Systems

**Operator's Library:
IBM System/370
Model 145
Operating Procedures**

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PREFACE

This reference manual contains information necessary to operate the following units of the IBM System/370 Model 145.

- IBM 3145 Processing Unit
- IBM 3210 Console Printer-Keyboard
- IBM 3215 Console Printer-Keyboard
- Console File

Operating information for related software and peripheral devices is not included.

The reader is assumed to have:

1. Basic computer knowledge and experience, or
2. Operated other related data processing equipment, or
3. Previous computer operating experience on a similar system.

The visual index, located at the beginning of this manual, is an aid for quickly locating the controls and indicators described in this publication.

IBM is grateful to the American National Standards Institute (ANSI) for permission to reprint its definitions from the American National Standard Vocabulary for Information Processing (Copyright © 1970 by American National Standards Institute, Incorporated), which was prepared by Subcommittee X3.5 Terminology and Glossary of American National Standards Committee X3.

This publication has five major sections:

- System Control Panel Indicators, Switches, and Keys

  This section describes the purpose of individual indicators, switches, and keys. It does not describe the applications of these facilities within operating procedures.
- Console File

  This section contains procedures for the handling, insertion, and removal of magnetic disk cartridges.
- Console Printer-Keyboard

  This section contains PR-KB manual operations, initial set-up and operator adjustments, maintenance procedures, and descriptions of indicators and controls.
- Operating Procedures

  This section contains procedures for system operation, initialization, and error recovery.
- Handling Abnormal Situations

  This section contains flowcharts and text for your use in analyzing unusual situations.
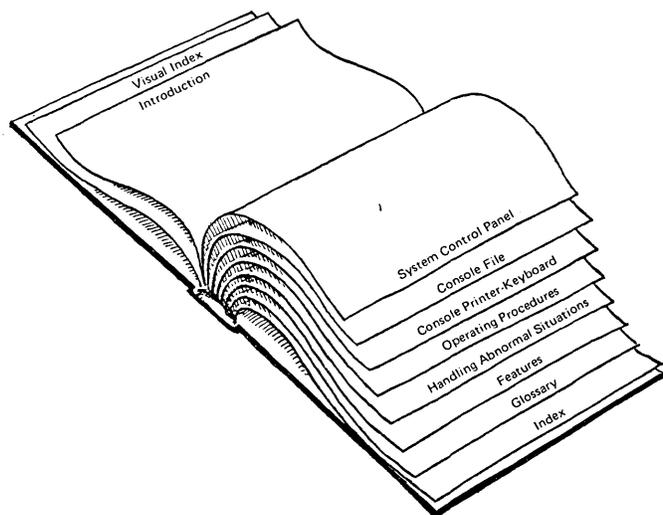
Associated publications are:

IBM System/360 Disk Operating System Operator Communications and Messages, Order No. GC24-5074.

IBM System/360 Operating System Messages and Codes, GC28-6631.

IBM System/370 Model 145 Functional Characteristics, GA24-3557.

IBM System/360 and System/370 Bibliography, GA22-6822.

OS/VS Message Library: VS1 System Messages, GC38-1001.

VISUAL INDEX

Numbers indicate the pages where descriptive text is found.

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I·O INTFS DSBLD
I·O INTERFACE B   ON   OFF
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CMND
DISK ADR
BYTE CNTR

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ADDRESS COMPARE CONTROL
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SYNC
NORM
STOP
INTERVAL TIMER
NORMAL
DISABLE

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POWER THERM

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A REGISTER DISPLAY
1 STORAGE/EXT REGS
2 DOCUMENTARY CNSL
3 S.P.T.L REGISTERS
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6 CHAN WORD A
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BYTE 0   BYTE 1   BYTE 2   BYTE 3

ADDRESS COMPARE
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CTRL WORD ADR TRAP
DATA COMP TRAP

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MPX CHAN
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EXT REG
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PROCESS
INSTRUCTION STEP
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CONSOLE FILE BYTE COUNT HARD STOP

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DIAGNOSTIC/CONSOLE FILE CONTROL
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SWS A H
LOAD
RECYCLE
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SWS A H
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START CONSOLE FILE
CONTROL ADDRESS SET
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MAIN STORAGE ADDRESS
CONTROL STORAGE ADDRESS
LOAD UNIT ADDRESS

A   CONSOLE FILE ADDRESS   C   CONSOLE FILE BYTE COUNT   E   F   WORD ADDRESS   G   H   BYTE X LATE REGS
STORE DISPLAY ADDRESS

INTERRUPT   SYS MAN WAIT TEST LOAD   LOAD

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CONTENTS

ABBREVIATIONS

ADR	address	IPL	initial program load
ADDR	address	I/O	input or output
ASCP	automatic system checkout program	MAN	manual
CF	console file	MS	main storage
CORR	correction	OS	operating system
CPU	central processing unit	PR-KB	printer keyboard
CTCA	channel-to-channel adapter	PSW	program status word
CU	control unit	PWR	power
DIAGN	diagnostic	REG	register
DOS	disk operating system	REQD	required
EXE	execute	SDBO	storage data bus-out
IC	instruction counter	SEREP	system error record editing program
IMPL	initial microprogram load	SYS	system
INTVN REQD	intervention required	SYS RES	system residence
INVLD	invalid	TOD CLK	time-of-day clock
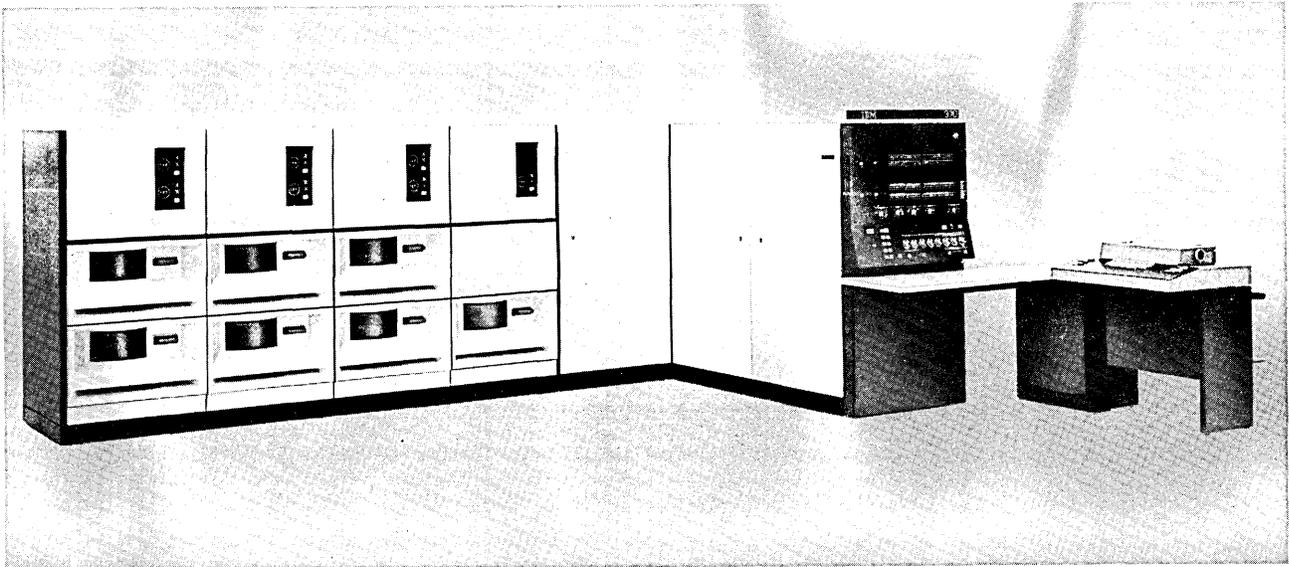
System/370 Model 145 Data Processing System

This manual contains information necessary to operate the System/370 Model 145 Processing Unit and integrated devices, except the IFA. Order numbers for manuals containing operating procedures for individual input/output devices can be found in the *IBM System/360 and System/370 Bibliography,* GA22-6822. Controls and indicators used only by service personnel are covered in maintenance documentation for the system.

System/370 Model 145 performs data manipulations and input/output operations by executing microprogram routines. The routines executed are determined by the machine language instruction being processed. The Initial Microprogram Load (IMPL) disk contains the 370 microprogram and is inserted into the Console File (CF) before power is applied to the system.

When power is applied to the system and the 370 microprogram is loaded into control storage, the system is ready to load the operating system (OS, DOS, etc.) or a stand-alone program. These programs are loaded by using the

Initial Program Load (IPL) procedure in this manual.

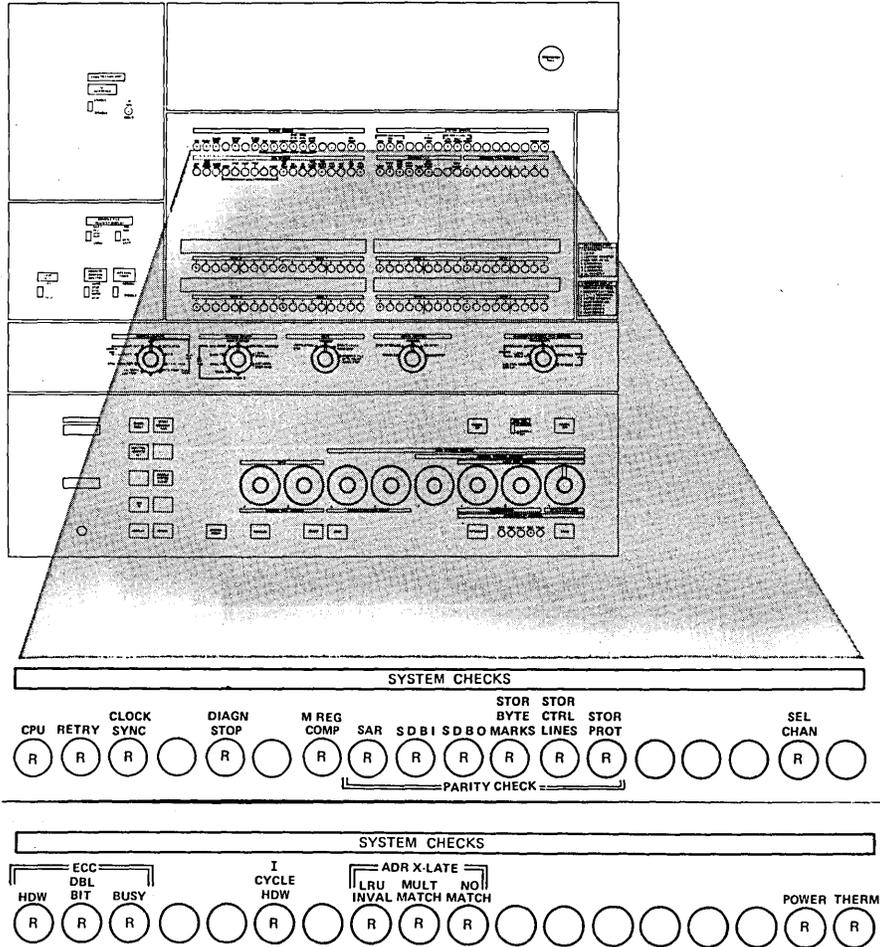Operating procedures necessary before a problem program can be run are:

1. Disk Cartridge Insertion (IMPL disk)

2. Power-on

3. IMPL (automatic with power-on)

4. IPL the operating system (if required).

Whenever power has been removed from the system, these four procedures must be followed. When power is dropped, the contents of control storage and main storage are invalid.

To help us provide you with better documentation, please use the Reader's Comment Form in the back to evaluate this manual.

SYSTEM CONTROL PANEL INDICATORS, SWITCHES, and KEYS

SYSTEM CHECK INDICATORS

SYSTEM CHECKS																

```
                    CLOCK        DIAGN      M REG                    STOR STOR
                    SYNC         STOP       COMP   SAR  S D B I  S D B O  BYTE CTRL  STOR              SEL
CPU  RETRY                                                        MARKS LINES PROT              CHAN
```

CPU	RETRY	CLOCK SYNC		DIAGN STOP		M REG COMP	SAR	S D B I	S D B O	STOR BYTE MARKS	STOR CTRL LINES	STOR PROT			SEL CHAN	
R	R	R		R		R	R	R	R	R	R	R			R	

└────── PARITY CHECK ──────┘

SYSTEM CHECKS														

```
       ┌──── ECC ────┐              I        ┌── ADR X-LATE ──┐
       │    DBL      │            CYCLE       │LRU  MULT   NO │
       HDW  BIT  BUSY│            HDW         │INVAL MATCH MATCH                      POWER  THERM
```

HDW	DBL BIT	BUSY			I CYCLE HDW		LRU INVAL	MULT MATCH	NO MATCH				POWER	THERM
R	R	R			R		R	R	R				R	R

SYSTEM CHECK RECOVERY

If a system check is indicated, re-IMPL and then re-IPL.
If the error recurs, see "Handling Abnormal Situations—
Introductory Flowchart," page 84.

## POWER and THERMAL CHECK RECOVERY

When a power supply failure or overtemperature condition
occurs during a system operation, a power-off sequence oc-
curs. The POWER check indicator on alone indicates a
power supply failure. The THERM indicator on along
with the POWER check indicator indicates an overtem-
perature condition.

1. Press CHECK RESET key (resets the indication and
   allows the POWER ON key to be operative).

2. Press POWER ON key.

If the condition causing the failure was temporary, power
will come up normally. If power cannot be restored, see
"Handling Abnormal Situations—Introductory Flowchart,"
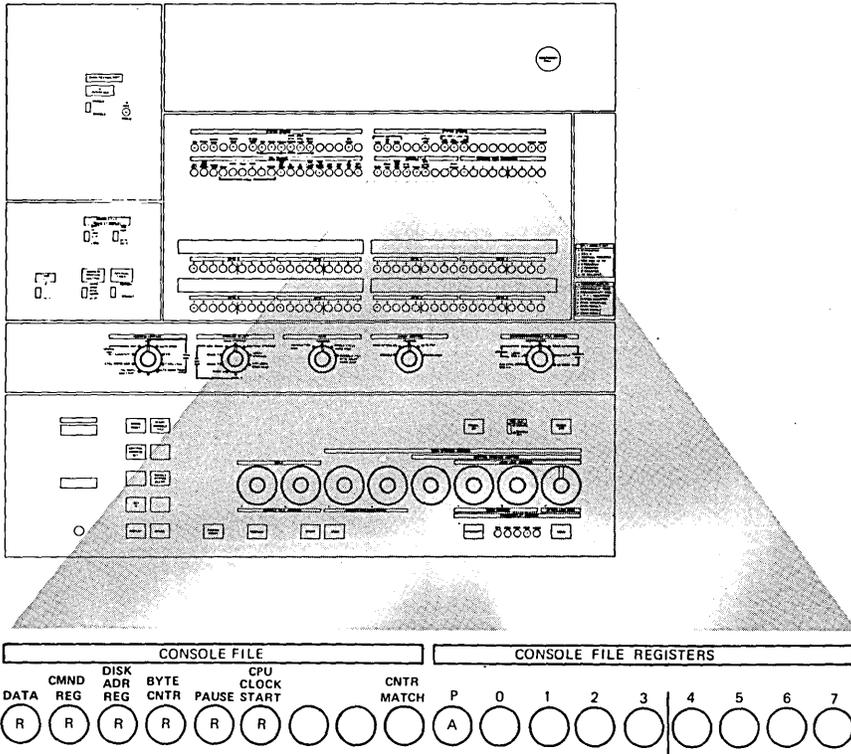page 84.

CPU STATUS INDICATORS
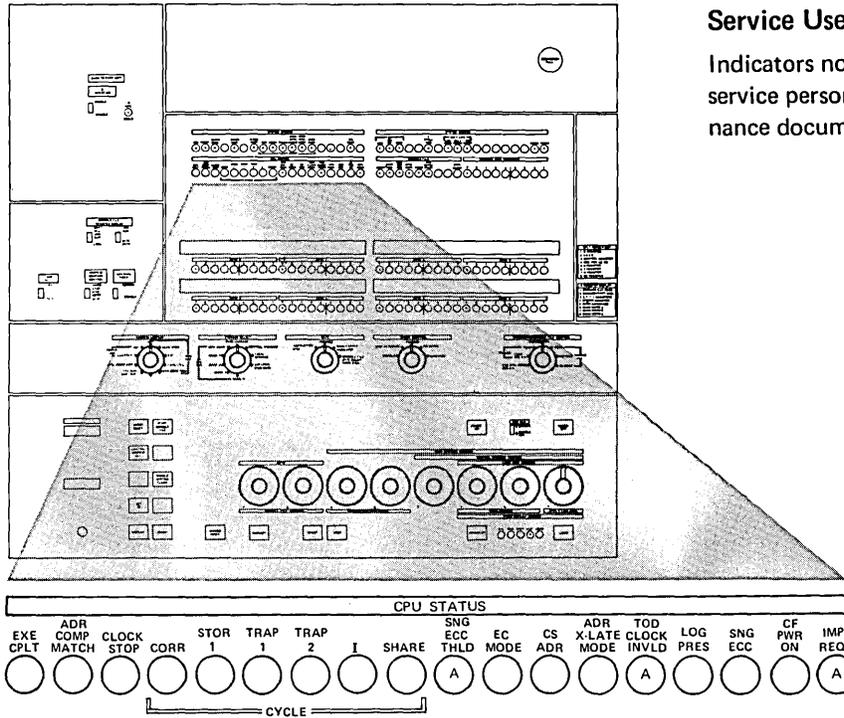
Service Use

Indicators not described in the chart are for service personnel and are described in maintenance documentation.

INDICATOR	CONDITION INDICATED
EXE CPLT	CPU stopped state reached as a result of: 1. Pressing the STOP key. 2. The RATE switch being in the INSTRUCTION STEP position. 3. A match being detected while in the address match mode of operation.
ADR COMP MATCH	The address (real or logical) being used to access main storage matches the address set into switches CDEFGH during an address match operation. The action taken by the CPU as a result of the match condition is controlled by the setting of the ADDRESS COMPARE CONTROL switch.
CLOCK STOP	CPU is in a hard-stop condition (CPU clock not running).
TOD CLOCK INVLD	Time-of-day clock is invalid. The indicator is turned off by successfully executing a set clock instruction.
LOG PRES	A log is present in the log area of main storage. When the CHECK CONTROL switch is in the STOP AFTER LOG position and the LOG PRES indicator is on, SEREP may be run.
SNG ECC	One of the data or check bits from storage has been corrected.
CF PWR ON	Power is applied to the console file.
IMPL REQD	An IMPL operation is required. (See page 44)

CONSOLE-FILE INDICATORS

CONSOLE FILE						CONSOLE FILE REGISTERS								
DATA	CMND REG	DISK ADR REG	BYTE CNTR	CPU PAUSE	CLOCK START	CNTR MATCH	P	0	1	2	3	4	5	6	7
(R)	(R)	(R)	(R)	(R)	(R)	(○)	(○)	(A)	(○)	(○)	(○)	(○)	(○)	(○)	(○)

Operator Use

CONSOLE FILE CHECKS

Re-IMPL when any console-file check indicator is on. If
the error recurs see "Handling Abnormal Situations--
Introductory Flowchart," page 84

Service Use

CNTR MATCH and CONSOLE FILE REGISTERS

These indicators are used by service personnel, and
described in maintenance documentation.

SYSTEM INDICATORS

SYS MAN WAIT TEST LOAD
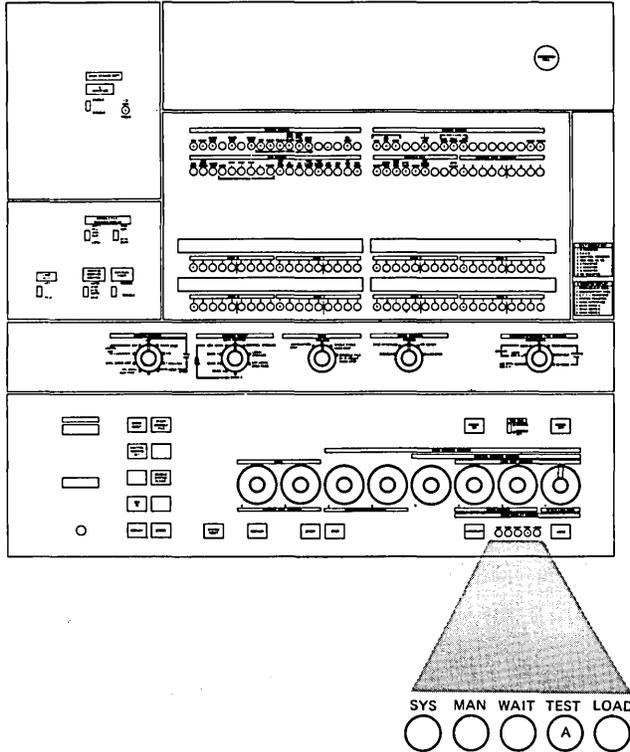
INDICATOR	CONDITION INDICATED
SYS	CPU operations are in progress and either use meter is running.
MAN	CPU clock is stopped or the system is in a soft-stop state. All pending interrupts are handled. Manual store/display operations are possible only when the MAN indicator is on.
WAIT	System is in a wait state (CPU clock running but no instruction processing taking place). If an interrupt occurs, the CPU is taken out of wait state and processing is started under control of the program being executed.
TEST	Any of the following switches are not in the PROCESS or NORMAL position. 1. RATE 2. CHECK CONTROL 3. DIAGNOSTIC/CONSOLE FILE CONTROL 4. ADDRESS COMPARE CONTROL
LOAD	Initial Program Load (IPL) is in process. This indicator turns on when LOAD is pressed and turns off when the initial PSW is loaded successfully.

DISPLAY ASSEMBLER OUT ROLLER SWITCH
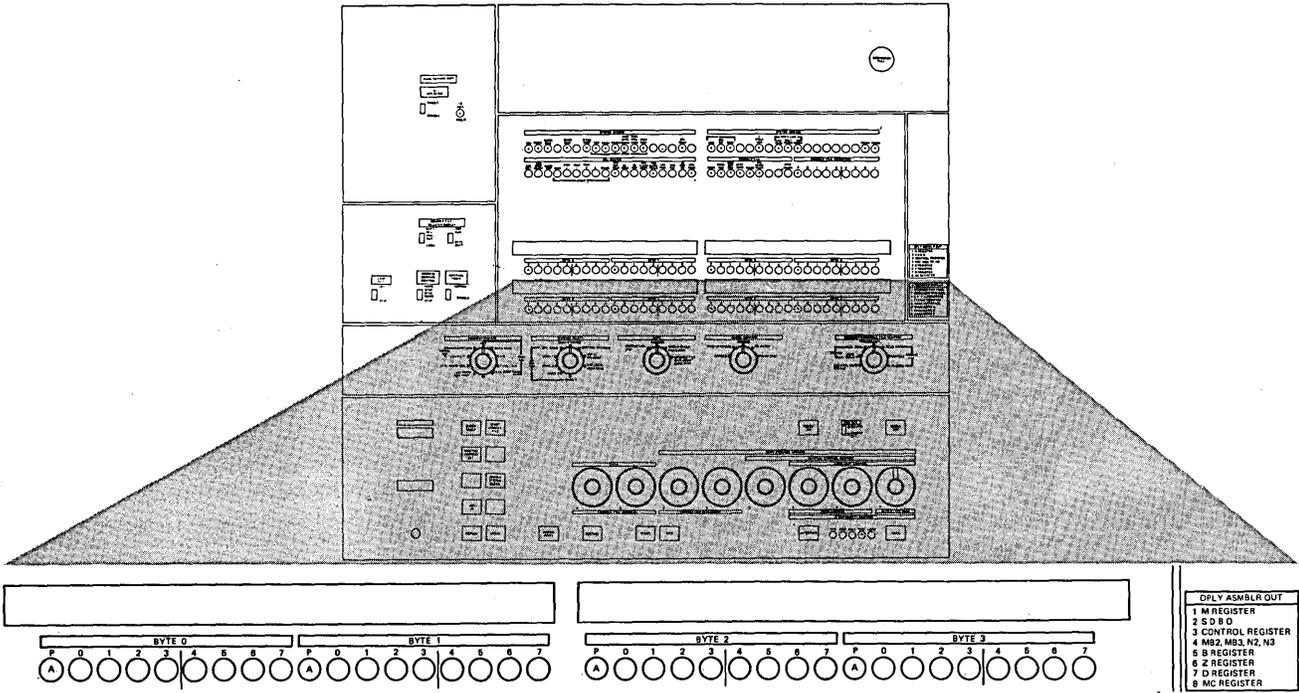
The DPLY ASMBLR OUT roller switch provides a continuous
display of the following:

POSITION	INFORMATION DISPLAYED			
	Byte 0	Byte 1	Byte 2	Byte 3
1	M-Register Bytes 1, 2, and 3 (Notes 1 and 2)			
2	Storage Data Bus-Out			
3*	C-Register			
4*	MB-2	MB-3	N2	N3
5*	B-Register			
6*	Z-Register			
7*	D-Register			
8*	MCKA			

Notes:

1. Storage protect stack key is displayed in bits 0-3 of byte 0.
2. Bits 0-3 of byte 1 displays the selected channel.

*Positions 3 through 8 are for service personnel.

A-REGISTER DISPLAY ROLLER SWITCH
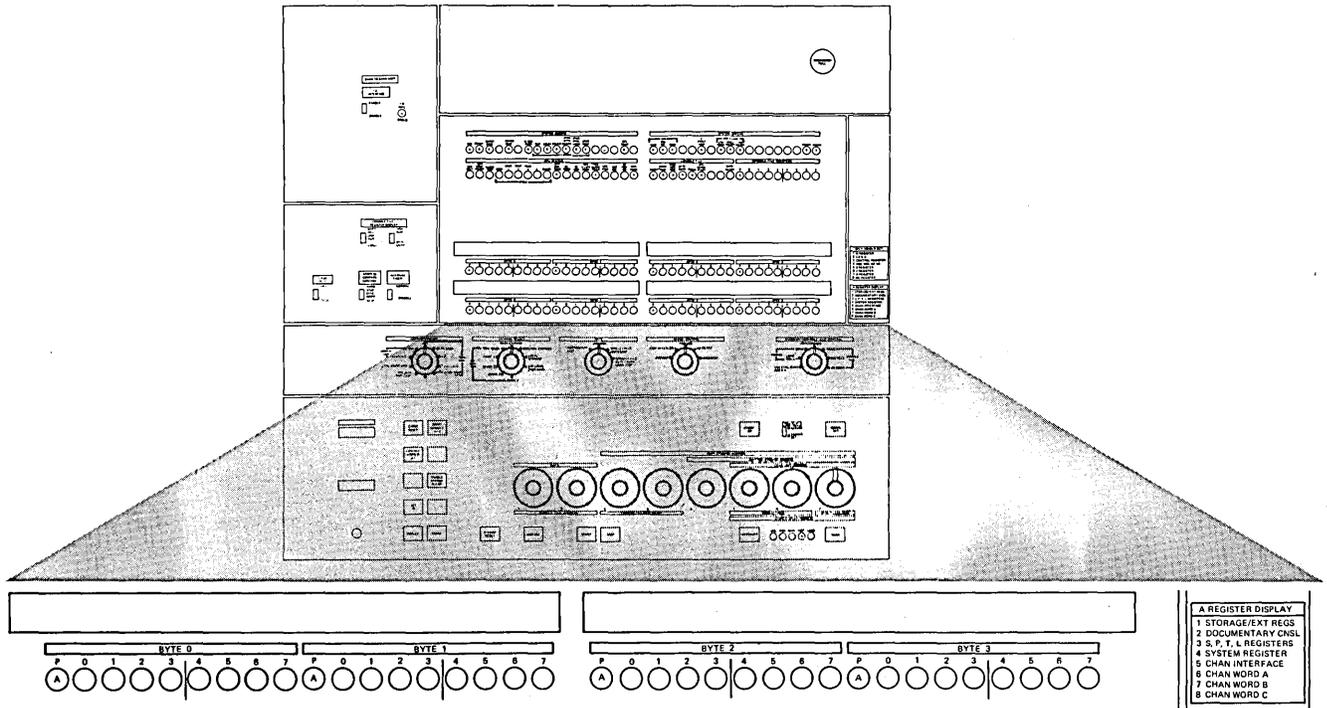
The A-REGISTER DISPLAY roller switch is used with the
STORAGE SELECT switch to display the following.

POSITION	INFORMATION DISPLAYED			
	Byte 0	Byte 1	Byte 2	Byte 3
1	Storage or External Register (Notes 1 and 2)			
2*	TI-Register	TA-Register	TT-Register	TE-Register
3*	S-Register	P-Register	T-Register	L-Register
4*	System Register Bytes 0, 1, and 2			H-Register
5*	MPX Channel Registers or Selector Channel External Word GTAG (IFA: FTAG)			
6*	Channel Word A (External Word GSTAT) (IFA: FSTAT)			
7*	Channel Word B (External Word GBS) (IFA: FCND)			
8*	Channel Word C (External Word GBUF) (IFA: FBAK)			
Notes: 1. Position 1 is described in the "Manual Store/Display Operations," page 61. 2. When the CPU is in soft-stop state (MAN indicator on), the indicators display the next instruction address.				

* Positions 2 through 8 are for service personnel.

TOGGLE SWITCHES
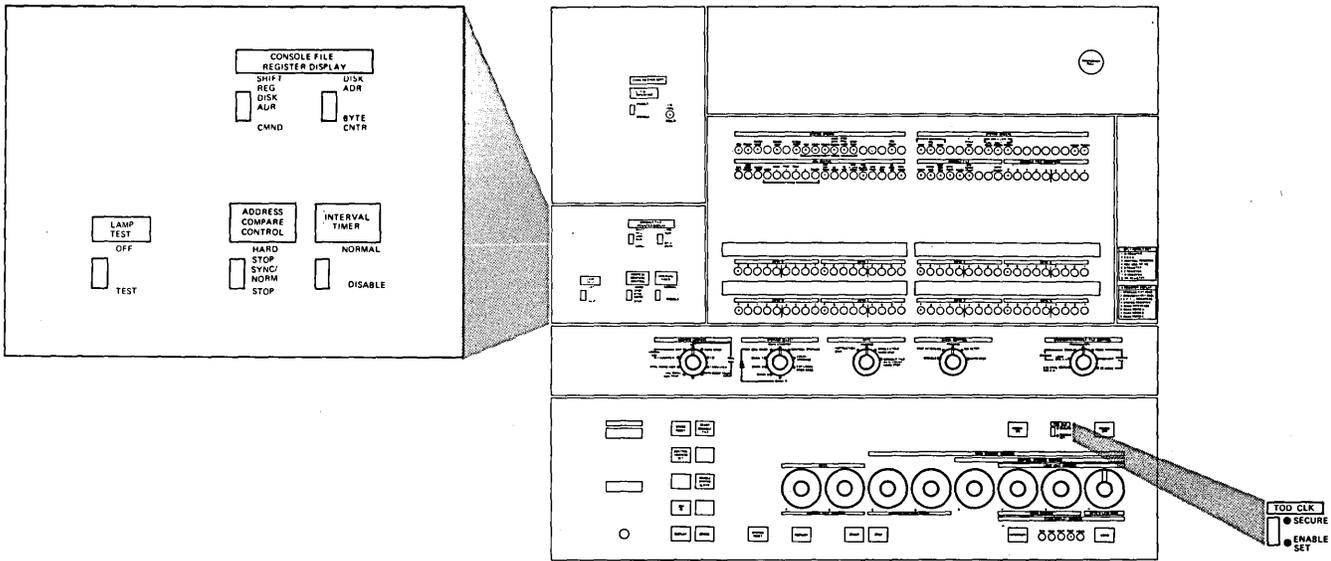
Lamp Test

All system control-panel and PR-KB indicators should light when the LAMP TEST toggle switch is in the TEST position. This switch can be operated at any time without affecting system operation.

Interval Timer

NORMAL

This position allows a value to be set into or read out of the interval timer location, main storage location 80 (hex 50).

DISABLE

This position disables the interval timer. The content of the timer is not available to the data flow for timer functions. Display of timer location 80 (hex 50) in this position shows the last value stored into storage location 80 (hex 50). This value could be the initial timer setting or other program information.

Time-of-Day Clock (TOD CLK)

ENABLE SET

This position enables the set clock instruction to change the value of clock.

SECURE

This position allows executing the set clock instruction without affecting the clock value.

Address Compare Control

This switch is used with the ADDRESS COMPARE and the STORAGE SELECT rotary switches to determine the action taken by the CPU as a result of an address compare match. The CPU should be in manual state (MAN indicator on) before using this switch. (Example: Press STOP key.)

SYNC/NORM

This position is the normal operating position. This position also provides a sync pulse for service use, and does not result in a stop on an address match.

STOP

This position provides a soft-stop whenever an address match is detected. To restart the CPU, press the START key. With the switch in this position, the TEST indicator is on.

HARD STOP

This position is for service personnel and is described in maintenance documentation. With the switch in this position, the TEST indicator is on.

Console-File Register Display

These switches are used by service personnel and are described in maintenance documentation.

ADDRESS COMPARE SWITCH

- This switch provides a match when the address used to access main storage matches the address set in rotary switches CDEFGH, and the STORAGE SELECT switch is set to the MAIN STORAGE position.

- The action taken by the CPU as a result of the match condition is determined by the ADDRESS COMPARE CONTROL toggle switch.
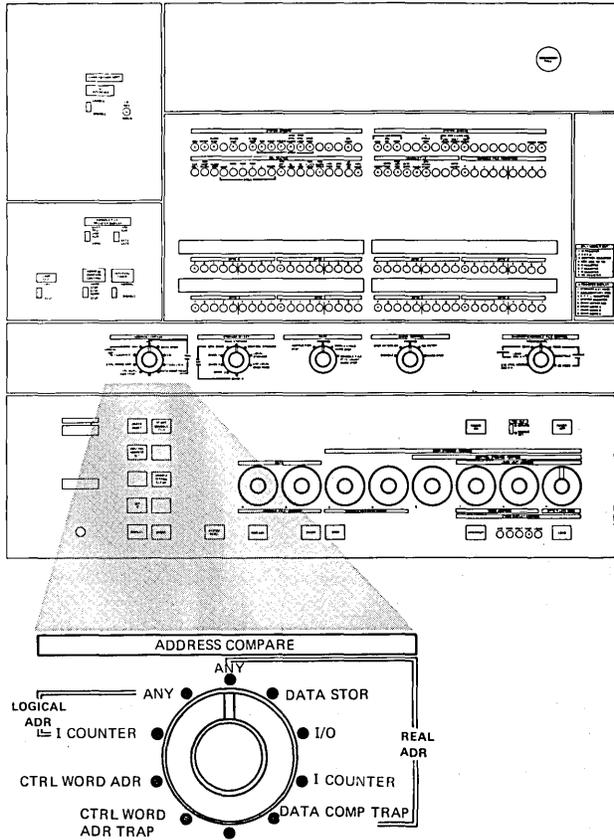
Operator Use

ANY (REAL ADR)

This position is for normal program processing. With the switch in this position, a match occurs for main storage access when the storage address matches the address set in rotary switches CDEFGH.

Note: To guarantee a match on instruction addresses, the I-COUNTER positions must be used.

DATA STOR

This position allows a match when the storage address matches the address set in rotary switches CDEFGH during a data store operation.

I/O (Input/Output)

This position allows a match when the storage address matches the address set in rotary switches CDEFGH, and the operation is storing or fetching data for an I/O operation.

I-COUNTER (REAL or LOGICAL ADR)

These positions allow a match when the real or logical main storage address matches the address in rotary switches CDEFGH, and the operation is an instruction fetch from main storage.

Note: Significant throughput degradation can occur while processing with this switch set to the I-COUNTER REAL ADR position, and the ADDRESS COMPARE CONTROL switch in the STOP or HARD STOP position.

DATA COMPARE TRAP

This position determines which instruction is causing a particular storage byte location to be modified. See "Data Compare Trap," page 59.

ANY (LOGICAL ADR)

This position allows a match when the logical main storage address used to access storage matches the address set in rotary switches CDEFGH.

Note: To guarantee a match on instruction addresses, the I-COUNTER positions must be used.

Service Use

The switch positions not defined are for service personnel and are described in maintenance documentation.

STORAGE SELECT SWITCH

- This switch selects the proper storage for manual store/display operations. It is also used with ADDRESS COMPARE and ADDRESS COMPARE CONTROL switches for address match functions.

- Store and display functions should be initiated from the PR-KB because that facility cannot cause concurrent I/O operations to overrun. The manual store and display functions should be used only when no I/O operation is in process or when loss of I/O information is unimportant.

Operator Use

MAIN STORAGE

This position is for normal program processing and for manual store and display operations of main storage.

LOCAL STORAGE

This position is for manual store and display of general and floating-point registers.

Service Use

The switch positions not defined are for service personnel and are described in maintenance documentation.

STORAGE SELECT

MAIN STORAGE
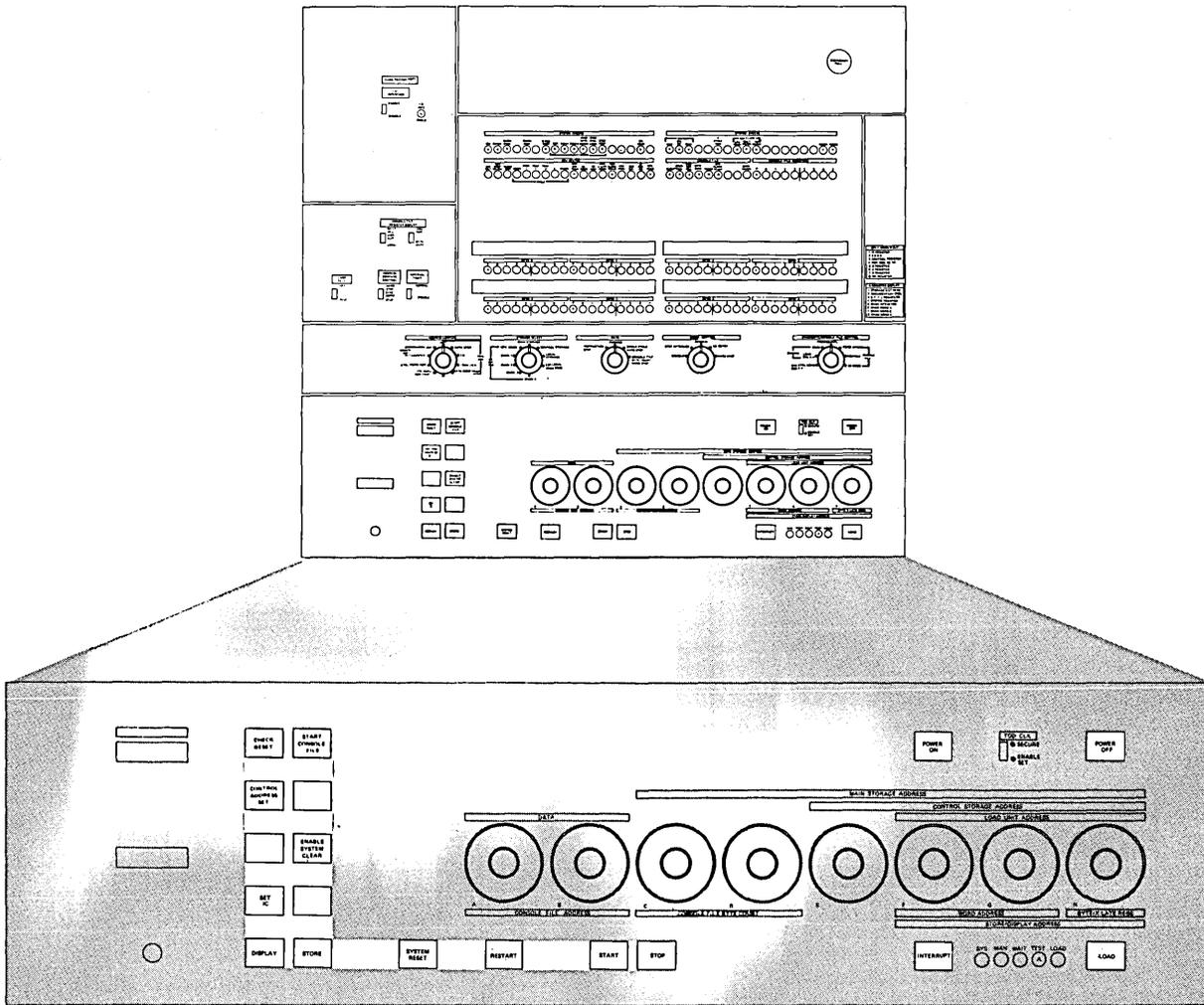
MPX CHAN ● ● CONTROL STORAGE

CHAN 1 ● ● LOCAL STORAGE

OR EXT REG

CHAN 2 ● ● EXP LOCAL STOR REGS

CHAN 3 ●

● CHAN 4
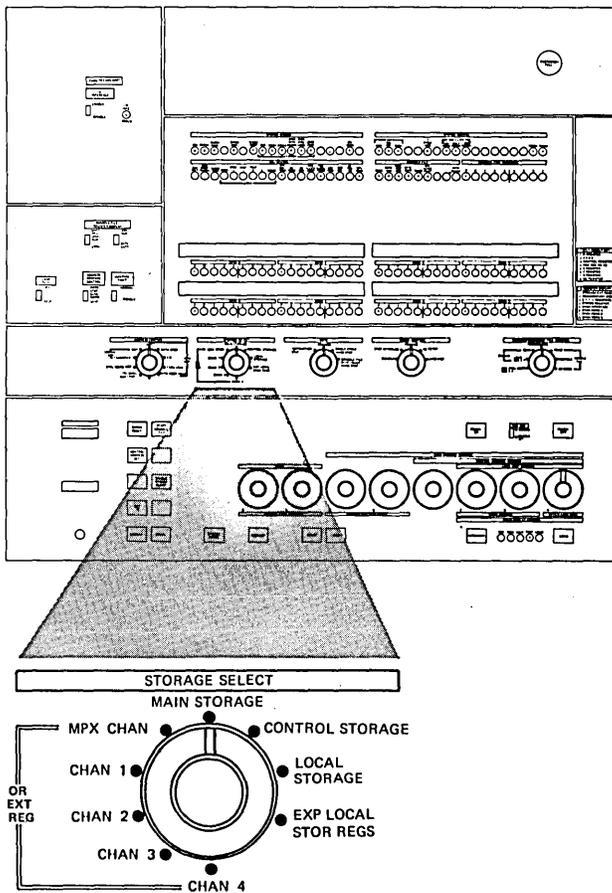
RATE SWITCH

- This switch controls the rate at which the CPU processes instructions.

- This switch, in any position other than PROCESS, turns on the TEST indicator.
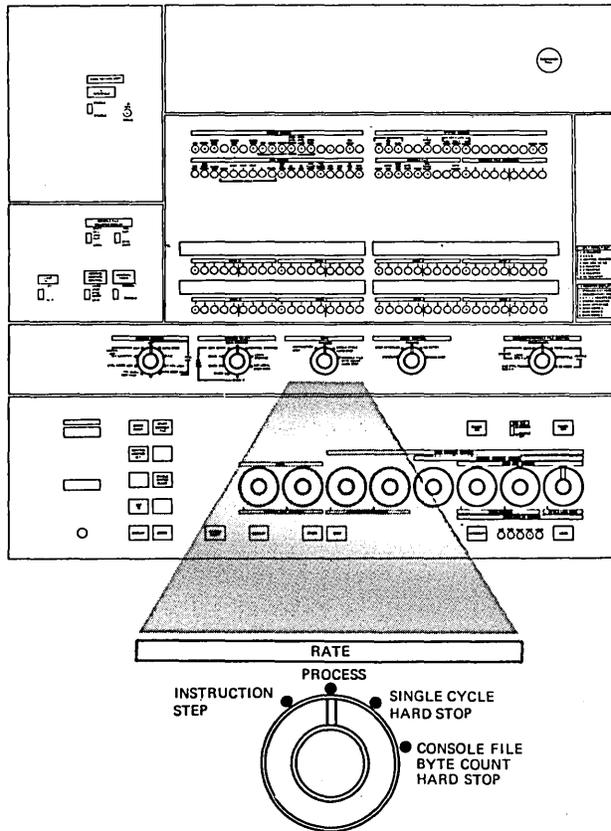
Operator Use

PROCESS

This position is for normal program processing.

INSTRUCTION STEP

In this position, one complete machine language instruction (including all pending interrupts allowed by the system mask) is executed for each operation of the START key. The machine enters the soft-stop state, and the EXE CPLT indicator turns on. The address of the next instruction is displayed in the A-REGISTER DISPLAY roller switch, position 1.

Service Use

The switch positions not defined are for service personnel and are described in maintenance documentation.

RATE

PROCESS

INSTRUCTION STEP

SINGLE CYCLE HARD STOP

CONSOLE FILE BYTE COUNT HARD STOP

CHECK CONTROL SWITCH

- This switch controls the action taken by the CPU when a machine check occurs.

- This switch, in any position other than PROCESS, turns on the TEST indicator.
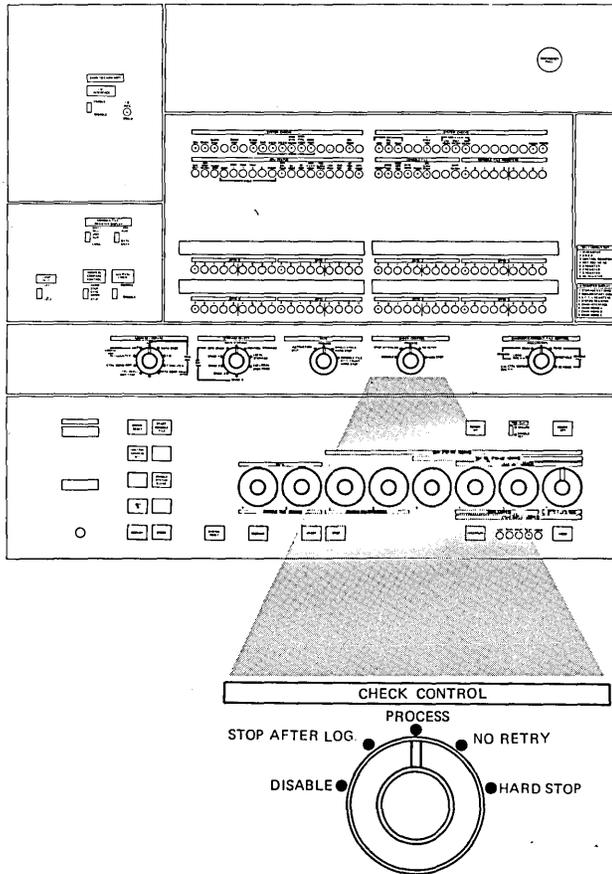
Operator Use

PROCESS

This position is for normal program processing when an operating system with automatic recording of logout data is used.

STOP AFTER LOG

This position is for normal program processing when an operating system without automatic recording of logout data is used.

With the switch in this position, a diagnostic logout into main storage (locations 128 through 704) stops processing and turns on the LOG PRES and RETRY indicators. The diagnostic logout can contain information about a machine check, channel control check, or an interface control check.

After a diagnostic logout, you may run the System Error Record Editing Program(SEREP).

Note: Programs using storage locations 128 through 704 are invalid after a diagnostic logout into main storage. To continue processing,you must re-IPL.

Service Use

The switch positions not defined are for service personnel and are described in maintenance documentation.

DIAGNOSTIC/CONSOLE-FILE CONTROL SWITCH

- The DIAGNOSTIC/CONSOLE FILE CONTROL switch controls console-file and diagnostic functions.

- This switch, in any position other than PROCESS/IMPL, turns on the TEST indicator.
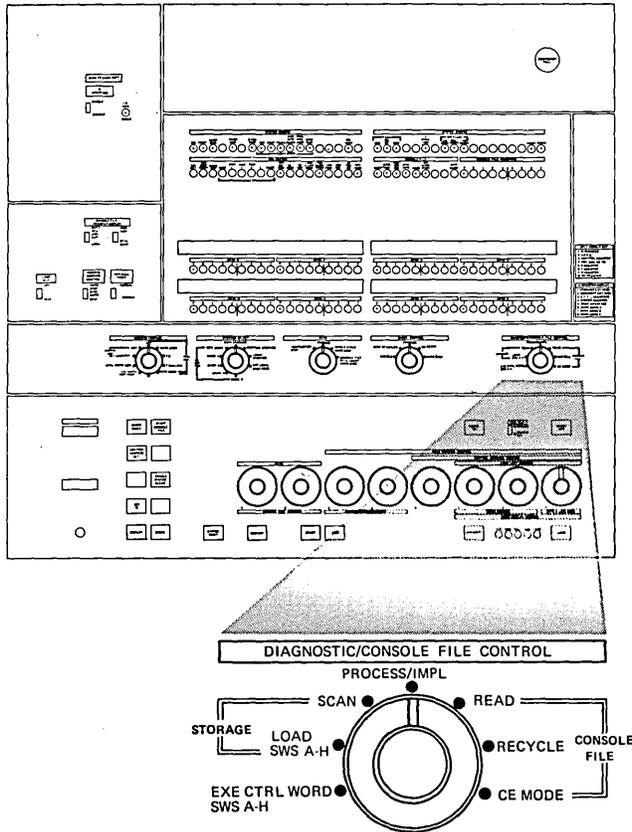
Operator Use

PROCESS/IMPL

This position is for normal program processing and for loading from the console file.

Service Use

The switch positions not defined are for service personnel and are described in maintenance documentation.

ROTARY SWITCHES A THROUGH H
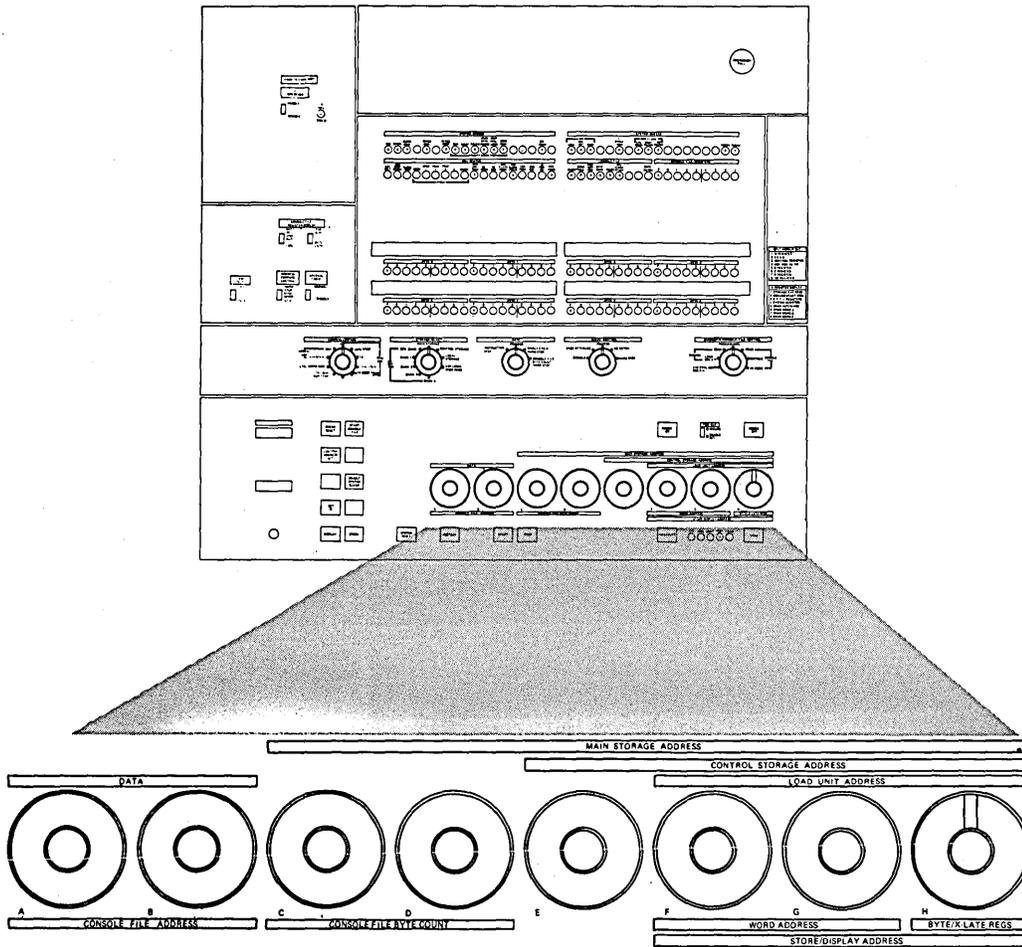
SWITCHES	LABEL	FUNCTION
AB	DATA	Specifies the value of data to be entered on manual store operations.
	CONSOLE FILE ADDRESS	For service personnel and described in maintenance documentation.
CD	CONSOLE FILE BYTE COUNT	For service personnel and described in maintenance documentation.
CDEFGH	MAIN STORAGE ADDRESS	Specifies the main storage address for manual store/display operations and for ADDRESS COMPARE switch functions.
EFGH	CONTROL STORAGE ADDRESS	For service personnel, to specify a control storage address for manual store/display and address compare functions.
FG	WORD ADDRESS	Used to display general and floating-point registers.
FGH	LOAD UNIT ADDRESS	Specifies the load-unit address for IPL operations.
FGH	STORE DISPLAY ADDRESS	Used to store/display local storage.
H	BYTE/X-LATE REGS	Specifies the byte to be altered during manual store operations.

USE METERS

Customer

Service

Key Switch
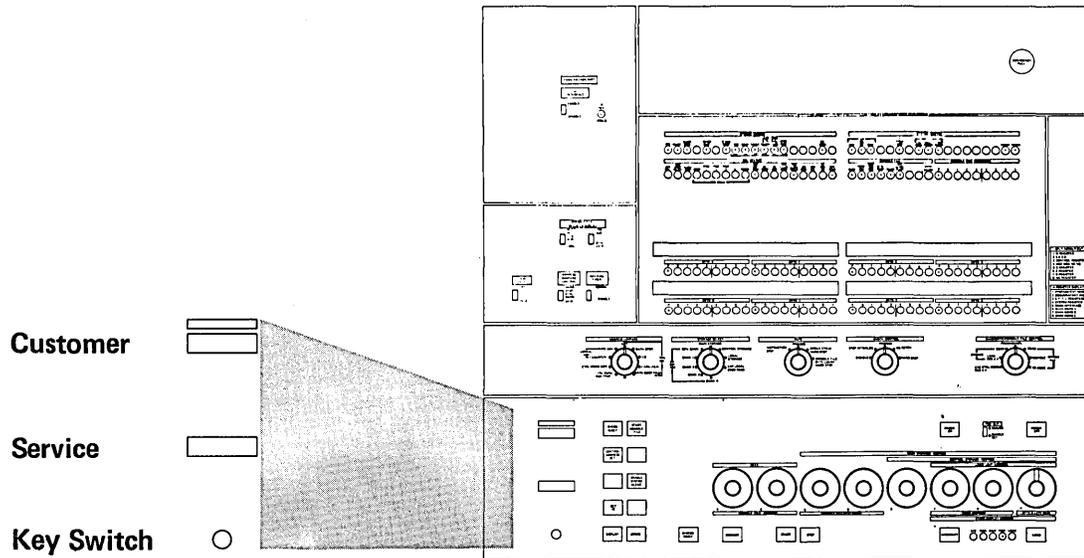
Two direct reading use meters record CPU operating time including manual store and display operations. Either meter runs for a minimum of approximately one second each time it is started. One meter records customer operating time and the other records service operating time. The position of the key switch determines which of the two meters is to record operating time. Your service representative has the key for this switch. Whenever he is performing maintenance on the CPU, he sets the switch to cause the service meter to run.

KEYS

KEY	FUNCTION
CHECK RESET	Resets all machine check circuitry and POWER and THERM indicators.
START CONSOLE FILE	Starts a console-file read operation.
CONTROL ADDRESS SET	For service personnel; described in maintenance documentation.
ENABLE SYSTEM CLEAR	With SYSTEM RESET or LOAD key, clears main storage. (See "Clear Storage," page 58.)
SET IC	Loads the contents of rotary CDEFGH into the instruction counter. Instruction processing starts from this address.
DISPLAY	Displays main store, general registers, and floating-point registers. (See "Manual Store/Display Operations," page 61.)
STORE	Stores information into main storage or registers. (See "Manual Store/Display Operations," page 61.)
SYSTEM RESET*	Resets CPU circuitry. Turns on the IMPL REQD indicator and executes system reset and resident diagnostic micro-programs to check CPU hardware. Any error detected by system reset turns on the DIAGN STOP indicator. A successful system reset turns off the IMPL REQD indicator and places the system in a soft-stop awaiting your action.
RESTART	Stores the contents of the current PSW in locations 8-15 and loads the doubleword starting at address 0 as the current PSW. The channels are not reset and processing starts under control of the PSW.
START	With the rotary switches in the normal or PROCESS positions, initiates CPU processing.
STOP	Soft-stops the CPU when the current instruction and pending interrupts are completed. The instruction counter is displayed in the A-REGISTER DISPLAY indicators while the CPU is in the soft-stopped state.
INTERRUPT	Requests an external interrupt. The interrupt is taken if programmed and allowed by the system mask.
LOAD**	Starts an IPL operation.
POWER ON	Initiates a power-on sequence.
POWER OFF	Initiates a power-off sequence.

*The control registers and PSW contents remain unchanged.
**The control registers are set to their initial state, and the PSW is set to all zeros
with valid parity.

FEATURES (INDICATORS and SWITCHES)

Channel-to-Channel Adapter (CTCA)
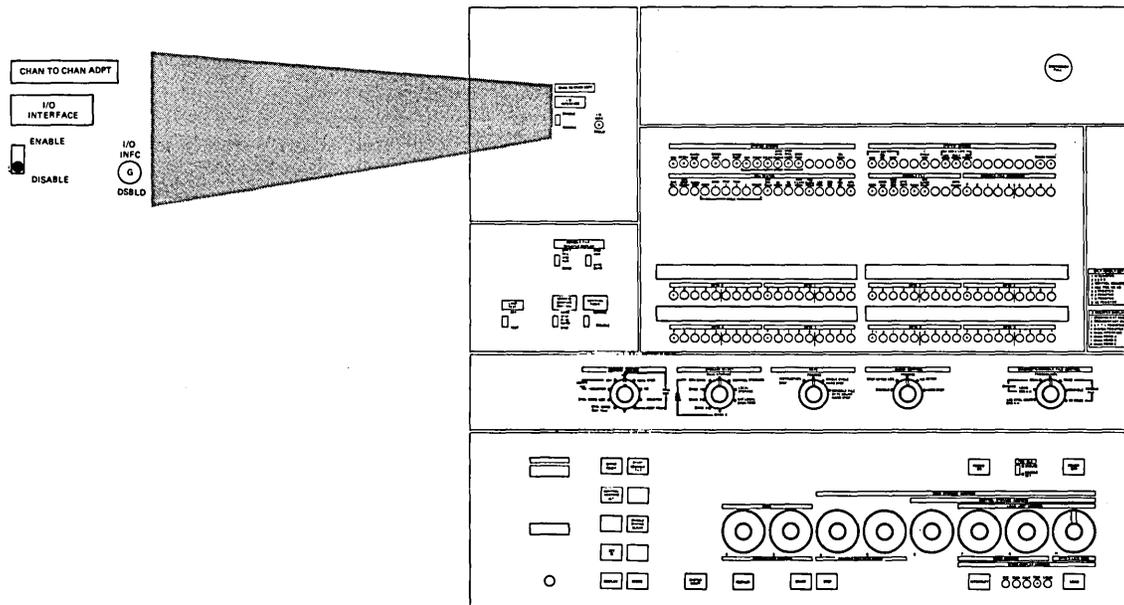
I/O INFC DSBLD

ON: Indicates that the adapter is offline and not available
to the program.

OFF: Indicates that the adapter is available to the
program.

I/O INTERFACE

ENABLE: This position makes the adapter available to
the program.

DISABLE: This position removes the adapter from use
by the program.

FEATURES (INDICATORS and SWITCHES)

Integrated Storage Control (ISC)

- This feature supports a one-or-two channel application (with or without the two-channel switch special feature). If you have a single channel application, your ISC feature has one (1) function switch (I/O INTERFACE A). The I/O INTERFACE B and MULTITAG switches are non-functional. If you have a two-channel application, your ISC feature has the two-channel-switch special feature, and all feature associated switches are functional.
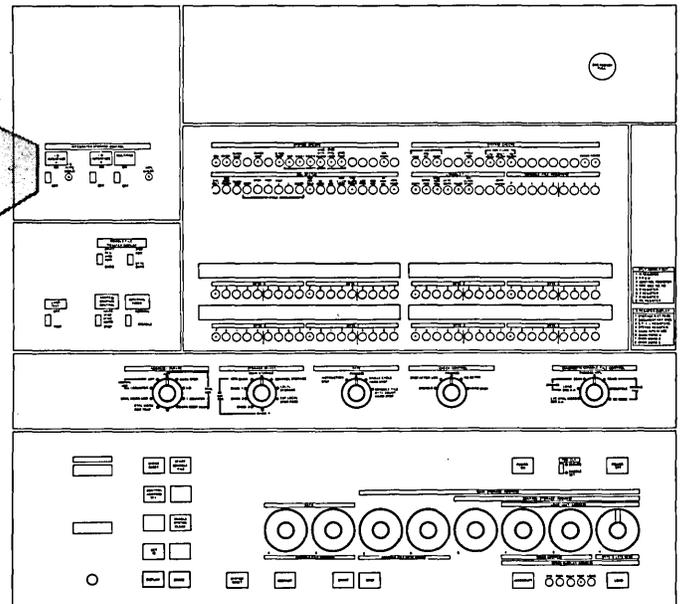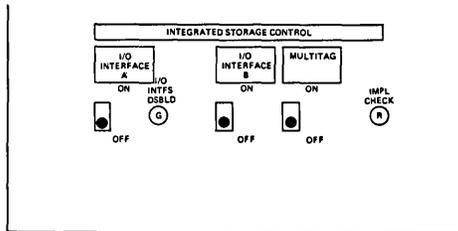
ISC (Two-channel switch not installed)

I/O INTERFACE A (switch)

ON: This position makes the ISC Feature available to the program.

OFF: (ISC not in use) This position removes the ISC from use by the program.

OFF: (ISC in use) This position removes the ISC from use by the program only after the system has entered a manual state (MAN indicator on).

I/O INTFS DSBLD (indicator)

ON: Indicates that the ISC feature is not available to the program. (I/O INTERFACE A switch is OFF.)

OFF: Indicates that the ISC feature is available to the program.

ISC (Two-channel switch installed)

I/O INTERFACE A and B (switches)

ON: This position of switch A or B makes the ISC feature available to the system program using that particular channel interface.

OFF: (ISC not in use) This position of switch A or B removes the ISC feature from use by any system program using that particular channel interface.

OFF: (ISC in use) This position of switch A or B removes the ISC feature from use by the system program using that respective interface only after that system has entered a manual state (MAN indicator on).

I/O INTFS DSBLD (indicator)

ON: Indicates that the ISC feature is not available to any system program. (Both I/O INTERFACE A and B switches are OFF.)

OFF: Indicates that the ISC feature is available to the system(s) programs.

MULTITAG (non-functional without two-channel switch)

- Determines how the disk drive will generate device-end.

ON: A drive is available after a channel clears the device-end generated by the drive.

OFF: A drive is available to either channel after one of the channels clears device-end generated by the drive.

IMPL CHECK

Indicates an unsuccessful IMPL operation in the ISC feature.

CONSOLE FILE
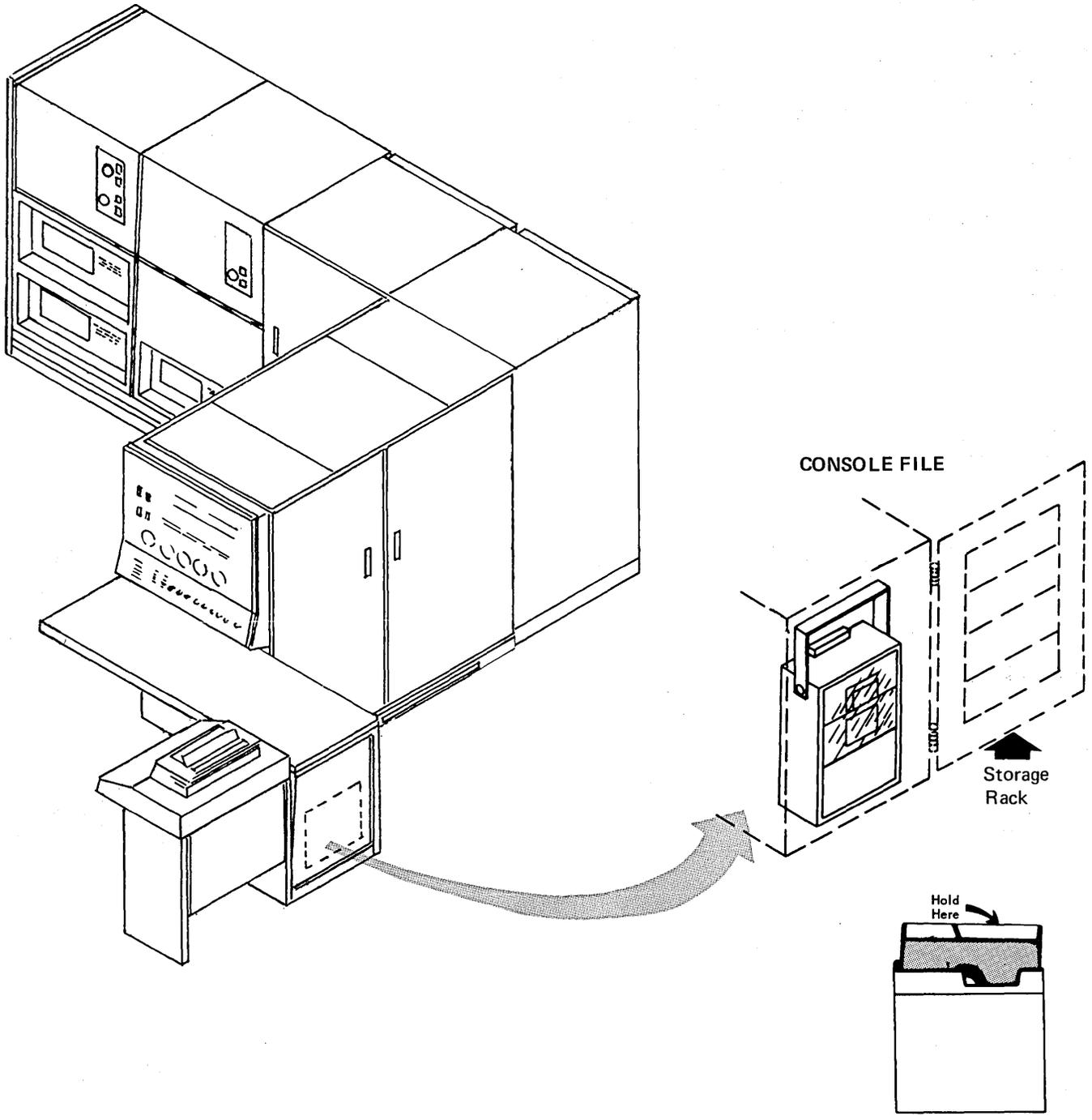
CONSOLE FILE

Storage
Rack

Hold
Here

DISK CARTRIDGE and ENVELOPE

CARTRIDGE HANDLING

- The disk cartridge contains information vital to system operation which may not be easily duplicated. HANDLE THE CARTRIDGE WITH CARE!

CAUTIONS

- No pens or pencils. Never write on disk cartridge. Writing pressure damages disk.
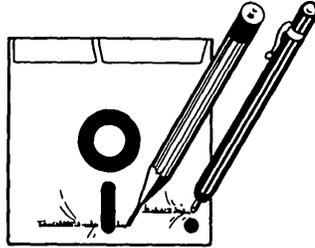
- Replace cartridge envelopes when they become worn, cracked, or distorted.

- No smoking while handling cartridges.
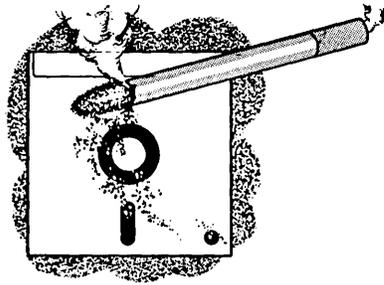
- Keep cartridge away from magnetic fields or from ferromagnetic materials which might be magnetized.
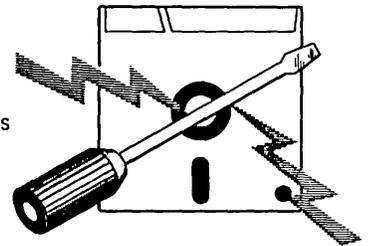
- Return cartridge to envelope whenever it is removed from the console file.
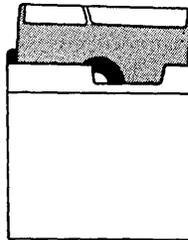
- Do not expose cartridges to heat or sunlight.
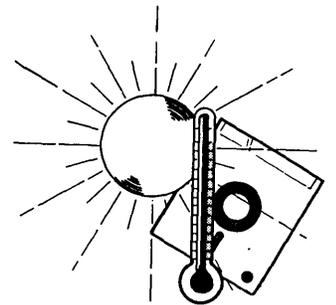
- Do not touch or clean the disk surface.
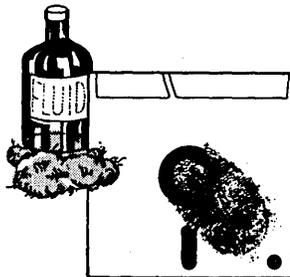
- Store cartridges in their original shipping cartons, or in the storage rack on the access door.
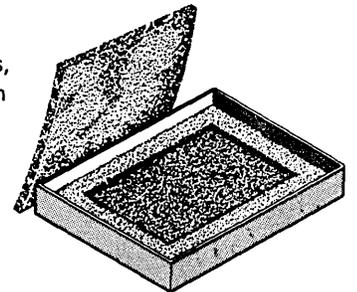
CONSOLE PRINTER-KEYBOARDS

The console printer-keyboard is an input/output device
that provides alter/display and control functions.

3210 CONSOLE PRINTER-KEYBOARD MODEL 1
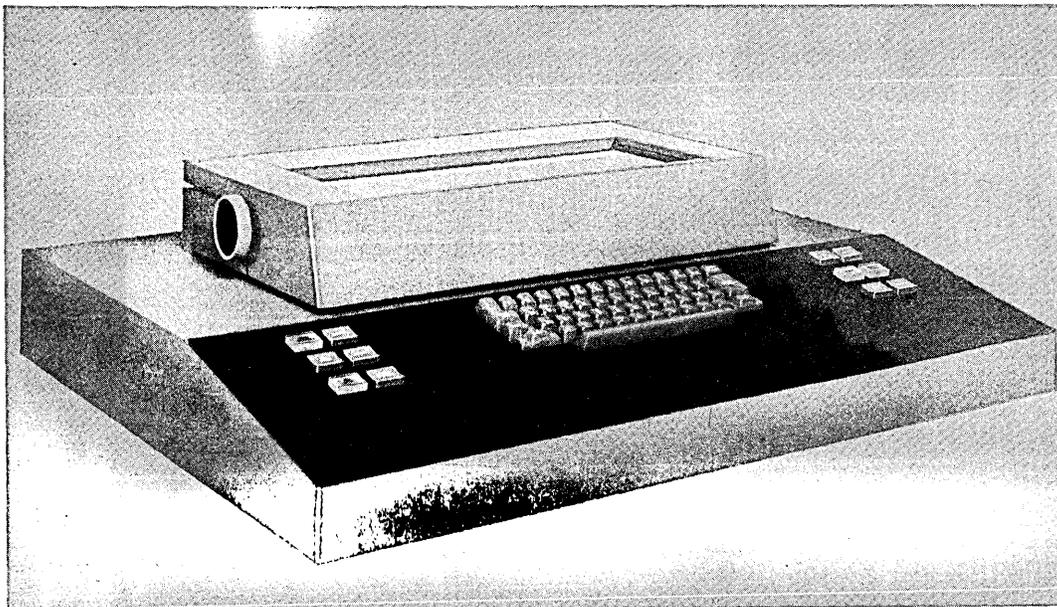
3215 CONSOLE PRINTER-KEYBOARD

PRINTER CONTROLS (3210)

Impression Control Lever

This lever can be positioned in any of five notches. The notch closest to the platen is number 1 and represents the minimum striking force of the print element. The notch farthest from the platen is number 5 and represents the maximum striking force of the print element. You can vary the density of print impression by placing the lever in the appropriate notch.

Note: To change the position of the lever, first move it out of the notch. Then move it forward or backward.

Ribbon Lift Lever

To provide for ribbon wear distribution you can select either the top or bottom half of the ribbon for printing. When the lever is moved to the left, the bottom half of the ribbon is positioned for printing. When it is moved to the right, the top half is positioned for printing.

Ribbon Load Lever

This lever latches to the right to keep the ribbon guides raised, for ease in threading the ribbon.

Impression Control Lever

Ribbon Lift Lever

Ribbon Load Lever
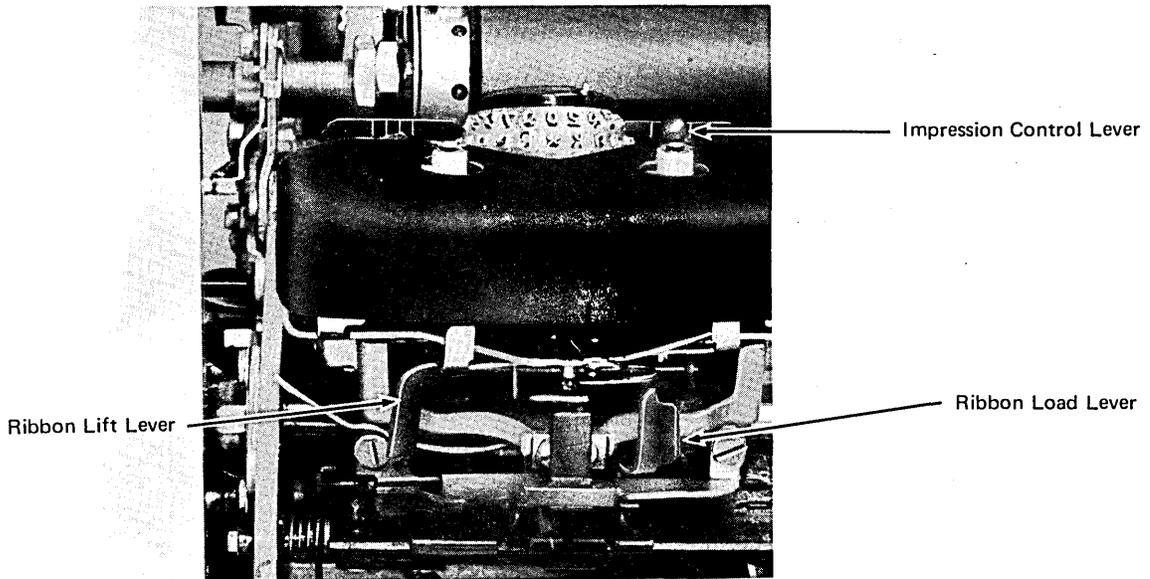
CARRIAGE CONTROLS

Forms Load Lever

When this lever is pulled toward the keyboard, the forms-sensing lever moves away from the platen and permits the forms to be inserted. This turns on INTVN REQD and makes the PR-KB not ready.

Copy Control Lever

This lever compensates for the thickness of multiple-part forms. When the lever is moved toward the keyboard, the platen moves closer to the print element.

Platen Knobs

When either knob is rotated, the paper advances. The right platen knob provides fine adjustment to the forms by changing the vertical alignment.

To adjust the vertical alignment, press the right platen knob in and hold it against the spring tension. Turn the knob as required to obtain the desired vertical alignment.

Left Platen Knob   Copy Control Lever   Forms Load Lever   Right Platen Knob

KEYBOARD

Character Keys

Forty-four character keys are provided. Uppercase or lower-case characters are determined by the SHIFT key.

Function Keys

KEY	FUNCTION
SHIFT	Provides uppercase or lowercase characters.
LOCK	Locks the SHIFT key in uppercase.
RETURN	Returns the print carrier to the left margin and advances the forms.
SPACEBAR	Moves the print carrier one space.

CONSOLE (3210 MODEL 1, and 3215)

Control Keys and Indicators

LEGEND   INDICATORS   KEYS
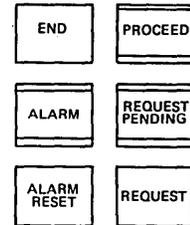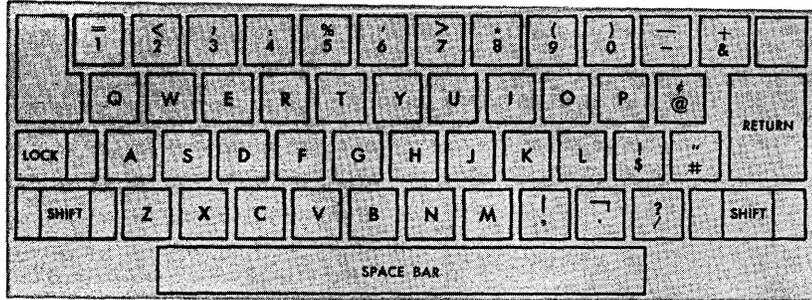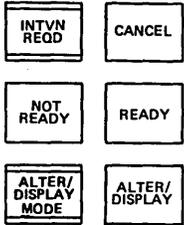
INDICATOR	CONDITION	KEY	FUNCTION
INTVN REQD	The printer is out of forms, the forms load lever is toward the keyboard, the cover is open, the NOT READY key has been operated, or the 3215 PR-KB is in CE mode.	NOT READY	Places the printer in a not ready condition.
ALTER/DISPLAY MODE	A request for an alter/display operation was accepted.	CANCEL	Terminates a read command when the operator has made an error in data entry. Normally, the program issues the same read command again.
		READY	Places the PR-KB in the ready condition.
ALARM	An alarm command was issued, and manual intervention is required by the operator. If PR-KB is not ready during an IMPL operation, the audible alarm sounds to indicate GO-NO-GO messages.	ALTER/DISPLAY	Requests or ends an alter/display operation. When used to end an alter/display operation, the PR-KB remains in alter/display mode.
PROCEED	The PR-KB is ready to accept characters. This indicator is turned on by the ALTER/DISPLAY key, or by a read command.	END	Terminates a read, write, or alter/display operation.
		ALARM RESET	Resets the alarm indicator.
REQUEST PENDING	A request operation was initiated. This indicator is turned off when the attention status is accepted by the CPU.	REQUEST	Requests the CPU to initiate a read command to the PR-KB. Under programming control, this allows the operator to enter data.

3210 MODEL 2 PRINTER-KEYBOARD

Alter/display operations can not be performed on the
3210 Model 2. Associated key and indicator are not
on this PR-KB.

A POWER ON key and a POWER OFF key are provided
to turn power on and off this PR-KB.

RIBBON REMOVAL and REPLACEMENT

3210 Console Printer-Keyboard

TO REMOVE AND REPLACE A RIBBON:

1. Press the NOT READY key.

2. Raise the top cover.

3. Move the ribbon load lever to the right until latched.

4. Lift the ribbon cartridge up and remove the ribbon
   from the ribbon guide.

5. Position the new cartridge with the ribbon facing
   the platen.

6. Slide the ribbon through the slots in the ribbon guides.

7. Position the cartridge on the cartridge posts and press
   into place.

8. To rewind excess ribbon, turn either cartridge post in
   the direction of the arrow.

9. Move the ribbon load lever to the left to lower the
   ribbon guides.
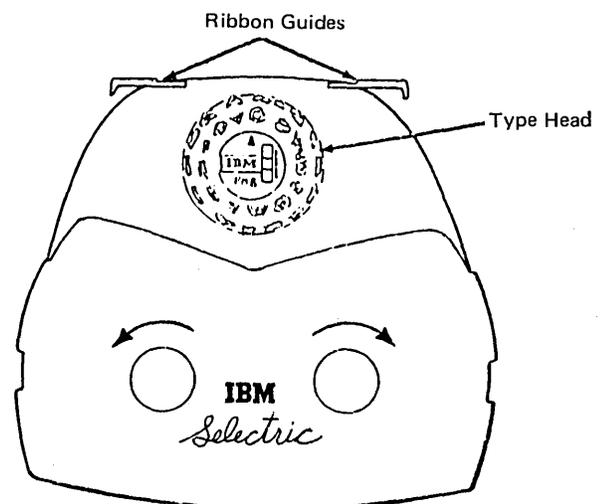
RIBBON THREADING SCHEMATIC

RIBBON REMOVAL AND REPLACEMENT
(continued)

3215 Console Printer-Keyboard

● Either of two types of ribbon cartridges are used on the 3215 PR-KBs.

TO REMOVE THE RIBBON CARTRIDGE:

1. Press the NOT-READY key on the keyboard.
2. Raise the printer cover.
3. Set the left test switch to OFFLINE.
4. Set the right test switch to STOP-START *until* print head is centered. Then return switch to OFF.
5. Push copy control lever back for maximum distance between print head and platen.
6. Lower safety shield from over print head. Back of shield has ribbon-threading decal for reference.

7. Remove ribbon from under plastic guide **1** and from around the guide posts **2** and **3**.
8. With the left hand, pull and hold the ribbon cartridge latch **4** while rotating counterclockwise the ribbon cartridge **5** with the right hand to release the cartridge from the aligning fingers **6** .
9. Lift out the ribbon cartridge. (Rotating the cartridge back and forth facilitates its removal.)

Pin-Feed Door

Copy-Control Lever

Line-Feed Select Lever

Test Switches

Paper-Advance Knob

Paper-Advance Knob

Ribbon Cartridge

Shield

Print Position Indicator
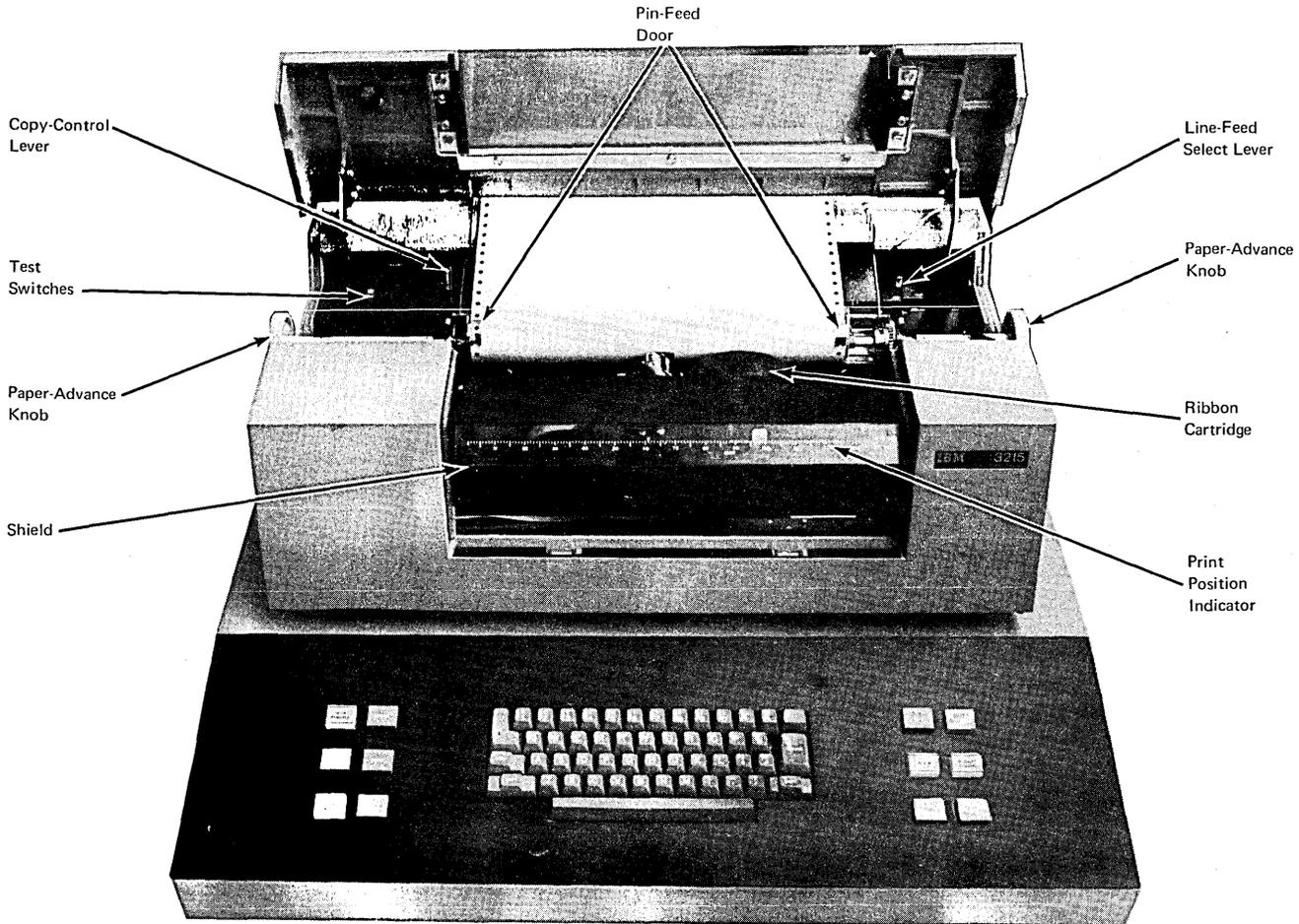
TO REPLACE THE RIBBON CARTRIDGE:

10. With the left hand, pull and hold the cartridge latch **4** .
11. Seat the cartridge on the pivot and rotate the cartridge clockwise to engage the aligning fingers **6** with the aligner.
12. Release the cartridge latch **4** .
13. Thread the ribbon around the print head. (Be careful not to get oil on the ribbon from the oil wick.) Work the ribbon under the plastic guide **1** , in front of the print head, and back around the front guide post **2** .
14. Locate the twist **7** in the ribbon between the front and rear guide posts **2** and **3** .
15. Place the ribbon over the rear guide post **3** .
16. Remove (and discard) the tab **8** (not shown) protecting the ribbon entrance to the cartridge.

17. Rotate the drive roll knob **9** counterclockwise to take up the ribbon slack. Continue rotating the knob until ribbon is feeding properly.
18. Close the safety shield.
19. Set the copy control lever for the recommended thickness.
20. Set the right test switch to CONTINUOUS or to STOP-START. Return the switch to OFF when the print head *begins* to return to the left margin.
21. Set the left test switch to ONLINE.
22. Close the printer cover.
23. Press the READY key on the keyboard.
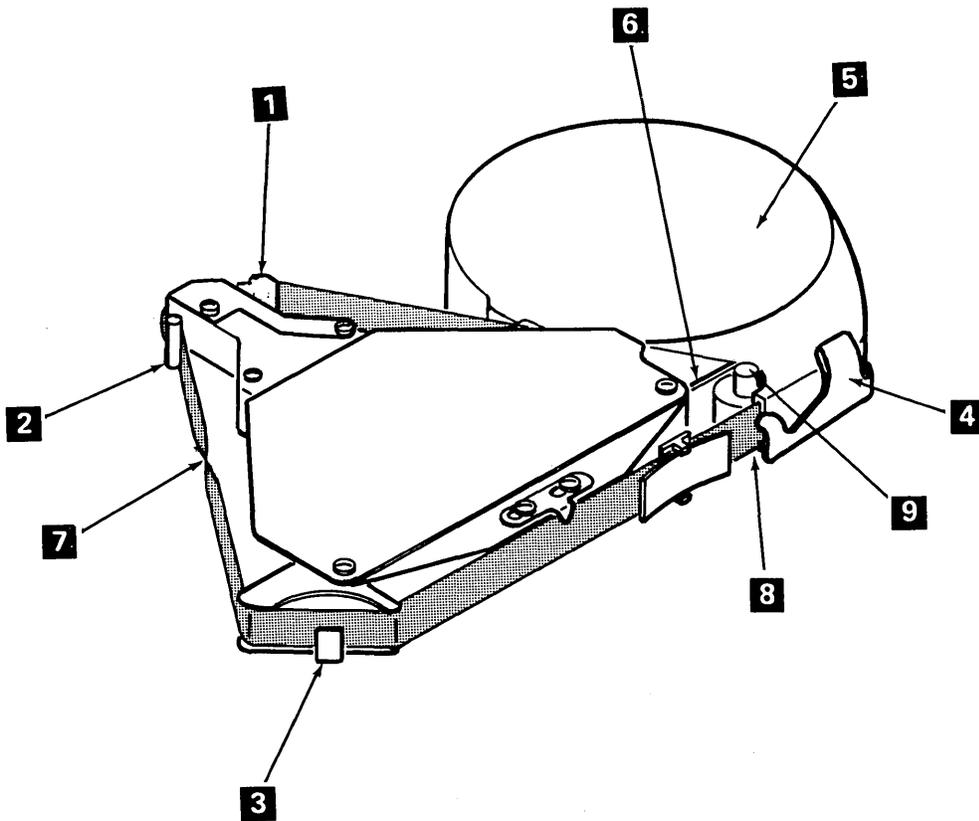
RIBBON THREADING SCHEMATIC

RIBBON REMOVAL and REPLACEMENT (continued)

3215 Console Printer-Keyboard

CAUTION

Using a ribbon cartridge not designed for this
PR-KB can damage the locating pin.

TO REMOVE THE RIBBON CARTRIDGE

1. Press the NOT READY key.
2. Raise the printer cover.
3. Remove the ribbon and cartridge.

TO REPLACE THE RIBBON CARTRIDGE

4. Position the hole in the bottom of the cartridge over
   the locating pin sticking up out of the ribbon feed
   mechanism, and press the cartridge into place.
5. Thread the ribbon through the ribbon guides following
   the path shown. Do not twist the ribbon.
6. Rewind any slack in the ribbon by turning the left
   (front) cartridge post in the direction of the arrow.
7. Lower the printer cover.
8. Press the READY key.

Print Head

Ribbon
Cartridge

Print Position Scale
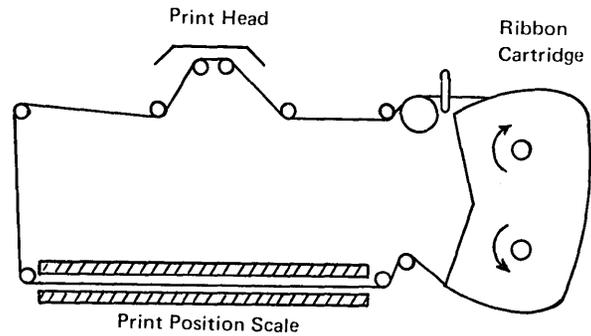
RIBBON THREADING SCHEMATIC

FORMS INSERTION

● Do not use forms thicker than three parts.

1. Place the forms on the lower rack of the forms stand.

2. Raise the printer cover.

3. Move the forms load lever away from the keyboard.

4. Insert the paper behind the platen and turn the platen knob until the paper comes out in front.

5. Move the forms load lever toward the keyboard.

6. Guide the paper between the retaining clips and the feed pins. Make sure that the pins engage the margin holes in the forms.

7. Using the right platen knob, position the paper for correct vertical alignment of the first print line.

8. Close the printer cover.

9. Press the READY key.

PLATEN REMOVAL AND REPLACEMENT

Removal

1. Press the NOT READY key.

2. Raise the top cover.

3. Move the forms load lever toward the keyboard.

4. Press down the platen latches at both ends of the platen assembly and lift the platen out.

Replacement

1. Position the platen with the ratchet teeth to the right.

2. Center the end plate in the groove at the right end of the platen shaft and press the platen into place until latched.

Platen Latch

Platen Latch
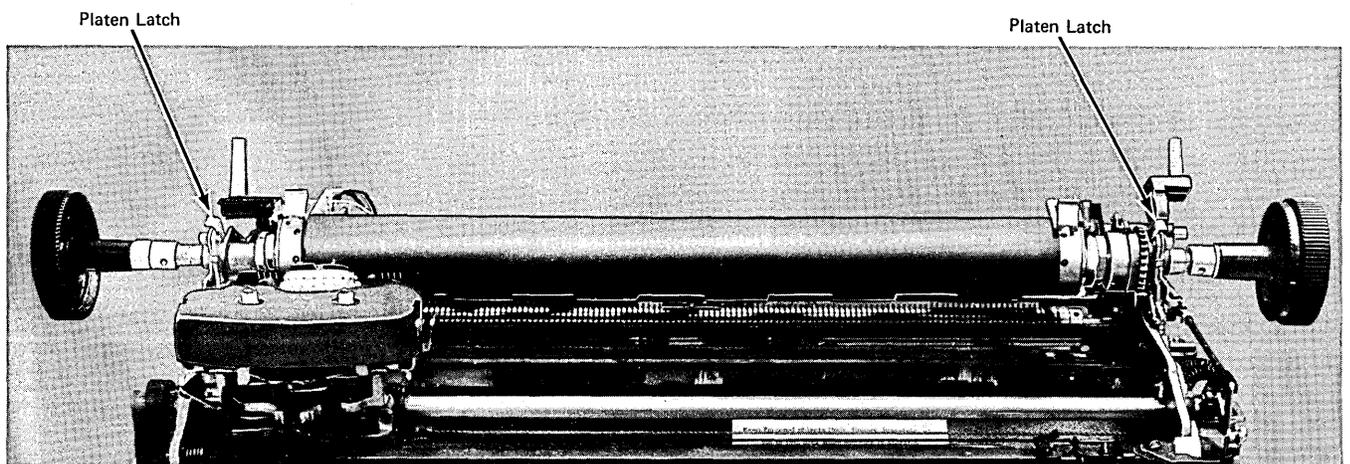
PRINT ELEMENT REMOVAL and REPLACEMENT (3210)

Removal

1. Press the NOT READY key.
2 Raise the printer cover.
3. Note the direction of the arrow on the print element.
4. Lift the print element release lever.
5. Lift the print element off the print element post.

Replacement

1. Install the print element on the print element post with the arrow pointing in the same direction it was on removal.
2. Lower the print release lever to lock the print element in in place.

Print Element
Release Lever

Print Element
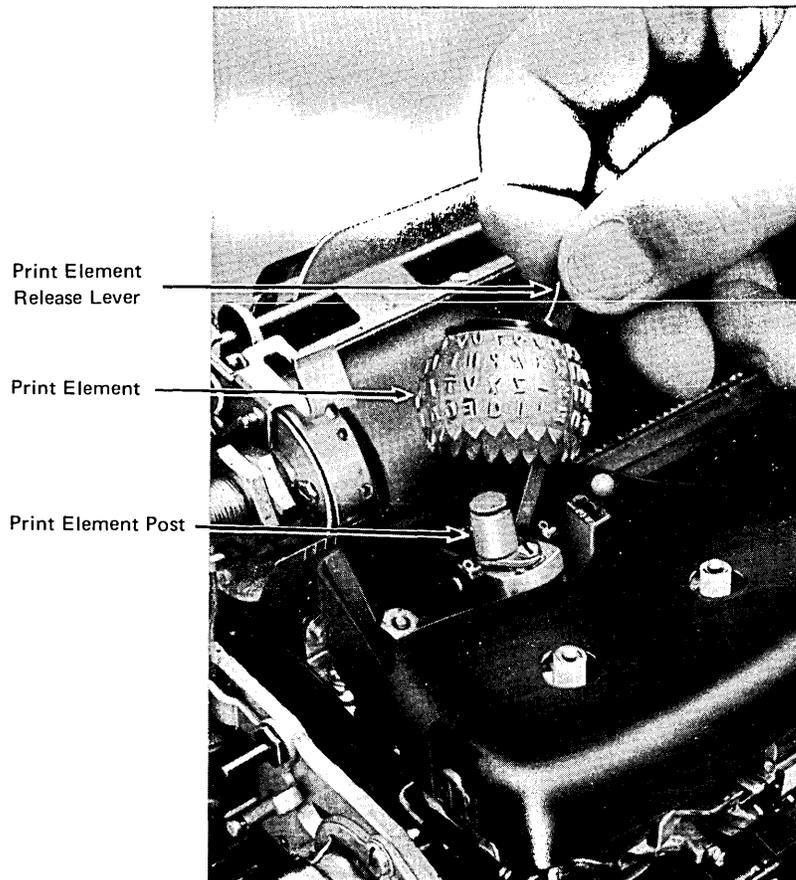
Print Element Post

PRINT ELEMENT CLEANING (3210)

CAUTION

Do not clean the 3215 print element. Cleaning is done as
required by your service representative.

TO CLEAN THE 3210 PRINT ELEMENT:

1. Press the NOT READY key.

2. Note the direction of the arrow on the print element.

3. Remove the print element.

4. Clip the print element to the end of the dual-purpose
   brush.

5. Brush away from you and toward the top of the print
   element using the element brush ,as shown.

6. Replace the print element with the arrow pointing in
   the same direction it was on removal.
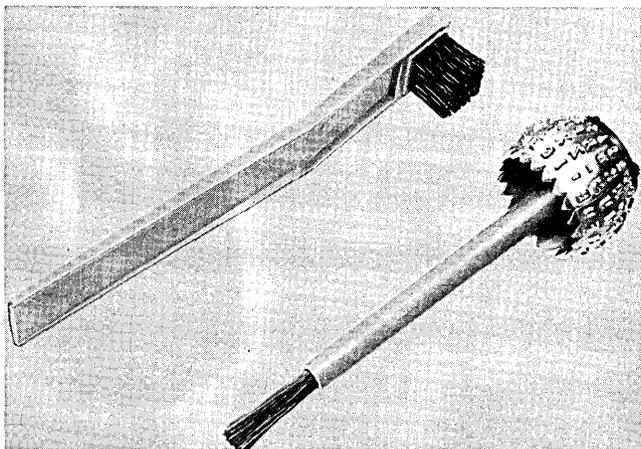
OPERATING PROCEDURES

CONSOLE FILE CARTRIDGE INSERTION and REMOVAL

Storage
Rack

E
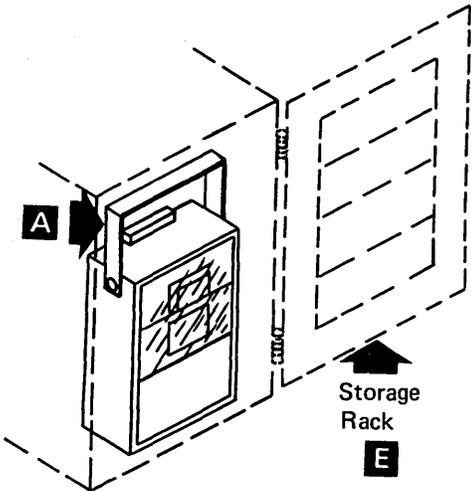
Removal

1. Pull handle **A** to open console-file cover.

2. Grasp the cartridge **B** by its white handling area and lift it straight up.

3. Slide the cartridge into its envelope and return it to the disk storage rack **E** or to the storage area.

Insertion

1. Pull handle **A** to open console-file cover.

2. Grasp the cartridge **B** by its white handling area and remove it from its envelope.

3. Lower the cartridge **C** until it is stopped by the locating surfaces.

4. Close cover carefully **D**. The centering cone must slide freely into the center of the disk. If not, check that the cartridge is seated against the locating surfaces and that the cartridge is not damaged.

5. Return the empty carriage envelope to the disk storage rack. **E**
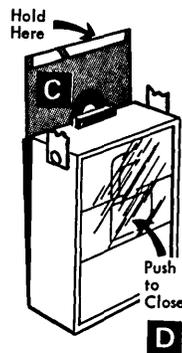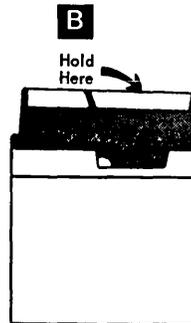
Storing Cartridges

Before using, acclimate cartridges to the computer room:

If in mailing carton, wait 24 hours.
If not in mailing carton, wait 1 hour.
If mounted on a non-powered file, wait 1/2 hour.

Place cartridges in their envelopes and store them either in the storage rack or in their original mailing cartons. A storage environment should meet the following criteria:

Temperature	40°–100°F (4.4°–37.8°C)
Relative Humidity	8%–80%
Maximum Wet Bulb Temperature	80°F (26.7°C)

> CAUTION
>
> A disk cartridge exposed to a magnetic field of 50 oersteds or more may lose information.

Shipping and Receiving

Ship cartridges inside the original shipping carton. Additional shipping cartons are available at IBM Branch Offices. With the cartridge in place, the package weighs 10 ounces. Be sure to label the package, "DO NOT EXPOSE TO HEAT OR SUNLIGHT."
When receiving cartridges, check for carton and cartridge damage. Save the carton for storing a cartridge and for possible future cartridge shipment.

POWER-ON PROCEDURES

● Power-On procedure depends upon the features installed.
The following procedures may be used:

No Features Installed

1 Press the POWER-ON key.

Pressing the POWER-ON key initiates a power-on sequence
for the CPU and on-line I/O units. The key turns red when
pressed and turns white when the power-on sequence is complete.
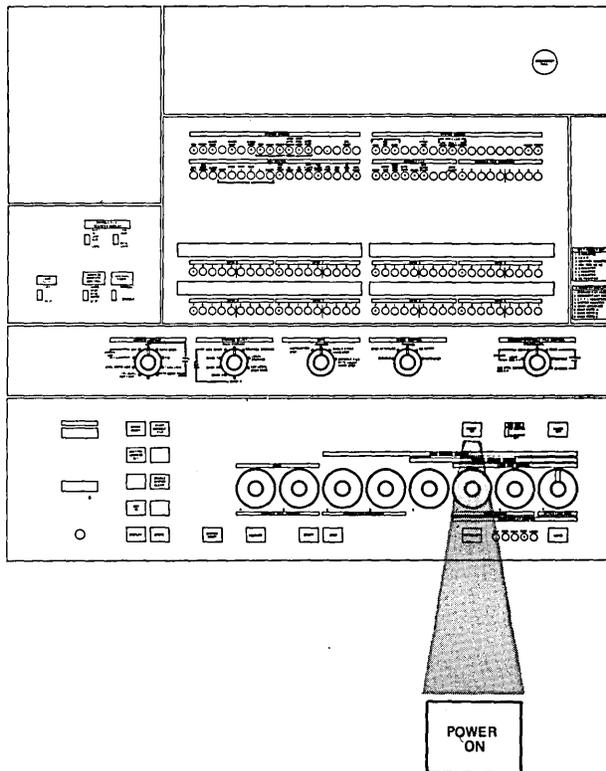
POWER
ON

Note:
The time required for a power-on sequence is determined
by the number and type of I/O units on-line. The contents of
storage is not valid after a power-on sequence. Also, an IMPL
operation is required. (The IMPL is automatic if the rotary
switches are in their normal processing positions, the ADDRESS
COMPARE CONTROL switch is set to SYNC/NORM, and the
*370 microprogram disk is mounted on the console file).

POWER-ON PROCEDURES

Channel-to-Channel Adapter (CTCA) Feature Installed

1 Press the POWER ON key.

Pressing the POWER-ON key initiates a power-on
sequence for the CPU and on-line I/O units. The key
turns red when pressed and turns white when the power-
on sequence is complete. The time required for a power-
on sequence is determined by the number and type of
I/O units on-line. The contents of storage is not valid
after a power-on sequence. Also, an IMPL operation is
required. (The IMPL is automatic if the rotary switches
are in their normal processing positions, the ADDRESS
COMPARE CONTROL switch is set to SYNC/NORM,
and the *370 microprogram disk is mounted on the
console file.)

2 Wait for the I/O INFC DSBLD indicator to turn on.

I/O
INFC
(G)
DSBLD

I/O
INTERFACE

ENABLE

DISABLE
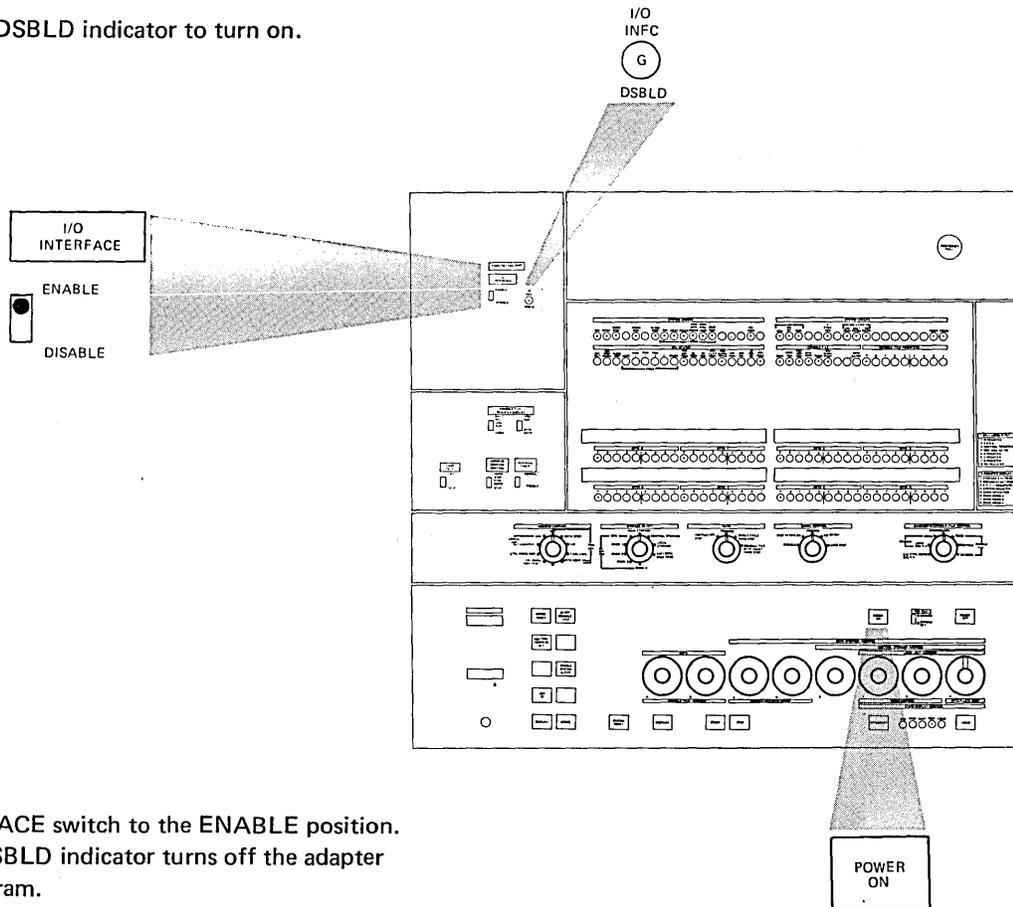
POWER
ON

3 Move the I/O INTERFACE switch to the ENABLE position.
When the I/O INFC DSBLD indicator turns off the adapter
is available to the program.

POWER-ON PROCEDURES

Integrated Storage Control (ISC) Feature Installed

● This procedure has the two-channel-switch special feature included.

● I/O INTERFACE B and MULTITAG switches are non-functional on a single channel ISC application.

1 Press the POWER-ON key.

Pressing the POWER-ON key initiates a power-on sequence for the CPU and on-line units. The key turns red when pressed and turns white when the power-on sequence is complete. The time required for a power-on sequence is determined by the number and type of I/O units on-line. The contents of storage is not valid after a power-on sequence. Also, an IMPL operation is required. (The IMPL is automatic if the rotary switches are in their normal processing positions, the ADDRESS COMPARE CONTROL switch is set to SYNC/NORM, and the *370 microprogram disk is mounted on the console file.)

2 Wait for the IMPL REQD indicator to turn off.
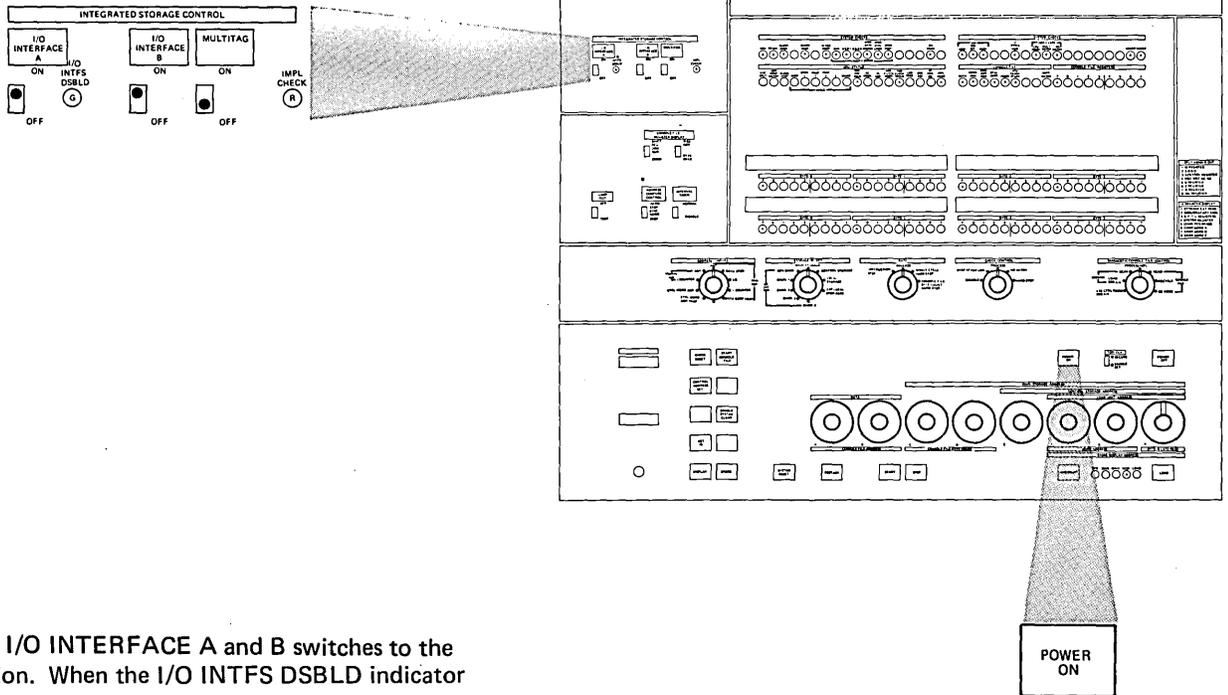
3 Move the I/O INTERFACE A and B switches to the ON position. When the I/O INTFS DSBLD indicator turns off the ISC is available to the program.

INITIAL MICROPROGRAM LOAD (IMPL)

● Ensure that forms are inserted in the console PR-KB and the *370 microprogram disk is mounted in the console file.

1 Set all rotary switches to their normal operating positions. Ensure that the ADDRESS COMPARE CONTROL toggle switch is set to SYNC/NORM.

ADDRESS
COMPARE
CONTROL

HARD
STOP
SYNC/
NORM
STOP
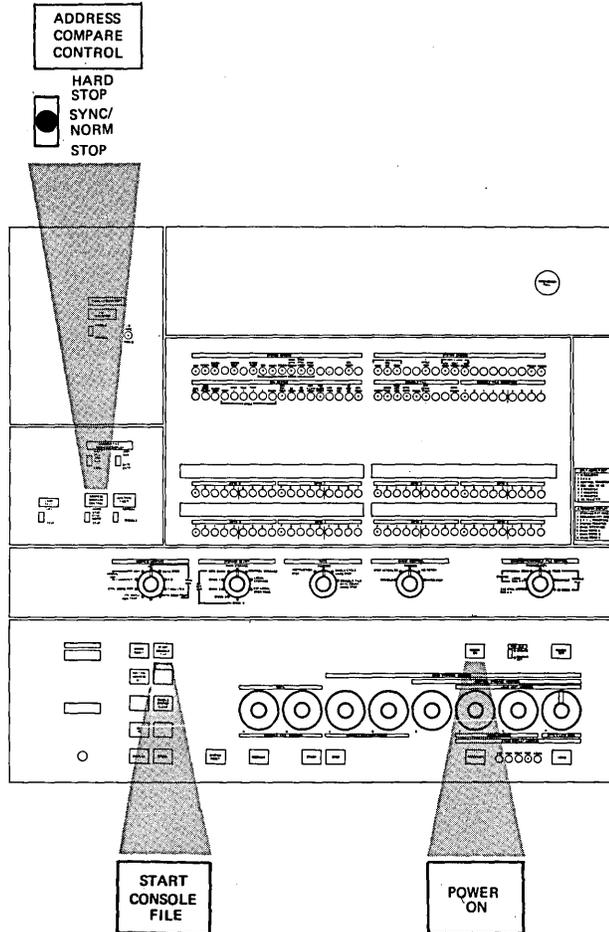
2 If power is not on, press the POWER ON key. An automatic IMPL occurs. If power is on, press START CONSOLE FILE key to initiate the IMPL.

START
CONSOLE
FILE

POWER
ON

3 The IMPL REQD and CF PWR ON indicators turn on and the START CONSOLE FILE key turns red.

When the console file starts reading, the START CONSOLE FILE key turns white.

The message GO-NO-GO COMPLETE prints on the PR-KB. If the message GO-NO-GO FAILED prints, refer to "IMPL Error Recovery," page 47.

Note: If the PR-KB is not ready during an IMPL operation, the audible alarm sounds to indicate GO-NO-GO messages.
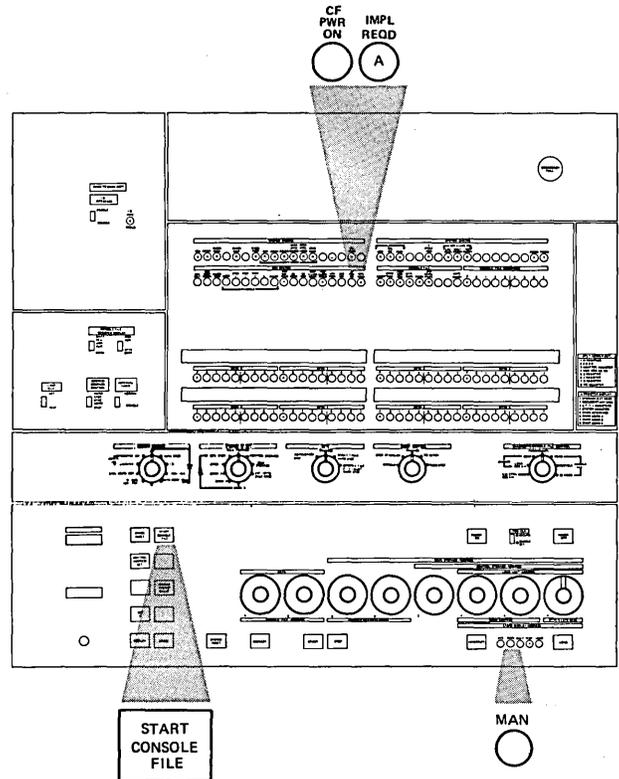
4 When control storage is loaded, the console file powers off automatically. The CF PWR ON indicator and the START CONSOLE FILE key light turn off.

The system reset routine executes, the IMPL REQD indicator turns off, and the CPU enters the soft-stop state (MAN indicator on).

The IMPL operation takes approximately 35 seconds.

5 Exceptions:

Note 1: If the system has been powered on without the *370 microprogram disk inserted in the console file, the following procedure must be performed before using the system.

a. Insert the *370 microprogram disk in the console file.

b. Press the START CONSOLE FILE key.

c. After IMPL is complete, perform a clear storage, operation as follows:

1. Press and hold ENABLE SYSTEM CLEAR key.
2. Press the SYSTEM RESET or the LOAD key. All of main storage is cleared to zeros (hexadecimal 00); control storage is not affected.

START CONSOLE FILE

ENABLE SYSTEM CLEAR

SYSTEM RESET

LOAD
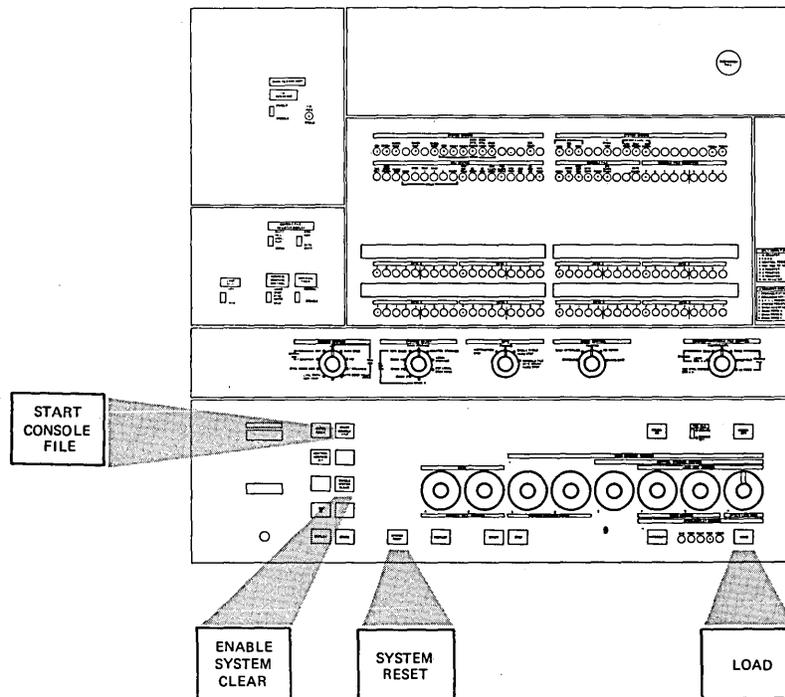
Note 2: Microprogram Patch Procedure

1. After PR-KB prints GO-NO-GO message, it may print microprogram patch-card IPL procedure.
2. If required, follow microprogram patch-card procedure before you IPL the SYS RES device.

IMPL ERROR RECOVERY

- Are switches set properly?

- Is *370 microprogram disk inserted correctly with label upright and facing you?

Attempt to re-IMPL using the START CONSOLE FILE key. If unsuccessful, press the CHECK RESET key and re-IMPL by using the POWER ON key. If the error continues, see "Handling Abnormal Situations– Introductory Flow Chart," page 84.
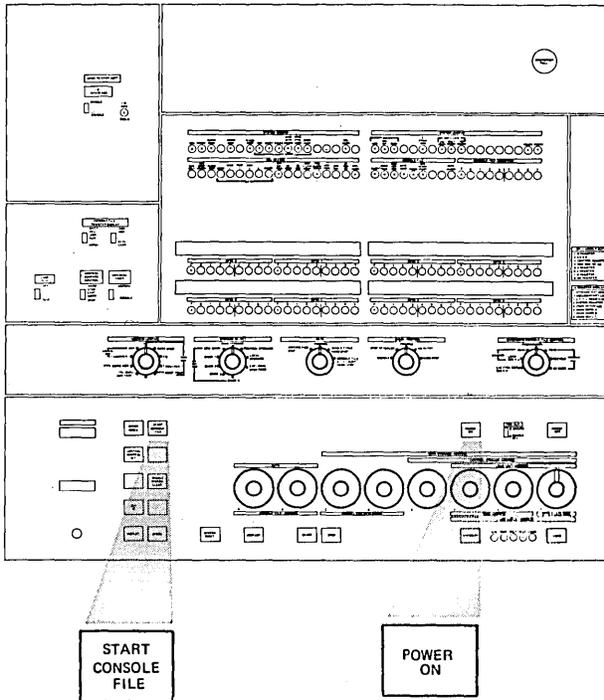
IMPL Error Indicator Chart

INDICATOR			ERROR CONDITION
START CONSOLE FILE KEY	IMPL REQD	CF PWR ON	
RED	ON	ON	Wrong disk mounted. Disk inserted upside down or backward. Disk not turning.
RED	ON	ON	Error during loading of control storage
RED	ON	OFF	Control storage loaded. Error in execution of system reset.

CONSOLE PRINTER-KEYBOARD MANUAL OPERATIONS

Data Entry

During a program-controlled read operation, PROCEED is turned on when the system requires data entry by the operator from the keyboard. The operation is ended by processing the END key.

3210 MODEL 1 CONSOLE PRINTER-KEYBOARD
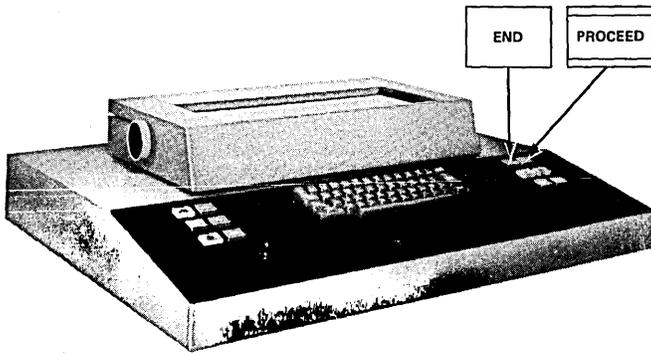
Note: Because of the similarity of the PR-KBs, illustrations of PR-KBs are of the 3210 Model 1.

Alter/Display Operations

Alter/display operations are performed by the operator from the PR-KB. The PR-KB provides a record of the operation, the location(s) accessed, and the data involved.

Display operations print data from storage for operator inspection. The data is not changed.

Alter operations change the data in storage.

48

ALTER

Data is entered one hex digit at a time by using the space
bar to skip over positions not being altered. The data in the
skipped-over positions remains unchanged and prints out
each time the spacebar is operated.

To end the alter operation, press the ALTER/DISPLAY
or END key.

DISPLAY

Data is printed starting at the address specified and con-
tinues until the ALTER/DISPLAY or END key is pressed.

END
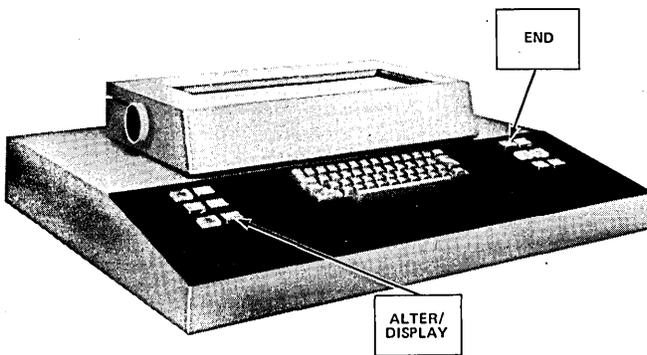
ALTER/
DISPLAY

Note: When the operation is ended by the ALTER/DISPLAY
key, the PR-KB remains in alter/display mode (ALTER/
DISPLAY MODE indicator on).

When the operation is ended by the END key, alter/display
mode is terminated.

For alter/display of general and floating-point registers, a
wraparound occurs (F to 0 for general registers, and 6 to 0
for floating-point registers).

When addressing main storage, either a word or byte
address may be used. If the starting address is not on a word
boundary, the PR-KB spaces and aligns at the byte addressed.

Alter/Display Procedures

Note: Steps 1 to 3 are common for alter and display operations.

1 Press the STOP key or set the RATE switch to either INSTRUCTION STEP or SINGLE CYCLE HARD STOP.
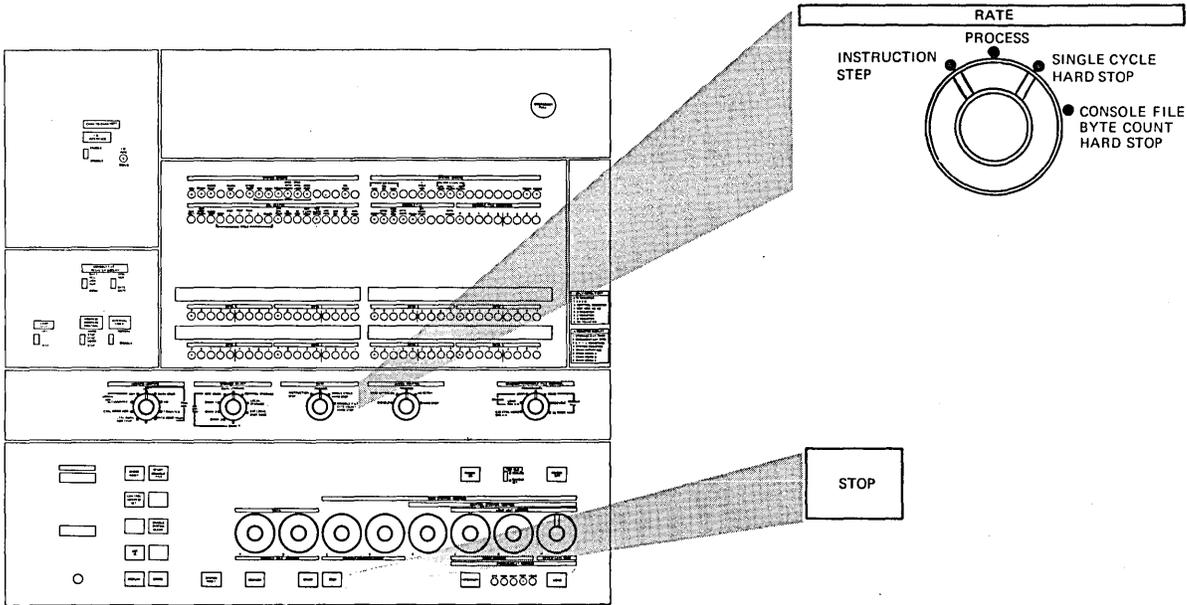
2 Press the ALTER/DISPLAY key.

3 Wait for both ALTER/DISPLAY MODE and PROCEED indicators to turn on.
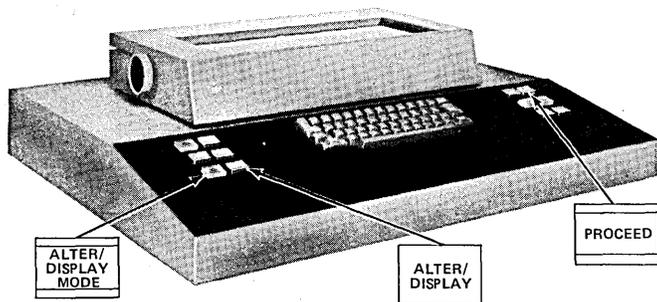
4 From the following chart, type the appropriate two-character mnemonic and address of the storage area or register to be altered or displayed.

STORAGE AREA	ALTER MNEMONIC	DISPLAY MNEMONIC	ADDRESS RANGE
MAIN STORAGE	AM	DM	000000-03FFFF*
STORAGE KEY	AK	DK	000000-03FFFF*
CONTROL REGISTER	AC	DC	0-F
GENERAL REGISTER	AG	DG	0-F
FLOATING-POINT REGISTER	AF	DF	0, 2, 4, 6
CURRENT PSW	AP	DP	None required
STORE STATUS	NONE	ST	None required
VIRTUAL STORAGE	AV	DV	000000-FFFFFF
* The upper boundry is movable and depends upon the capacity of main storage.			

5 When zeros are typed to the left of the address, a new line operation is started automatically. When zeros are not inserted, press the RETURN key.
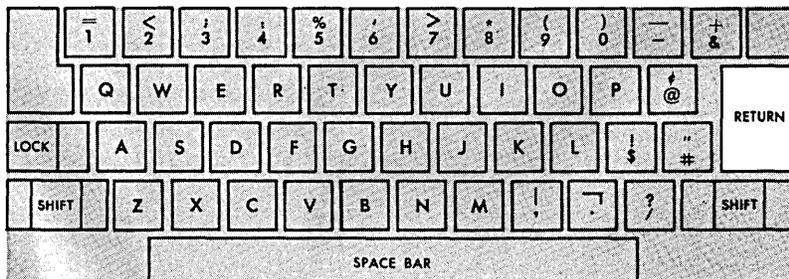
6 To continue program processing when the alter or display operation is completed, return the RATE switch to PROCESS and press the START key.
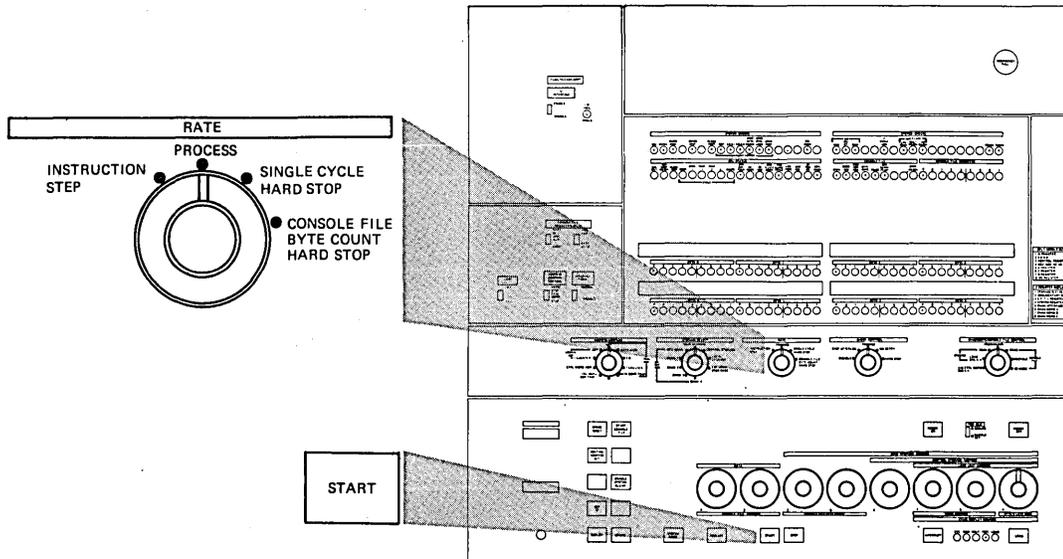
Alter/Display Examples

In the following examples, the Xs represent characters displayed or entered and printed by the PR-KB.

MAIN STORAGE

DM 00008D
    XXXXXX XXXXXXXX XXXXXXXX-------XX
XXXXXXXX XXXXXXXX (Press the ALTER/DISPLAY or END key.)

DM 8D (Press the RETURN key.)
    XXXXXX XXXXXXXX XXXXXXXX---------XX
XXXXXXXX XXXXXXXX (Press the ALTER/DISPLAY or END key.)

AM 480 (Press the RETURN key.)
XXXXXXXX XXXX (Press the ALTER/DISPLAY or END key.)

FLOATING-POINT REGISTER

DF 2
XXXXXXXX XXXXXXXX XXXXXXXX---------XX

STORAGE KEY

DK 009000
XXXXXXXX XXXXXXXX XXXXXXXX (Press the ALTER/DISPLAY or END key.)

Each word contains four storage keys.

CURRENT PSW

AP
XXXXXXXX XXXXXXXX

VIRTUAL STORAGE

Type in logical address: LLLLLL; system types out = RRRRRR (real address).

DV LLLLLL=RRRRRR

XXXXXXXX XXXXXXXX XXXXXXXX
XXXXXXXX XXXXXXXX (Press ALTER/DISPLAY key.)

AV LLLLLL=RRRRRR
XXXXXXXX XXXXXXXX XXXXXXXX
XXXXXXXX XXXXXXXX (Press ALTER/DISPLAY key.)

Alter/Display Error Messages

INVAL CHAR

This message prints when one of the following error occurs:

1. The first character of a mnemonic is not A, D, or S.
2. The second character is not M, S, L, K, C, G, F, P,
   T, or V.
   (S and L are for service personnel.)
3. An invalid hex digit is typed when addressing or
   altering data.
4. The CANCEL key is pressed.
5. A character with a parity error is detected on the
   PR-KB bus-in line.

CANCEL
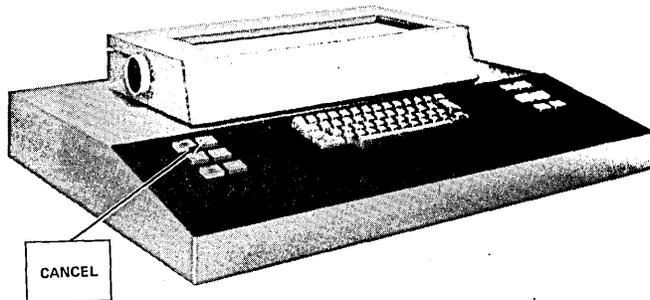
INVAL ADDR

Prints when one of the following errors occurs:

1. Invalid starting address.
2. Updated address exceeds the capacity of specified storage.
3. Non-translated logical address.. (DV LLLLLL
                                       INVAL ADDR).
4. The translated real address exceeds the capacity of main
   storage. (DV LLLLLL = RRRRRR
            INVAL ADDR).

Store Status

- An operator-initiated function that places the programmable registers in fixed locations in processor storage.

- The function is initiated by placing the PR-KB in alter/display mode and typing in ST.

Store Status Procedure

1. Press the STOP key, or place the RATE switch in either INSTRUCTION STEP or SINGLE CYCLE HARD STOP position. This places the CPU in a stopped state.
2. Press the ALTER/DISPLAY key on the PR-KB. The PROCEED light turns on.
3. Type in the mnemonic ST. The function is executed, the carriage on the PR-KB returns, and the CPU exits from the ALTER/DISPLAY mode and returns to a stopped state. (No printout is given.)

The following programmable registers are affected:

    CPU timer
    Clock comparator
    Current PSW
    Floating point registers
    General registers
    Control registers

Note: The fixed storage location addresses for these areas are given in *IBM System/370 Model 145 Functional Characteristics,* GA24-3557.

INITIAL PROGRAM LOAD (IPL)

1 Load and ready the SYS RES device.

2 Dial the address of the IPL device into LOAD UNIT
ADDRESS switches F,G,and H.

IPL ERROR RECOVERY

- Are LOAD UNIT ADDRESS switches F,G,and H correct?
- Is SYS RES device ready?

If setup is correct and IPL errors still occur, see "Handling
Abnormal Situations--Introductory Flowchart," page 84.
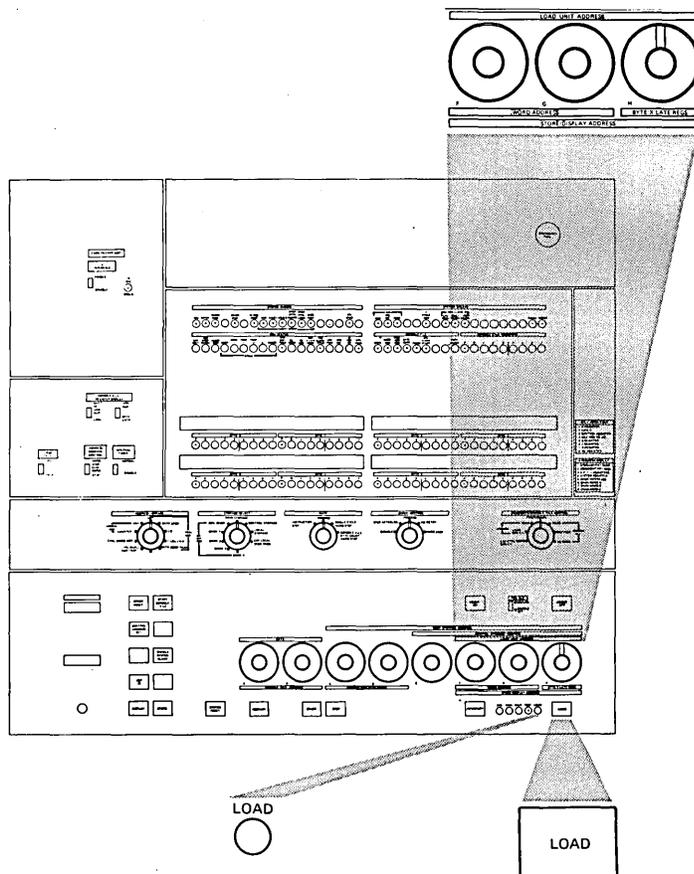
LOAD

LOAD

3 Press the LOAD key.
- After an automatic system reset, the IPL operation
  starts.
- The LOAD indicator turns on.
- When IPL is complete, the LOAD indicator turns off
  and the system either executes the program or enters
  the soft-stop state awaiting your action.

SET IC (INSTRUCTION COUNTER)

1 Press the STOP key.

2 Dial the desired address into rotary switches C, D, E, F, G, and H.
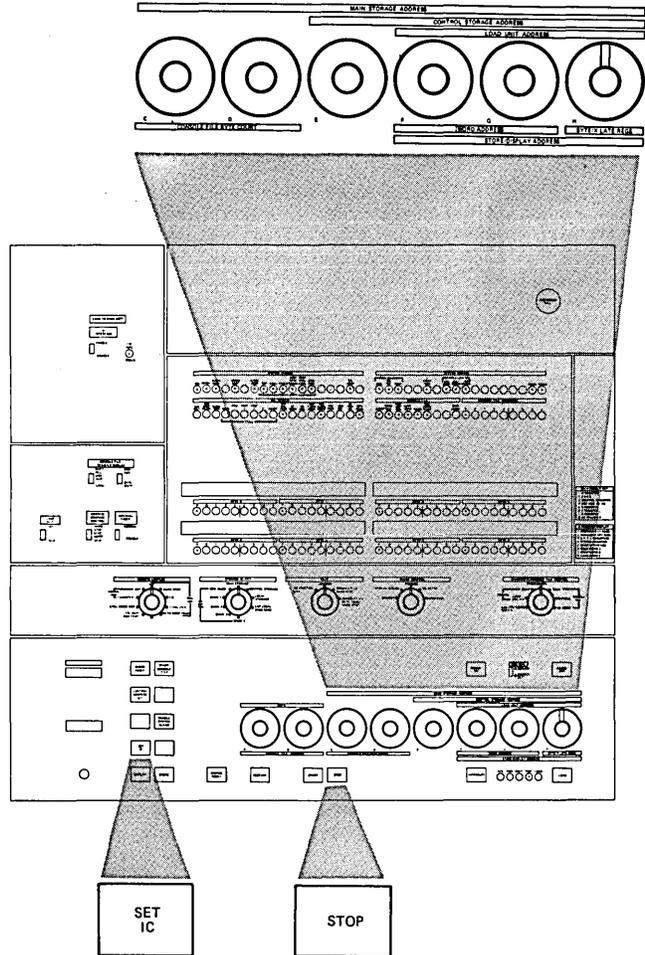
3 Press the SET IC key.

The set instruction counter operation loads the address from switches C, D, E, F, G, and H into the instruction counter. Instruction processing starts from this address when the START key is pressed.

INSTRUCTION STEP

1 Press the STOP key.

2 Set the RATE switch to INSTRUCTION STEP.

3 Press the START key.

One machine language instruction is executed for each operation of the START key. The instruction counter (displayed in the A-REGISTER DISPLAY indicators) contains the address of the next instruction to be executed.
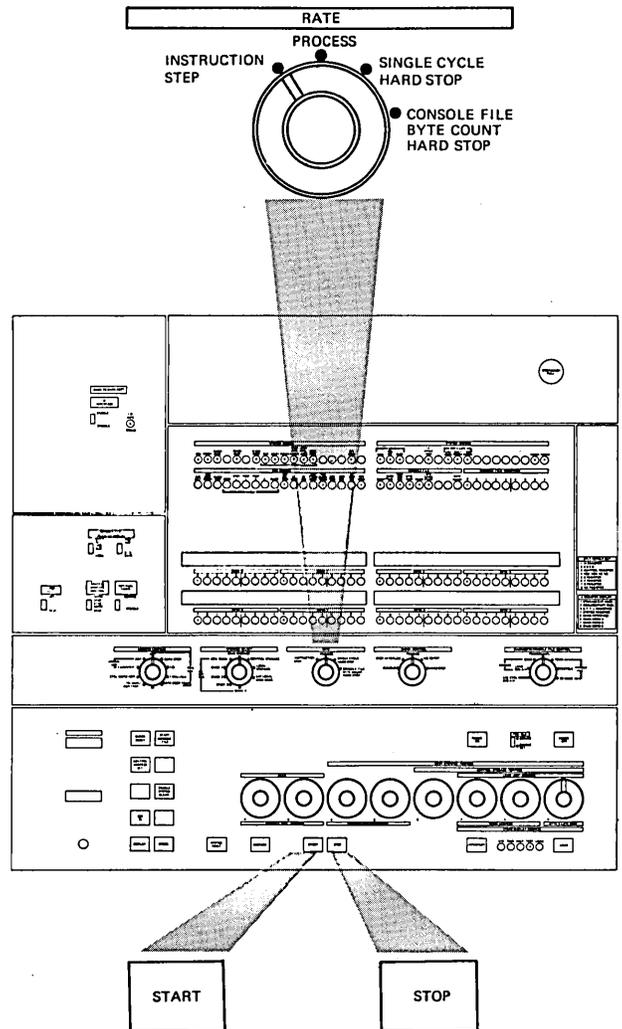
CLEAR STORAGE

- Main storage can be cleared to zeros by the following procedure.

1 Hold the ENABLE SYSTEM CLEAR key in the operated position.
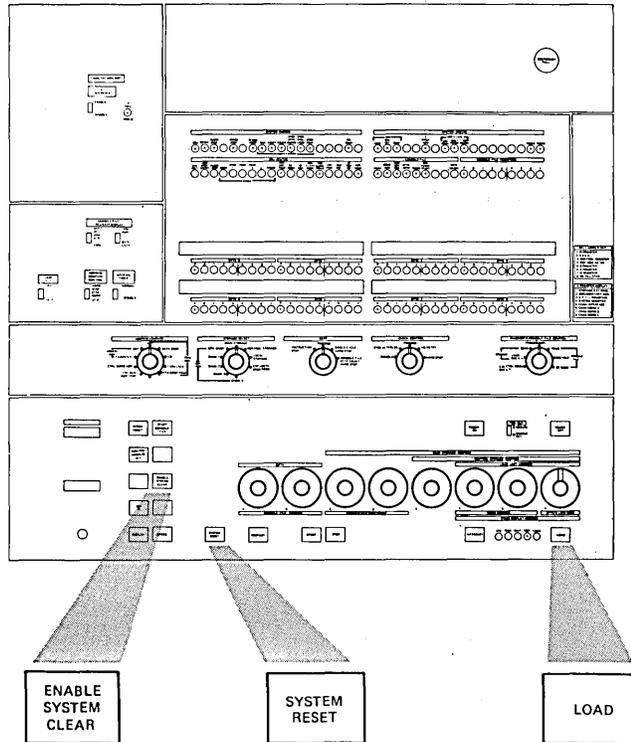
2 Press the SYSTEM RESET or LOAD key.

All of main storage is cleared to zeros (hexadecimal 00); control storage is not affected.

3 Release the ENABLE SYSTEM CLEAR key.

DATA COMPARE TRAP

1 Press the STOP key.

2 Set the ADDRESS COMPARE switch to DATA COMPARE TRAP.
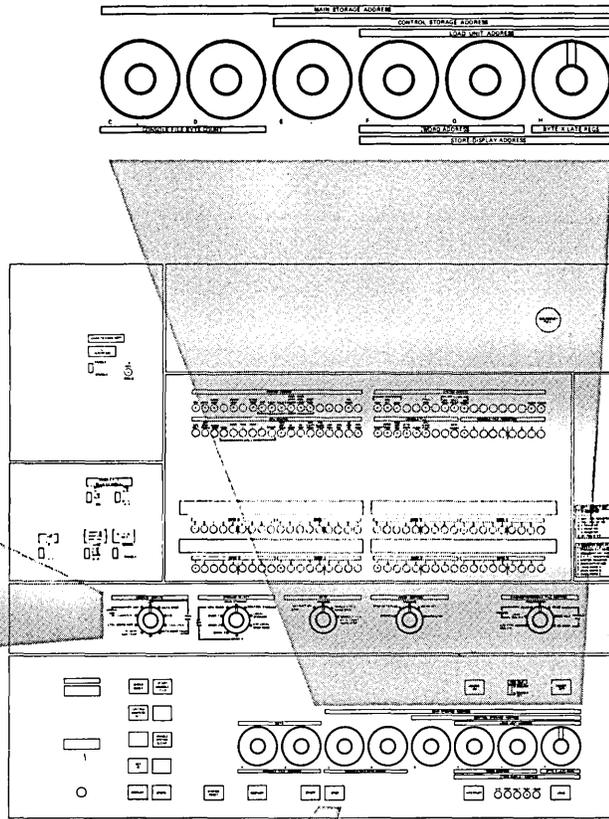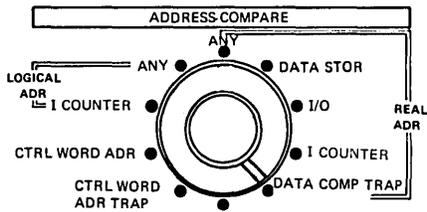
3 Set the address of the storage byte location being modified in rotary switches C, D, E, F, G, and H.

4 Set data switches A and B to the desired byte match value.

5 Set the ADDRESS COMPARE CONTROL toggle switch to STOP.

ADDRESS
COMPARE
CONTROL

HARD
STOP
SYNC/
NORM
STOP

DATA
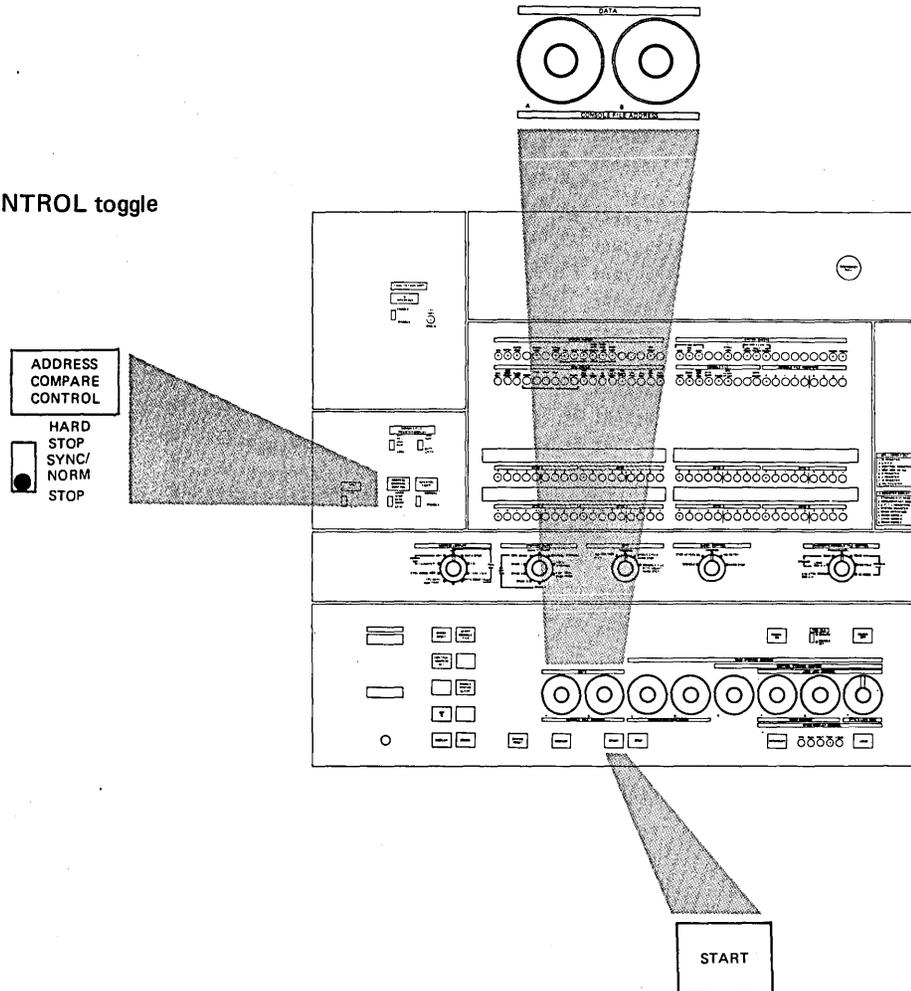
START

6 Press the START key.

When a store operation modifies the specified storage byte location to the value set in switches A and B, the ADR COMP MATCH indicator turns on and the CPU enters a soft-stop state.

To determine the address of the instruction in operation, display the current PSW (refer to "Console PR-KB Manual Operations," page 48) and subtract the current instruction length code from the instruction address in the current PSW.

Note: The instruction found with this procedure may not have modified the data. An I/O data trap occurring during execution of this instruction could have modified the data.

MANUAL STORE DISPLAY OPERATIONS

● The MAN indicator must be on for the STORE and
  DISPLAY keys to be operative. If the CPU is running,
  press the STOP key to turn on the MAN indicator. If
  the CPU is stopped and the MAN indicator is not on, check
  that the toggle and rotary switches are in the normal
  positions, and press the START key to turn on the
  MAN indicator.
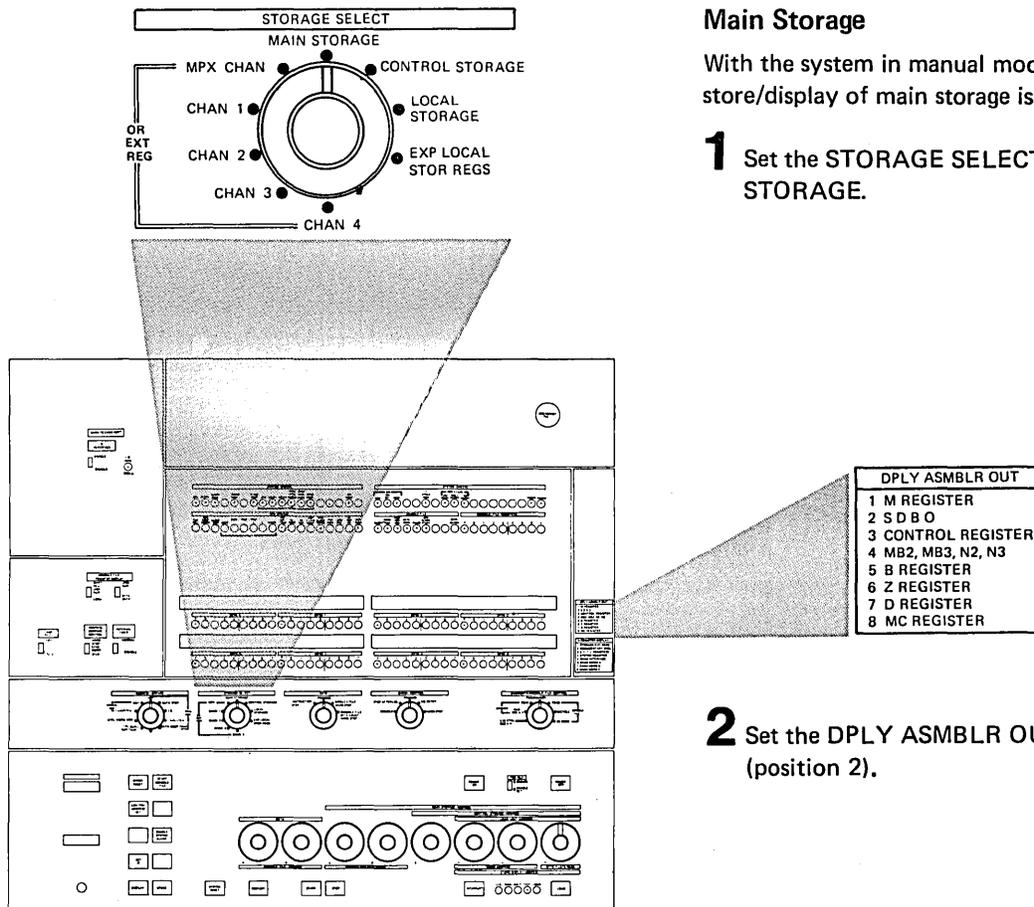
Main Storage

With the system in manual mode (MAN indicator on),
store/display of main storage is performed as follows:

1 Set the STORAGE SELECT switch to MAIN
STORAGE.

DPLY ASMBLR OUT
1 M REGISTER
2 S D B O
3 CONTROL REGISTER
4 MB2, MB3, N2, N3
5 B REGISTER
6 Z REGISTER
7 D REGISTER
8 MC REGISTER

2 Set the DPLY ASMBLR OUT roller switch to SDBO
(position 2).

3 Dial the desired word address into rotary switches, C, D, E, F, G, and H.
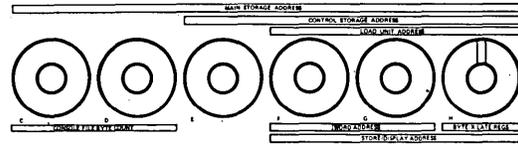
4 For a store operation, set rotary switches A and B to the hexadecimal byte value to be stored.
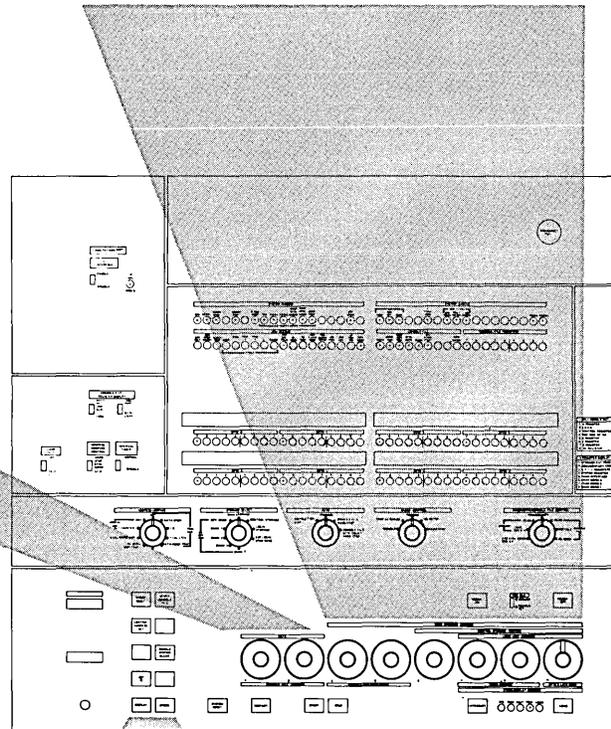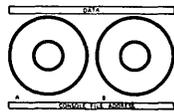
5 Press the STORE or DISPLAY key.

- The addressed main storage word is displayed in the DPLY ASMBLR OUT roller switch indicators at the end of the store or display operation. Any byte stored is displayed in its stored condition.

DISPLAY   STORE

General and Floating-Point Registers

Store or display of these registers is performed as follows:

1 Set the STORAGE SELECT switch to LOCAL STORAGE.
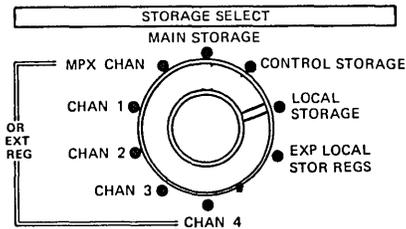
2 Dial the word address of the desired register into rotary switches F and G (see chart page 64).
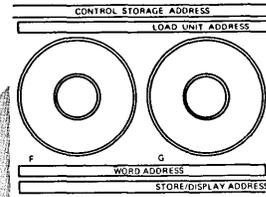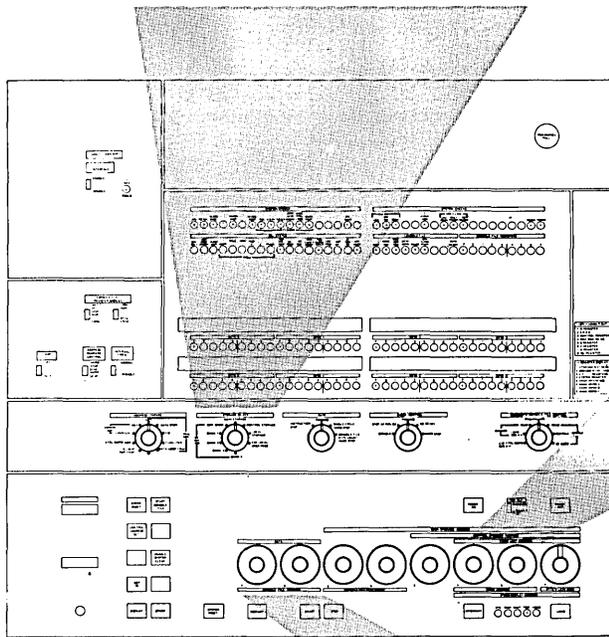
3 For store operations, set the value to be stored in switches A and B.
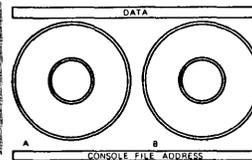
4 Set the byte address at which the data is to be stored in switch H (only the two low-order bits of switch H designate the byte). For example, if switch H is set to C (1100 binary), byte zero is selected.
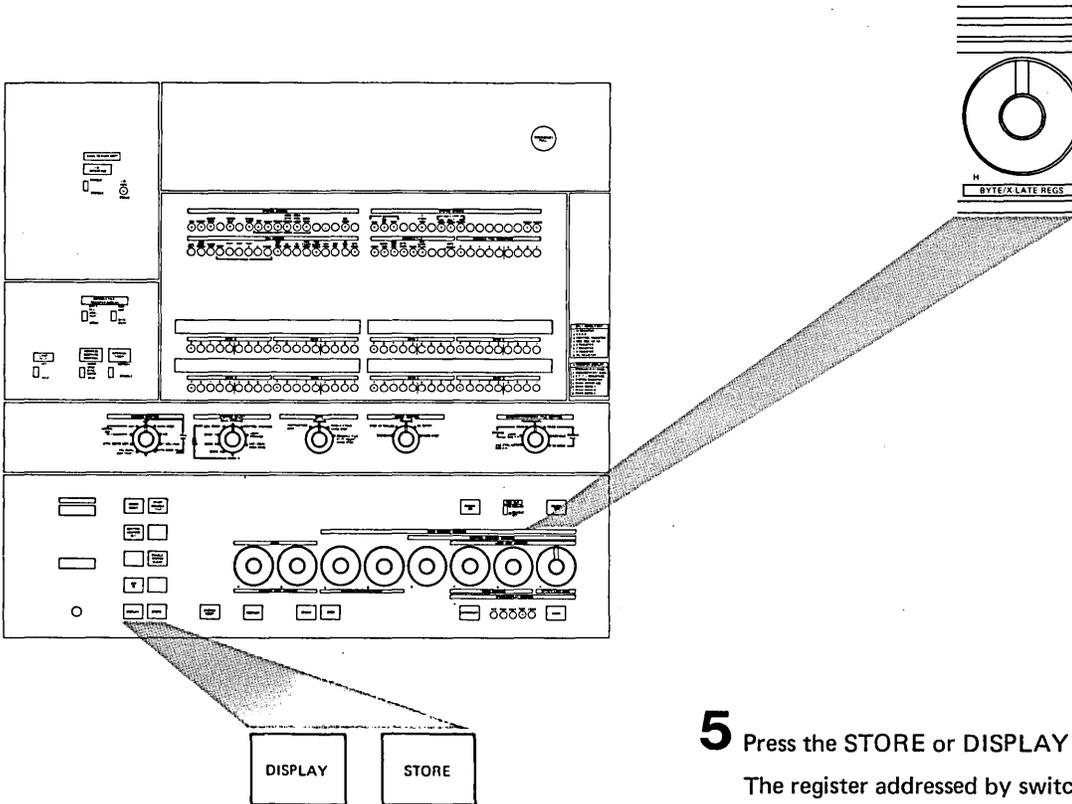
5 Press the STORE or DISPLAY key.

The register addressed by switches F and G is displayed in the A-REGISTER DISPLAY roller switch indicators at the end of the store or display operation.

WORD ADDR	REGISTER DISPLAYED
00	General Register 0
01	General Register 1
02	General Register 2
03	General Register 3
04	General Register 4
05	General Register 5
06	General Register 6
07	General Register 7
08	General Register 8
09	General Register 9
0A	General Register A
0B	General Register B

WORD ADDR	REGISTER DISPLAYED
0C	General Register C
0D	General Register D
0E	General Register E
0F	General Register F
30	Floating-Point Register 0
31	Floating-Point Register 0
32	Floating-Point Register 2
33	Floating-Point Register 2
34	Floating-Point Register 4
35	Floating-Point Register 4
36	Floating-Point Register 6
37	Floating-Point Register 6

POWER-OFF PROCEDURES

- Pressing the POWER-OFF key removes power to the
  CPU and on-line I/O units. Main and control storage
  information is lost.

- The power-off procedure depends upon the
  features installed. The following procedures may
  be used:

No Features Installed
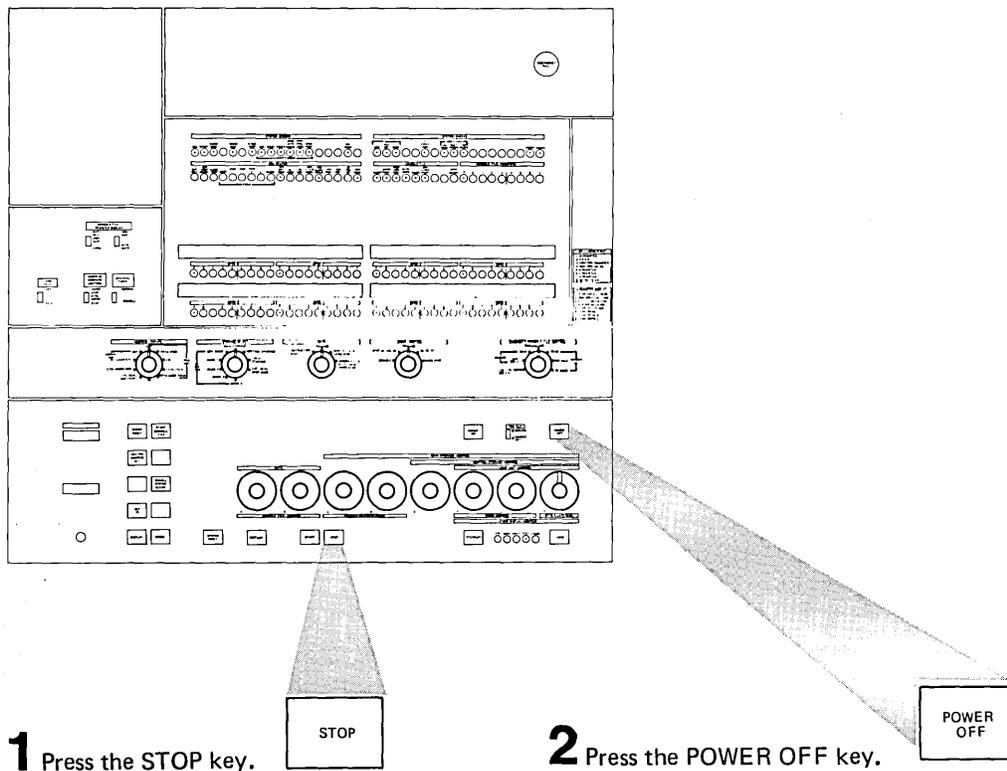
1 Press the STOP key.

STOP

2 Press the POWER OFF key.

POWER
OFF

Note:
If the system is powered-off, do not turn power back on
for at least 10 seconds. If the POWER-ON key is pressed
before 10 seconds have elapsed, a power check may occur.
This power check condition can be corrected by pressing the
CHECK RESET key.

POWER-OFF PROCEDURES

Channel-to-Channel Adapter (CTCA) Feature Installed

1 Inform the operator of the other system that the channel-to-channel adapter is to be removed from use.

2 Move the I/O INTERFACE switch to the DISABLE position.

CHAN TO CHAN ADPT

I/O INTERFACE

ENABLE

DISABLE

I/O INFC

(G)
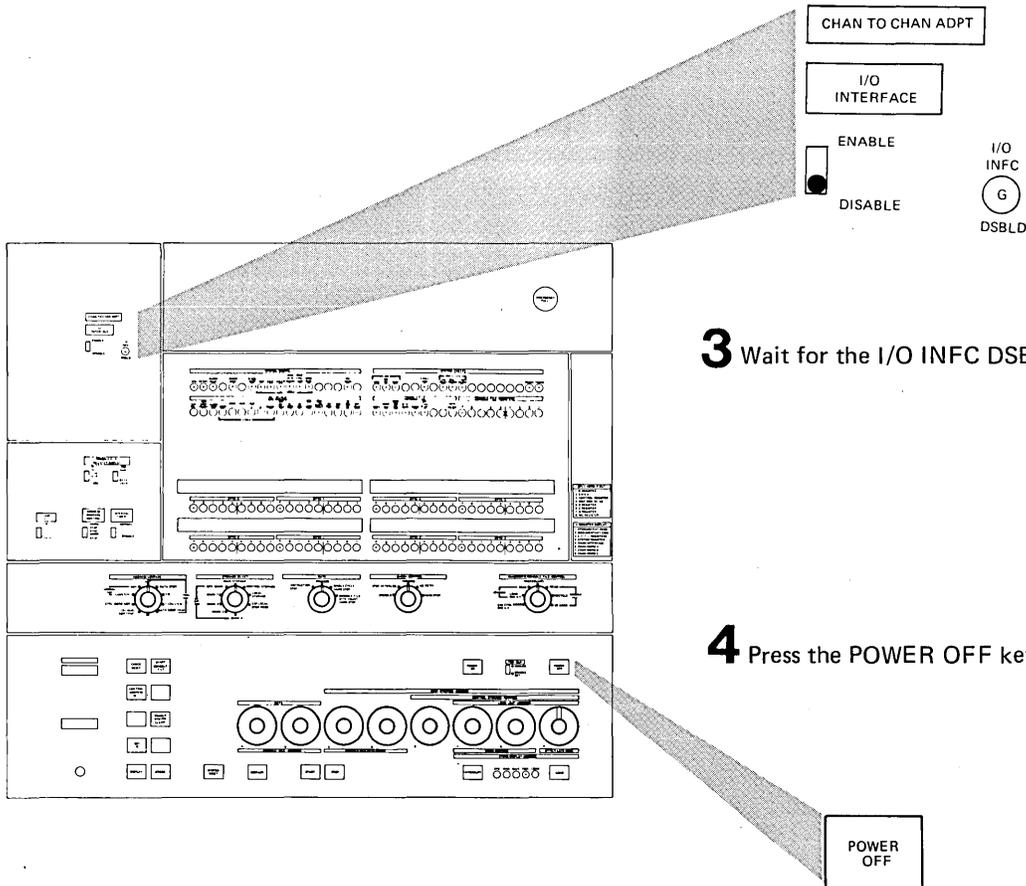
DSBLD

3 Wait for the I/O INFC DSBLD indicator to turn on.

4 Press the POWER OFF key.

POWER OFF

Note:
If the system is powered-off, do not turn power back on for at least 10 seconds. If the POWER-ON key is pressed before 10 seconds have elapsed, a power check may occur. This power check condition can be corrected by pressing the CHECK RESET key.

POWER-OFF PROCEDURES

Integrated Storage Control (ISC) Feature Installed

- This procedure has the two-channel-switch special feature included.
- I/O INTERFACE B and MULTITAG switches are non-functional on a single channel ISC application.

1 Inform the operator of the other system that the ISC feature is to be removed from use.

2 Move the I/O INTERFACE A and B (switches) to the OFF position.
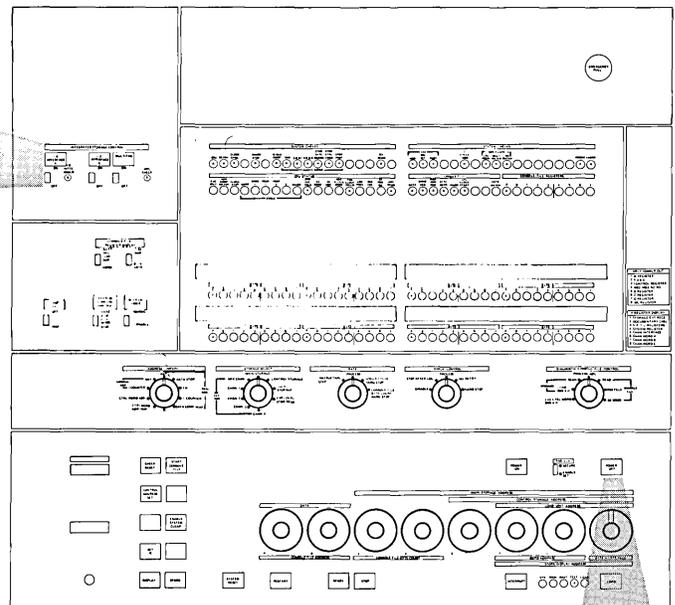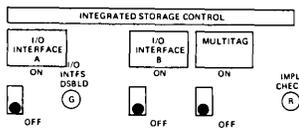
3 Wait for the I/O INTFS DSBLD indicator to turn on.

4 Press the POWER OFF key.

Note:
If the system is powered-off, do not turn power back on for at least 10 seconds. If the POWER-ON key is pressed before 10 seconds have elapsed, a power check may occur. This power check condition can be corrected by pressing the CHECK RESET key.

EMERGENCY PULL SWITCH

- Pulling the EMERGENCY PULL switch turns off electrical power to the CPU and online I/O units, and makes the POWER ON key ineffective until the EMERGENCY PULL switch is reset by a service representative.

CAUTION

The EMERGENCY PULL switch is readily identified by its red knob. Pull the red knob (into the fixed, latched position) in a true emergency only (A system fire or any case of danger to personnel).
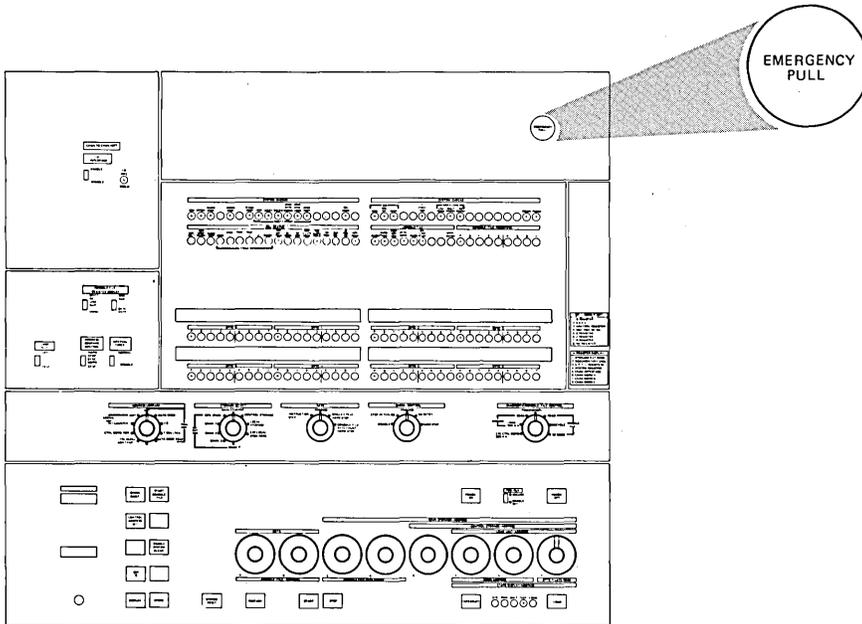
AUTOMATIC SYSTEM CHECKOUT PROGRAM (ASCP)

Purpose

- Indicates the reliability of the CPU, channel(s), and all I/O devices.
- Identifies the failing device(s), when used to investigate a specific problem.

Prerequisites

- A completely dedicated system is needed. ASCP does not run under control of an operating system.
- A good *370 microprogram disk IMPL operation must precede.
- Only devices made ready are tested by ASCP.
- "Scratch" or work tapes or disks should be used for testing.

The I/O devices that can be configurated and tested by ASCP are:

Disk File and Drum Storage:
   2303, 2305, 2311, 2314, 2319, 2321, 3330

Magnetic Tape:
   2400, 2415, 2420, 3420

Punch Card I/O:
   1442N1, 2501, 2520, 2540

Printers:
   1403, 1443, 3211

Displays:
   2250, 2260

Console I/O:
   2702, 2715, 3210, 3215

Magnetic Character Reader:
   1259

Paper Tape I/O:
   1017, 1018, 2671

Transmission Control Devices
   2701, 2702, 2715

Sources

- Furnished on two console-file disks: STF1 and STF2. If you desire, your service representative can generate an ASCP tape or card deck.

Run Time

- Minimum time for reliability testing is approximately three minutes. (This gives at least one reliability printout.)
- ASCP must be terminated manually by the operator.

Program Concepts

ASCP loads from the console-file disks, tape, or cards, and communicates with the operator via an output device (preferably a printer). All devices made ready by the operator are tested. Reliability reports are printed at intervals on the selected ouptut device.

- Comparisons made with past ASCP reports may indicate failure trends and the need for scheduling maintenance.
- When ASCP is used to handle an abnormal situation, indicate the results to the dispatcher when you call for service. (Make ASCP results available to your service representative.)
- Recommended running the ASCP for reliability checking twice weekly.

ASCP OPERATING PROCEDURE
When Running from Console-File Disks
(STF1 and STF2)

1 Load the first ASCP disk (STF1) in console file.

Hold Here

Push to Close

3 Press the START CONSOLE FILE key.
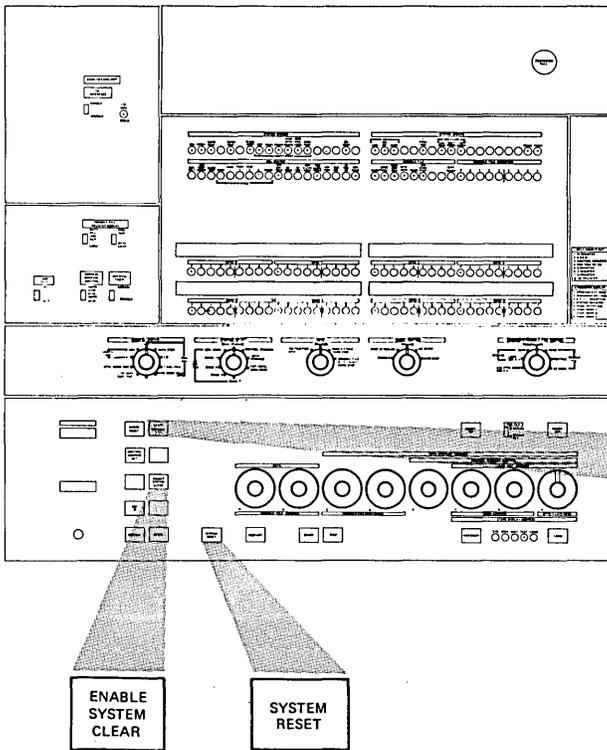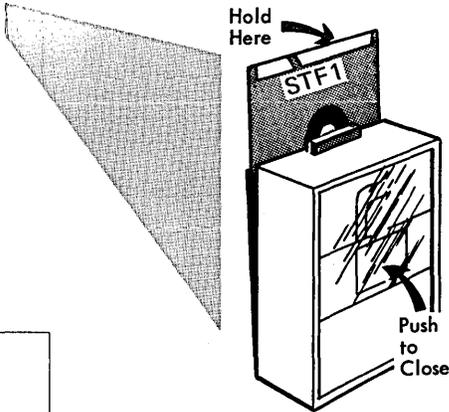
START CONSOLE FILE

ENABLE SYSTEM CLEAR

SYSTEM RESET

2 Hold the ENABLE SYSTEM CLEAR key in the operated position and press the SYSTEM RESET key.

4 Press the SYSTEM RESET key, and then press the RESTART key.
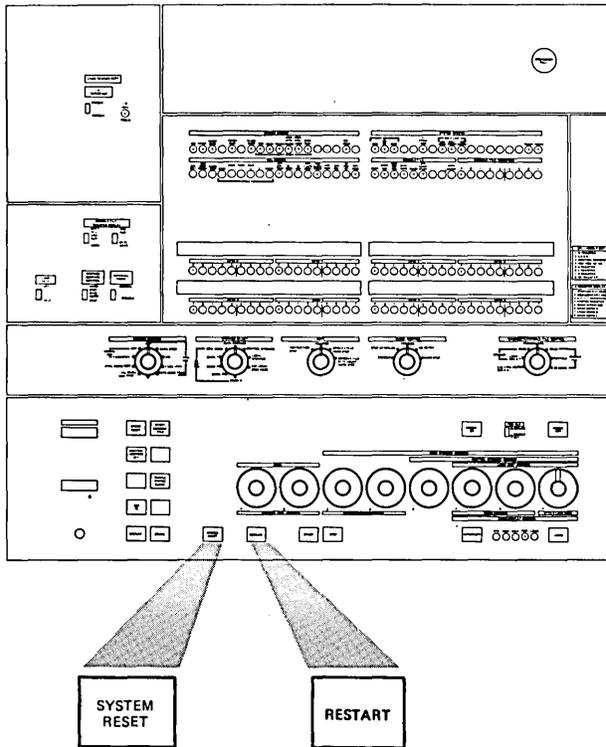
5 PR-KB gives message: Type EOJ or LOOP.

Only response: Type EOJ. All other responses are for service use only. PR-KB gives message: LOAD ASCP DISK #2 (STF2).
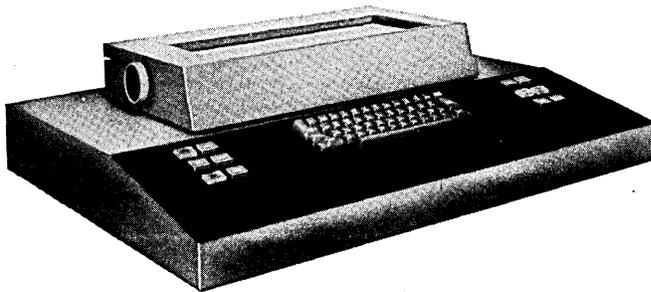
6 Press the SYSTEM RESET key.
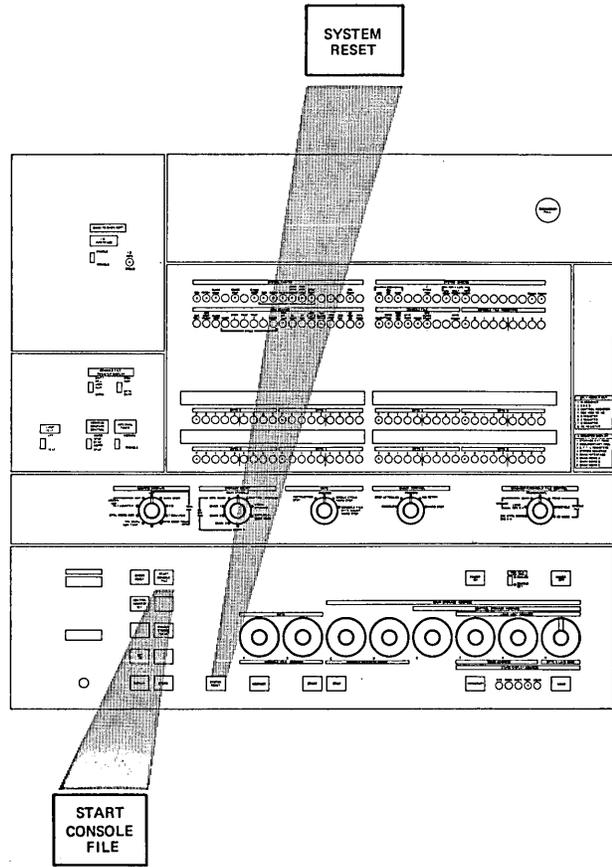
7 Load the ASCP Disk #2 (STF2) and press the START CONSOLE FILE key.

Hold Here

STF2

Push to Close
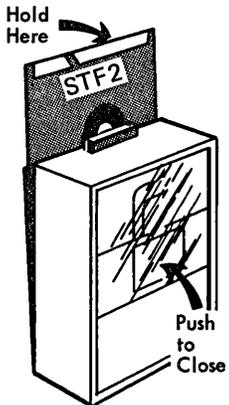
8 Press the SYSTEM RESET key, and then press the
RESTART key.
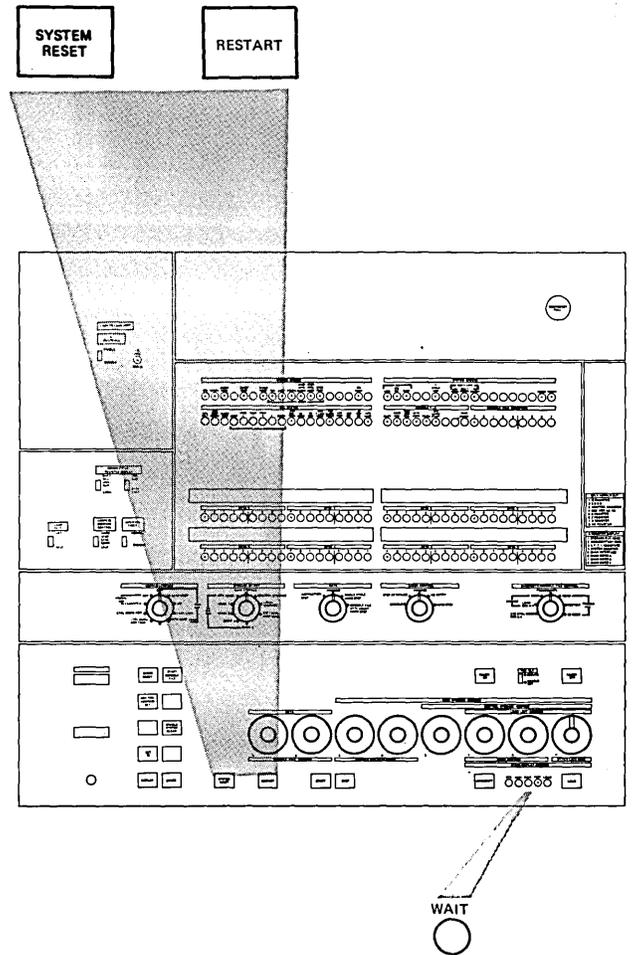
9 The WAIT indicator comes on and the system enters
a wait state. At this point, ready the device that is
to be used as an output (example: 1403 Printer).

10 If you wish to use the PR-KB as an output device, press the REQUEST key on the PR-KB.

- The instructions for running ASCP are printed on the output device.
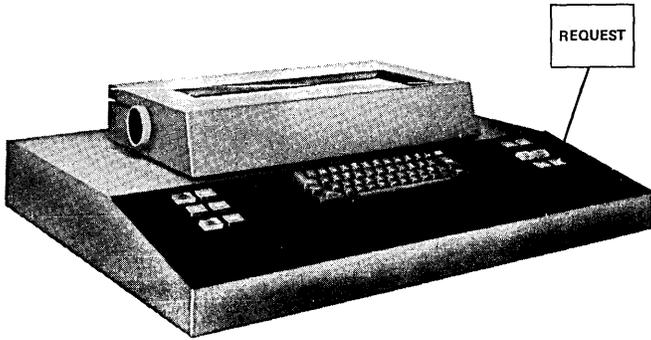
11 Ready all devices to be tested. ASCP tests only those devices that are ready.

EXAMPLES
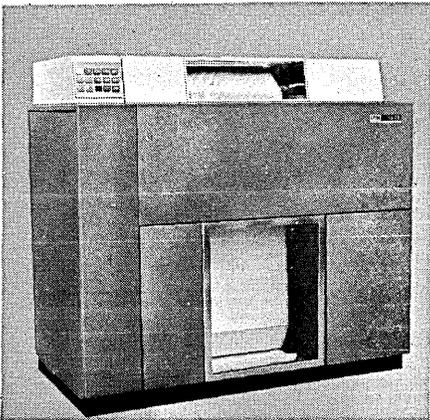
1403 N1 Printer

2311 Disk Storage Drive
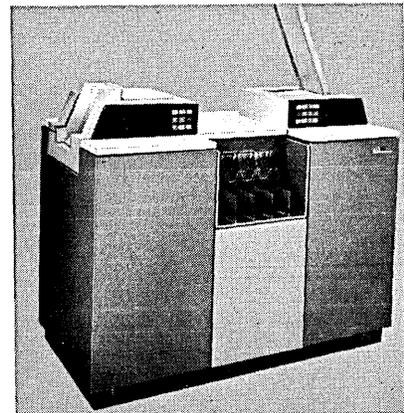
2540 Card Read Punch

12 Press the INTERRUPT key on the system control panel. ASCP prints out a table of devices. The printout takes approximately 10 seconds.

- Check the devices listed on the table against the devices made ready for testing.
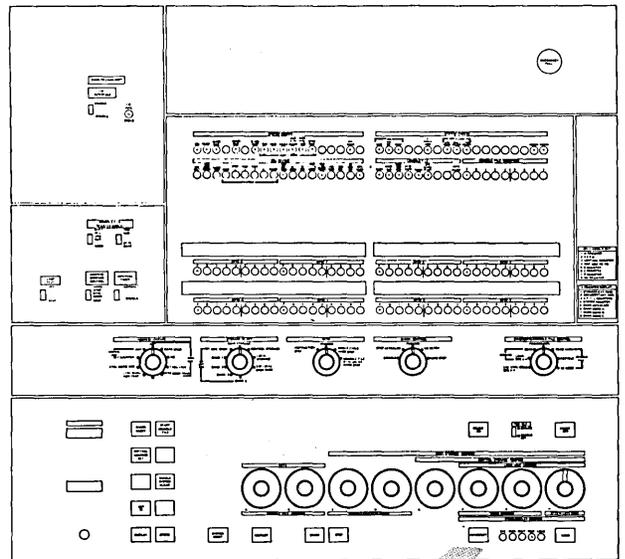
INTERRUPT

13 Press the INTERRUPT key to continue the ASCP run. Reliability reports are printed at intervals. (The first report should print out after approximately 3 minutes.)

- For an interpretation of the reports, see the "Reliability Report Example," page 78.

14 ASCP must be terminated manually by the operator. Press the PR-KB REQUEST key and type in CANCEL.

REQUEST
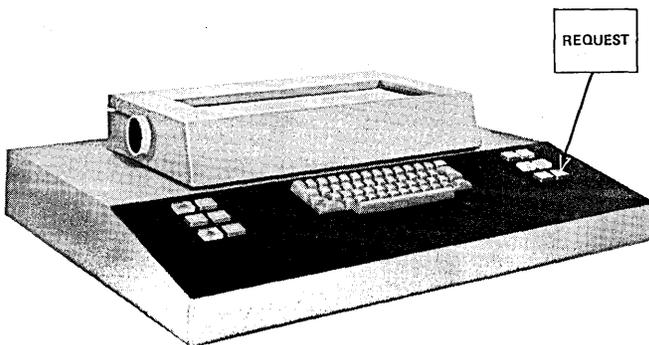
Loading ASCP from Magnetic Tape

- Set all rotary switches to normal process mode.
- Set the unit address in switches F, G, and H (example: 180).
- Ready and load the tape drive with ASCP tape.

1 Press the LOAD key.

2 CPU goes into the wait state (WAIT indicator on).
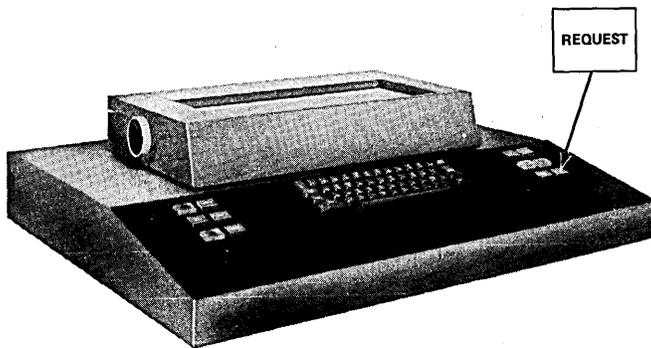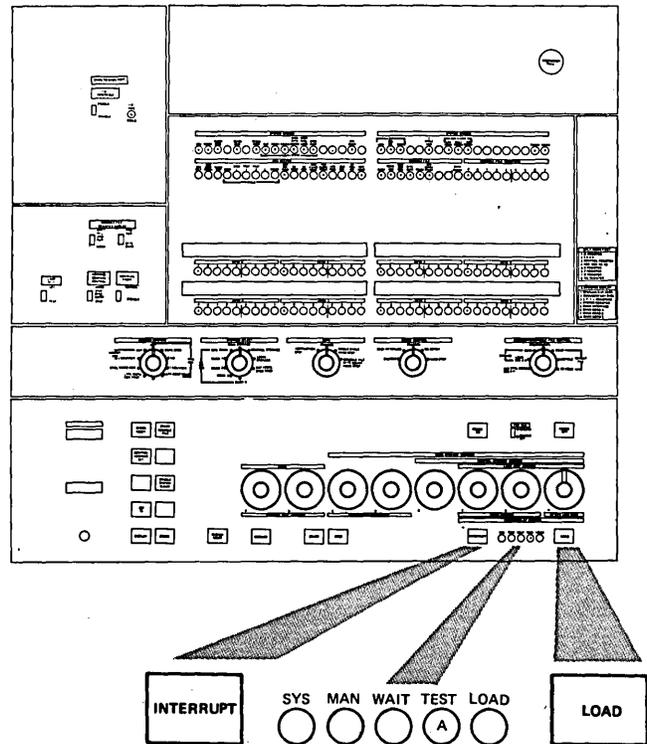
3 Press the REQUEST key on the PR-KB.

4 Read the instructions for running the program that are printed on this device.

5 Ready the devices to be tested and press the INTERRUPT key to continue. When the unit table is printed (after about 10 seconds), check that all devices made ready are in the table.

6 Press the INTERRUPT key to continue the program. Reliability reports are printed at intervals. For interpretation of reports, see "Reliability Report Example," page 78.

Loading ASCP from Cards

- Set all rotary switches to normal process mode.
- Set the load device address in switches F, G, and H (example: 00C).
- Ready the card reader with ASCP deck.

1 Press the LOAD key.

2 CPU goes into the wait state (WAIT indicator on).
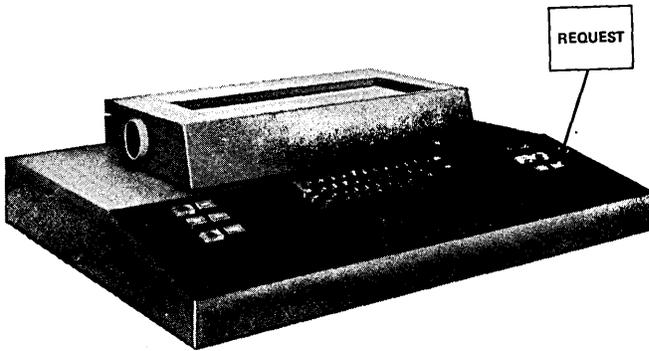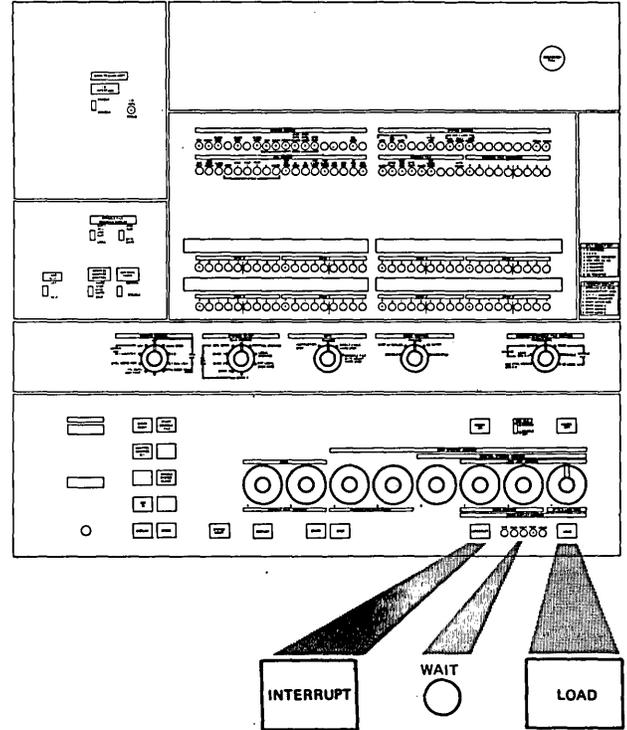
3 Press the REQUEST key on PR-KB.

4 Read the instructions for running the program that are printed on this device.

5 Ready the devices to be tested and press the INTERRUPT key to continue. When the unit table is printed (after about 10 seconds), check that all devices made ready are in the table.

6 Press the INTERRUPT key to continue the program. Reliability reports are printed at intervals. (For interpretation of reports), see "Relability Report Example," page 78.

Reliability Report Example

REPORT 08—Indicates the number of reports since the start of the test.
0001 MIN, 40 SEC—Indicates the elapsed time since the last report.

CLOCK=00/00/00—Indicates clock setting at time of report.

I/O BLOCKS—Indicates the total number of I/O blocks run.

CPU—Indicates the number of operations and failures against each class of CPU test.

I/O UNITS—Itemizes information about the I/O units (see chart).

```
REPORT 08 0001 MIN, 40 SEC
CLOCK=00/00/00
 BLOCKS    OPERATED   FAILED
  I/O       000529    000013
  CPU
FIXED PT    005371    000000
FLOAT PT    001020    000000
DECIMAL     000612    000000

  I/O UNITS       BLOCKS   ACUM NOT
ADDRESS CLAS   OPER FAIL   STAT RDY RDY
 00001F   TY   0000 0000
 000190   DS   0058 0000
 000191   DS   0059 0000
 000193   DS   0057 0013  0E00      *UNIT ERROR*   CE,DE,UCK
 000280   TP   0355 0000
 000281   TP   0000 0000
 000282   TP   0000 0000
 000283   TP   0000 0000
```

Notes:

1. This line indicates the failing device. Give the information on this line to the dispatcher when you call for service.

2. The maximum acceptable error percentage varies with the I/O device media used. The percentage figure should be arrived at through discussion with your service representative.

ADDRESS	Unit address of the device
CLAS	Denotes the class of the unit (TP=Tape)
OPER	Indicates the number of I/O blocks run by this unit
FAIL	Number of failures for the unit
ACUM STAT	Total status accumulated by the unit since the last report
NOT RDY	Indicates a change of unit status to not ready
RDY	Indicates a change of unit status to ready
CHAN ERROR	Error against the channel
CU ERROR	Error against the control unit
UNIT ERROR	Error against the unit

SYSTEM ERROR RECORD AND EDITING PROGRAM (SEREP)

SEREP is a self-loading program used to retrieve and edit hardware logout information. It provides a hard copy listing of available data pertinent to the error. SEREP does not perform any diagnostic function except to provide edited logout data for the service representative.

When to Use

SEREP is run after a machine check, channel control check, or interface control check when operating with a control program not using the automatic logging of error data on an external storage device. The system must be run with the CHECK CONTROL switch set to the STOP AFTER LOG position. When a log is present in the log area of storage, the LOG PRES and MAN indicators are on, and SEREP should be run. Save the error data for the service representative.

LOG PRES

CHECK CONTROL

PROCESS

STOP AFTER LOG   NO RETRY

DISABLE   HARD STOP

MAN
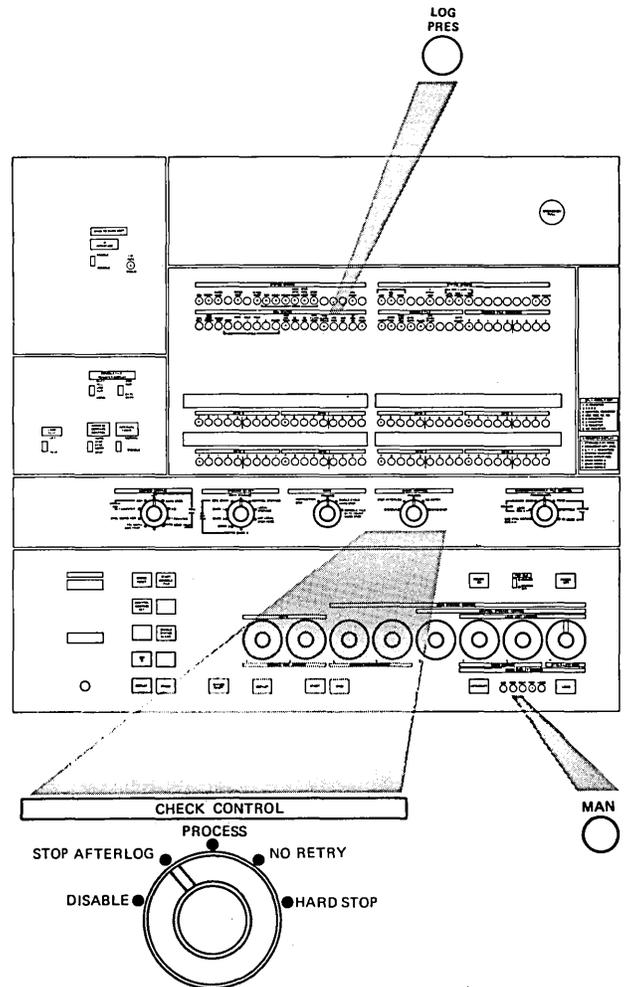
Program Loading

The program is assembled with device address 00E as the output device. If this device is acceptable and available as an output device, it is only necessary to IPL the SEREP deck from the card reader. The output device may be changed in two ways:
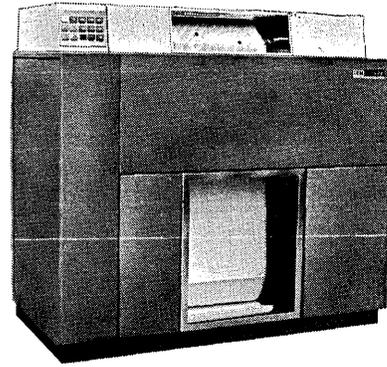
**1403 N1 PRINTER
(ADDRESS 00E)**

1 Punch the address of the desired output device in columns 67,68, and 69 of the last TXT card (next to the last card in the SEREP deck).
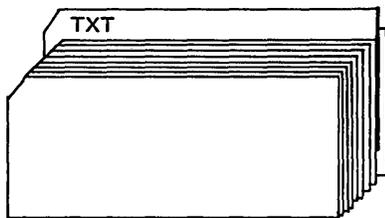
OR
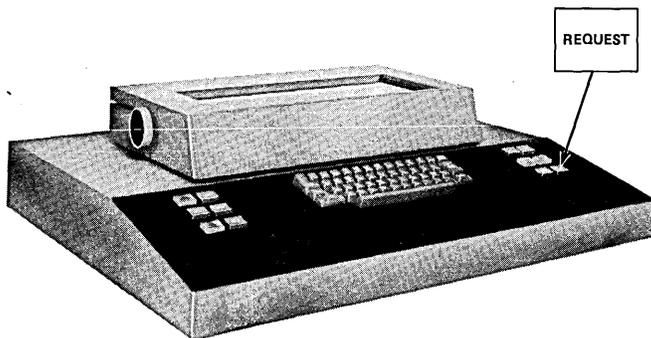
2 Reproduce this card, but leave these columns blank. In this case, SEREP goes into the wait state after loading. By causing a not-ready-to-ready interrupt on a device (or by operating the REQUEST key on the PR-KB), that device is assigned as a output device. No other operator action is required.

● After edit is complete, write the date and time on the first page of the logout.

80

Normal Program Waits

When no output device is specified, or the specified device is not ready, SEREP enters the wait state after loading.

Termination

When logout is complete or if no log is found, a message prints, and the system enters the wait state.
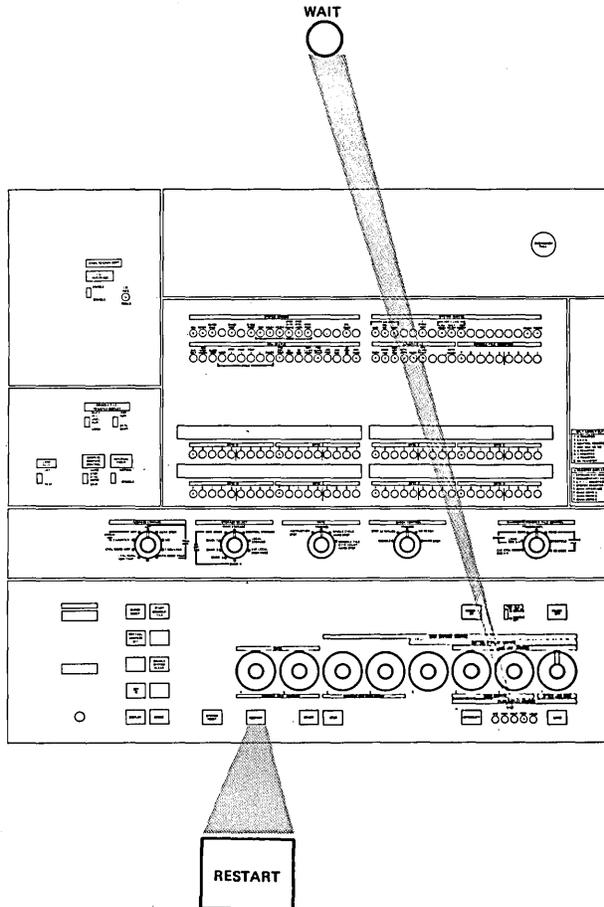
Error Waits

An unexpected program check during execution of SEREP causes a message to be printed and the system to enter the wait state. Retry is attempted by pressing the RESTART key. Re-IPL because alteration of PSWs by the SEREP program may cause the edit to be erroneous.

Operator's Notes:

INTRODUCTION

This section can assist you to determine whether a problem exists, and how to handle and report the specific type of error you encounter.

Operator investigation and reporting of abnormal situations reduces overall system down time. The following facilities are used to investigate abnormal situations.

1. Flowcharts (in this section)
2. PR-KB messages
3. System control panel switches and indicators
4. Automatic system checkout program (ASCP).

The flowcharts in this section can help you analyze problems that cannot be rectified immediately. These charts provide systematic checks that help identify a hardware problem from a software or operational problem.

When using the flowcharts, always start with the "Introductory Flowchart." This is an overview of the four major type problems that can be encountered. When used properly, it leads your to a specific problem flow.

You may be able to correct the problem yourself and thus eliminate system down time. Any information you gather can assist your service representative and shorten system down time.

The flowcharts may direct you to examine PR-KB messages or system indicators and switches. If you are directed to run ASCP, examine the reliability printout and relay all pertinent information to the dispatcher when you place a call for service.

HANDLING ABNORMAL SITUATIONS--INTRODUCTORY FLOWCHART

1. Comply with all OS, DOS, or OS/VS messages before
proceeding into flow. (Refer to appropriate SRL:
DOS, GC24-5074; OS, GC28-6631; OS/VS GC38-1001.)

Start

Cannot power system on

Cannot start any jobs

Cannot IMPL | **Cannot IPL**

Cannot power system on:

1. Check customer power source. (circuit breakers for CPU and I/O devices)
2. Retry power on.
3. If system power doesn't come up, report:
   a. Status of indicator
   b. Power-on failure
   c. Status of I/O Devices.

A

Power Problem
Page 86

Cannot IMPL:

1. Check that:
   a. PR-KB ready: not out of paper, etc.
   b. Console-file disk *370 is inserted properly.
2. Re-IMPL (press START CONSOLE FILE key).
3. If IMPL ok, IPL and process jobs.
4. If IMPL failed, see IMPL problem flowchart.

C

IMPL Problem
Page 88

Cannot IPL:

1. Check that:
   a. IPL device is ready.
   b. Address COMPARE CONTROL TOGGLE switch in SYNC/NORM position.
   c. All rotary switches in PROCESS positions.
2. Retry IPL (press LOAD key).
3. If IPL failed again, see IPL problem flowchart.

D

IPL Problem
Page 89

84

```
                          ┌──────────────────┐                              ┌──────────────────┐
─────────────────────────>│                  │                              │ Cannot power     │
                          │ Cannot continuously                             │ system off       │
                          │ run any jobs     │                              │                  │
                          └──────────────────┘                              └──────────────────┘
```

Wait State	Loop (SYS Indicator on)	Power or Thermal Check	System Check	
1. Check that PR-KB is ready and not out of paper. 2. Press STOP key (manual indicator should come on). 3. Check job setup and retry if possible. 4. If you return to wait state at same place in job, see OS or DOS SRL for wait messages. 5. If SRL provides corrective information, use it and continue with flowcharts.	1. Press STOP key. Manual indicator comes on. If it does not, run ASCP and save results. 2. Check job setup and retry if possible. 3. If you entered the same loop again, see SRL OS or DOS "Loop Messages."	1. Record all indicators, and try to reset the check with CHECK RESET key. 2. For therm check, "Power or Thermal Check Recovery," page 8. 3. Retry power on. 4. If POWER/THERM CHECK came back on, see power problem flowchart.	1. Record all error indicator(s). 2. Record the low 16 bits of the M-reg by using DPLY ASMBLR OUT roller switch, position No. 1. 3. Continue with flowcharts.	1. Check that: a. Blowers have stopped (5-min delay). b. Color of POWER ON key. 2. Report: a. Power-off failure. b. Status of indicator.

```
        E                          A              F               G                B
Wait State Problem         Power Problem   System Check    System Check     Power Off
Page 90                    Page 86         Problem         Problem          Problem
                                           Log Pres Ind    Log Pres Ind     Page 87
                                           On-Page 91      Off-Page 92
```

Note:
The power-on sequence
takes approximately
45 seconds.

Page 84/85

A

POWER
Check Indicator
On

Yes → Press CHECK RESET Key

No → 1. Check customer CPU power source. Reset circuit breakers if necessary.
2. Check all I/O device power sources.

Press POWER ON Key

POWER
Check Indicator
On

No

Yes

THERM
Check Indicator
On

Yes → Wait 5 Minutes

Press CHECK RESET Key

THERM
Check Indicator
On

Yes

No

No → Press CHECK RESET Key

POWER-ON
Key Indicator

Red or Off

White

START
CONSOLE FILE
Key Indicator

Red or White → C

IMPL
Page 88

Note:
IMPL takes about 35 seconds.

Off

Power-On
Complete

POWER
Check Indicator
On

Yes

No → Press POWER ON Key

Report:
1. Power Failure
2. Status of Indicators
3. Status of all I/O Devices

POWER ON Key Indicator

Red or off

White

Power-On
Complete

Page 85

B

Press CHECK
RESET Key

POWER
ON Key
Indicator — White

Off

POWER
Check Indicator
On

No — Yes

Blowers stopped
within 5 minutes — No

Yes

POWER
ON Key
Indicator — Red

Off

Power-Off
Complete

Report:
1. Power-off problem
2. Status of all indicators

IMPL Problem

PR-KB Message

- No Message →
- GO—NO—GO FAILED →
- GO—NO—GO COMPLETE, With IMPL REQ Indicator On ↓

Left branch (No Message):

See Note:

Check:
1. PR-KB ready, no INTVN REQD
2. *370 console-file disk inserted correctly
3. DIAG/CONSOLE FILE CONTROL switch in PROCESS/IMPL and ADDRESS COMPARE CONTROL switch in SYNC/NORM

→ (1) →

Press START CONSOLE FILE key

↓

PR-KB Message
- GO—NO—GO FAILED, or No Message →
- GO—NO—GO Complete ↓

IMPL REQD Indicator
- On →
- Off ↓

Load Patch Cards If Required, As Per PR-KB Message

↓

(Perform IPL)

Center branch (GO—NO—GO COMPLETE, With IMPL REQ Indicator On):

Re-insert *370 Console File Disk

↓

Press START CONSOLE FILE Key

↓

PR-KB Message
- GO—NO—GO FAILED, or No Message →
- GO—NO—GO Complete ↓

IMPL REQD Indicator
- On →
- Off ↓

(Perform IPL)

Report:
1. IMPL Failure
2. Status of Indicators

Right branch (GO—NO—GO FAILED):

Any CONSOLE FILE Check Indicator On
- Yes →
- No ↓

START CONSOLE FILE Key Red
- Yes →
- No ↓

DIAGN STOP Indicator On
- Yes → (1)
- No ↓

Check:
1. CONSOLE FILE CONTROL switch in PROCESS/IMPL
2. ADDRESS COMPARE CONTROL switch in SYNC/NORM

↓

Press START CONSOLE FILE Key

↓

PR-KB Message
- GO—NO—GO FAILED, or No Message →
- GO—NO—GO Complete ↓

IMPL REQD Indicator
- On →
- Off ↓

(Perform IPL)

Note:
If PR-KB is not ready during an IMPL operation, the AUDIBLE ALARM sounds to indicate GO—NO—GO messages.

D

PR-KB
Message — Yes → Refer to OS/DOS SRL
for appropriate action

No

LOAD
Indicator — On →

Off

Check:
1. SYS RES device ready
   ENABLE/DISABLE
   switch in ENABLE.
2. Address set in switches
   F, G, and H.
3. Correct SYS RES pack
   mounted on IPL device

On ← MAN
Indicator

Off

1. ADDRESS COMPARE CONTROL
   switch in SYNC/NORM.
2. Rotary switches in PROCESS

WAIT
Indicator — On → ①

Off

Yes ← SYS RES Device,
and Rotary Switches
Ok

No

All switches
set
correctly — Yes →

No

Take storage
dump if possible

1. Select new SYS RES device;
   set ADDR in switches F, G,
   and H.
2. Report the defective I/O
   device at this time

Correct Problem

Run ASCP

Note: Move SYS RES
pack only once

Perform IPL

Report:
1. IPL Failure
2. Save ASCP Results

Perform IPL

①

PR-KB must
be ready

For "Low-Core Error
Message Procedure" refer to
to appropriate OS or DOS
Operator's Guide

Page 85

E

Check PR-KB for READY
(No INTVN REQD)

Be sure that console keys
and switches are in normal
operating position

Press STOP Key

MAN
Indicator
On

Yes

No

Second
time through
chart

No

Yes

Check for PSW
wait codes or
low-core messages

Perform IMPL, then IPL

Run ASCP

For Operator
Communication Messages,
see appropriate SRL:
OS—GC28-6631 or
DOS—GC24-5074 or
OS/VS—GC38-1001

Continue processing

Report:
1. Wait State Problem
2. Save ASCP Results

Page 85

F

Use SRL low-core
error byte informa-
tion if usable

For DOS — Can four low-order bytes
be used for SRL message?
See GC24-5074.

For OS — Can twelve low-order bits
of PSW be used for SRL
message? See GC28-6631.

Set CHECK CONTROL
rotary switch to
PROCESS position

Run SEREP
stand alone, and
save results

See SEREP
operating procedures
page 79

Run ASCP

See " ASCP Operating
Procedures," page 70

ASCP
Results Indicate

System
still usable

Excessive Failures

RE—IMPL

Perform IPL

Report:
1. System Check
Indication
2. Save ASCP
Results

Page 85

G

Record:
1. Error indicator(s)
2. Sixteen low-order bits of
   M-register using DPLY
   ASMBL OUT roller
   switch, position 1

Record and Save:
Contents of MCKA register
using roller 1 position 8

Run ASCP ── ── ── See "ASCP Operating
                   Procedure," page 70

ASCP
Results Indicate

System still
usable

Excessive
Failures

RE-IMPL

Perform IPL

Report:
1. SYSTEM CHECK
   Indicators
2. Save ASCP
   Results

INTEGRATED FILE ADAPTER (IFA)

Operating procedures for the direct access storage devices that attach to the Integrated File Adapter Feature are described in the Operating Procedures Manual for each specific device. For a listing of these manuals, see the *IBM System/360 and System/370 Bibliography*, GA22-6822.

CHANNEL-TO-CHANNEL ADAPTER (CTCA)

A description of the indicator and switch used with CTCA is found on page 24. The operating procedures are found on the following pages:

● A description of the CTCA can be found in *IBM System/370 Model 145 Functional Characteristics*, GA24-3557.

EMULATORS

Two emulators are available:

1. IBM 1401/1460, 1440
2. IBM 1401/1460, 1440 and IBM 1410/7010

Operating procedures for the system being emulated and operator messages associated with these features are described in the publication for the program being used. For a listing of these manuals, see the *IBM System/360 and System/370 Bibliography*, GA22-6822.

INTEGRATED STORAGE CONTROL (ISC)

A description of the indicators and switches used with ISC is found on page 25.
   The operating porcedures for ISC are found on the following pages:

● A description of the ISC feature can be found in *IBM System/370 Model 145 Functional Characteristics*, GA24-3557.

GLOSSARY

Automatic System Checkout Program (ASCP): A stand-
alone program used for system diagnosis.

hard stop: A stop in which the CPU clock is stopped.
No interrupts can be handled and the CLOCK STOP
indicator is on.

Initial Microprogram Load (IMPL): An operation that
provides for loading the control storage area with the *370
microporgram or diagnostic programs.

logical address: The calculated effective address of an
operand formed by B + X + D.

loop*: A sequence of instructions that is executed
repeatedly until a terminal condition prevails.

real address: The actual physical address in main storage.

Soft stop: A stop in which the CPU clock continues to
run. Interrupts and timer updates are handled if re-
quested and the MAN indicator is on.

System Error Record Editing Program (SEREP):
A standalone program used on error conditions to
edit and print hardware logout information from
main storage.

Wait State: (1) The condition of a task that depends
on one or more events in order to enter the ready condi-
tion. (2) The condition of a central processing unit when
all operations are suspended.

*American National Standard Definition

READER'S COMMENT FORM

Operator's Library: IBM System/370 Model 145 Operating Procedures   GC38-0015-2

- Are you able to find information in this publication easily?

- Are the illustrations adequate, clear, and concise?

- Which of the following are included in your occupational responsibilities?

  System operating . . . .

  Programming . . . .

  Supervising . . . .

  Instructing . . . .

  Maintaining . . . .

  Other . . . .

- We would appreciate your comments; please give specific page and line references where appropriate.

Reply Requested?

Yes ☐

No ☐

NAME . . . .

STREET . . . .

CITY . . . .

STATE . . . . . . ZIP CODE . . . .

GC38-0015-2

Fold   Fold

Fold   Fold

Cut Along Line

Operator's Library: IBM System/370 Model 145 Operating Procedures Printed in U.S.A. GC38-0015-2

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