, and an interrupt produced.

TELETYPE NETWORKS.

2-262. Each of the stations and the adaptor has a "2-character call". If the net, as it is called, is idle, the computer system can initiate a call sequence and/or message to any or all of the stations on the net. In the same manner, any station, if the net is idle, can call the adaptor and/or any other station and transmit to it information. Teletype networks have a standard calling and message discipline that is followed by all who use the net.

801 AUTOMATIC CALLING UNIT (ACU).

2-263. The 801 adaptor is first used to transmit a dial sequence through the 801 data set. The 801 dataset is, in fact, connected to the telephone exchange through the normal dataset that will be used once the telephone connection has been established. After the connection has been made, then the information is processed to and from the remote station through the TWX adaptor and the 801 is not used during this period of time.

NOTE

At this writing, the connection/adaptor function between the Data Speed II, the UNIVAC 1004 and the IBM 1050 has not been thoroughly detailed and defined.

SECTION 3

LOADING AND MAINTAINING THE SYSTEM

GENERAL.

3-1. This section describes the procedures for loading and maintaining the B 5500 Disk File System.

DISK FILE SYSTEM PROGRAMS.

- 3-2. When a user obtains a B 5500 Disk File System, he is supplied with the following items which are described in more detail in subsequent paragraphs.
 - a. Disk File System tape.
 - b. Disk File MCP Loader.
 - c. Cold Start deck.
 - d. Disk Halt/Load Button card.
 - e. LOAD control cards for the system programs.
 - f. SYMBOL tape. This is a multi-file tape containing the source programs for some of the system programs.
 - g. Symbolic patch decks for all programs on the SYMBOL tape.

DISK FILE SYSTEM TAPE.

3-3. This system tape is a library tape, created through the use of a DUMP control card which has the library tape name SYSTEM and contains the B 5500 compilers, the system programs, and any other library programs which may be desired by the user. Programs which are at the present time considered system programs are the following:

File Name

Program Function

MCP/DISK

Master Control Program.

ALGOL/DISK

ALGOL compiler programing system.

COBOL/DISK

COBOL compiler programing system.

FORTRAN/TWO

FORTRAN II programing system.

FORTRAN/FOUR

FORTRAN IV programing system.

ESPOL/DISK

ESPOL programing system.

LOGOUT/DISK

Routine to print system log.

PRNPBT/DISK

Routine to print printer back-up tapes.

MAKCAST/DISK

Routine to create symbolic library files.

LDCNTRL/DISK

Routine to place card decks on tape or disk.

3-4. Because of the importance of the system tape, each installation should make a back-up copy of it. This can be done by means of a DUMP control card. This card can also be used to add or delete items on the tape when making a new tape.

DISK FILE MCP LOADER.

3-5. The MCP Loader is a CARD LOAD SELECT program (i.e., a program loaded with the CARD LOAD SELECT button on) which searches for the magnetic tape unit which has the system tape containing the file MCP/DISK. The program then loads the MCP from the tape to its reserved area at the beginning of the system disk. The MCP Loader consists of a deck of punched cards of a fixed size, and requires no parameter cards.

COLD START DECK.

3-6. The Cold Start deck is a CARD LOAD SELECT program (i.e., a program loaded with the CARD LOAD SELECT button on), which has the primary function of creating an initial disk directory, and setting initial operating conditions. This routine must be run before the MCP is used for the first time, since the MCP expects to find a disk directory on the disk. It is generally considered a one-time routine. The Cold Start routine is explained in greater detail in paragraphs 3-20 through 3-99.

DISK HALT/LOAD BUTTON.

3-7. The Disk Halt/Load Button is a one-card CARD LOAD SELECT program which causes the MCP to be initiated by reading a portion of the MCP code from disk into core memory, and then branching to that code.

LOAD CONTROL CARDS.

3-8. The LOAD cards which cause programs to be read from the system tape and entered as library files on the user disk are identical in construct to the LOAD cards described in Section 4 of this document. For example, a LOAD card to load ALGOL to disk could appear as follows:

? LOAD FROM SYSTEM ALGOL/DISK

3-9. It should be noted that with the exception of the MCP, system programs are executed from the user disk. (The user disk is that portion of the disk reserved for user files. It includes all disks except the system disk which is an area on the first disk module which is reserved for the MCP, special MCP tables, and overlay storage.) The MCP is executed from the system disk.

catha stagt ands

3-10. The SYMBOL tape contains source programs for system programs. The source programs for ALGOL/DISK, COBOL/DISK, ESPOL/DISK, MAKCAST/DISK, and LOGOUT/DISK are, in Extended ALGOL. The source program for MCP/DISK is in ESPOL. The routines PRNPBT/DISK and LOCNTRL/DISK were coded in part by hand and do not exist in a source language. These routines are, in fact, partly contained in their respective program files and partly within communicate routines in the MCP. Consequently, they are not on the SYMBOL tape.

3-11. The file identifications for the files on the SYMBOL tape are as follows:

File Identification	Program Function Program Function
Self more object 100% of the re-	MCP.
ALGOLSY	ALGOL programing system.
COBOLSY	COBOL programing system.
SECTION YEARS SET TO THE PROPERTY OF THE BOOK	FORTRAN II programing system.
UADS FOFORSY town from the isolate	FORTRAN IV programing system.
ESPOLSY (ADJ. 3 . A) TRACTOR (D)	ESPOL programing system.
	Routine to print system log.
MKASTSY	Routine to create symbolic library files.
	NOTE (COLDING METSY'S CREATED AND SHEET

SYMBOLIC PATCH DECKS.

3-12. The symbolic patch decks for the programs on the SYMBOL tape are, with the exception of the deck for the MCP, ALGOL patch decks. That is, they each contain a COMPILE control card for ALGOL, label equation cards, a DATA or LABEL control card, \$ TAPE cards, patch cards if any, a 9's card, and an END control card. The symbolic patch deck for the MCP contains an EXECUTE control card to carl out ESPOL, label equation cards, a DATA or LABEL control card and, as it is with ALGOL, \$ TAPE cards, patch cards if any, a 9's card, and an END control card.

UPDATING SYSTEM PROGRAMS.

- 3-13. If changes are made in system programs, users are supplied with symbolic patch cards which reflect these changes. It is then the responsibility of the user to:
 - a. Place the patch cards, according to the sequence numbers in columns73 through 80, in the symbolic patch deck for which they were intended.
 - b. Recompile the subject program in order to obtain the updated version.
- 3-14. Programs compiled on the disk file system are, of course, compiled to disk. If the user wishes to obtain an updated version of the system tape, he must create that tape through the use of a DUMP control card.
- 3-15. It should be noted that when compiling system programs to user disk, the system program being compiled is generally given a different name than that by which it must be called when used. This is done to avoid a duplicate library condition. However, once the new version of the system program has been successfully compiled to disk, the old version of the program can be removed. Then the name of the new version can be changed through the use of a CHANGE control card.
- 3-16. One additional point which should be brought out is that when the MCP is recompiled, it must be dumped to a system tape, and then loaded through the use of the MCP LOADER. The file MCP/DISK must exist as a file on the user disk if it is to be placed on a system tape through the use of a DUMP control card. But the MCP is never executed from the user disk. The only means provided to place the MCP on the system disk for execution is the MCP LOADER.

DISK FILE SYSTEM LOADER.

- 3-17. The two prerequisites to operation on a B 5500 Disk System are:
 - a. The MCP must be on disk.
 - b. The disk directory must be on disk.
- 3-18. The Disk File System Loader is used to establish the above two conditions. In addition, the System Loader provides for the following:
 - a. A means for initializing the current date word and "option codes".
 - b. A means for specifying the disk file configuration and the amount of disk to be used for data overlay storage.
 - c. Loading of the B 5500 compilers.
- 3-19. The Disk File System Loader consists of the following:
 - a. MCP loader (refer to paragraph 3-5).
 - b. Cold Start routine.
 - c. DISK HALT/LOAD BUTTON CARD
 - d. Control cards used to load the compilers to disk.

The above are discussed in detail in the following paragraphs.

COLD START ROUTINE.

3-20. The Cold Start routine constructs the initial disk directory, initializes the current date word and "option" codes, and handles the reserving of the disk for data overlay storage.

3-21. The Cold Start routine deck is a deck of punched cards, the last of which must be a STOP card, i.e., a card containing the word STOP. Two or more parameter cards must immediately precede the STOP card.

3-22. The parameter cards for the Cold Start routine have a free-field format and are described in the following paragraphs.

DIRECT CARD.

3-23. The DIRECT card provides an integer which specifies the address of the highest addressed disk segment which should be used for the disk directory. A DIRECT card must appear in the Cold Start deck.

3-24. When determining the figure to be specified as the upper boundary, it should be realized that every 15 files on the disk use 16 segments in the directory.

3-25. The DIRECT card must have the following information:

DIRECT (integer)

Example: DIRECT 2500

BACKUP CARD.

3-26. The BACKUP card provides an integer which specifies the address of the highest addressed disk segment which should be used for data overlay storage. Disk segments with addresses greater than specified for data overlay are available for user storage. A BACKUP card must appear in the Cold Start deck.

3-27. When determining the figure to be specified as the upper boundary for overlay storage, it should be realized that the MCP requires all disk segments through address 999, and the disk directory uses the segments up to the address on the DIRECT card. Also, it should be realized that each program in the MIX is assigned a minimum of 500 segments for data overlay storage.

3-28. The BACKUP card must contain the following information:

BACKUP (integer)

Example: BACKUP 15000

ESU CARD.

3-29. The ESU (electronic storage unit) card supplies an integer which indicates the number of Electronics Units attached to the system. Specifically, the integer on this card must have a value which expresses the sum of the number of Electronics Units on DKA (i.e., Disk File Control Unit 1) plus 100 times the number of Electronics Units on DKB (i.e., Disk File Control Unit 2). For example, if a B 5500 system had three Electronics Units on DKA, and two on DKB, then the integer on the ESU card should be 203. An ESU card must appear in the Cold Start deck.

3-30. The ESU card must contain the following information:

ESU (integer)

Examples: ESU 1 ESU 202

DATE CARD.

3-31. The Date card is optional, but should precede all FILE cards in the Cold Start deck, if any. A date supplied in a DT keyboard message, entered subsequent to the use of the DATE card, would supercede the information on the DATE card.

3-32. The DATE card provides three integers, separated by the character /. The first integer specifies the two digits of the month; the second integer specifies the day, and the third specifies the last two digits of the year. This card causes the date-word on the disk to be set to the date specified. (This date-word contains the current date used, e.g., in tape labels.)

3-33. The DATE card must contain the following information:

Example: DATE 12/29/64

FILE CARD GROUP.

- 3-34. The function of a FILE card group is to define a user file which is to be listed in the disk directory. This method of defining a file, as opposed to defining a file through the use of a file declaration in a program, allows an installation to explicitly assign specific disk addresses for files.
- 3-35. A FILE card group consists of a FILE card and one or more file address cards. There may be as many FILE card groups as desired in the Cold Start deck.
- 3-36. The FILE card contains the word FILE, which identifies the File card group, and the card supplies the following information in the order listed and separated by commas (see example):
 - a. A data file specifier, which provides the data file name to be listed in the disk directory.
 - b. An integer x integer construct, where the first integer specifies

 the number of areas on disk to be used by the file, and the second

 integer specifies the number of 30-word disk segments in each area.
 - number of days past the date of last access that the file is to be retained on disk).

3-37. In total then, a FILE card must contain the following information:

FILE \(\)data file specifier\(\), \(\)(integer\) x \(\)(integer\), \(\)(integer\)
Example: FILE PREFIX/NAME, 2x1000, 30

- 3-38. A file address card contains a single integer, which is different from zero, and which specifies the absolute disk address of the first word in an area to be used by the file whose name was supplied by the preceding FILE card. There must be one file address card for each area specified for the file. The first file address card in a FILE card group provides the beginning address of the first area to be used by the file, the second file address card provides the beginning address of the second area to be used and so on. A zero integer for an address denotes that the MCP is to assign the address for that area.
- 3-39. As noted above, a file address card must contain the following information:

⟨integer⟩

Example: 2000

0

- 3-40. Three examples of a FILE card group are as follows:
 - a. FILE SYSTEM/LOG, 1x1000, 2

n

b. FILE DAVES/AREA, 3x900, 15

2500

3400

0

c. FILE B 280/RESERVE, 2x1500, 365

4300

8000

3-41. It should be noted that if log information for the system is to be recorded, a file with the file identification prefix SYSTEM, and the file identification LOG must be defined on the disk. Also, this file must be limited to one area on the disk. Consequently, if system log information is to be retained, a FILE card group (such as the first example above) should appear in the Cold Start deck.

OPTION CARDS.

3-42. If the option cards described in the following paragraphs are not used, the corresponding options are automatically set to off.

3-43. USE DRA CARD -- OPTN 47 CARD. The USE DRA card may be used to set an option code that specifies that a system is equipped with a drum memory unit designated DRUM A. Consequently, this option can be used only when the system is so equipped. When this option is specified, the MCP will use DRUM A for data overlay storage. When this storage area is available, it will be used in preference to disk. Also, when the DRA option is specified, a loader which loads the MCP from disk to core at HALT-LOAD time, is placed on the drum so that a HALT-LOAD from the drum can be used to initiate operation of the system. If the DRA option is not used, a "CARD LOAD SELECT" HALT-LOAD must be performed to initiate the system. This is done by using the DISK LOAD BUTTON card which is described later in this section.

3-44. The USE DRA option may also be specified through the use of the OPTN 47 card. The OPTN 47 card is equivalent to the USE DRA card.

3-45. The USE DRA card must contain the following information:

USE DRA

Example: USE DRA

3-46. The OPTN 47 card must contain the following information:

OPTN 47

Example: OPTN 47

3-47. USE DRB -- OPTN 46 CARD. The USE DRB card may be used to set an option card that specifies that a system is equipped with a drum memory unit designated DRUM B. Consequently, this option can only be used when the system is so equipped. When this option is specified, the MCP will use DRUM B for data overlay storage, and when available, drum memory is used in preference to disk memory.

3-48. The USE DRB option may also be specified through the use of the OPTN 46 card. The OPTN 46 card is equivalent to the USE DRB card.

3-49. The USE DRB card must contain the following information:

USE DRB

Example: USE DRB

3-50. The OPTN 46 card must contain the following information:

OPTN 46

Example: OPTN 46

- 3-51. TYPE BOJ CARD -- OPTN 45 CARD. The TYPE BOJ card may be used to set an option code that specifies that a BOJ (program ID) message is to be typed each time the DF MCP initiates a compiler or an object program.
- 3-52. The TYPE BOJ option may also be specified through use of the OPTN 45 card. The OPTN 45 card is equivalent to the TYPE BOJ card.

3-53. The TYPE BOJ card must contain the following information:

TYPE BOJ

Example: TYPE BOJ

3-54. The OPTN 45 card must contain the following information:

OPTN 45

Example: OPTN 45

3-55. TYPE EOJ CARD -- OPTN 44 CARD. The TYPE EOJ card may be used to set an option code that specifies that an EOJ message is to be typed when a compiler or an object program is completed.

3-56. The TYPE EOJ option may also be specified through use of the OPTN 44 card. The OPTN 44 card is equivalent to the TYPE EOJ card.

3-57. The TYPE EOJ card must contain the following information:

TYPE EOJ

Example: TYPE EOJ

3-58. The OPTN 44 card must contain the following information:

OPTN 44

Example: OPTN 44

3-59. TYPE OPN CARD -- OPTN 43 CARD. The TYPE OPN card may be used to set an option that specifies that a "file open" message should be typed whenever an object program opens a file.

3-60. The TYPE OPN option may also be specified through use of the OPTN 43 card. The OPN 43 card is equivalent to the TYPE OPN card.

3-61. The TYPE OPN card must contain the following information:

TYPE OPN

Example: TYPE OPN

3-62. The OPTN 43 card must contain the following information:

OPTN 43

Example: OPTN 43

3-63. USE TERMNATE CARD -- OPTN 42 CARD. The USE TERMNATE card may be used to set an option code that specifies that the TERMINATE procedure of the MCP is to be called if the MCP must discontinue processing of a program due to an error condition.

3-64. Since it is the function of the TERMINATE procedure to clear the system of all information pertaining to a discontinued program, the USE TERMNATE option generally should always be specified. However, if an error condition should occur where it is necessary to obtain a memory dump that reflects core conditions at error time, the USE TERMNATE option should not be specified.

3-65. The USE TERMNATE option may also be specified through use of the OPTN 42 card. The OPTN 42 card is equivalent to the USE TERMNATE card.

3-66. The USE TERMNATE card must contain the following information:

USE TERMNATE

Example: USE TERMNATE

3-67. The OPTN 42 card must contain the following information:

OPTN 42

Example: OPTN 42

3-68. TYPE DATE CARD -- OPTN 41 CARD. The TYPE DATE card may be used to set an option code that specifies that the DT PLEASE message is to be typed at HALT-LOAD time. When this option is specified and the DT PLEASE message is typed at HALT-LOAD time, the system operator must enter a DT keyboard input message before processing can commence.

3-69. The TYPE DATE option may also be specified through use of the OPTN 41 card. The OPTN 41 card is equivalent to the TYPE DATE card.

3-70. The TYPE DATE card must contain the following information:

TYPE DATE

Example: TYPE DATE

3-71. The OPTN 41 card must contain the following information:

OPTN 41

Example: OPTN 41

3-72. TYPE TIME CARD -- OPTN 40 CARD. The TYPE TIME card may be used to set an option code that specifies that the TR PLEASE message is to be typed at HALT-LOAD time. When this option is specified and the TR PLEASE message is typed at HALT-LOAD time, the system operator must enter a TR keyboard input message before processing can commence.

3-73. The TYPE TIME option may also be specified through use of the OPTN 40

card. The OPTN 40 card is equivalent to the TYPE TIME card.

3-74. The TYPE TIME card must contain the following information:

TYPE TIME

Example: TYPE TIME

3-75. The OPTN 40 card must contain the following information:

OPTN 40

Example: OPTN 40

3-76. USE ONEBREAK CARD -- OPTN 39 CARD. The USE ONEBREAK card may be used to

set an option code that specifies that all programs performing BREAKOUT will use

the same magnetic tape as a BREAKOUT tape. If the option is not specified, each

such program will be assigned its own BREAKOUT tape.

3-77. The USE ONEBREAK option may also be specified through the use of the

OPTN 39 card. The OPTN 39 card is equivalent to the USE ONEBREAK card.

3-78. The USE ONEBREAK card must contain the following information:

USE ONEBREAK

Example: USE ONEBREAK

3-79. The OPTN 39 card must contain the following information:

OPTN 39

Example: OPTN 39

3-80. USE AUTOPRNT CARD -- OPTN 38 CARD. The USE AUTOPRNT card may be used to set an option code that specifies that printer back-up tapes (not including those created previous to the latest HALT-LOAD) are to be automatically printed whenever a back-up tape and a line printer are not in use at the same time. If the option is not specified, printer back-up tapes will be printed only if the system operator enters a "PB" keyboard input message.

3-81. The USE AUTOPRNT option may also be specified through the use of the OPTN 38 card. The OPTN 38 card is equivalent to the USE AUTOPRNT card.

3-82. The USE AUTOPRNT card must contain the following information:

USE AUTOPRNT

Example: USE AUTOPRNT

3-83. The OPTN 38 card must contain the following information:

OPTN 38

Example: OPTN 38

3-84. TYPE TUMAITING CARD -- OPTN 36 CARD. The TYPE TUMAITING card may be used to set an option code that specifies that the MCP will type a message to notify the operator when a Data Communications Terminal Unit is output ready (i.e., waiting for another line of a multiple line message), but no output message has been provided to satisfy this need. An output ready condition without a message available is not necessarily an error condition, but it is generally uncommon and may indicate a program error. (The "TU (integer)" input message can be used to eliminate the output ready condition, if that action is desired.)

3-85. The TYPE TUWAITING option may also be specified through the use of the OPTN 36 card. The OPTN 36 card is equivalent to the TYPE TUWAITING card.

3-86. The TYPE TUWAITING card must contain the following information:

TYPE TUWAITING

Example: TYPE TUWAITING

3-87. The OPTN 36 card must contain the following information:

OPTN 36

Example: OPTN 36

3-88. TYPE CMPLRFIL CARD -- OPTN 35 CARD. The TYPE CMPLRFIL card may be used to set an option code that specifies that "file open" and "file close" messages should be typed for compiler files, according to the respective settings of the TYPE OPN and TYPE CLOSE options. If this option is not specified, no messages will be typed due to the opening and/or closing of files used by compilers.

3-89. The TYPE CMPLRFIL option may also be specified through the use of the OPTN 35 card. The OPTN 35 card is equivalent to the TYPE CMPLRFIL card.

3-90. The TYPE CMPLRFIL card must contain the following information:

TYPE CMPLRFIL

Example: TYPE CMPLRFIL

3-91. The OPTN 35 card must contain the following information:

OPTN 35

Example: OPTN 35

3-92. TYPE CLOSE CARD -- OPTN 34 CARD. The TYPE CLOSE card may be used to set an option code that specifies that a "file close" message should be typed whenever an object program closes a file.

3-93. The TYPE CLOSE option may also be specified through the use of the OPTN 34 card. The OPTN 34 card is equivalent to the TYPE CLOSE card.

3-94. The TYPE CLOSE card must contain the following information:

TYPE CLOSE

Example: TYPE CLOSE

3-95. The OPTN 34 card must contain the following information:

OPTN 34

Example: OPTN 34

3-96. TYPE ERRORMSG CARD -- OPTN 33 CARD. The TYPE ERRORMSG card may be used to set an option which specifies that the programmatic recovery feature is to be used. If the option is set, non-terminal error messages will be typed.

3-97. The TYPE ERRORMSG option may also be specified through the use of the OPTN 33 card. The OPTN 33 card is equivalent to the TYPE ERRORMSG card.

3-98. The TYPE ERRORMSG card must contain the following information:

TYPE ERRORMSG

Example: TYPE ERRORMSG

3-99. The OPTN 33 card must contain the following information:

OPTN 33

Example: OPTN 33

3-100. STOP CARD. The last card in the Cold Start deck must be a STOP card. The STOP card must contain the following information:

STOP

Example: STOP

DISK LOAD BUTTON CARD.

3-101. The Disk Load Button card is a binary card containing code that causes the MCP to be initiated. This card must be used in conjunction with a "CARD LOAD SELECT" HALT-LOAD operation to initiate the MCP. The only exception to this would occur when the system is equipped with a drum memory unit and the DRA option is specified.

CONTROL CARDS USED TO LOAD COMPILERS TO DISK.

- 3-102. The control cards used in the SYSTEM LOADER to load compilers to disk are: (1) a LOAD card specifying the library tape name SYSTEM and the names of the compilers to be loaded, and (2) an END card.
- 3-103. The following example shows a possible choice of such control cards:
 - ? LOAD FROM SYSTEM ALGOL/DISK, COBOL/DISK
 - ? END

SYSTEM START UP PROCEDURE.

3-104. Before beginning any operation, the system must be turned on by pressing the POWER ON switch located on the operator's console.

LOADING THE DISK SYSTEM FROM THE SYSTEM TAPE.

- 3-105. The entire software package (MCP, compilers, system programs, etc.) is contained on the system tape. Any or all of the above items can be loaded on to the disk by means of the Disk File System Loader. This loading can be accomplished all at one time, or at different times. Once the desired items have been placed on the disk, they remain there until a subsequent loading operation is called for.
- 3-106. To load the disk system with all the items on the system tape at the same time, the operator must perform the following steps:
 - a. Press the CARD LOAD SELECT and HALT switch on the operator's console.

 (These switches will be lit when properly actuated.)
 - b. Place the system tape on a tape unit.
 - c. Place the Disk File System Loader in the card reader.
 - d. Press RESET and START on the card reader.
 - e. Press LOAD on the operator's console.
- 3-107. Since the MCP Loader and the Cold Start are independent routines, they may be loaded on disk separately or together by placing the respective card decks in the card reader and performing a "CARD LOAD SELECT" HALT-LOAD operation. Also the DISK LOAD BUTTON card can be used anytime the MCP and the disk directory are on the disk. The control cards used to load the compilers may be used any time the MCP is in operation. Therefore, the MCP LOADER, the Cold Start, the DISK LOAD BUTTON or the compiler load cards may be used separately. For example, if a compiler that was not initially loaded is required on the disk, a LOAD

card alone can be used to place that compiler on the disk. If a modified MCP is to replace the MCP already on the disk, the MCP LOADER alone can be initiated with a "CARD LOAD SELECT" HALT-LOAD operation.

3-108. There are messages which will be typed out while loading the system. They are as follows:

Message	Description
MCP FILE LOADED	The MCP LOADER has successfully loaded
	the MCP on to disk.
DIRECTORY BUILT	Cold Start has constructed a disk directory.
-HL-	The MCP has assumed control of the system.
INCORRECT CARD	An erroneous card is read during the
	operation of the Cold Start. This situation
	can be remedied by placing the correct card
	in the card reader, pressing RESET, then
	START on the card reader.
⟨unit mnemonic⟩ ERROR	Cold Start must be re-initiated.

PROGRAM SCHEDULING INFORMATION.

3-109. After the desired information has been loaded on to the disk, the MCP is ready to begin processing. The MCP is told what is to be processed by means of control information. This information, made available to the MCP via punched cards, is placed in an available card reader by the operator.

3-110. The MCP scans the available input/output units, reading a record from each input file. During this scanning operation, the MCP recognizes the card it reads as containing the needed control information. The card is then analyzed and the indicated operation is performed.

SECTION 4

CONTROL INFORMATION

GENERAL.

- 4-1. Information about the various functions to be performed by the B 5500 is normally entered into the system via punched cards or typewriter messages. These cards, commonly called the schedule deck, are of two basic types: control cards, and program-parameter cards. It should be noted that there are other cards that may appear in the schedule deck, notably source-deck cards, and \$ sign cards.
- 4-2. This section describes in detail the control cards, the program-parameter cards, and the compiler option cards. For typewriter messages refer to Appendix C.

CONVENTIONS.

- 4-3. In describing the format of control information, the following conventions will be used:
 - a. If a word in a description is a word that would appear as part of the control information, this word will be written in UPPER CASE letters.
 - b. If a word in a description is merely a word used in the expression of the description, the word will be in lower case letters.
 - c. If a word or phrase in a description has a particular definition, the word or phrase will be contained within broken brackets (i.e., $\langle \rangle$).

DEFINITIONS.

4-4. A number of terms will be used throughout the discussion of control information. The meanings of many of these terms are common and well known. However, in an attempt to avoid misinterpretation and to provide meanings for any unfamiliar terms, a number of definitions are provided below. When used, the defined terms will appear within broken brackets.

Term Definition (letter) Any letter of the alphabet of the English language. (digit) Any one of the characters listed below: 1 2 3 5 7 $\langle {\sf integer} angle$ A contiguous string of digits. One or more blank card columns, or one or more (space) horizontal space movements on a typewriter, a Gradisko sekabbi perantopija Pili whichever is relevant. (special character) Any one of the characters listed below: % A (letter) or a (digit) or a (special character) (legitimate character) or a single (space).

and high the more considerable and the control of the first of the control of the two the control of the control

<u>Definition</u>

⟨illegitimate character⟩

Any card code that does not represent a {legitimate character}. When used in descriptions of control cards and program parameter cards, an {illegitimate character} will be represented as a question mark (i.e., ?).

<quote>

The character ".

<string>

Any contiguous string of $\langle legitimate character \rangle s$, excluding $\langle quote \rangle s$, that is preceded by and followed by a $\langle quote \rangle$.

(identifier)

Any contiguous string of $\langle letter \rangle$ s or $\langle letters \rangle$ and $\langle digit \rangle$ s, that begins with a $\langle letter \rangle$ and is not greater than 63 characters in length.

⟨reserved character⟩

Any one of the four characters listed below:

•

,

⟨reserved word⟩ *

Definition

Any one of the words listed below:

ALGOL	DUMP	LOAD	REMOVE
BACK	END	NO	SPECIAL
CHANGE	EXECUTE	PAPER	STACK
COBOL 224	FILE	PRINT	SYNTAX
COMMON	FORM	PRIORITY	TAPE
COMPILE	IO	PROCESS	UNIT
DATA	LABEL	PUNCH	UP
DISK	LIBRARY		

(comment)

Any list of <legitimate character>s that does not contain either <reserved word>s or <reserved character>s. A <comment> can, of course, consist entirely of <space>s.

⟨separator⟩

An (identifier), providing it is not a (reserved word); a (string); or a (special character), providing it is not a (reserved character).

⟨program identifier⟩

An (identifier) of seven or less characters, excluding (reserved word)s, or a (string) of seven or less characters.**

^{**} A <program identifier >, a <program identifier suffix >, a <file identifier >, or a <file identifier prefix > may appear in control information as more than seven characters; however, when this is the case, only the first seven characters are taken to be significant.

Term	Definition
<pre>⟨program suffix⟩</pre>	An (identifier) of seven or less characters,
	excluding $\langle reserved word \rangle s$, or a $\langle string \rangle$ of
	seven or less characters.**
⟨program name⟩	<pre>⟨program identifier⟩ ⟨program identifier suffix⟩</pre>
<pre>⟨program specifier⟩</pre>	<pre>⟨program identifier⟩ ⟨separator⟩</pre>
	<pre>⟨program identifier suffix⟩</pre>
$\langle ext{file identification} angle$	An <pre>dentifier</pre> of seven or less characters,
	excluding (reserved word)s, or a (string) of
	seven or less characters.**
<pre> ⟨file identification prefix⟩</pre>	An <identifier> of seven or less characters,</identifier>
Thre identification prefix,	excluding (reserved word)s, or a (string) of
	seven or less characters.**
<pre>⟨multiple file identification⟩</pre>	A \file identification prefix \rangle.
⟨data file name⟩	A \langle file identification prefix \rangle \langle file
	identification \rangle or a \langle file identification \rangle ,
	in which case the (file identification prefix)
	is assumed to be zeros.
<pre>⟨data file specifier⟩</pre>	A $\langle \text{file identification prefix} \rangle / \langle \text{file} \rangle$
	identification).

^{**} A <program identifier >, a <program identifier suffix >, a <file identifier >, or a <file identifier prefix > may appear in control information as more than seven characters; however, when this is the case, only the first seven characters are taken to be significant.

Definition

30 (<mark>ominu</mark>m) a no ježenom ben

A (data file specifier) or a (file identification), in which the (file identification prefix) is assumed to be zeros.

Kaithua bottiapiat ascopiat (file list)

A (file specifier) or a (file list), (file department of specifier. . Turkayayayayayayayayaya

⟨change element⟩

A A program specifier > <separator > program specifier > or a <data file specifier > to the specifier).

⟨change list⟩

A Change element or a change list, change , exhibiting to be a first so that the second \cdot , \cdot , . මෙම සහ සහ ක්රෙක්කත්වීම උසුලුම්ම දේශේෂ්

A term with one of the following three formats: ,rrr

THE COURSE CONTRACTOR OF ALTERNATION

nrr, ddddd , rrr

,rrr, ddddd, cc

where rrr is an integer of three or less characters and specifies the reel number, and ddddd is a five character (integer), and its first two (digits) specify the year, and the last three which to the day of the specify the number of the day of the विक्रमें कि अवस्थित अस्तर है। इस्तर है year, and cc is an (integer) of two or less characters and specifies the cycle number.

ිද්දෙයන් රාත්තුවට සහ එයි. හරුණන සහා සෞඛ්ය කණ්ඩු

y Koralin Edward Chair Roman y Comment (compiler name)

COBOL or ALGOL. ere a la collecte de la companya de la com න්**වර් Name Z** වෙනස් කොට්ට වෙන වියාව සිට වියාව සිතින් සිට වෙනස් වෙනව සිට පිළිබුණ වෙන සිට සිට සිට සිට සිට සිට සිට - කටස්තිව ක්කාලම්ම සංඛ්ය දෙන වෙනස් සිට සිට කම් වෙනස්ම සිතින්සේ දෙනත් වෙනස්මේ දෙනත් ක්රම් කාල් කිරීමේ මස්මේ සිට

(library tape name)

⟨unit mnemonic⟩

Definition

 $\langle multiple file identification \rangle$.

Any one of the three-character codes listed below. (The definition of each (unit mnemonic), as recognized by the MCP, is listed to the right of the code.)

Code	Definition			
MTA	Magnetic	tape	unit	Α
МТВ	Magnetic	tape	unit	В
MTC	Magnetic	tape	unit	С
МТО	Magnetic	tape	unit	D
MTE	Magnetic	tape	unit	Ε
MTF	Magnetic	t a pe	unit	F
MTH	Magnetic	tape	unit	Н
MTJ	Magnetic	tape	unit	J
MTK	Magnetic	tape	unit	K
MTL	Magnetic	tape	unit	L
MTM	Magnetic	tape	unit	М
MTN	Magnetic	t a pe	unit	N
MTP	Magnetic	tape	unit	Р
MTR	Magnetic	tape	unit	R
MTS	Magnetic	tape	unit	s
MTT	Magnetic	tape	unit	Τ.
CRA	Card read	der A		
CRB	Card read	der B		
LPA	Line prir	nter A	•	

Definition

		arriados - Torres de Caracteria de Caracteri
<pre>⟨unit mnemonic⟩ (cont)</pre>	Code	<u>Definition</u> Her Squarement
	LPB	Line printer B
	CPA	Card punch
en en la companya de la companya de La companya de la co	SPO	Supervisory printer
en e	CDA	Pseudo card reader A
	CDB	Pseudo card reader B
	CDC	Pseudo card reader C
en e	CDD	Pseudo card reader D
(aggregate file name)	= / = or	= $/$ \langle file identification \rangle or = $/$
	<pre></pre>	identification suffix \rangle or \langle file
	identific	cation prefix \rangle / = or \langle program
	identific	cation \ / =.
⟨aggregate file list⟩	⟨file lis	st〉or〈aggregate file name〉or
	\aggregat	te file list \rangle , \langle file list \rangle or
	\aggregat	te file list \rangle , \langle aggregate file name \rangle .

CONTROL INFORMATION VIA PUNCHED CARDS.

4-5. As stated previously, the punched cards used to supply control information to the MCP are classified as control cards and program-parameter cards. These cards are distinguishable from other punched cards used in the system in that they are required to have an (invalid character) in column 1.

4-6. Aside from the invalid character in column 1, the information on control cards and program-parameter cards is in a free field format, with the exception of label cards. Label cards have a fixed format. Although the information on control cards is in a free field format, it must appear in the order denoted by the following descriptions.

- 4-7. Only the first 72 columns of a control card (with the exception of the label card) or label equation card may contain control information. The MCP ignores the information in columns 73-80. Also, if the special character "." (period) appears in a control card or label equation card, and is not a part of a (string), all information following the period will be ignored.
- 4-8. In the following descriptions (control cards, program-parameter cards, etc.) the information specified as being contained in a particular card may, in fact, be contained in more than one card, except in the case of a label card. If it is desired to continue information from one card to another, the character following the information which will be continued must be a hyphen (i.e., the reserved character "-"). The hyphen cannot, however, divide an (identifier). Also, the cards onto which the information is being continued must not contain an (invalid character) in column 1.
- 4-9. Through the use of the semicolon (i.e., the reserved character ";") one punched card can contain information for more than one control card and/or program-parameter card. The appearance of a semicolon in a control card or program-parameter card denotes the logical end of that card and the beginning of another. When the semicolon convention is used, no question mark is required or accepted in the control information following.

CONTROL CARDS.

4-10. In the following paragraphs each control card used in the B 5500 Disk System is listed together with a detailed function of each card.

COMPILE CARD.

4-11. The COMPILE card is used to call out either the ALGOL or COBOL compiler for the purpose of compiling a source program. The COMPILE card designates the compiler to be used, and the type of compile run to be made. A compile-and-go run, a compile-for-library run, or a compile-for-syntax-check run may be specified. Each of these three runs is described in the following paragraphs.

a. A compile-and-go run causes the compiled program to be scheduled to run after an error-free compilation. But it does not enter the program in the disk directory. The disk space used by the program is returned after the program is run. The COMPILE card for a compile-and-go run must contain the following information:

b. A compile-for-library run causes the compiled program to be left on the disk, and entered in the disk directory after an error-free compilation.
But it does not cause the program to be scheduled to run. The COMPILE card for a compile-for-library run must contain the following information:

? COMPILE \(\rangle\text{program specifier}\rangle\text{comment}\rangle\(\text{comment}\rangle\)
\(\langle\text{comment}\rangle\text{LIBRARY}\rangle\text{comment}\rangle\)

the compilation. The COMPILE card for a compile-for-syntax-check run must contain the following information:

Examples:

- ? COMPILE JOB BY CMB WITH ALGOL FOR LIBRARY
- ? COMPILE PATSER BY RNF ALGOL SYNTAX
- ? COMPILE "124-6A"/VEW USING ALGOL
- ? COMPILE PF SEPARATE "10" ALGOL LIBRARY
- ? COMPILE BRUTE BY BILL IN COBOL. GO GO GO

EXECUTE CARD.

4-12. The EXECUTE card is used to call out a library program from the disk for execution. The EXECUTE card must contain the following information:

? EXECUTE program specifier > <comment >

Examples:

- ? EXECUTE JOB/CMB
- ? EXECUTE PF NUMBER 10
- ? EXECUTE PROSORT BY IRP. THIS IS RUN 2.

REMOVE CARD.

4-13. The REMOVE card causes the specified file(s) to be removed from the disk directory, and causes the disk space used by the file(s) to be made available for other use.

NOTE

The files SYSTEM/LOG and DIRCTRY/DISK cannot be removed from the disk.

4-14. To specify what files are to be removed, file lists and/or aggregate file names (i.e., an (aggregate file list)) may be used. A file list, of course, provides a file specifier for each file to be removed. An aggregate file name specifies one or more files are to be removed. Specifically, the various choices for REMOVE card information can be explained as follows.

a. If a REMOVE card contains information of the form:

? REMOVE (file list)

then all files that are both in the file list and the disk directory will be removed.

b. If a REMOVE card contains information of the form:

? REMOVE = / \langle file identification \rangle

or

? REMOVE = / / program identification suffix>,

then all files with the given file identification or program identification suffix -- which are on the disk -- will be removed.

c. If a REMOVE card contains information of the form:

? REMOVE <file identification prefix > / =

or

? REMOVE (program identification) / =,

then all files with the given file identification prefix or program identification, which are on the disk, will be removed.

d. If a REMOVE card contains information of the form:

then all files on the disk will be removed.

To summarize, the information on a REMOVE card must contain the following information:

? REMOVE \(aggregate file list \)

Examples:

- ? REMOVE PROG/CAL, PROG/IRA, DATA/IRACAL
- ? REMOVE = / IRA
- ? REMOVE PROG / =
- ? REMOVE = / =
- ? REMOVE P/I, = / DISK, DATA / =, A/B

DUMP CARD.

4-15. The DUMP card causes one or more library programs and/or data files to be copied on a scratch tape from disk. The file information written on the magnetic tape forms a multi-file reel, and is referred to as a library tape. The DUMP card facility does not remove files from the disk directory.

NOTE

The files SYSTEM/LOG and DIRCTRY/DISK cannot be dumped.

4-16. To specify what files are to be dumped, file lists and/or aggregate file names (i.e., an (aggregate file list)) are to be used. A file list, of course, provides a file specifier for each file to be dumped. An aggregate file name specifies one or more files are to be dumped. Specifically, the various choices for DUMP card information can be explained as follows:

a. If a DUMP card contains information of the form:

? DUMP TO library tape name <file list >,

then all files that are both in the file list and the disk directory will be dumped.

b. If a DUMP card contains information of the form:

or

? DUMP TO \(1ibrary tape name \) = / \(file identification \)

? DUMP TO \langle 1ibrary tape name \rangle = $/\langle$ program identification suffix \rangle , then all files with the given file identification or program identification suffix, which are on the disk, will be dumped.

c. If a DUMP card contains information of the form:

? DUMP TO \langle library tape name \rangle \langle file identification prefix \rangle / = or

? DUMP TO \langle library tape name \rangle \langle program identification \rangle / =, then all files with the given file identification prefix or program identification, which are on the disk, will be dumped.

d. If a DUMP card contains information of the form:

? DUMP TO <1ibrary tape name > = / =

then all files on the disk will be dumped.

To summarize, the information on a DUMP card must contain the following information:

? DUMP \(separator \) \(\lambda \) | tape name \(\lambda \) | aggregate file list \(\lambda \)
Examples:

- ? DUMP TO IRASYST PROG/CAL, PROG/IRA, DATA/IRACAL
- ? DUMP TO IRASYST = / IRA
- ? DUMP TO CALSYST PROG / =
- ? DUMP TO LIBTAPE = / =
- ? DUMP TO LIBTAPE P/I, =/DISK, DATA/=, A/B

LOAD CARD.

4-17. The LOAD card causes the files specified by the $\langle 1ibrary tape name \rangle$ and $\langle file 1ist \rangle$ to be loaded on the disk and entered in the disk directory.

NOTE

The files SYSTEM/LOG and DIRCTRY/DISK cannot be loaded.

- 4-18. To specify what files are to be loaded, file lists and/or aggregate file names (i.e., an (aggregate file list)) may be used. A file list, of course, provides a file specifier for each file to be loaded. An aggregate file name specifies one or more files are to be loaded. Specifically, the various choices for LOAD card information can be explained as follows:
 - a. If a LOAD card contains information of the form:
 - ? LOAD FROM (library tape name) (file list)

then all files that are both in the file list and the library tape will be loaded.

b. If a LOAD card contains information of the form:

? LOAD FROM (library tape name) = / (file identification)
or

? LOAD FROM $\langle \text{library tape name} \rangle = / \langle \text{program identification suffix} \rangle$ then all files with the given file identification or program identification suffix, which are on the library tape, will be loaded.

c. If a LOAD card contains information of the form:

? LOAD FROM \langle 1ibrary tape name \rangle \langle file identification prefix \rangle / = or

? LOAD FROM (library tape name) (program identification) / = then all files with the given file identification prefix or program identification, which are on the library tape, will be loaded.

d. If a LOAD card contains information of the form:

? LOAD FROM (library tape name) = / =

then all files on the library tape will be loaded.

To summarize, the information on a LOAD card must contain the following information:

? LOAD \(separator \) \(\lambda \) | tape name \(\lambda \) | aggregate file list \(\lambda \)
Examples:

- ? LOAD FROM IRASYST PROG/CAL, PROG/IRA, DATA/IRACAL
- ? LOAD FROM IRASYST = / IRA

- ? LOAD FROM CALSYST PROG / =
- ? LOAD FROM LIBTAPE = / =
- ? LOAD FROM LIBTAPE P/I, = /DISK, DATA/=, A/B

CHANGE CARD.

4-19. The CHANGE card is used to change the names of program files and/or data files which are on disk. The first (file specifier) in a (change element) signifies the name of the file whose name is to be changed. The second (file specifier) in a (change element) signifies the new name for the file. The CHANGE card must contain the following information:

? CHANGE (change list)

Examples:

- ? CHANGE DATA1/"001" TO DATA1/"0001"
- ? CHANGE ALGOL/DISK TO OLDALGOL/A, NEWALGOL/A TO ALGOL/DISK
- ? CHANGE A BY ME TO B BY ME, AB/C TO AC/B, BAD/N TO GOOD/N

LABEL CARD.

- 4-20. The LABEL card may be used to relate a card file with a \(\)data file name \(\) and other label information. With the exception of the \(\)invalid character \(\) required in column 1, the information in a LABEL card is defined as it is for a standard B 5500 label, as would be used on a magnetic tape file.
- 4-21. A LABEL card has a fixed format, as described below. In the description below, the character "b" signifies a single (space). The LABEL card is described as follows:

Characters	Field Description
1-8	Must contain ?LABELbb
9	Must be zero
10-16	Multiple file identification
17	Must be zero
18-24	File identification
25-27	Reel number
28-32	Creation date
33-34	Cycle number
35-64	(Irrelevant for card files)
65-80	Users portion (for COBOL)

DATA CARD.

4-22. The DATA card can be used in lieu of a LABEL card, if the \(\)multiple file identification \(\) for a card file consists of zeros, and if there is no desire to provide label information other than a \(\)file identification \(\). The DATA card must contain the following information:

? DATA (file identification)

Example:

? DATA CARDS

END CARD.

4-23. The primary function of the END card is to denote the end of card information for a particular program. This designation of the end of information is required by the MCP whenever a program for any reason is terminated while it has card information yet to be read. Consequently, the END card is required to be the last card in a deck pertaining to a program. That is, the END card relevant to a particular program should not be followed by any other control card, or any program-parameter cards, or any data cards for that same program.

4-24. If a program attempts to read an END card as data, and End-of-File notification will occur. However, the END card is not required to denote the end of a data file. An attempt to read any control card as data will cause an End-of-File notification. Consequently, if a program requires more than one card file, the end of one file will be denoted by the LABEL card or DATA card for the next.

4-25. The END card must contain the following information:

? END (comment)

Example:

? END

END CONTROL CARD.

4-26. The END CONTROL card must be used to denote the end of a CONTROL DECK file used by the system program LDCNTROL/DISK. The END CONTROL card must contain the following information:

? END CONTROL

Example:

? END CONTROL

PROGRAM-PARAMETER CARDS.

4-27. Program-parameter cards can be classified as program-parameter cards for compilers and program-parameter cards for object programs. The only difference between the two classifications is that the cards for compilers have a (compiler name) following the (invalid character), and refer to the specified compiler; and the cards for object programs do not contain a (compiler name) and refer to the object program.

- 4-28. Program-parameter cards for a compiler must be included in the programparameter cards that immediately follow a COMPILE card. Also, for a compile-andgo run, the program-parameter cards for the object program must be included in
 the program parameter cards immediately following the COMPILE card. For compilefor-syntax-check or compile-for-library runs, program-parameter cards may be
 included as for a compile-and-go run, but they will be ignored.
- 4-29. When an object program is to be called for execution through use of an EXECUTE card, the program-parameter cards for the object program must immediately follow the EXECUTE card. Within a group of program-parameter cards, order is irrelevant.

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4-30. In the paragraphs that follow, each program-parameter card of the B 5500 with the paragraphs and whose parameters are program parameter card of the B 5500 parameters and the B 5500 parameters are parameter

PROCESS CARD.

- 4-31. The PROCESS card specifies the maximum amount of process time an object program or compiler is to be allowed. If the process time for the program concerned exceeds the amount specified, the MCP will terminate the program. The (integer) on the PROCESS card specifies the maximum process time in minutes.
- 4-32. The PROCESS card for a compiler must contain the following information:

sel Example⊈ event orabilisatos rollización sollisteda, en excella con envice os electromensorado

- , Ser? ALGOLD PROCESS: Time at 1 sales for the second of the color of the color of the color of the colors of the
- CONTROL PROCESS: F13-6-11 AL CARALTER VALUE OF THE GOVERNMENT OF THE SECOND PROCESS.

4-33. The PROCESS card for an object program must contain the following information:

Example:

- ? PROCESS = 4
- ? PROCESS MAXIMUM = 5

IO CARD.

4-34. The IO card specifies the maximum amount of I/O channel (i.e., I/O Control Unit) time an object program or compiler is to be allowed. If the I/O channel time for the program concerned exceeds the amount specified, the MCP will terminate the program. The \langle integer \rangle on the IO card specifies the maximum channel time in minutes.

4-35. The IO card for a compiler must contain the following information:

Examples:

- ? ALGOL IO = 4
- ? COBOL IO TIME MAX = 5

4-36. The IO card for an object program must contain the following information:

Examples:

- ? I0 = 4
- ? IO MAXIMUM ALLOWED = 3. COMMENT

STACK CARD.

4-37. The STACK card specifies the number of words to be assigned in core memory for the stack of the compiler or the object program. (The MCP assigns 512 words unless a STACK card specifies to do otherwise.) The (integer) in the STACK card specifies the stack size in B 5500 words.

4-38. The STACK card for a compiler must contain the following information:

? (compiler name) STACK (comment) = (integer)

Examples:

- ? ALGOL STACK = 320
- ? COBOL STACK SIZE = 640

4-39. The STACK card for an object program must contain the following information:

? STACK (comment) = (integer)

Examples:

- ? STACK SHALL BE = 256
- ? STACK = 560

PRIORITY CARD.

4-40. The PRIORITY card specifies the priority to be assigned a compiler or object program. Priorities may range from 0 to 32767, where 0 is the highest priority and 32767 the lowest. For scheduling purposes, priorities greater than MIXMAX, i.e., priorities greater than the maximum number of programs allowed in the MIX are taken to be equivalent to MIXMAX. However, during processing, the specified priorities are used, regardless of value. (The MCP assigns a priority of MIXMAX, unless a priority card specifies otherwise.) The (integer) on the PRIORITY card specifies the priority to be assigned.

4-41. The PRIORITY card for a compiler must contain the following information:

? (compiler name) PRIORITY (comment) = (integer)

Examples:

- ? ALGOL PRIORITY FOR THIS RUN = 1
- ? COBOL PRIORITY = 3

4-42. The PRIORITY card for an object program must contain the following information:

? PRIORITY (comment) = (integer)

Examples:

- ? PRIORITY = 0
- ? PRIORITY LOWEST I AM ALLOWED = 4

FILE CARD (LABEL EQUATION).

4-43. The FILE card (often referred to as the Label Equation Card) may be used to specify the (data file name) to be associated with a file identifier used in a source program to refer to a particular file. Also, the FILE card can specify various options for output files.

4-44. In the following description, the term \langle file identifier \rangle refers to the file identifier used in I/O statements in the source program. The terms described in the following paragraphs are optional (i.e., they may or may not be used). However, if they are included, they must occur in the order specified.

- a. The term <rdc > may be included.
- operator before a file requiring special forms is opened. The following word specifies (forms option): FORM.

- a label on the specified file. The following words are used to specify the (no-label option): NO LABEL.
- d. The term (output medium) may be used to specify the type of output to be used for the file.
 - 1) The (output medium) BACK UP can be used to specify that a line printer file is to be placed on a printer back-up file.
 - 2) The (output medium) PRINT OR BACK UP can be used to specify that a line printer file can be placed on a printer back-up file if a line printer is not available.
 - 3) The (output medium) SPECIAL denotes that the first three characters of the (file identification) specify the (unit mnemonic) for the output unit to be used for the file.
 - 4) If (output medium) DISK is specified, a random accessing technique will be assumed. SERIAL and UPDATE refer to disk files with serial and update accessing techniques.
 - The remaining choices for \(\)output medium \(\) are self-explanatory.
 If no \(\)output medium \(\) is specified, magnetic tape (i.e., TAPE)
 will be assumed.
 - 6) Any of the following reserved words may be used for (output medium):

DISK

BACK UP

TAPE

PRINT OR BACK UP

PUNCH

SERIAL

PAPER TAPE

UPDATE

PRINT

SPO

- 4-45. The information on a FILE card for a compiler must appear as follows:
 - ? (compiler name) FILE (file identifier) = (data file designator) (rdc)
 (forms option) (no-label option) (output medium)

Examples:

- ? ALGOL FILE TAPE = ZILCH
- ? ALGOL FILE LINE = LINE BACK UP
- 4-46. The information on a FILE card for an object program must appear as follows:
 - ? FILE \langle file identifier \rangle = \langle data file designator \rangle \langle rdc \rangle \langle form option \rangle \langle no-label option \rangle \langle output medium \rangle

Examples:

- ? FILE REED = MULFILE/FILEID
- ? FILE RITE = MUL/FID NO LABEL TAPE
- ? FILE RIGHT = L/PRNT FORM PRINT
- ? FILE ABC = "001"/KZ00,01,64350,02
- ? FILE XYZ = M/N, 3, 64351
- ? FILE F1 = MTEFX01 SPECIAL

COMMON CARD.

4-47. The COMMON card may be used to specify an (integer) which is to be converted to binary and stored as an integer in the PRT (Program Reference Table) of an object program or compiler, just before the object program or compiler is initiated. The PRT cell in which the integer is stored is the first cell beyond cell 20, which contains a zero at load time. PRT cells reserved for simple variables, arrays, and various other program entities, contain zeros at load time. Consequently, when the COMMON card is to be used, the variable which is to receive the value of the (integer) should occur as the first identifier declared in the program.

4-48. The (integer) contained on a COMMON card must not contain more than eight digits. There may be at most one COMMON card per object program or compiler.

4-49. The COMMON card for a compiler must contain the following information:

? $\langle compiler name \rangle COMMON \langle comment \rangle = \langle integer \rangle$

Examples:

? ALGOL COMMON = 127

4-50. The COMMON card for an object program must contain the following information:

 $COMMON \langle comment \rangle = \langle integer \rangle$

Example:

? COMMON = 12345678

COMPILER OPTION CARDS.

4-51. The Compiler Option Cards are discussed in the following paragraphs.

\$ CARD.

4-52. The absence of this card specifies that the source program is to be input via the card reader and listed. Further discussion of this card will be covered separately below for ALGOL and COBOL.

ALGOL SOURCE PROGRAMS.

4-53. The format of this card for use with ALGOL is now free form except for the following conditions:

- a. The "\$" must be placed in column 1.
- b. The input media option (i.e., CARD or TAPE) must precede all other options used.
- c. The options must be delimited by at least one blank.
- 4-54. The syntax of the \$ CARD for ALGOL is as follows:

⟨\$ card⟩ ::=\$ ⟨control options⟩

⟨control options⟩::=⟨option⟩ | ⟨option⟩ ⟨control option⟩

<option > ::= CARD | TAPE | LIST | NEWbTAPE | PRT | DEBUGN | PUNCH | <empty>

CARD ::= The source program is to be input via the card reader.

TAPE ::= The source program is to be input via magnetic tape. Updating source program cards will be accepted from the card reader.

LIST ::= The source program is to be listed. In addition the segment number and the relative address of the last word generated for each source program statement will appear to the right of the statement's sequence number.

PRT ::= The program's relative PRT locations assigned by the compiler will be printed immediately following, and to the left of the associated source program statement.

DEBUGN ::= The object code produced by the compiler will be listed following each ALGOL statement.

PUNCH ::= If a source program card or card image is encountered which contains a syntactical error, the card will be punched in its original form.

COBOL PROGRAM.

4-55. The format for the \$ CARD for COBOL is as follows:

<u>Column</u>	Contents	Meaning
1	\$	Absence of \$ card has the same effect
		as CARD LIST.
3-6	CARD	The source program is to be input via
erig (Pitting)		the card reader.
3-6	TAPE	The source program is to be input via
		magnetic tape. Updating source program
		cards will be accepted from the card
y kathada a sa		reader.
8-11	LIST	The source program is to be listed.
	Andrew State of the Community of the Com	atta in the same that the same was the
13-15	PRT	The program's relative PRT locations
		assigned by the compiler will be listed.
		The paragraph number will also be printed.

17-24	NEWBTAPE	The source program, whether input via
		the card reader and/or magnetic tape,
		will be placed on magnetic tape. The
		label of this tape will be "SOLT".
26-31	DEBUGN	The object code produced by the compiler
		(including SORT) will be listed following
		each COBOL statement.
33-36	SPEC	This will cause TOTAL SEGMENT SIZE and
		DRUM SIZE to be printed at the end of
		compilation. It will also suppress
		MOVE TRUNCATION messages and CORRESPONDING
		messages.

4-56. A \$ TAPE card may be used at any point in the card deck to initiate reading from the SOLT tape. A subsequent \$ CARD card will suppress reading from the SOLT tape. Reading from the tape will begin again when another \$ TAPE card is encountered, starting with the record following the last one processed before the \$ CARD card was encountered. The card deck following the last \$ TAPE card must contain a sequence number higher than any on the SOLT tape (such as 999999) unless the last card contains END-OF-JOB in columns 8-17.

4-57. \$ CARDs which are not first in the deck must allow for sequence numbers. To do this, the \$ sign is to be put in column 7 instead of column 1 and the other option-fields. For example, CARD, LIST, PRT are placed 6 columns to the right of the above \$ CARD layout.

ALGOL \$\$ CARD.

4-58. The \$\$ CARD is used to call out symbolic sub-programs from a source language library tape (made by the MAKCAST/DISK program). The format of this card is free form except for the following conditions:

- a. The two \$ symbols must appear in columns 1 and 2.
- b. Column 72 must be blank.

4-59. The syntax of the \$\$ CARD is as follows:

NOTE

The starting card number is the relative location of the card image in the sub-program, not the actual card sequence number.

COBOL \$\$ CARD.

4-60. The COBOL \$\$ Card has the following format:

Columns 1-2 - \$\$

Column 3 - Blank

Columns 4-10 - Sub-file ID

4-61. The sub-file ID in the above format refers to the sub-file ID on the CASTA library file, and it is limited to a maximum of seven characters. The \$\$ card must appear before any other cards in the deck, except that \$ Cards with a \$ sign in column 1 must proceed the \$\$ card. Only one \$\$ card is allowed in a deck.

4-62. Cards following the \$\$ Card will be merged with the records on the CASTA sub-file under sequence number control. The CASTA sub-file may not contain COPY FROM LIBRARY statement. The entire CASTA sub-file will be processed through the compiler. All \$ Card options are permissible except TAPE. Once the CASTA sub-file has been processed, the SOLT file may be initiated with a \$ TAPE Card.

SOURCE PROGRAM CARDS.

4-63. The discussion of these cards will be covered separately for ALGOL and COBOL programs.

ALGOL SOURCE PROGRAMS.

4-64. Unless the source program is coming from tape, the last statement must be "END.". The period in "END." should not occur in card column 72.

4-65. Additional "\$" cards may be placed within the source program deck. The action taken is that specified by the last "\$" card encountered during processing.

COBOL SOURCE PROGRAMS.

4-66. Unless the source program is coming from tape, the last statement must be "END-OF-JOB.".

"NINES" CARD.

4-67. This card is to be used only if the source program is coming from tape and the last statement of the source program updating cards is not "END." (for ALGOL) or "END OF JOB." (for COBOL). The format of this card is:

Columns 1-6 - all 9's.

Columns 7-72 - blanks.

Columns 73-80 - all 9's.

FORTRAN TRANSLATOR INPUT DATA CARDS.

4-68. Each FORTRAN deck must be preceded by a START\$ card.

4-69. The FORTRAN deck should be re-ordered so that each subroutine is placed ahead of all subroutines which call upon it. Otherwise, forward procedure declarations will have to be inserted in the ALGOL deck prior to compilation.

4-70. Each FORTRAN deck should be followed by a LAST\$ card.

FORTRAN TRANSLATOR CONTROL CARDS.

4-71. FORTRAN translator control cards are punched in the same format as the FORTRAN statements themselves. That is, they are punched in columns 7-72, blanks are ignored, and they may be continued on succeeding cards providing a punch other than a blank is punched in column 6 of each continuation card.

4-72. SYNTAX. The syntax for the START card is as follows:

⟨START\$ CARD⟩ ::= START\$ ⟨empty⟩ | START\$ ⟨start list⟩ \$

⟨start list⟩ ::= ⟨start list element⟩ | ⟨start list element⟩ | ⟨start list⟩
⟨start list element⟩ ::= ⟨punch option⟩ | ⟨common declaration⟩ | ⟨own option⟩ |

```
(FORTRAN listing option) | (ALGOL listing option) |
                          (tape file request)
                          ⟨sense switch option⟩ | ⟨sense light option⟩ |
                          (modal option list) | (suppress equivalence option) |
                          \( \suppress common option \) \( \lambda \) format abbreviation definition \( \rangle \)
                          (global option) | (octal option)
⟨punch option⟩ ::= PC | PCO
⟨common declaration⟩ ::= C ⟨unsigned integer⟩
⟨own option⟩ ::= OWN
⟨FORTRAN listing option⟩ ::= SFL
⟨ALGOL listing option⟩ ::= SAL
⟨tape file request⟩::= TAPE, ⟨tape list⟩ | TAPES unsigned integer)
⟨tape list⟩::= ⟨unsigned integer⟩ | ⟨unsigned integer,⟩ ⟨tape list⟩
⟨sense switch option⟩ ::= SW | SW, ⟨boolean initial value list⟩
(sense light option) ::= SL | SL, (boolean initial value list)
(boolean initial value list) ::= (truth value) (truth value),
                                  (boolean initial value list)
⟨truth value⟩::= T | F
⟨modal option⟩ ::= B1|F1
⟨suppress equivalence option⟩ ::= XE
⟨suppress common option⟩ ::= XC
⟨format abbreviation definition⟩ ::= (FORMAT ← ⟨format abbreviation⟩)
⟨format abbreviation⟩ ::= ⟨identifier⟩
⟨global option⟩ ::= GLOBAL
⟨octal option⟩ ::= OKTL ← ⟨integer⟩
〈LAST$ Card〉::= LAST$
```

```
\langle \text{Start list element} \rangle ::= \langle \text{Punch option} \rangle | \langle \text{Memory option} \rangle |
                                                           (Octal format option) (Configuration option)
                                                           \(Listing option\) \( \Oisk file option \)
⟨Disk file option⟩ ::= DISK ⟨Disk description⟩
(Disk description):= ((Unit number), (Disk configuration))|
                                                         (Unit number), (Disk configuration)),
                                                         (Disk description)
                                                                                                                                       BON OF HER BONSEN OF WAR
⟨Unit number⟩ ::= ⟨integer⟩
                                                                                        ⟨Disk configuration⟩ ::= ⟨Disk item⟩ | ⟨Disk configuration⟩, ⟨Disk item⟩
⟨Disk item⟩ ::= ⟨File type⟩|⟨Disk access technique⟩
                                                                                                                                          ·公司 (1544年) 1927年 (東京) (1524年) 1927年
                                      (number of areas) | (number of logical records)
                                     \langle Number of words \rangle | \langle Associated variable \rangle | \langle Save factor \rangle
⟨File type⟩ ::= PERM TEMP
                                                                    全面被引擎 (1) $P$ (2) $P$
⟨Disk access technique⟩ ::= SERIAL | RANDOM | UPDATE
\(\)Number of areas\(\)::= AREAS ← integer
\(\text{Number of logical records}\) ::= LOGICAL RECORDS ← \(\text{integer}\)
\(\text{Number of words}\) ::= WORDS←\(\text{integer}\)
⟨Associated variable⟩ ::= AV←⟨integer variable⟩
                                                                                                                                            Bright Bright Starting Control
⟨Save factor⟩ ::= SAVE←⟨integer⟩
4-73. If (File type) is omitted, TEMP is assumed. If (Disk access technique) is
omitted, RANDOM is assumed. If (Number of areas) is omitted, 1 area is assumed.
(Number of logical records) and (Number of words) are necessary for all files
that are to be created. (Associated variable) is necessary for all random files.
(Save factor) is necessary for all permanent files that are being created.
                                   START$ DISK (5, RANDOM, TEMP, AREAS-2, LOGICAL RECORDS-50, WORDS-10,
            Example:
```

AV←INDEX)\$

4-74. This start card will generate the following file declaration in ALGOL:

FILE DISK5 DISK RANDOM [2:50] (1, 10);

- 4-75. This file will have the name "0000000/DISK5" on the disk file.
- 4-76. REMARKS. The START list elements may be in any order, and their effects are as follows:
 - a. If PC then an ALGOL deck is punched.
 - b. If PCO then an ALGOL deck is punched only. OCRDIMG is not created so that one less scratch tape is required in order to translate.
 - c. If C (unsigned integer) then the global array COMMON is declared, the dimensions depending upon (unsigned integer).
 - d. If OWN then local variable and local arrays will be declared as OWN.
 - e. If SFL this will suppress FORTRAN listing.
 - f. If SAL this will suppress ALGOL listing.
 - g. If TAPE,n,m, etc. then FILE TAPEn 2(2,15); FILE TAPEm 2(2,15) etc, are declared.
 - h. If SW then SENSE SWITCH statements are translated. A Boolean array SENSW [0:6] is set up and initialized to the values specified by (boolean initial value list). All values not specified are assumed to be false.

- i. If SL the SENSE LIGHTS are initialized according to the \(\)boolean initial value list \(\). Unspecified values are assumed to be false.
 Whether or not SL is present on the START\(\) card, the Boolean array
 SENSL [0:4] is declared, and all SENSE LIGHT statements are translated.
- j. If B1 then interpret B in card column 1 to mean the statement is boolean.
- k. If F1 the interpret F in card column 1 to mean the function on the card may be used as a sub-program argument.
- 1. If XE then all EQUIVALENCE statements which occur in the FORTRAN deck are ignored.
- m. If XC then all COMMON statements which occur in the FORTRAN deck are ignored.
- n. If FORMAT (\(\format abbreviation\)) then the identifier occurring between the above parentheses will be defined as an abbreviation for "FORMAT". Thus, (FORMAT*FMT) would cause a statement such as FMT (14,F10.6) to be recognized as FORMAT (14,F10.6). The abbreviation must be an identifier not longer than six characters. The use of abbreviations such as "END", "GO TO", etc., is not recommended.
- o. If GLOBAL then all identifiers in COMMON will appear as COMMENTS.
- p. If OKTL then WRITE TAPE instructions will be written in octal.

SECTION 5

UTILITY ROUTINES

GENERAL.

- 5-1. There are a number of routines in the disk file programing system that are designed to facilitate the operation of the system. These routines are:
 - a. Scheduling from disk.
 - b. Symbolic library maintenance.
 - c. Log maintenance.
 - d. Disk directory.
 - e. Printer back-up.
- 5-2. For purposes of presentation, these routines have been arbitrarily called utility routines. The manner in which each routine performs its particular function will be discussed in detail in this section.

SCHEDULING FROM DISK.

5-3. The system program LDCNTRL/DISK and special features of the MCP provide a means whereby card deck information, including control information, can be placed on disk in the form of a pseudo card deck, and then used as though it were in a card reader. The LDCNTRL/DISK Program, pseudo card readers, and pseudo card decks are described in the following paragraphs.

LDCNTRL/DISK PROGRAM.

5-4. The system program LDCNTRL/DISK is a specially coded program which is partly contained within the MCP and partly contained as an object program on the system tape. The LDCNTRL/DISK Program can place either a magnetic tape file or a card file on the disk, and copy a file onto magnetic tape.

- 5-5. LOADING A CONTROL DECK FILE TO DISK. The primary function of the program LDCNTRL/DISK is to read a file with the \(\text{multiple file identification} \) CONTROL and the \(\text{file identification} \) DECK, and to place that file on disk in a special format, as one or more pseudo card decks. The file labeled CONTROL DECK may be a file in a card reader or a file on magnetic tape.
- 5-6. CARD READER CONTROL DECK FILE. If a CONTROL DECK file is to be read from a card reader, the file must be preceded by a LABEL CARD to identify it. Also the last card in the CONTROL DECK must be an END CONTROL card, containing the information: ? END CONTROL.
- 5-7. MAGNETIC TAPE CONTROL DECK FILE. If a CONTROL DECK file is to be copied from magnetic tape to disk, the tape must be properly labeled, and, as is the case with a CONTROL DECK from a card reader, the last card image on the tape file must be an ? END CONTROL card. In addition to these requirements, the tape file must be properly formatted so that question mark cards (i.e., control card and program-parameter cards) can be recognized. Specifically, the tape must have the following characteristics:
 - a. The tape must be unblocked.
 - b. Each record containing a question mark card must be 9 words in length.
 - c. Each record containing a card which is not a question mark card must be 10 words in length.

- 5-8. PSEUDO DECKS ON DISK. When the LDCNTRL/DISK Program reads a CONTROL DECK file, it places it on disk as one or more pseudo card decks. The number of pseudo card decks created depends upon the number of ? END cards located within the CONTROL DECK. That is, each time a ? END card is encountered, it is taken to denote the end of a deck; and then creation of another pseudo deck is initiated. As each new pseudo deck is created, it is given an identification of the form: # (integer).
- 5-9. It should be noted that what is referred to as a pseudo deck is analogous to a single continuous deck that would be placed in a card reader. Therefore, if a pseudo deck contains more than one file, each file, following the first, will be recognized only when the file preceding it has been passed.
- 5-10. It should also be noted that there is no set limit to the number of cards that may be contained in a CONTROL DECK file, but a pseudo card deck (the end of which is denoted by a ? END card) can contain no more than 12,000 cards.
- 5-11. REMOVING PSEUDO DECKS FROM DISK. When each pseudo card deck is placed on disk, the deck is linked to the previous deck, forming a queue waiting to be used by a pseudo card reader. Because of the queue feature, the RD keyboard input message must be used to remove pseudo decks from the disk.
- 5-12. COPYING A CONTROL DECK TO TAPE. The secondary function of the LDCNTRL/DISK Program is to read a file labeled CONTROL DECK, delimited by a ? END CONTROL card, and to copy it onto magnetic tape. If the CONTROL DECK being copied is a card file, the file will be copied onto tape in the required format specified above (see paragraph 5-7). If the CONTROL DECK being copied is a magnetic tape file, a tape copy is performed.

5-13. CALLING THE LDCNTRL/DISK PROGRAM OUT FOR EXECUTION. The LDCNTRL/DISK may be called out either by a keyboard input message or control cards.

5-14. If LDCNTRL/DISK is to be executed to place a CONTROL DECK on the disk, the keyboard input message

LD DK

may be used or a control card containing

? EXECUTE LDCNTRL/DISK

may be used.

5-15. If LDCNTRL/DISK is to be executed to copy a CONTROL DECK onto tape, the keyboard input message

LD MT

can be used or control cards containing

- ? EXECUTE LDCNTRL/DISK
- ? COMMON = 1

can be used.

5-16. PARITY ON A CONTROL DECK MAGNETIC TAPE FILE. If a parity error is encountered in a CONTROL DECK file being read from magnetic tape, the parity file is skipped. In effect, the file containing parity is completely ignored.

PSEUDO CARD READERS AND THE USE OF PSEUDO CARD DECKS.

5-17. To make use of pseudo card decks, the MCP contains logic which can, in effect, supply the system with up to four pseudo card readers. These pseudo card readers in many ways appear to be much like physical peripheral units. That is, system messages are typed for the pseudo card readers as though they were card readers, and keyboard input messages can reference the pseudo card readers. The pseudo card readers are identified by the (unit mnemonic)s:

CDA

CDB

CDC

CDD

5-18. At HALT-LOAD time, all pseudo card readers are turned off. The system operator may cause these readers to be turned on through use of an RN keyboard input message.

5-19. THE RN MESSAGE TO TURN ON PSEUDO CARD READERS. When an "RN digit" message is initially entered, and the digit is not equal to zero, the MCP automatically searches for pseudo card decks to satisfy the need of the specified number of pseudo card readers. Thereafter, as long as pseudo card readers are on and pseudo card decks are available, the MCP will keep the readers loaded.

5-20. THE RN MESSAGE TO TURN OFF PSEUDO CARD READERS. If the system operator wishes to turn off pseudo card readers, he need only type in an RN message that specifies the number of pseudo card readers he wants left on. The MCP will then turn off a sufficient number of readers to meet these requirements as soon as the readers complete processing their current deck.

5-21. REMOVING DECKS FROM PSEUDO CARD READERS. If, for any reason, it is desired to remove a deck from a pseudo card reader (e.g., a card file never opened by a program that was discontinued), the removal can be accomplished by entering an ED keyboard input message.

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5-22. HANDLING OF CONTROL CARD ERRORS IN PSEUDO CARD DECKS. If, while a pseudo card deck is being read, an error is detected in a control card or program-parameter card, the MCP will remove the deck in which the erroneous card appears and continue to the next available pseudo deck.

SYMBOLIC LIBRARY FILE ON DISK.

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- 5-23. The symbolic library facility (MAKCAST/DISK) is such that library files can exist on disk as well as magnetic tape. In making this disk capability available, the ALGOL compiler file CASTA and the COBOL compiler file LIBRAR have been set up so that the library files they reference are expected to be on disk. (The ALGOL compiler files CASTB and CASTC are set up to expect library files on magnetic tape.)
- 5-24. Although the standard media for symbolic library files is as noted above, the media can be specified through use of Label Equation cards. Also, if it is desired to change the standard set-up for the files, that change can be accomplished by changing the file declarations for those files, and recompiling the compilers.
 - 5-25. If Label Equation cards are to be used in reference to the files for symbolic libraries, or if file declarations are to be modified, the make-up of the file declarations within the compilers must be known.

5-26. The card images for the symbolic library files in the ALGOL compiler contain the following information: (Note: BUFFSIZE is DEFINEd equal to 56.)

File Declaration

FILE CASTA DISK SERIAL "CASTA" "LIBRARY" (1, BUFFSIZE);
FILE CASTB (1, BUFFSIZE);
FILE CASTC (1, BUFFSIZE);

5-27. The card images for the symbolic library file in the COBOL compiler contain the following information:

File Declaration

FILE LIBRAR DISK SERIAL "CASTA" "LIBRARY" (1, 56);

5-28. An example of a Label Equation card which could be used to specify disk as the media for an ALGOL symbolic library file is as follows:

? ALGOL FILE CASTC = CASTC/LIBRARY SERIAL

5-29. An example of a Label Equation card which could be used to specify tape as the media for a COBOL symbolic library file is as follows:

? COBOL FILE LIBRAR = CASTA TAPE

CONTROL CARD SYNTAX.

5-30. The expanded control card syntax is as follows:

⟨control card⟩ ::= \$\$\$ ⟨master control card⟩

 $\langle code \rangle \langle subcontrol card \rangle | $$$ $\langle end card \rangle$

⟨code⟩ ::= \$\$\$ | ⟨continuation code⟩

(continuation code) ::= \$-\$

```
(master control card) ::= DISPLAY (tape identifier)(master display features)|
                              MAKE (tape identifier) (master make features)
                              MAKE \(\lambda\) tape identifier \(\rangle\) FROM \(\lambda\) tape identifier \(\rangle\)
                                     ⟨master make features⟩
⟨tape identifier⟩ ::= A B C
(master display features) ::= LIST | PUNCH | DIR | SINGLE | (master display features)
                                   LIST (master display features) PUNCH
                                   (master display features) DIR
                                   ⟨master display features SINGLE | ⟨empty⟩
(master make features) ::= (master display features) COPY
                                \( master make features \) COPY \( \langle empty \rangle \)
⟨subcontrol card⟩ ::= ⟨display types⟩ | ⟨make types⟩
⟨end card⟩ ::= END
⟨display types⟩ ::= ⟨subprogram identifier⟩⟨list-punch option⟩
t-punch option := LIST | PUNCH | tist-punch option > LIST |
                            (list-punch option) PUNCH (empty)
⟨make types⟩ ::= DELETE ⟨subprogram identifier⟩⟨list-punch option⟩|
                    REPLACE \(\subprogram\) identifier \(\rangle\) replacement option \(\rangle\)
                    ⟨rename option⟩⟨make features⟩⟩ PATCHA
                    ⟨subprogram identifier⟩⟨location option⟩
                    ⟨rename option⟩⟨make features⟩⟩
                    PATCHC \(\subprogram identifier\)\(\lambda\) (location option)
                    ⟨rename option⟩⟨make features⟩|ADD ⟨subprogram identifier⟩
                    \langle location option \rangle \langle insertion option \rangle \langle rename option \rangle
                    \langle make features \rangle \langle \subprogram identifier \rangle \langle \langle \text{location option} \rangle
                    ⟨rename option⟩⟨make features⟩
```

- 5-31. SEMANTICS. The control cards for the symbolic library maintenance routine are designed to provide the features needed in creating, updating, and displaying a symbolic library.
- 5-32. There are three kinds of control cards: Master, Subcontrol, and End cards. The first three columns of the Master and End cards must contain the control card flag: \$\$\$. The first three columns of the Subcontrol card may contain \$\$\$ or the Continuation code: \$-\$. The Continuation code is provided in case one Subcontrol card is not enough to contain all of the required Subcontrol options. As many Continuation cards as necessary may be used, with all cards except the last one in the group starting with \$-\$; the last Continuation card in the group must have \$\$\$.

- 5-33. The information on all control cards is free-field, with the restriction that each syntactically defined element must be separated from the next by at least one blank column. Further, a syntactically defined element may not be split across two Continuation cards. Normally, all control-card information must be entered in columns 1-72, with columns 73-80 reserved for comments. However, a percent sign (%) inserted anywhere on a control card (except columns 1-3, which must contain the control card flag) will have the effect of marking the "end" of the card; comments may be inserted after the percent sign.
- 5-34. The Master control card indicates whether a new library file is to be made (MAKE) or information about an existing library is required (DISPLAY). If a new library is being made, the Master control card indicates whether an existing library is to serve as a base for the new library (MAKE FROM). If FROM is not used, the new library will contain only those subprograms called for explicitly in Subcontrol cards. When FROM is used, all subprograms on the existing input library will be transferred to the new library unless Subcontrol cards indicate otherwise (e.g., REPLACE or DELETE). If a library is to be displayed (DISPLAY), the Master control card specifies the input source:
- 5-35. Other reserved words appearing in the control cards have the following meanings:
 - a. <u>DIR</u> specifies that a directory of all subprograms on the library is to be printed. (For MAKE functions, the directory reflects the contents of the new output library; for DISPLAY functions, the directory reflects the contents of the input library.)

- 1) The number of subprograms that can be recorded on one library is limited by the directory size; the directory will hold up to 1324 characters. Each identifier to be placed in the directory, corresponding to a subprogram placed on the library, will use N + 4 characters, where N is the number of characters in the subprogram identifier.
- b. A, B, and C refer to the three possible subprogram libraries which can be referenced. The libraries are labeled CASTA, CASTB, and CASTC, are referenced in the control cards as A, B, and C, respectively.
- c. OCRD refers to a tape labeled OCRDIMG being used as input.
- d. PATCHA and PATCHC are used to distinguish patching of ALGOL and COBOL sub-programs. PATCHA (ALGOL patching) utilizes sequence numbers as they appear in columns 73-80 of the data cards. PATCHC (COBOL patching) utilizes sequence numbers as they appear in columns 1-6 of the data cards.
- e. <u>SEQA</u> and <u>SEQC</u> are used to distinguish resequencing of ALGOL and COBOL sub-programs. SEQA 100, for example (ALGOL resequencing), specifies that the data cards are to be resequenced in columns 73-80, with the resulting cards numbered 00000100, 00000200, 00000300, ..., etc. Similarly, SEQC 1000 (COBOL resequencing) specifies that the data cards are to be resequenced in columns 1-6, with the resulting cards numbered 001000, 002000, 003000, ..., etc.

- f. <u>LIST</u>, <u>PUNCH</u>, or both may appear on the Master and/or the Subcontrol cards. When LIST and/or PUNCH appear on the Master control card, the effect is that of having requested the indicated option(s) on every Subcontrol card which follows.
- g. <u>SINGLE</u> appearing on a Master control card specifies that page skipping is not to be performed on the Line Printer output. When SINGLE is omitted, the listing for each subprogram will begin at the top of a new page; also, each control card will be printed at the top of a new page.
- h. <u>COPY</u> appearing on a MAKE or MAKE FROM Master control card specifies that an additional copy of the new library is to be made on tape.
- 5-36. MAINTENANCE FUNCTION EXAMPLES. The following are maintenance function examples.

a. DISPLAY Function

Example: \$\$\$ DISPLAY A DIR

1) This control deck would yield the Directory of a CASTA tape.

\$\$\$ DISPLAY A LIST DIR
\$\$\$ END

2) When no subcontrol cards are present to select specified subprograms, the LIST-PUNCH option on the Master control card will cause all subprograms on the tape to be listed and/or punched, as requested. The above example would yield a Directory of the CASTA library, and a listing of all subprograms on the library.

Example: \$\$\$ DISPLAY A PUNCH DIR

\$\$\$ SUB1

\$\$\$ SUB2 LIST

\$\$\$ SUB3

\$\$\$ END

- 3) This control deck would yield a punched card output of SUB1, SUB2, and SUB3, a listing of SUB2, and a Directory of the CASTA library.
- 4) When subprograms are punched, the card output for each subprogram includes a header card; this card contains \$\$\$ in columns 1-3 and the subprogram identifier starting in column 5.

b. MAKE Function (ADD)

Example: \$\$\$ MAKE A FROM B DIR LIST

\$\$\$ ADD SUB1 SEQA 10 PUNCH

(Followed by data cards, which cannot have \$\$\$ or \$-\$ in columns 1-3.)

\$\$\$ ADD SUB2 SEQC 100

(Followed by data cards, which cannot have \$\$\$ or \$-\$ in columns 1-3.)

\$\$\$ ADD SUB3 ON OCRD AFTER B4 PUNCH

\$\$\$ ADD C4 ON C END

\$\$\$ ADD C2 ON C RENAME NEW

\$\$\$ END

1) The following shows the effect of using the above card deck.

MAKE Function (ADD) (cont'd.)

OCRDIMG Input Tape	Master Input Library B	Input Library C	New Library A	Other Output
•	В1	C 1	SUB1	Listing & card output
•	B2	C2	SUB2	Listing
• · · · · · · · · · · · · · · · · · · ·	В3	C3,	В1	Listing
Card images	В4	_{1,1,1,1} ,04, _{1,1}	B2	Listing
corresponding	B <i>5</i>	C 5	В3	Listing
to SUB 3		eriotar et la	в4	Listing
•		and the second	SUB3	Listing & card output
•		to the Committee with	B <i>5</i>	Listing
•			c4	Listing
			NEW	Listing
	er er er			Directory of new CASTA library

The ADD function is allowed only in conjunction with the MAKE FROM function. (An ADD Subcontrol card cannot reference a subprogram on the Master Input library, e.g., the CASTB library in the above example.) When the ADD Subcontrol card does not locate the source of the subprogram (e.g., ADD XYZ ON A), it is assumed that the subprogram is in the Card Reader following the ADD Subcontrol card. Note that LIST appearing on the Master control card not only has the effect of having requested the LIST option on each of the subprograms referenced in Subcontrol cards, but additionally will cause listing of each subprogram transferred from the Master Input library to the new library. The ADD -- END card specifies that the referenced subprogram is to follow any remaining subprograms on the Master Input library.

c. MAKE Function (DELETE)

Example: \$\$\$ MAKE A FROM B LIST
\$\$\$ ADD C5 ON C AFTER B3
\$\$\$ DELETE B4
\$\$\$ ADD C2 ON C PUNCH
\$\$\$ DELETE B6 LIST
\$\$\$ END

1) The following shows the effect of using the above card deck.

Master t Library B	Input Library C	New Library A	Other Output
B1 (22)	, C1	В1	Listing
B2	C2	B2	Listing
В3	C3	В3	Listing
в4	С4	C 5	Listing
B5	C 5	C2	Listing & card output
В6	c ₆	B5	Listing
B7			Listing (of B6)
В8		В7	Listing
		в8	Listing

2) The DELETE function is allowed only in conjunction with the MAKE FROM function. (A DELETE Subcontrol card can reference only a subprogram on the Master Input library, e.g., the CASTB library in the above example.) Note that subprograms to be deleted are not listed or punched when LIST or PUNCH appears on the Master control card. If listing and/or punching of a subprogram to be deleted is desired, then LIST and/or PUNCH must appear on the DELETE Subcontrol card.

d. MAKE Function (REPLACE)

Example: \$\$\$ MAKE A FROM B

\$\$\$ DELETE B2

\$\$\$ ADD C3 ON C

\$\$\$ REPLACE B4 WITH C1 ON C LIST

\$\$\$ REPLACE B6 RENAME CARDPROGRAM LIST

(Followed by data cards, which cannot have \$\$\$ or \$-\$ in columns 1-3.)

\$\$\$ END

1) The following shows the effect of using the above card deck.

Master Input Library B	Input Library C	New Library A	Other Output
B1	C 1	B1	
B2	C2	C3	
В3	С3	В3	
В4	С4	C 1	Listing
B <i>5</i>	C 5	B5	
в6	c6	CARDPROGRAM	Listing

2) The REPLACE function is allowed only in conjunction with the MAKE -FROM function. (A REPLACE Subcontrol card can reference only a
subprogram on the Master Input library, e.g., the CASTB library in
the above example.) When the new subprogram to be added is in the
Card Reader, the REPLACE Subcontrol card does not specify WITH -ON. For subprograms located on an A, B, C, or OCRDIMG tape, the
reserved words WITH -- ON will specify the source.

3) For example, to replace B4 with a subprogram in the reader which is to have the same name, the Subcontrol card would state:

REPLACE B4

4) To replace B4 with a subprogram in the reader which is to be renamed CARDS, the Subcontrol card would state:

REPLACE B4 WITH CARDS

or

REPLACE B4 RENAME CARDS

5) To replace B4 with the subprogram on a OCRDIMG tape which is to be renamed NEW, the Subcontrol card would state:

REPLACE B4 WITH NEW ON OCRD

6) To replace B4 with the subprogram on a OCRDIMG tape which is to have the same name, the Subcontrol card would state:

REPLACE B4 WITH B4 ON OCRD

7) A subprogram to be replaced cannot be listed or punched; if such action is desired, use the DELETE function (Paragraph 3, above).

e. MAKE Function (Identifier)

Example: \$\$\$ MAKE B DIR

\$\$\$ YXZ LIST

(Followed by data cards, which cannot have \$\$\$ or \$-\$ in columns 1-3.)

\$\$\$ A1 ON A

\$\$\$ B3 ON B LIST

\$\$\$ C2 ON C

\$\$\$ A2 ON A PUNCH LIST

\$\$\$ END

1) The following shows the effect of using the above card deck.

Input Library A	Input Library B	Input Library C	New Library B	Other Output
A 1	В1	C 1	XYZ	Listing
A2	B2	C2	A 1	
А3	В3	C3	В3	Listing
Α4	В4	С4	C2	
	B <i>5</i>		A2	Listing & card output
	В6			Directory of new CASTB librar

2) A Subcontrol card starting with a subprogram identifier is allowed in conjunction with both the MAKE and MAKE -- FROM functions. (This type of Subcontrol card, when used with the MAKE -- FROM function, cannot reference a subprogram on the Master Input library.

f. MAKE Function (PATCH)

Example: \$\$\$ MAKE A FROM B

\$\$\$ PATCH C B1 SEQC 100

(Followed by patch cards, which cannot have \$\$\$ or \$-\$ in columns 1-3.)

\$-\$ PATCHA XYZ ON

\$\$\$ OCRD SEQA 10

(Followed by patch cards, which cannot have \$\$\$ or \$-\$ in columns 1-3.)

\$\$\$ ADD CARDPROGRAM

(Followed by data cards, which cannot have \$\$\$ or \$-\$ in columns 1-3.)

\$\$\$ END

- 1) The PATCH function is allowed in conjunction with both the MAKE and MAKE -- FROM functions. A PATCH Subcontrol card may reference a subprogram on any subprogram tape or the OCRDIMG tape. If PATCH is used with the MAKE -- FROM function and the Subcontrol card does not specify ON (e.g., PATCHA A3), it will be assumed that the source program to be patched is on the Master Input library.
 - 2) Patching will be performed according to the collating sequence. For example, a card sequenced "bbbbA100" will precede a card sequenced "bbbbB200". A card sequenced "bb340000" will precede a card sequenced "00000010".

3) In regard to sequence number:

When the patch card < subprogram card, the patch card will be selected.

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When the patch card = subprogram card, the patch card will replace the subprogram card.

When the patch card > subprogram card, the subprogram card will be selected.

4) The user will find it convenient at times to use a "dummy" call on the PATCH function. If, for example, we have a CASTB library with subprograms B1, B2, B3, . . . , B10, and we wish to generate a new CASTB library exactly the same except for resequencing of subprogram B5, the simplest control deck to accomplish such a function would be:

\$\$\$ MAKE B FROM B \$\$\$ PATCH A B5 SEQA 100

\$\$\$ END

5) With no B 5 patch cards in the reader, the effect will be simply to resequence B5. All the subprograms will retain their original order.

END OF JOB AND ERROR MESSAGES

5-37. The Line Printer or printer-backup file is used to log error messages or the "job complete" message. The following messages may appear during a run of MAKCAST:

- a. JOB COMPLETE. NO ERROR SITUATIONS ENCOUNTERED.
- b. JOB TERMINATED. ERROR IN MASTER CONTROL CARD.
- c. JOB TERMINATED. ERROR IN SUBCONTROL CARD.
- d. JOB TERMINATED. ITEM NOT FOUND IN DIRECTORY.
- e. JOB TERMINATED. DIRECTORY HAS IMPROPER FORMAT.
- f. JOB TERMINATED. REFERENCED PROGRAM IS NOT FORWARD ON THE MASTER LIBRARY.
- g. JOB TERMINATED. OUTPUT TAPE DIRECTORY OVERFLOW.

SETUP

5-38. The setup to make a CAST library tape is as follows:

- a. ? EXECUTE MAKCAST/DISK
- b. ? DATA CARD
- c. Master Control Card.
- d. First subcontrol card.
 - 1) First subprogram card images.
- e. Second subcontrol card.
 - 1) Second subprogram card images.

- g. Last subcontrol card.
 - 1) Last subprogram card images
- h. End Card
- i. ? END

COPYING SYMBOLIC LIBRARY TAPES TO DISK

5-39. To change existing library files from magnetic tape to disk, a program need only perform a direct copy to disk. The copying program should use read symbolic library tapes as unblocked 56-word records and write them on disk in the same fashion. Examples of file declarations which could be used by a copying program written in ALGOL are:

FILE IN CASTA (2, 56);

FILE OUT CASTA DISK SERIAL [20:240] "CASTA" "LIBRARY" (2, 56, SAVE 30);

LOG MAINTENANCE

5-40. Log information for programs run on a B 5500 Disk File System is written in a file on user disk. The log file occupies one area on disk, and has the \(\forall file identification \) prefix\(\rightarrow\) "SYSTEM" and the \(\forall file identification\) "LOG". It is the user's responsibility to provide this file.*

5-41. The file SYSTEM/LOG is blocked. There are six logical records per physical record. The logical records are five words (i.e., 40 characters) in length; the physical records are 30 words in length.

LOG ENTRY SPECIFICATIONS

5-42. Entries in the log can be considered to fall into one of three categories:

(1) Compile and Go entries, (2) Compile Only entries, and (3) Execute entries.

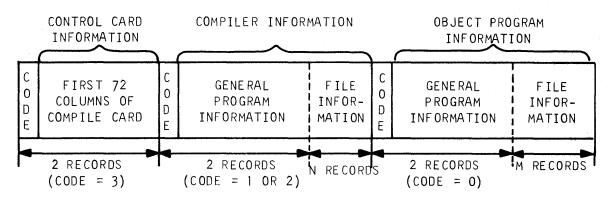
With respect to these categories, the following rules determine how a program will be entered in the log:

^{*} For information as to how this area should be reserved, reference should be made to Section 3, paragraph 3-41.

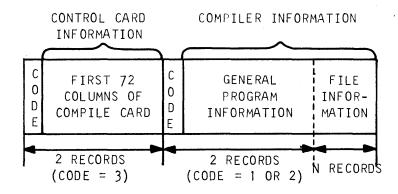
- a. If a "compile and go" run is made and the program being compiled contains no syntax errors, the log information for both the compiler and the object program will be listed in a Compile and Go entry.
- b. If a "compile and go" run is made and the program being compiled contains syntax errors, or if a "compile for syntax" run is made, or if a "compile to library" run is made, the log information for the compiler will be listed in a Compile Only entry.
- tion for the object program will be listed in an Execute entry.
- 5-43. The general format of log entries is shown on the following page. The first log entry starts in the record with relative address 1.

The following illustration shows the general format of each of the three types of log entries.

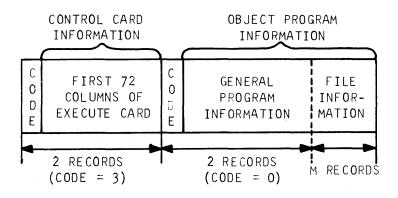
COMPILE AND GO ENTRY



COMPILE ONLY ENTRY



EXECUTE ENTRY



NOTE: N = Number of files declared by compiler
M = Number of files declared by object program.

- 5-44. CODE WORD. As shown, each log entry contains (1) Control Card information and (2) Compiler and/or object program information. The "code" word preceding each group of information denotes the type of information. That is, information preceded by a 1 pertains to the ALGOL compiler; information preceded by a 2 pertains to the COBOL compiler; and, information preceded by a 3 pertains to an object program. Code "4" denotes the end of log information.
- 5-45. CONTROL CARD INFORMATION. Control Card information is contained in the first two records of a log entry, starting at the second word of the first record. This information is a copy of the contents of the first 72 columns of the COMPILE card or EXECUTE card that caused the particular run to be scheduled.
- 5-46. The word immediately preceding Control Card information is a code with the integer value 3.
- 5-47. COMPILER AND OBJECT PROGRAM INFORMATION. Compiler information and object program information have identical formats; therefore, the format of this information will be discussed under the general name "program information".
- 5-48. Program information falls into two categories: (1) general program information and (2) file information. The general program information is contained in two records. The file information requires a variable number of records, depending upon the number of files declared by the program. That is, there is one record required in the log for each file declared by the program. Each record of file information, however, has the same format.
- 5-49. The format of general program information is shown below.

The following illustration shows the format of general program information in a log entry (including the code word).

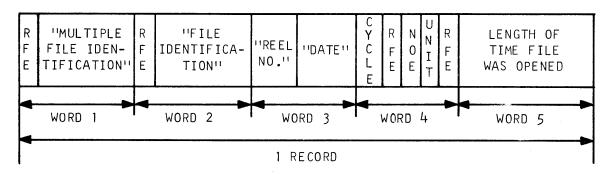
GENERAL PROGRAM INFORMATION NO. OF PRO-PROCESS I/0START STOP FINISH CODE FILES RATE D ''DA TE'' RFE TIME TIME TIME TIME CODE DECLARED TIME 1 WORD WORD 1 RECORD 1 RECORD

<u>Entry</u>	Description	<u>on</u>
CODE	INTEGER:	1 = ALGOL, $2 = COBOL$, $3 = obj$. prog.
NO. OF FILES OPENED	INTEGER	
PROCESS TIME	INTEGER:	Time in 60ths of a second
I/O TIME	INTEGER:	Time in 60ths of a second
PRORATED TIME	INTEGER:	Time in 60ths of a second
DATE	BCL:	YYDDD format* (e.g., 65046)
START TIME	INTEGER:	60ths of a second since HALT-LOAD time
STOP TIME	INTEGER:	60ths of a second since HALT-LOAD time
FINISH CODE	INTEGER:	0 = EOJ, 1 = SYNTAX ERROR, 2 = DS-ED 3 = ABORT
RFE	(Reserved	for Expansion)

[†] The YYDDD format provides that the YY characters specify the last two digits
of the year, and the DDD characters specify the number of the day of the year.

5-50. The following shows the format of one file information record:

FILE INFORMATION



Entry	Descripti	<u>on</u>
MULTIPLE FILE IDENTIFICATION	BCL:	Located in 2nd thru 8th characters of WORD 1
FILE IDENTIFICATION	BCL:	Located in 2nd thru 8th characters of WORD 2
REEL NO.	BCL:	Located in 1st thru 3rd characters of WORD 3
DATE	BCL:	Located in 4th thru 8th characters of WORD 3
CYCLE	BCL:	Located in 1st thru 2nd characters of WORD 4
NOE (Number of errors while handling file)	BINARY:	Located in 5th thru 6th characters of WORD 4
UNIT	BINARY:	Located in 7th character of WORD 4 (See list, below, for meanings of the values of UNIT.)
LENGTH OF TIME FILE WAS OPENED	INTEGER:	Time in 60th of a second.
RFE	(Reserved	l for expansion)

5-51. The values of UNIT specify what unit was used by the subject file. The values are defined as follows:

Value	I/O Unit
0 1 2 3 4 5 6 7 8 9	NOT OPENED MTA MTB MTC MTD MTE MTF MTH MTH MTJ MTK MTL
11 12 13 14 15 16 17 18 19 20	MTM MTN MTP MTR MTS MTT DRA DRB DKA DKB
21 22 23 24 25 26 27 28 29 30 31	LPA LPB CPB CRA CRB SPO PPA PRA PPB PRB

SPECIAL RECORDS AND LOG INITIALIZATION

5-52. RECORD ZERO. The first record in SYSTEM/LOG (i.e., the record with relative address 0), is used ty the MCP when making log entries. The value of the first word in record zero specifies the number of records written in the log. The value of the second word specifies the record capacity of the log. The third and fourth words are used in conjunction with the warning messages supplied by the MCP which signify when the log is half-full and full. The fifth word contains, in BCL, "DISKLOG".

5-53. RECORD n + 1. The first word of the record immediately following the last log entry contains a code with the value 4. This record dentoes the end of log information, and it is not included in the value contained in the first word record of record zero.

5-54. INITIALIZING THE LOG. If a user program wishes to initialize the log (i.e., set up the log so that the MCP considers the log empty), the following actions must be performed:

- a. The 1st, 3rd, and 4th words in record zero must be set to zero.
- b. The 1st word in record 1 must be set to 4.

DISK DIRECTORY

5-55. The MCP maintains, on disk, a disk directory which provides information about all permanent files on the disk. The disk directory is composed of one or more "directory sections", depending upon the number of files on the disk.

5-56. Each directory section can contain the directory information required for as many as 15 files. The first segment of a directory section contains the names (i.e., file identifications) of each file defined in the section. The end of the directory is marked by the first name being equal to 76. Removed files are marked by the first name being equal to 12. The remaining 15 segments are referred to as file headers.

5-57. There is one file header for each file defined in the section. Each file header contains various information about the file, such as the creation date, date of last access, etc. Each file header also specifies the number of areas declared for the file, the size of these areas, and the absolute disk address of each area. When a program is using a file, the file header is read into core memory and remains there while the file is being used.

5-58. The format of the file header is as follows:

Word	Bits	Description
0	1:14	Record length (binary).
	15:15	Block length (binary).
1		System use (for expansion).
2		System use (for expansion).
3	1:17	Save factor (binary).
4	12:30	Date of last access (alpha).
5		System use (for expansion).
7		End-of-File pointer (binary).
8	,	Disk segments per row (binary).
9		Maximum number of rows (binary).
10-29		Row addresses (binary).

5-59. The disk directory begins at segment 1000 and ends at the value of the DIRECT card in the Cold Start deck. If it is desired to read the directory, a permanent file should be placed there through the use of the Cold Start deck.

PRINTER BACK-UP INFORMATION

- 5-60. When a program requests a line printer, an attempt is made by the MCP to assign one. If a program requires a printer only (i.e., does not permit the use of a Printer Back-up Tape) and no printers are available, then the LP RQD message is typed out on the Message Printer. The program then waits until a printer is available. If desired, the operator could type in the OU message to allow the output to go to a Printer Back-up tape.
- 5-61. If a printer is not available, and the output may go to a Printer Back-up tape, a check is made for available back-up tapes or scratch tapes. If none exist, the LP, PBT MT RQD message is typed out. The program must then wait until a printer or a back-up tape is available.
- 5-62. If a program <u>requires</u> a Printer Back-up tape, and none are available, the PBT MT RQD message is typed out. The program then waits until a back-up tape or a scratch tape is available. If desired, the operator may type in the OU message to allow the output to go to the line printer.
- 5-63. When a printer is released, a check is made for programs waiting for a printer. If any are waiting, the highest priority program is scheduled. If no programs are waiting, available back-up tapes may be scheduled for printing, depending upon the content of AUTOPRNT.

- 5-64. One Printer Back-up tape may contain the outputs of several files. When such a back-up tape is listed on a printer, each file is preceded by its own label.
- 5-65. If an end-of-tape condition occurs while a Printer Back-up tape is being written, a search is made for a scratch output tape. If a scratch output tape is not available, the PBT MT RQD message is typed and the program is put in a waiting status. When a scratch tape becomes available, it is used as a Printer Back-up tape.
- 5-66. Printer Back-up tapes may be selectively printed when desired. The content of AUTOPRNT at load time determines how back-up tapes are scheduled.
- 5-67. When a back-up tape has been printed, take the following action:
 - a. If a write ring is in the tape reel, rewind, purge the tape, and release both tapes and unit to the system.
 - b. If no write ring is in the tape reel, rewind the tape with lock.
 The unit is available if tape is removed.

APPENDIXES

APPENDIX A
CHARACTER REPRESENTATION

				BINARY CODES	
BCL	PUNCHED CARD CODE		Α	В	С
CHARACTER SET			BCL CODE P BA 8421	PAPER TAPE E C L XOH 8421	INTERNAL CODE BA 8421
	ZONE	NUMERIC			
Blank			1 01 0000	00 1 0000	11 0000
• • • • • • • • • • • • • • • • • • •	12 12 12	8-3 8-4 8-5	1 11 1011 0 11 1100 1 11 1101	11 0 1011 11 1 1100 11 0 1101	01 1010 01 1011 01 1101
< → &	12 12 12	8-6 8-7	1 11 1110 0 11 1111 0 11 0000	11 0 1110 1 00 0 0000 11 1 0000	01 1110 01 1111 01 1100
\$ * * *	11 11 11 11 11	8-3 8-4 8-5 8-6 8-7	0 10 1011 1 10 1100 0 10 1101 0 10 1110 1 10 1111 1 10 0000	10 1 1011 10 0 1100 10 1 1101 10 1 1110 10 0 1111 10 0 0000	10 1010 10 1011 10 1101 10 1110 10 1111 10 1100
/ % =]	0 0 0 0 0	1 8-3 8-4 8-5 8-6 8-7	0 01 0001 0 01 1011 1 01 1100 0 01 1101 0 01 1110 1 01 1111	01 1 0001 01 1 1011 01 0 1100 01 1 1101 01 1 1110 01 0 1111	11 0001 11 1010 11 1011 11 1101 11 1110 11 1111
# @ : > \		8-3 8-4 8-5 8-6 8-7	1 00 1011 0 00 1100 1 00 1101 1 00 1110 0 00 1111	00 0 1011 00 1 1100 00 1 1010 00 0 1110 00 1 1111	00 1010 00 1011 00 1101 00 1110 00 1111

APPENDIX A (cont)

CHARACTER REPRESENTATION

				BINARY CODES	
BCL	PUNCHED CARD CODE		Α	В	С
CHARACTER SET			BCL CODE P BA 8421	PAPER TAPE E C L XOH 8421	INTERNAL CODE BA 8421
	ZONE	NUMERIC			
+ A B C D E F G H I × J K	12 12 12 12 12 12 12 12 12 12 12 11 11	0 1 2 3 4 5 6 7 8 9	0 11 1010 1 11 0001 1 11 0010 0 11 0011 1 11 0100 0 11 0101 0 11 0111 1 11 1000 0 11 1001 1 10 1010 0 10 0001 0 10 0010	11 1 1010 11 0 0001 11 0 0010 11 1 0011 11 0 0100 11 1 0101 11 0 0111 11 0 1000 11 1 1001 10 0 1010 10 1 0001 10 1 0010	01 0000 01 0001 01 0010 01 0011 01 0100 01 0101 01 0111 01 1000 01 1001 10 0000 10 0001 10 0010
L M N	11 11 11	3 4 5	1 10 0011 0 10 0100 1 10 0101	10 0 0011 10 1 0100 10 0 0101	10 0011 10 0100 10 0101
O P Q R	11 11 11 11	6 7 8 9	1 10 0110 0 10 0111 0 10 1000 1 10 1001	10 0 0110 10 1 0111 10 1 1000 10 0 1001	10 0110 10 0111 10 1000 10 1001
≠ S T U V W X	0 0 0 0 0	8-2 2 3 4 5 6	1 01 1010 0 01 0010 1 01 0011 0 01 0100 1 01 0101 1 01 0110 0 01 0111	01 0 1010 01 0 0010 01 0 0011 01 1 0100 01 0 0101 01 0 0110 01 1 0111	11 1100 11 0010 11 0011 11 0100 11 0101 11 0110
Y Z	0 0	8 9	0 01 1000 1 01 1001	01 1 1000 01 1 1001	11 1000 11 1001

APPENDIX A (cont) CHARACTER REPRESENTATION

				BINARY CODES	
BCL	PUNCHED		Α	В	С
CHARACTER SET	CARD CODE		BCL CODE P BA 8421	PAPER TAPE E C L XOH 8421	INTERNAL CODE BA 8421
	ZONE	NUMERIC			·
0		0	0 00 1010	01 0 0000	00 0000
1		1	1 00 0001	00 0 0001	00 0001
2	<u> </u>	2	1 00 0010	00 0 0010	00 0010
3		3	0 00 0011	00 1 0011	00 0011
4		4	1 00 0100	00 0 0100	00 0100
5		5	0 00 0101	00 1 0101	00 0101
6		6	0 00 0110	- 00 1 0110	00 0110
7		7	1 00 0111	00 0 0111	00 0111
8		8	1 00 1000	00 0 1000	00 1000
9		9	0 00 1001	00 1 1001	00 1001
?	All Other Card		0 00 0000	00 0 1101	00 1100
	Codes				

- Note: 1) Characters are listed in collating sequence. Blank being lowest and the invalid code (?) being highest.
 - 2) Internal code 00 1100 (?) is punched as card code 8-2.
 - 3) Paper tape feed punches are 11 1 1111.
 - 4) A paper tape feed code acts as a delete code and when read is not transferred to the associated processor.
 - 5) The paper tape sprocket hole is between channels 8 and 4.

APPENDIX B

IDENTIFIERS

Identifiers which may be required by control cards or program-parameter cards for modification to any of the programs contained in the B 5500 system are as follows:

ALGOL Compiler

Program Identifier ALGOL

Program Identifier Suffix DISK

File ID's

Source program card input file ID CARD*

Source program tape input file ID TAPE

Source program tape output file ID NEWTAPE

Source program printer output file ID LINE

Source program punch output file ID PNCH

COBOL Compiler

Program Identifier COBOL

Program Identifier Suffix DISK

File ID's

Source program card input file ID DATA

Source program tape input file ID SOLT

Source program tape output file ID TATA

Source program printer output file ID OUTPT

FORTRAN Translator II

Program Identifier FORTRAN

Program Identifier Suffix TWO

^{*} It should be noted that the ALGOL and COBOL compilers will use the card file immediately following the COMPILE card, regardless of file ID.

File ID's

FORTRAN program card input file ID CARD

Generated ALGOL program tape output file ID PUNCH

Generated ALGOL program punch output file ID PPUNCH

Generated ALGOL program print output file ID PRINT

FORTRAN IV

file ID

Program Identifier FORTRAN

Program Identifier Suffix FOUR

File ID's

FORTRAN program card input file ID CARD

Generated ALGOL program tape output file ID PUNCH

Generated ALGOL program punch output file ID PPUNCH

PRINT

Generated ALGOL program print output

APPENDIX C

MESSAGES

GENERAL.

√ Special State
 √ Special State

The operator and the MCP communicate with each other by means of the message printer and keyboard. Through the use of the message printer, the MCP can direct the operator and supply the answers to inquiries from him. The operator, on the other hand, can acknowledge instructions typed by the MCP and initiate inquiries that must be answered by the MCP.

SYSTEM MESSAGES.

The messages given to the operator are of two basic types: those for informative purposes only, and those requiring action by the operator. To minimize the amount of time used by the message printer, the messages are made up of mnemonic codes followed by the variable information that is needed to make the message meaningful. Each element of the message (including the mnemonic code) will be separated from adjacent elements by at least one blank.

A system message which requires an action by the system operator is prefixed with the character "#".

System messages which denote that a program will be discontinued before "EOJ" are preceded by the character "-".

System messages related to the breakout and restart facility are preceded by the character pair "--".

In the descriptions of system messages, the construct $\langle \text{job specifier} \rangle$ will be used, and is defined as follows: $\langle \text{program specifier} \rangle = \langle \text{mix index} \rangle$. An example of a $\langle \text{job specifier} \rangle$ is: PROGID/SUPID=1.

The \langle mix index \rangle provided in a \langle job specifier \rangle is the one to be used in any keyboard input messages referencing the subject program, if the input message requires a \langle mix index \rangle.

Another construct which will be used in describing keyboard output messages is \(\text{\terminal reference}\). The \(\text{\terminal reference}\) is defined as: S = \(\text{\text{integer}}\), A = \(\text{\text{integer}}\), where the \(\text{\text{integer}}\) following the S is the number of the program segment which was being executed when the subject program was discontinued (except in the case of an intrinsic segment where the number refers to the last non-intrinsic segment executed), and the \(\text{\text{integer}}\) following the A is the relative address, within the segment specified, of the syllable that was last executed.

A third construct is $\langle \text{file specifier} \rangle$. A $\langle \text{file specifier} \rangle$ is defined as: $\langle \text{file identification} \rangle$ or $\langle \text{program identifier} \rangle / \langle \text{program identifier suffix} \rangle$.

A complete list of system messages is presented below in alphabetical order, along with an explanation of each message and any operator action that is required.

In addition, the items of the messages specified by the construct "(unit mnemonic)" will actually appear in mnemonic form. They are:

MTA	Magnetic	Tana	Unit	Δ
MTB	Magnetic	Tape	Unit	В
MTC	Magnetic	Tape	Unit	C
MTD	Magnetic	Tape	Unit	D
MTE	Magnetic	Tape	Unit	Ε
MTF	Magnetic	Tape	Unit	F
MTH	Magnetic	Tape	Unit	Н

MTJ	Magnetic Tape Unit J
MTK	Magnetic Tape Unit K
MTL	Magnetic Tape Unit L
MTM	Magnetic Tape Unit M
MTN	Magnetic Tape Unit N
MTP	Magnetic Tape Unit P
MTR	Magnetic Tape Unit R
MTS	Magnetic Tape Unit S
MTT	•
	Magnetic Tape Unit T
LPA	Line Printer A
LPB	Line Printer B
CPA	Card Punch A
CRA	Card Reader A
CRB	Card Reader B
PRA	Paper Tape Reader A
PRB	Paper Tape Reader B
PPA	Paper Tape Punch Unit A
PPB	Paper Tape Punch Unit E
SP0	Supervisory Printer
CDA	Pseudo Card Reader A
CDB	Pseudo Card Reader B
CDC	Pseudo Card Reader C
CDD	Pseudo Card Reader D
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KEYBOARD OUTPUT MESSAGES.

The keyboard output messages or system messages are listed and described in the following paragraphs.

⟨program specifier⟩ ABORT

This message will be typed at HALT-LOAD time if a system HALT occurred before a job in the MIX was programmatically discontinued. One such message is typed for each program that was in the MIX when the HALT occurred.

BAD LIBRARY TAPE THE THE TRANSPORT OF THE PROPERTY OF THE PROP

This message is typed when a library tape has irrecoverable parity errors on it, and the tape couldn't be loaded.

--BADUMP - Applicable of the many many and the second of t

This message is typed if an irrecoverable write parity error occurs while a BREAKOUT is being taken. The BREAKOUT is consequently discontinued.

BED OVRFLW

The occurrence of this message denotes that too many entries have been made in the BED, a table used by the control section of the MCP. If the condition indicated by this message should occur, a HALT-LOAD operation is required.

⟨job specifier⟩ = ⟨mix index⟩ BOJ

This message is typed when an object program first begins to execute, providing the TYPE BOJ option is set.

 $\langle compiler name \rangle / \langle program identifier \rangle = \langle mix index \rangle BOJ$

This message is typed when either the ALGOL or the COBOL compiler begins a compilation, providing the TYPE BOJ option is set.

--BREAKOUT FILE OPEN (unit mnemonic) DUMPTP (program identifier)

This message is typed when a scratch tape is selected and initially used for a BREAKOUT file. The $\langle program\ identifier \rangle$ specifies the program that performed the BREAKOUT.

--BREAKOUT NUMBER (integer) FOR (program identifier)

This message is typed each time a BREAKOUT is taken on a BREAKOUT file.

(unit mnemonic) BUSY

The occurrence of this message denotes that an I/0 operation was attempted on the specified unit, and the unit was found to be apparently busy.

⟨file specifier⟩ CHANGED TO ⟨file specifier⟩

This message is typed after the MCP has performed an operation specified on a CHANGE control card.

CONTROL CARD ERROR (unit mnemonic) {information from control card}

The occurrence of this message indicates that the MCP has expected to read control information from the designated I/O unit but has found the information to be in error.

CP RQD \langle data file designator \rangle \langle rdc \rangle : \langle job specifier \rangle The occurrence of this message indicates that a program has need for a card punch and no such I/O device is currently available.

\langle unit mnemonic \rangle / \langle I/O operation \rangle DA = \langle integer \rangle; #SEG = \langle integer \rangle;
#RTRY = \langle integer \rangle; #TRNS = \langle integer \rangle

This message is typed when retries had to be made on the disk file. The $\langle I/0 \text{ operator} \rangle$ is an R if it was on a read, W if on a write. The number appearing after DA is the disk address; the number appearing after #SEG is the number of segments read or written; the number appearing after #RTRY is the number of retries necessary (modulo 10); the number appearing after #TRNS is the number of disk transactions since the last HALT-LOAD operation.

-DC TU NOT OUTPUT POSSIBLE (job specifier), (terminal reference)

The occurrence of this message denotes that an object program attempted to perform a write on a terminal unit that was not set for output. Because of this erroneous action, processing of the subject program was discontinued.

DECK # <integer > REMOVED

This message is typed when a pseudo card deck has been removed either due to an operators action or the job being completed.

DECK (integer) REMOVED

This message is typed when a control deck is removed from the disk due to completion of job or keyboard input message.

-DIV BY ZERO (job specifier), (terminal reference)

The occurrence of this message denotes that an object program performed a divide operation using a zero denominator. Consequently, processing of the subject program was discontinued.

DIV BY ZERO BRANCH (job specifier), (terminal reference)

This message will be typed upon the occurrence of a divide by zero when the programmatic recovery feature is being used.

⟨job specifier⟩ = ⟨mix index⟩ DS-ED

This message is typed if processing of an object program is discontinued before end-of-job, providing the EOJ option is set.

⟨compiler name⟩ / ⟨program identifier⟩ = ⟨mix index⟩ DS-ED

This message is typed if a compilation is discontinued before the compiler has reached end-of-job, providing the TYPE EOJ option is set.

DT PLEASE

This message is typed at HALT-LOAD time, if the TYPE DATE option has been set. The system operator is required to enter a DT message before processing can commence.

(file specifier) DUMPED

This message is typed after the MCP has performed an operation specified on a DUMP control card.

DUP FIL \(\data file designator \) \(\text{rdc} \) : \(\) job specifier \) \(\duplicate file list \)

The occurrence of this message denotes that an object program wishes to open an input file and that the MCP has found more than one file with the desired identification. (Files on disk are not taken into regard).

The duplicate file condition causes the designated program to be suspended until operator action is taken. The condition may be rectified by making only one of the acceptable files available and then entering a \(\text{mix index} \)

OK message.

DUP LIBRARY \(file specifier \): \(job specifier \)

The occurrence of this message indicates that an attempt has been made to add a file to the disk library, but the file's name is identical to the name of a file already in the disk directory. The program which attempted to add the file to the library is temporarily suspended until the operator remedies the situation. (To remedy the situation the system operator may eliminate the conflict by using a CHANGE card or REMOVE card and then an OK message; or he may DS the program that attempted to place the new file in the library; or he may enter an RM keyboard input message.)

--END OF REEL (unit mnemonic). BREAKOUT IN PROCESS WILL BE RESTARTED ON NEW REEL

This message is typed when the end of tape is reached on a BREAKOUT tape. When this occurs, the BREAKOUT that was being taken when the end-of-tape condition occurred is restarted on a new reel.

-EOF NO LABEL (file designator): (job specifier), (terminal reference)

The occurrence of this message denotes that an object program has reached the end of the designated input file and has not specified what is to be done. Consequently, processing of the program was discontinued.

⟨job specifier⟩ = ⟨mix index⟩ EOJ

This message is typed when an object program reaches end-of-job, providing the TYPE EOJ option is set.

⟨compiler name⟩ / ⟨program identifier⟩ = ⟨mix index⟩ EOJ

This message is typed when a compiler reaches end-of-job, providing there were no syntax errors and providing the TYPE EOJ option was set.

-EOT NO LABEL (file designator): (job specifier), (terminal reference)

The occurrence of this message denotes that an object program has reached the end of the designated files declared area, as on disk. Consequently, processing of the program was discontinued.

-EXCESS TIME (job specifier), (terminal reference)

The occurrence of this message denotes that the process time of an object program has exceeded the time specified on its PROCESS program parameter card. Consequently, processing of the program was discontinued.

(file specifier) EXPIRED

This message is typed in reference to files on disk at HALT-LOAD time, if (the file's date of last access) + (the file's SAVE factor) does not result in a date greater than the current date.

-EXPON OVRFLW (job specifier), (terminal reference)

The occurrence of this message denotes that an object program has performed an operation which caused an exponent overflow to occur. Consequently, processing of the program was discontinued.

EXPON OVRFLW BRANCH (job specifier), (terminal reference)

This message will be typed, upon the occurrence of an exponential overflow when the programmatic recovery feature is being used.

-FILE UNOPENED (job specifier), (terminal reference)

The occurrence of this message denotes that an object program attempted to write on a file that has not been opened. Consequently, processing of the program was discontinued.

-FLAG BIT (job specifier), (terminal reference)

The occurrence of this message denotes that an object program has performed an operation which caused a word with a flag bit of 1 to be accessed as if it were an operand. Consequently, processing of the program wad discontinued.

FLAG BIT BRANCH (job specifier), (terminal reference)

This message will be typed, upon the occurrence of a flag bit when the programmatic recovery feature is being used.

FM RQD \(data file designator\) \(\frac{\range rdc}{\range}\): \(\frac{\job specifier}{\range}\)

The occurrence of this message indicates that a program is ready to open a file which -- as specified on a label equation card -- is required to use "special forms". (The FM message must be entered before the subject program can continue processing.)

⟨unit mnemonic⟩ IN ⟨data file designator⟩ ⟨rdc⟩: ⟨job specifier⟩

This message is typed when a program opens a card or tape file for input, providing the necessary options have been set. The message will be typed for object program files if the TYPE OPN option is set. The message will be typed for compiler files if both the TYPE OPN and TYPE CMPLRFIL options are set.

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and the first of the second of

en de la composition La composition de la -INTGR OVRFLW (job specifier), (terminal reference)

The occurrence of this message denotes that an object program performed an operation which caused an integer overflow to occur. Consequently, processing of the program was discontinued.

INTGR OVRFLW BRANCH (job specifier), (terminal reference)

This message will be typed upon the occurrence of a integer overflow when the programmatic recovery feature is being used.

-INVALD ADRSS (job specifier), (terminal reference)

The occurrence of this message denotes that an object program performed an operation which addressed a memory location in an absent memory module or an address less than 00512. Consequently, processing of the program was discontinued.

INVALD ADRSS

The occurrence of this message denotes that an invalid address occurred during processing in control state, and the invalid address could not be associated with a particular program in the MIX. If the condition indicated by this message should occur, a HALT-LOAD operation is required.

-INVALID EOJ (job specifier), (terminal reference)

The occurrence of this message denotes that a COBOL program attempted to execute the END-OF-JOB statement. Consequently, processing of the program was discontinued.

-INVALD INDEX (job specifier), (terminal reference)

The occurrence of this message denotes that an object program attempted to index out of the limits of the array being referenced. Consequently, processing of the program was discontinued.

INVALD INDEX BRANCH (job specifier), (terminal reference)

This message will be typed upon the occurrence of an invalid index when the programmatic recovery feature is being used.

<unit mnemonic > INV CHR IN COL <integer >

This message is typed when a card has an invalid character other than one in column 1 of a control card. The column with the invalid character is given in the message. The operator must replace this card with a correct card.

INV KBD {typed-in information}

This message is typed if the MCP does not recognize a message entered from the keyboard.

I/O ERROR (integer) (file designator): (job specifier)

There are a number of messages which have the above format; the (integer) in the message denotes its specific meaning. The meanings of this message are listed below according to the (integer).

(integer) value

Meaning

1

A COBOL program attempted to open an input file that was not closed; consequently, processing of the program was discontinued.

3

A COBOL program attempted to open reverse a file that was not closed; consequently, processing of the program was discontinued.

⟨integer⟩ value	<u>Meaning</u>
5	A COBOL program attempted to open reverse a
	file that was not blocked properly; consequently,
	processing of the program was discontinued.
6	A COBOL program attempted to open an output
	file that was not closed; consequently, pro-
	cessing of the program was discontinued.
16	The record count on an input tape does not
	agree with the internally accumulated record
	count.
17	The block count on an input tape does not agree
	with the internally accumulated block count.
18	The HASH TOTAL on a COBOL input tape does not
	agree with the internally accumulated HASH TOTAL.
19	An irrecoverable parity error occurred on a file
	used by a COBOL program and no USE ROUTINE has
	been provided. (This message appears only once
	per block.)
21	A COBOL program attempted to read a file that
	could not be read (e.g., the file had not been
,	opened or an output file). Consequently, pro-
	cessing of the program was discontinued.
	•

(integer) value Meaning A COBOL program attempted to read reverse a 22 file that could not be read; consequently, the program was discontinued. A COBOL program attempted to write a file that 23 could not be written; consequently, the program was discontinued. The number of records within a string on a tape, 71 used by a COBOL SORT program, was wrong (this was due to an incorrect read or write on that tape). Consequently, processing of the program was discontinued. 76 An error occurred within a string being written by a COBOL SORT program; the number of records that should have been written did not equal the number written on the designated unit. Con-

discontinued.

sequently, processing of the program was

(integer) value

79

Meaning

The number of records that should have been read from other tape units in the final merge pass of a SORT, being performed by a COBOL SORT program, did not equal the number of records written onto the final output tape. However, after action was taken to type this message, the SORT closed the final output reel or executed the user's output routine, signaling end-of-file. Consequently, the output tape may be used in spite of this error message. (The tape unit indicated in this message is meaningless.)

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The total number of records input to the SORT, being performed by a COBOL SORT program, was not equal to the number of records output from the SORT in the final merge pass. However, after action was taken to write this message, the SORT closed the final output file or executed the user's output routine signaling end-of-file. Consequently, the output tape may be used in spite of this message. (The tape unit indicated in this message is meaningless.)

⟨unit mnemonic⟩ I/O INV ADDR

The occurrence of this message denotes that an invalid address occurred when data was to be transferred between an I/O channel and core memory.

The MCP recognizes this error condition and rectifies the errors if possible. The primary purpose of this message is to draw attention to a condition which, if it occurred frequently, could denote a hardware failure.

(unit mnemonic) I/O MEM PAR

The occurrence of this message denotes that a memory parity error occurred during the transfer of data between an I/O channel and core memory. The MCP recognizes this error condition and rectifies the error, if possible. The primary purpose of this message is to draw attention to a condition which, if it occurred frequently, could denote a hardware failure.

⟨file specifier⟩ LIBRARY MAINTENANCE IGNORED

This message is typed if the MCP cannot perform the library maintenance operation specified on a control card.

⟨file specifier⟩ LOADED

This message is typed after the MCP has performed an operation specified on a LOAD control card.

#LOG HALF FULL

This message is typed if the log file "SYSTEM/LOG" is half full as a warning to the operator, so that log information will not be lost due to a log wrap around.

LOGOUT/DISK AUTO SCHED

This message is typed if the MCP is required to automatically schedule the program "LOGOUT DISK" due to the fact that the file "SYSTEM/LOG" has been filled to its limit.

LOG WRAP AROUND

This message is typed if the MCP has to write on the beginning of the log file "SYSTEM/LOG" due to the fact that the log file has been filled and not reinitialized.

LP BACK-UP ON (unit mnemonic)

This message is provided to notify the operator that a print back-up tape is on-line. (No operator action is required unless it is desired to print the tape. If the tape is to be printed, a PB message must be entered.)

LP, PBT MT RQD \(data file designator \) \(\rangle \text{rdc} \) : \(\text{job specifier} \)

The occurrence of this message indicates that a program has need for a line printer or printer back-up tape and neither is available. (The situation denoted by this message will be remedied if a line printer, back-up tape, or scratch tape becomes available. The nature of the condition can be altered through use of the OU message.)

LP RQD \(data file designator\) \(\forall rdc\): \(\forall job specifier\)

The occurrence of this message indicates that a program has need for a line printer and no such I/O device is currently available. (The situation denoted by this message will be remedied when a line printer becomes available; however, the OU message may be used to alter the nature of the condition.)

MORE THAN 12000 CARDS IN (control card)

This message is typed when there are more than 12000 cards in a card deck which is being placed on the disk by LDCNTRL/DISK. This card deck is then completely removed from the disk.

MT RQD \(data file designator\) \(\langle rdc\rangle : \(\langle job \) specifier\)

The occurrence of this message indicates that a program is in need of a scratch tape to use for a magnetic tape file.

-- (unit mnemonic) MUST BE (data file designator) -

This message may be typed when a RESTART is being performed. It notifies the system operator that a particular file is required to be on a particular I/0 unit before the program can be restarted.

-- (unit mnemonic) MUST BE SCRATCH FOR PRINT BACKUP

This message may be typed when a RESTART is being performed. It notifies the system operator that a scratch tape must be available on a particular I/O unit to satisfy a need for a printer back-up file. The tape must be available before the program can be restarted.

-NEGTV ARGMNT LN \(\rangle\) program specifier \(\rangle\) \(\text{terminal reference}\)

This message will be typed, upon the occurrence of a negative argument being passed to the LN intrinsic.

-NEGTV ARGMNT SQRT (program specifier) (terminal reference)

This message will be typed, upon the occurrence of a negative argument being passed to the SQRT Intrinsic.

NO BACK-UP DISK

The occurrence of this message denotes that a data overlay operation was required, but no back-up disk (i.e., overlay storage) was available. If the condition indicated by this message should occur, a HALT-LOAD operation is required.

NO FILE \(data file designator \) \(\rangle \text{rdc} \) : \(\text{job specifier} \)

The occurrence of this message denotes that a program has need for an input file which is apparently not available. (If the subject file is labeled, the situation denoted by this message may be remedied by making the file available. If the file is not labeled, the IL message must be used. If the file is a COBOL optional file, an OF message may be entered. If a COBOL program has read the final reel of a multi-reel unlabeled file, the FR message may be entered.)

NO FILE <1ibrary tape name > / FILE000

This message occurs when an attempt is made to LOAD files from a library stape which is not available to the system.

NO FIL ON DISK (data file designator): (job specifier)

The occurrence of this message denotes that a program has need for a file it expected to find on disk. (If the file noted in this message is made available on the disk so that the subject program can continue processing, the (mix index) OK message must be entered; then the MCP will again search for the file to make it available to the program. If the file noted in the message cannot be made available, a DS message should be entered for the subject program.)

(mix index) NO MEM

The occurrence of this message denotes that the MCP has made an attempt to obtain an area in core memory, but was unable to do so. After not obtaining the area, the MCP allows other processing, if any, to take place; and subsequently makes periodic attempts to obtain the desired area. If the area is ever obtained, the OK MEM message will be typed. The (mix index) in this message denotes the program for which the area was to be obtained; MIX = 0 denotes the MCP. (When the NO MEM message appears, it may or may not be followed by an OK MEM message. The system operator is required to determine actions subsequent to the NO MEM message; a HALT-LOAD operation may be required.)

⟨file specifier⟩ NOT IN DIRECTORY

This message is typed if a control card references a file which is not in the disk directory.

(file specifier) NOT LOADED (NOT ON TAPE)

This message is typed if a LOAD control card references a file which is not on the specified library tape.

(unit mnemonic) NOT READY

The occurrence of this message denotes that the MCP or an object program has attempted to perform an I/O operation on the designated unit, and has found the unit NOT READY.

(unit mnemonic) NOT READY EU

The occurrence of this message denotes that the MCP or an object program has attempted to perform an I/O operation on the designated unit and has found the disk file electronic unit not ready.

NO USER DISK

This message will occur if the MCP is requested to perform a library maintenance activity which requests an area on user disk and no such area is available. If the condition indicated by this message should occur, a HALT-LOAD operation is required.

NO USER DISK: (job specifier)

The occurrence of this message denotes that a program has attempted to obtain a file area on user disk, but an area of the required size is not available. (If subsequent action is taken to make user disk available, the OK message must be entered to cause the MCP to again attempt to find the requested area. If no user disk is made available, a DS message should be entered for the program.)

(mix index) OK MEM

This message may occur after a NO MEM message. The occurrence of this message denotes that the condition indicated by the NO MEM message no longer exists.

OPRTR ST-ED (job specifier)

The occurrence of this message means that the job has been suspended in response to an ST input message.

-OPRTR DS-ED (job specifier), (terminal reference)

This message is typed after the system operator causes processing of a program to be discontinued through use of a DS message.

⟨unit mnemonic⟩ OUT ⟨data file designator⟩ ⟨rdc⟩: ⟨job specifier⟩

This message is typed when a program opens a card, tape, or line printer file for output, providing the necessary options have been set. The message will be typed for object program files, if the TYPE OPN option is set. The message will be typed for compiler files if both the TYPE OPN and TYPE CMPLRFIL options are set.

\delta unit mnemonic \range OUT PBTMCP BACK-UP: \delta job specifier \range

This message is typed when a scratch tape is initally selected and used for a printer back-up tape, providing the necessary options have been set. The message will be typed when an object program places the first file on a printer back-up tape, if the TYPE OPN option is set. The message will be typed when a compiler places the first file on a printer back-up tape, if both the TYPE OPN and TYPE CMPLRFIL options are set.

PARITY ON (unit mnemonic)

The occurrence of this message means that the MCP has tried to read this tape and received an irrecoverable parity condition while reading the label information or scanning down a multi-file reel.

(unit mnemonic) PARITY, RW/L

The occurrence of this message indicates that the MCP has attempted to read the designated magnetic tape unit, but has received a parity error condition and has consequently made the unit inaccessible. The reason for the apparent parity condition might be that the tape unit has been set to the wrong density. (If the subject unit is made ready again -- either by placing the unit in LOCAL and then in REMOTE or through use of the RY message -- the MCP will make another attempt to read the tape. Also, a PG message referencing the subject unit can be entered, and the tape will be purged and made accessible.)

-PAR NO LABEL (file designator): (job specifier), (terminal reference)

The occurrence of this message denotes that there was an irrecoverable parity on the designated file and the object program did not specify any action for such a condition. Consequently, processing of the program was discontinued.

PBT MT RQD \(data file designator \) \(\tau c \) : \(\) job specifier \(\)

The occurrence of this message indicates that a program is in need of a scratch tape to use for a printer back-up file. (The situation denoted by this message will be remedied when a scratch tape is made available.

The nature of the condition can be altered through use of the OU message.)

(unit mnemonic) PG-ED

This message is typed when a tape is purged either by a keyboard input message or a program.

(unit mnemonic) PRINT CHECK

This message is typed when a print check error has occurred during printing of a line on a line printer. This message is provided for the purpose of notifying the operator that the error has occurred; processing of the program using the line printer is continued as though the error had not occurred.

PP RQD \(data file designator\) \(\langle rdc\rangle : \langle job specifier\rangle \)

The occurrence of this message denotes that a program has need for a paper tape punch and no such I/O device is currently available.

(unit mnemonic) PUNCH CHECK as medical description of the control of the control

This message is typed when a punch check error has occurred during the punching of a card. This message is provided for the purpose of notifying the operator that the error has occurred; processing of the program using the card punch is continued as though the error had not occurred.

(unit mnemonic) READ CHECK : A set of the control of the control

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This message is typed when a read check occurs on a card reader. The compensator must put the card through the card reader again. If the card is a badly worn card, it should be reproduced.

READ ERROR FOR {control card information}

The occurrence of this message denotes that a read error, probably recoverable parity, has occurred during the reading of a control deck for the disk. The control card which is printed out denotes the deck which will be deleted due to this error. The following decks will still be loaded.

READ ERROR RESTARTING

This message occurs if the MCP encounters an irrecoverable error while could not be performed, a HALT-LOAD operation is required.

(unit mnemonic) REL (data file designator) (rdc): (job specifier)
This message is typed when a program closes a card, tape, or line printer file, providing the necessary options have been set. The message will be typed for object program files if the TYPE CLOSE option is set. The message will be typed for compiler files, if both the TYPE CLOSE and TYPE CMPLRFIL options are set.

⟨file specifier⟩ REMOVED

This message is typed after the MCP has performed an operation specified on a REMOVE control card.

-RER NO LABEL (file designator): (job specifier), (terminal reference)

The occurrence of this message denotes that there was an R-format error on the designated input file and the object program did not specify any action for such a condition. Consequently, processing of the program was discontinued.

⟨unit mnemonic⟩ RET ⟨data file designator⟩

This message is typed when a magnetic tape with a write ring is made accessible to the system, if the file has a retention date that has not expired.

-H/L MARK {Roman numeral}

This message is typed immediately following a HALT-LOAD operation. (The Roman numeral in the message identifies the level of the MCP.)

-- (unit mnemonic) RW/L

This message is typed when a BREAKOUT tape is rewound and locked after it is restarted or after a new reel is being used as a BREAKOUT tape.

(unit mnemonic) RW/L

The occurrence of this message denotes that an operation has been performed to rewind the tape on the designated unit and to make the unit inaccessible.

(The unit may be made accessible again by placing it in LOCAL and then REMOTE or through use of the RY message.)

(unit mnemonic) RW/L (LIBRARY DUMP)

This message occurs after a library tape has been made through use of the DUMP card facility. The designated unit is the location of the newly created library tape, and the unit has been made inaccessible. (The unit may be made accessible again by placing it in LOCAL and then in REMOTE, or through use of the RY message.)

-SELECT ERROR (file designator): (job specifier), (terminal reference)

The occurrence of this message denotes that an object program did an invalid operation on the designated file, e.g. rewinding a card reader.

Consequently, processing of the program was discontinued.

SLATE OVRFLW

The occurrence of this message denotes that too many entries have been made in the SLATE, a table used by the control section of the MCP. If the condition indicated by this message should occur, a HALT-LOAD operation is required.

-STACK OVRFLW (job specifier), (terminal reference)

The occurrence of this message denotes that the operations performed by an object program have caused its stack to overflow its limit. Consequently, processing of the program has been discontinued.

\(compiler name\) / \(\(\) program identifier \(\) = \(\) mix index \(\) SYNTAX ERR

This message is typed when a compiler reaches end-of-job and the program
being compiled contained syntax errors, providing the TYPE EOJ option
was set.

(unit mnemonic) TAPE MK, RW/L

The occurrence of this message indicates that the MCP has attempted to read the designated magnetic tape unit and found the first word of information to be a tape mark and has consequently made the unit inaccessible. The reason for the apparent tape mark condition may be that the tape unit has been set to the wrong density. (If the subject unit is made ready again — either by placing the unit in LOCAL and then in REMOTE or through use of the RY message — the MCP will again attempt to read the tape. Also, a PG message referencing the subject unit can be entered, and the tape will be purged and made accessible.)

TR PLEASE

This message is typed at HALT-LOAD time, if the TYPE TIME option is set.

The system operator is required to enter a TR message before processing

can continue.

TU (integer) OK

This message is typed if a TU (integer) WAITING FOR 0 has been typed and a subsequent write has been initiated to the data communications terminal unit, to clear the "output ready" condition.

TU (integer) WAITING FOR O

This message is typed if a data communications terminal unit is "output ready" awaiting another line of a multiple line message, and a write for the next line has not been initiated. This message is typed under these conditions, however, only if the TUWAITING option is set.

UNEXP IO ERR

The occurrence of this message denotes that the MCP encountered an unexplained I/0 error that could not be directly associated with a particular program. If this error should occur, a HALT-LOAD operation is required.

-UNEXP IOERR (job specifier), (terminal reference)

The occurrence of this message denotes the MCP has performed an I/0 operation which caused an unexpected I/0 error. If the I/0 operation is directly related to a particular object program, processing of that program is discontinued.

(unit mnemonic) WRITE LOCK

The occurrence of this message denotes that a program has attempted to write on a magnetic tape with no write ring or on a disk or drum which has been locked out through use of hardware lockout switches. Consequently, processing of the program using the unit has been discontinued.

(unit mnemonic) WR PARITY

The occurrence of this message denotes that an irrecoverable write parity has occurred on the designated unit. Consequently, processing of the program using the unit has been discontinued.

ZIP ERROR - IGNORED

This message is typed if a program performs a generalized ZIP statement, but provides control information containing an error. Occurrence of this message signifies that the error was present and that all control information following and including the error was ignored.

-ZERO ARGMNT LN (program specifier) (terminal reference)

This message will be typed, upon the occurrence of an argument of zero being passed to the LN Intrinsic.

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KEYBOARD INPUT MESSAGES.

Operator messages are defined as messages with a free-field format which the operator can supply the MCP via the B 5500 console keyboard. In keeping with the concept of permitting the system to perform the control functions, the operator messages are primarily restricted to those actions that will facilitate processing. The messages are not intended to provide detailed information about individual programs, e.g., the settings for specific registers or the contents of designated memory locations.

To enter information from the keyboard, the operator must first depress the INPUT REQUEST key. The READY indicator on the message printer is turned on. At this time, the operator can enter his message. When he has finished keying in the message, he depresses the END OF MESSAGE key. This key causes a group mark to be inserted immediately after the last character entered and signals the MCP.

If the operator attempts to introduce a message that is not acceptable, the MCP will not act upon it, except to notify the operator that he has keyed in an invalid entry.

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The following list presents the allowable operator input messages.

THE CC MESSAGE -- ? MESSAGE

The CC message allows the system operator to supply control information to the MCP, via the console typewriter. The information following the letters CC, in the CC message, is recognized in the same fashion as the information following the character? on control cards and program parameter cards.

The character ? can be used in lieu of the characters CC, in the CC message, if desired.

When a CC message is entered and the END OF MESSAGE switch is pressed, the typewriter will become READY again, unless the CC message contained END card information. Consequently, the last CC message must always be an END card message.

The term (control information), used below, is defined as any information defined valid for use on control cards or program parameter cards.

The CC message may have either of the two following formats:

CC (control information)

or

? (control information)

Examples:

CC EXECUTE C/P; END

CC EXECUTE C/P

CC END

? COMPILE "00180" BY IRP WITH ALGOL

? ALGOL FILE CARD = IRACARD

? END

? COMPILE A/B; ALGOL FILE CARD = "OXXXXXXX"; END.

THE CD MESSAGE

The CD message causes the MCP to type the name and first card image of each pseudo card deck that was placed on the disk by the LDCNTRL/DISK program. If there are no pseudo card decks on the disk the following will be typed:

NO DECKS ON DISK

The CD message has the following format:

CD

Example:

CD

THE DS MESSAGE

The DS message allows the system operator to cause a program to be terminated.

There are two forms of the DS message. One form of the message requires that the program to be terminated by identified through use of a \(\text{mix index} \times \) term; the other message requires that the program be identified through use of a \(\text{program specifier} \).

If more than one program in a MIX have the same (program name) and a message using a (program specifier) is entered, the MCP will arbitrarily terminate the program -- with the name specified -- that has the lowest (mix index). Consequently, if a situation such as noted should occur, the DS message which identifies the program through use of the (mix index term) should be used.

^{*} The term (mix index) is an (integer) that represents the MIX index that the MCP has assigned to a particular program in the MIX (i.e., a program that is currently in process).

The DS message may have either of the two following formats:

⟨mix index⟩ DS

or

DS program specifier >

Examples:

2 DS

DS ALGOL/"00180"

THE DT MESSAGE

The DT message allows the system operator to change the value of the current date word used by the MCP.

The DT message requires the use of three <code>\(\) integer\(\)s</code>, the first two of which must be followed by the character <code>/</code>. The first <code>\(\) integer\(\) is recognized as the number of the month of the year; the second <code>\(\) integer\(\) is recognized as the day of the month; and the third <code>\(\) integer\(\) is recognized as the last two <code>\(\) digit\(\)s of the year.</code></code></code></code>

The DT message must have the following format:

DT (integer) / (integer) / (integer)

Example:

DT 10/30/65

THE ED MESSAGE

The ED message can be used to eliminate a pseudo card deck which is contained in a pseudo card reader, if the reader is not in use.

The ED message may have one of the following formats:

ED CDA

ED CDB

ED CDC

ED CDD

Examples:

ED CDA

ED CDB

ED CDC

ED CDD

THE FM MESSAGE

The FM message must be entered in response to a # FM RQD message. The \(\mathbb{m} \) index \(\) in the message must agree with the \(\mathbb{m} \) in the # FM RQD message, and the \(\) unit mnemonic \(\) must designate the unit to be used for the subject file.

The FM message has the following format:

⟨mix index⟩ FM ⟨unit mnemonic⟩

Example:

1 FM LPB

THE FR MESSAGE

The FR message allows the system operator to specify that the input reel, the reading of which was just completed, was the final reel of an unlabeled file.

The FR message has the following format:

⟨mix index⟩ FR

Example:

3. FR

THE IL MESSAGE

The IL message is used in response to a no-file message, and allows the system operator to designate the unit on which a particular input file is located. The unit designated in the IL message may denote the location of a non-standard file (i.e., a file with no standard B 5500 label) or a standard file (i.e., a labeled file). In either case, the file on the unit designated in the IL message will be assumed to be the file required in the related no-file message.

A (mix index) term must be used with the IL message since, during multi-processing, more than one no-file message may be in effect at the same time.

The IL message must have the following format:

⟨mix index⟩ IL ⟨unit mnemonic⟩

Example:

1 IL MTF

THE IN MESSAGE

The IN message allows the system operator to insert an (unsigned integer) into the Program Reference Table (PRT) of the program specified by the (mix index) at the relative location specified by the octal (index) unless the specified PRT cell contains a descriptor, or the (index) is less than 25 (octal) or out of the PRT bound.

The IN message has the following format:

/mix index > IN (index) = /unsigned integer >

Example:

2 IN 32 = 563

THE LD MESSAGE

The LD message causes the program LDCNTRL/DISK to be called out for execution.

The LDCNTRL/DISK program then searches for a tape or card file with the

(multiple file identification)

CONTROL

and the \file identification \

DECK

Then, if the message entered was

LD DK

the file CONTROL/DECK is placed on disk in such a fashion that the MCP can read the file as a pseudo card deck. If the message entered was

LD MT

the file CONTROL/DECK is placed on a magnetic tape.

The LD message may have either of the following formats:

LD DK

or

LD MT

Examples:

LD DK

LD MT

THE LN MESSAGE

The LN message causes the library program with the program identifier>

LOGOUT

and the program identifier suffix >

DISK

to be scheduled for execution.

The LN message has the following format:

LN

Example:

LN

THE MX MESSAGE

The MX message allows the system operator to request that the MCP type a list of \(\text{program specifier} \) s denoting the programs in the MIX; the priority and \(\text{mix index} \) for each program is also listed.* Specifically, each item in the list typed by the MCP, in response to the MX message, has the following format:

⟨priority⟩: ⟨program specifier⟩ = ⟨mix index⟩

If there is nothing in the MIX, the following message will be typed:

NULL MIX

^{*} It should be noted that the maximum number of programs allowed in the MIX is determined by two parameters which are DEFINEd in the MCP. The two parameters are MIXMAX and JOBNUMAX, where MIXMAX may be DEFINEd as an integer from 1 through 9 and JOBNUMAX must be DEFINEd as an even integer with a value four to five times greater than MIXMAX.

The MX message must have the following format:

MX

Example:

MX

THE OF MESSAGE

The OF message allows the system operator to specify that a file requested for a COBOL program was optional, so that the specified program can proceed without it.

The OF message has the following format:

(mix index) OF

Example:

1 OF

THE OK MESSAGE

The OK message causes the MCP to resume processing of a program which has been temporarily suspended due to the condition designated by the # DUP LIBRARY message, the NO USER DISK message, the NO FILE ON DISK, or the #OPRTR ST-ED message.

The OK message has the following format:

⟨mix index⟩ OK

Example:

1 OK

THE OL MESSAGE

The OL message allows the system operator to request that the MCP type information pertaining to labels of files on I/O units.

THE STORY OF STREET STREET STREET, WITHOUT STREET STREET, AND STREET

The OL message has many formats. One format specifies that a specific (unit mnemonic) may be entered. The other formats require two-letter codes which specify a type of I/O unit. The codes and the I/O units they represent are as follows:

(Quadrant Code) Code	<u>I/O Unit</u>	getin nedd de chewernge gaerfung, ar mol cell
CD	Pseudo Card Reader	
CP	Card Punch	का अपने दुव का के लें अभी अभी अभी समुद्रालय है। असी
CR	Card Reader	
LP	Line Printer	
MT	Magnetic Tape	
PP	Paper Tape Punch	
PR	Paper Tape Reader	

If an OL message specifying a specific (unit mnemonic) is entered, the response message will have one of the following formats, whichever is relevant.

\langle unit mnemonic \rangle IN USE BY \langle program specifier \rangle : \langle multiple file identification \rangle \rangle \rangle \text{unit mnemonic} \rangle LABELED \langle multiple file identification \rangle \rangle file identification \rangle \rangle rdc \rangle \text{unit mnemonic} \rangle NOT READY \rangle unit mnemonic \rangle SCRATCH \rangle unit mnemonic \rangle UNLABELED

If an OL message specifying a type of I/O unit is entered, and if a unit of the specified type is in use and/or labeled, the response message will have one of the following formats, whichever is relevant.

```
\label{eq:continuous} $$ \langle \text{unit mnemonic} \rangle $$ IN USE BY \langle \text{program specifier} \rangle : \langle \text{multiple file identification} \rangle $$ $$ \langle \text{file identification} \rangle $$ \langle \text{rdc} \rangle $$ $$ \langle \text{rdc} \rangle $$ $$ \langle \text{rdc} \rangle $$
```

(unit mnemonic) UNLABELED

If an OL message specifying a type of I/O unit is entered, and no unit of that type is in use and/or labeled, the following message will be typed:

NULL (unit mnemonic) TABLE

The OL message may have one of the following formats:

OL (unit mnemonic)

or

OL CD

or

OL CP

or

OL CR

or

OL LP

or

OL MT

or

OL PP

or

OL PR

Examples:

OL MTA

OL CR

OL MT

THE OT MESSAGE

The OT message allows the system operator to request the MCP to type out the value of a cell in a programs Program Reference Table (PRT). The program is specified by the \langle mix index \rangle and the cell by the octal \langle index \rangle. The MCP message typed will have the following format:

The value of <PRT data > will be expressed as an octal number for a descriptor, or an integer of up to eight digits for an operand.

The OT message has the following format:

⟨mix index⟩ OT ⟨index⟩

Example:

2 OT 32

THE OU MESSAGE

The OU message allows the system operator to designate the output media option for a line printer file, if an # LP RQD, a # LP PBT MT RQD, or a # PBT MT RQD message has been typed which references the job that uses the file.

The OU LP form of this message specifies that the subject line printer file must be output on a line printer.

The OU MT form of this message specifies that the subject line printer file must be output on a printer back-up tape.

The OU form of this message specifies that the subject line printer file may be output either on a line printer or a printer back-up tape. The OU message may have any one of the following formats:

⟨mix index⟩ OU LP

or

/mix index > 0U MT

or

(mix index) OU

Examples:

2 OU LP

1 OU MT

4 00

THE PB MESSAGE

The PB message allows the system operator to specify that a printer back-up file on a particular unit is to be printed. If the tape specified is not a printer back-up tape the following message will be typed:

NOT PRINTER BACK-UP TAPE

The PB message has the following format:

PB (unit mnemonic)

Example:

PB MTN

THE PD MESSAGE

The PD message allows the system operator to request that the MCP type information pertaining to what files are listed in the disk directory. The formats of the PD message are shown below. The action caused by the PD message depends upon the format of the message. Specifically, the actions caused by the PD message are as follows.

If a message of the form

PD

or

$$PD = / =$$

is entered, a list containing a <file specifier > for each file in the disk directory is typed.

```
If a message of the form
     PD (file specifier)
is entered and the file designated in the message is in the disk directory, the
(file specifier) for the file will be typed. If the file designated in the
message is not in the disk directory, the message
     NULL PD (file specifier)
will be typed.
If a message of the form
     = / (file identification)
or
     = / (program identification suffix)
is entered, a list of all files in the disk directory which have the designated
(file identification) or 'program identification suffix), if any, will be typed.
If no such files are in the disk directory, a message of the form
     NULL PD (file identification prefix) / =
or
     NULL PD (file identification prefix)
or
     NULL PD (program identification) / =
or
     NULL PD (program identification)
will be typed.
```

In total, the PD message may have any one of the following formats:

```
PD = / =

PD <file specifier >

PD = / <file identification >

PD = / 
/ program identification suffix >

PD <file identification prefix > / =

PD <file identification prefix >

PD 
/ program identification > / =

PD 
/ program identification > / =

PD
```

Examples:

PD
PD = / =
PD ALGOL/DISK
PD = / PARTS
PD = / DISK
PD PERSNEL / =
PD PERSNEL
PD ALGOL / =

THE PG MESSAGE

PD ALGOL

The PG message allows the system operator to purge a magnetic tape on a unit that is READY, in WRITE status, and not in use.

The PG message has the following format:

PG (unit mnemonic)

Example:

PG MTK

THE PR MESSAGE

The PR message provides a means whereby the system operator can specify the priority to be assigned a program currently in the MIX. The priority to be assigned is specified by the term (priority); the program to which the priority is to be assigned is specified by the (mix index). (The term (priority) must be an (integer).)

The PR message has the following format:

Example:

PR 1 = 7

THE RD MESSAGE

The RD message may be used to remove, from disk, pseudo card decks which were placed on disk by the system program LDCNTRL/DISK.

Pseudo card decks are identified by names having the following format:

(integer);

and the term (pseudo card deck list) is defined as:

(integer)

or

⟨pseudo card deck list⟩

Examples:

RD #0072

RD #0072, #6328

THE RM MESSAGE

The RM message can be used in response to a # DUP LIBRARY message. The RM message causes the file on disk -- with a name identical to the file created by the program specified in the # DUP LIBRARY message -- to be removed, and then causes the subject program to resume processing.

The RM message has the following format:

(mix index) RM

Example:

1 RM

THE RN MESSAGE

The RN message is used to specify the number of pseudo card readers to be used. In total, there are four pseudo card readers. At HALT-LOAD time, the number of pseudo card readers specified to be used is zero.

An RN message may be entered at any time. If an RN message specifies that more pseudo card readers are to be used than are currently being used, the MCP will search for pseudo card decks on disk, and make use of as many of the specified pseudo card readers as possible. If an RN message specifies that fewer pseudo card readers are to be used than are currently being used, a sufficient number of the pseudo readers will be "turned off" as soon as the readers complete handling of the pseudo card deck in process, if any.

If no (digit) is entered, the digit 1 is assumed.

The RN message has one of the following formats:

RN

or

RN (digit)

Examples:

RN

RN 0

RN 1

RN₂

RN₃

RN 4

THE RS MESSAGE

The RS message can be used only when no programs are in process on the system.

This message allows the system operator to restart a job at a rerun point that is recorded on a breakout file. The breakout file must be on the same unit as it was at breakout time, when it was created.

Since a breakout file may contain information for more than one rerun point, a 'dump number' term -- represented by two 'digits' -- is required with the RS message. The 'dump number' for the first rerun point on a breakout file is 00; the 'dump number' for the second rerun point is 01, etc. If no 'dump number' is provided in an RS message, 00 is assumed.

The (unit mnemonic) must specify the tape unit where the breakout file is located.

The RS message may have either of the following formats:

RS (unit mnemonic)

or

RS (unit mnemonic) (dump number)

Examples:

RS MTA

RS MTD 04

RS MTF 12

THE RW MESSAGE

The RW message allows the system operator to cause a rewind-and-lock action to be performed on magnetic tape file that is not in use.

3 4 3

The RW message has the following format:

RW (unit mnemonic)

Example:

RW MTE

THE RY MESSAGE

The RY message allows the system operator to cause, by entering a keyboard message, an effect analogous to the effect caused by placing a magnetic tape unit in LOCAL and then REMOTE. That is, if the designated unit is not in use and in REMOTE, the MCP will attempt to read a file label.

医三菱酸银 鐵鐵 医电阻紧张 化环 大大 医乳腺病 医乳头病 医二氏性小原性小原性 化乙酰化异物 医小原虫虫

The RY message causes locked files to be made accessible, and causes label cards (or DATA cards), which have been read but not referenced, to be ignored.

The RY message has the following format:

RY (unit mnemonic)

Examples:

RY MTC

RY CRA

THE SO, RO, AND TO OPTION MESSAGES

The MCP provides a number of features that are optional. That is, if a particular option is set, the MCP will use the respective feature; if the option is reset (i.e., not set), the feature will not be used.

The SO message allows the system operator to set options.

The RO message allows the system operator to reset options.

The TO message allows the system operator to request that the MCP type a message which lists the options and their settings.

Each optional feature provided by the MCP may be referenced either mnemonically through use of an option mnemonic or numerically through use of an option numeric code.

An option mnemonic is defined as one of the following:

USE DRA

USE DRB

TYPE BOJ

TYPE EOJ

TYPE OPN

USE TERMNATE

TYPE DATE

TYPE TIME

USE ONEBREAK

USE AUTOPRNT

TYPE TUWAITNG

TYPE CMPLRFIL

TYPE CLOSE

An (option numeric code) is defined as:

USE OPTN (integer)

where the (integer) used specifies the option.

USE DRA and USE OPTN 47 are equivalent. If this option is set, a drum memory unit designated DRUM A must be on-line, and that unit will be used for data overlay storage. If the option is reset, DRUM A will not be used.

USE DRB and USE OPTN 46 are equivalent. If this option is set, a drum memory unit designated DRUM B must be on-line, and that unit will be used for data overlay storage. If the option is reset, the unit will not be used.

TYPE BOJ and USE OPTN 45 are equivalent. If this option is set, BOJ messages will be typed each time a program is placed in the MIX for execution. If the option is reset, no such messages will be typed.

TYPE EOJ and USE OPTN 44 are equivalent. If this option is set, a message will by typed when a program is removed from the MIX. If the option is reset, no such messages will be typed.

TYPE OPN and USE OPTN 43 are equivalent. If this option is set, a message will be typed each time an object program opens a file; also, if the CMPLRFIL option is set, a message will be typed each time a compiler opens a file. If the option is reset, no such messages will be typed.

USE TERMNATE and USE OPTN 42 are equivalent. If this option is set, the TERMINATE procedure of the MCP will be called if a program is discontinued because of an error condition. (Since it is the function of the TERMINATE procedure to clear the system of all information pertaining to a discontinued program, the USE TERMNATE option generally should be set. However, if an object program error condition should occur where it is necessary to obtain a memory dump that reflects the core conditions at error time -- i.e., a useful memory dump -- the USE TERMNATE option should be reset.) If this option is reset, the TERMINATE procedure will not be called when a program is discontinued due to an error condition.

TYPE DATE is equivalent to USE OPTN 41. If this option is set, a DT PLEASE message will be typed at HALT-LOAD time, thus requiring the system operator to enter the date using the DT keyboard input message. If this option is reset, no DT PLEASE message will be typed.

TYPE TIME is equivalent to USE OPTN 40. If this option is set, a TR PLEASE message will be typed at HALT-LOAD time, thus requiring the system operator to enter the time using the TR keyboard input message. If this option is reset, no TR PLEASE message will be typed.

USE ONEBREAK is equivalent to USE OPTN 39. If this option is set, all programs performing BREAKOUTs, on a BREAKOUT tape provided by the system, will use the same magnetic tape. If this option is reset, each such program will be assigned its own BREAKOUT tape.

USE AUTOPRNT is equivalent to USE OPTN 38. If this option is set, the MCP will automatically cause printer back-up tapes (not including those created previous to the latest HALT-LOAD) to be printed whenever a back-up tape and line printer are concurrently not in use. If the option is reset, printer back-up tapes will be printed only if the system operator enters a PB keyboard input message.

USE PUNT and USE OPTN 37 are equivalent. This option is not used by the system.

TYPE TUMAITING and USE OPTN 36 are equivalent. If this option is set, the MCP will type a message to notify the operator when the condition occurs that a data communications terminal unit is output ready (i.e., waiting for another line of a multiple line message) but no output message has yet been provided to satisfy the need. (The message typed under these conditions is the TU (integer) WAITING FOR 0 message.) An output ready condition without a message available is not necessarily an error condition, but is a condition which is generally uncommon and may indicate a program bug. (The TU (integer) input message can be used to eliminate the output ready condition if that action is desired.) If the TUWAITING option is reset, no message is typed to notify the operator of the subject condition.

TYPE CMPLRFIL and USE OPTN 35 are equivalent. If this option is set, the MCP will type file open and file close messages for compiler files, according to the respective settings of the OPN and CLOSE options. If this option is reset, no messages will be typed due to the opening and/or closing of files used by compilers.

TYPE CLOSE and USE OPTN 34 are equivalent. If this option is set, a message will be typed each time an object program closes a file; also, if the CMPLRFIL option is set, a message will be typed each time a compiler closes a file. If the option is reset, no such messages will be typed.

TYPE ERRORMSG is equivalent to USE OPTN 33. If this option is set, a pseudoterminal message will be typed out for programmatic control of run time errors.

The SO message has either of the following formats:

SO (option mnemonic)

or

SO (option numeric code)

Examples:

SO TYPE BOJ

SO USE OPTN 45

The RO message has either of the following formats:

RO (option mnemonic)

or

RO (option numeric code)

Examples:

RO USE TERMNATE

RO USE OPTN 42

The TO message has the following format:

ΤO

Example:

T0

THE ST MESSAGE

The ST message allows the system operator to suspend the program referenced by the $\langle \text{mix index} \rangle$, as soon as that program becomes ready to be returned to normal state by the MCP. To resume processing of the program the operator must use the OK message.

The ST message has the following format:

(mix index) ST

Example:

1 ST

THE SV MESSAGE

The SV message may be used to cause a peripheral unit to be made inaccessible until a HALT-LOAD operation occurs or until an RY message referencing the inaccessible unit is entered. If, when the SV message is entered and the specified unit is not in use, the message

(unit mnemonic) SAVED

will be typed. If a unit is in use when an SV message referencing it is entered, the message

(unit mnemonic) TO BE SAVED

will be typed, and the unit will become inaccessible as soon as it is no longer in use. Until an RY message referencing the unit is entered or a HALT-LOAD occurs, the "saved" unit will not appear NOT READY.

The SV message has the following format:

SV (unit mnemonic)

Examples:

SV LPA

SV MTT

SV CRB

THE TI MESSAGE

The TI message causes the MCP to type out the amount of processor time that the subject program has used up at the time the TI message was entered. The time is provided as one to three $\langle integers \rangle$'s separated by $\langle space \rangle$'s.

For example:

1

or

2 49

or

1 48 7.

The right most (integer) specifies seconds, the second from right integer specifies minutes, and the third from right integer specifies hours.

The TI message has the following format:

⟨mix index⟩ TI.

Example:

3 TI

THE TR MESSAGE

The TR message allows the system operator to change the value of the time word used by the MCP.

The time, specified by the (integer) in the TR message, is designated according to a 24-hour clock (i.e., military time).

The TR message has the following format:

TR (integer)

Example:

TR 0800

THE TU MESSAGE

The TU message may be used in response to a TU (integer) WAITING FOR 0 message. When the TU message is entered, the (integer) used must correspond with the (integer) in the TU WAITING... message.

Entering this message causes the MCP to execute an operator-intervened message on the inquiry station waiting for output. This message written by the MCP contains an end-of-message character and consequently eliminates the output ready condition.

Since the condition denoted by the TU WAITING... message is not in itself an error condition, the TU message should be used only when it is known that an inquiry handling program is not going to handle the condition satisfactorily.

The TU message has the following format:

TU (integer)

Example:

TU 1

THE UL MESSAGE

The UL message is used in response to a no file message, and allows the system operator to designate the unit on which a particular unlabeled file is located. The unit designated in the UL message may denote the location of a standard file (i.e., a file on which the first record is a standard B 5500 label) or a non-standard file (i.e., a file with no standard label). However, in either case all records on the file including the standard label, if any, will be recognized as data records. (This message differs from the IL message in that, when the IL message is used in reference to a standard file, a standard label will not be recognized as a data record.)

A (mix index) term must be used with the UL message since, during multi-processing, more than one no file message may be in effect at the same time.

The UL message has the following format:

⟨mix index⟩ UL ⟨unit mnemonic⟩

Example:

1 UL MTT

THE WD MESSAGE

The WD message causes the MCP to type the date currently being used by the system. The date is given in the MM/DD/YY format.

The WD message has the following format:

WD

Example:

WD

THE WT MESSAGE

The WT message causes the MCP to type out the time of day currently recognized by the system. The time is given according to a 24-hour clock.

The WT message has the following format:

WT

Example:

WT

THE WY MESSAGE

The WY message allows the system operator to request that the MCP provide information as to why a program has been temporarily suspended, providing that the program has been temporarily suspended due to a reason previously designated in a system message which: (1) was preceded by the character # and (2) contained a (job specifier) (e.g., a program which was suspended because of the condition denoted by a previous # NO FILE message.).

In response to the WY message, the MCP does the following: (1) lists the twoletter codes for all keyboard input messages which could be entered to eliminate the condition that caused the program to be temporarily suspended, and (2) retypes the # message that was previously typed to inform the system operator of the condition that caused the program to be suspended.

The WY message has the following format:

⟨mix index⟩ WY

Example:

4 WY

en produce de la companya de la com La companya de la co

APPENDIX D

FORTRAN IV TRANSLATOR DECK SET-UP

The FORTRAN IV Translator has as its input file a file called "CARD". Therefore, when running the translator, the program to be translated, with appropriate \$ cards, must be preceded by a "CARD" label card.

The syntax of the source deck for the FORTRAN IV Translator is as follows:

⟨Source deck⟩ ::= ⟨FORTRAN deck⟩ ⟨LAST\$ Card⟩

/FORTRAN deck\ ::= \START\$ card\ \(\text{Program deck} \)

```
⟨Program deck⟩ ::= ⟨Subprogram⟩ | ⟨Subprogram⟩ ⟨Program deck⟩
(Subprogram)
                ::= (Subroutine) | (Function) | (Main Program)
(Subroutine)
                ::= (Subroutine declaration) (Main Program)
/Function>
                ::= (Function declaration) (Main Program)
(Main Program) ::= (Program body) | (Program body) (END card)
⟨Program body⟩ ::= ⟨Statement⟩ | ⟨Statement⟩ ⟨Program body⟩
/Statement >
                ::= (any FORTRAN statement except: START$, LAST$, END,
                          SUBROUTINE, or FUNCTION
The format for the START$ Card is as follows:
                 ::= START$ | START$ (START list) $
(START$ card)
(START list)
                 ::= (Start list element) | (Start list element) (Start list)
(Start list
                 ::= (Punch option) | (Memory Option) | (Octal format option) |
                           (Configuration option) | (Listing option)
   element>
(Punch option) ::= PC PCO
/Memory option) ::= XC|XE|GLOBAL
(Octal format
       option > ::= OCTAL | OCTAL ← (integer)
(Configuration
       option \rangle ::= \langle Configuration item \rangle \leftarrow \langle integer \rangle \mid \langle configuration item \rangle,
                           ⟨configuration item list⟩
```

```
⟨Configuration
    item⟩ ::= SW|SL|TAPES

⟨Configuration
    item list⟩ ::= ⟨integer⟩, ⟨configuration item list⟩
```

Listing Option ::= SFL|SAL|FL|AL

If the configuration option is not used, it is assumed that there are 16 tape files and no sense switches or sense lights. If the configuration item is used in the form:

⟨configuration item⟩ ← ⟨integer⟩

then:

- a. TAPES←n will declare n tapes (1-n).
- b. SL←n will declare 4 sense lights (all false).
- c. SW←n will declare 6 sense switches (all false).

If the configuration is used in the form:

⟨configuration item⟩, ⟨configuration item list⟩

then:

- a. SL, n, m will declare 4 sense lights with n and m true.
- b. SW, n, m, 1 will declare 6 sense switches with n, m, 1 true.
- c. TAPES, 5, 6 will declare tapes 5 and 6 only.

The Octal Option causes WRITE TAPE to be written in octal.

If the punch option is not used, the output will be on the tape labeled "OCRDIMG".

If the PC option is used, the output will also be on punched cards. If the PCO option is used, the output will only be on punched cards.

If the XC memory option is used, common statements are ignored. If the XE option is used, equivalence statements are ignored. If the GLOBAL option is used, the identifiers in COMMON will be declared as COMMENTS.

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