Systems

IBM System/370 Model 145 Operating Procedures

IBM

Systems

IBM System/370 Model 145 Operating Procedures

This manual contains reference material and operating procedures required to operate the IBM System/370 Model 145 Processing Unit and the following integrated attachments.

Console File
Console Printer-Keyboard

The reader is assumed to have a basic computer knowledge and previous operating experience on a similar system. Order numbers for manuals containing operating procedures for individual input/output devices. and 1400/7010 Emulators can be found in the *IBM System/360 Bibliography,* GA22-6822.

IBM

PREFACE

This publication is a graphic presentation of the operating procedures for the IBM System/370 Model 145 Processing Unit. This manual is divided into five major sections.

- Introduction

- Console Indicators, Switches and Keys

  Describes the console indicators, switches, and keys. Only information required by the operator is contained in this section.

- Printer-Keyboard

  Describes the mechanical features of the PR-KB and contains information required by the operator for normal PR-KB operation and maintenance.

- Operating Procedures

  Describes general operation, system initialization and error procedures required by the operator for normal system operation.

- Features

  Provides reference information on the integrated file adapter and available emulators.

  This manual is intended as a reference document for operators. The operator is assumed to have a basic knowledge of System/360 operating procedures.

First Edition (September, 1970)

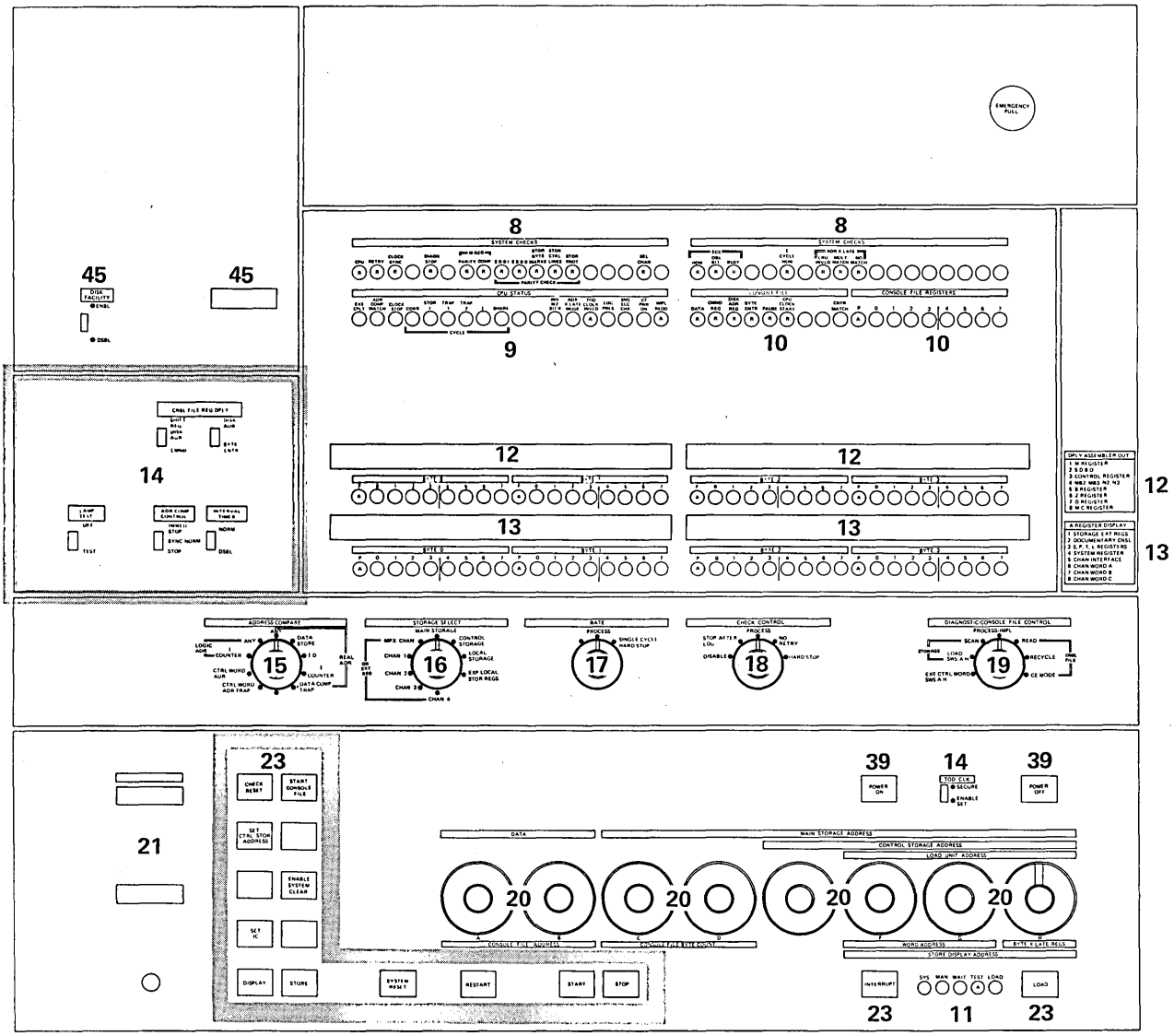
Changes are periodically made to the information herein; refer to the latest SRL Newsletter for the editions that are applicable and current.

Requests for copies of IBM publications should be made to your IBM representative or to the IBM sales office serving your locality. This manual has been prepared by the IBM Systems Development Division, Product Publications, Department 171, P.O. Box 6, Endicott, N.Y. 13760. A form for readers' comments is provided at the back of the publication. If the form has been removed, comments may be sent to the above-mentioned address.

VISUAL CONTENTS

This visual contents provides a quick method of finding page numbers for descriptions of indicators, switches, and keys on the system control panel.

Operating procedures using these indicators, switches, and keys are located in the operating procedures section of this manual.

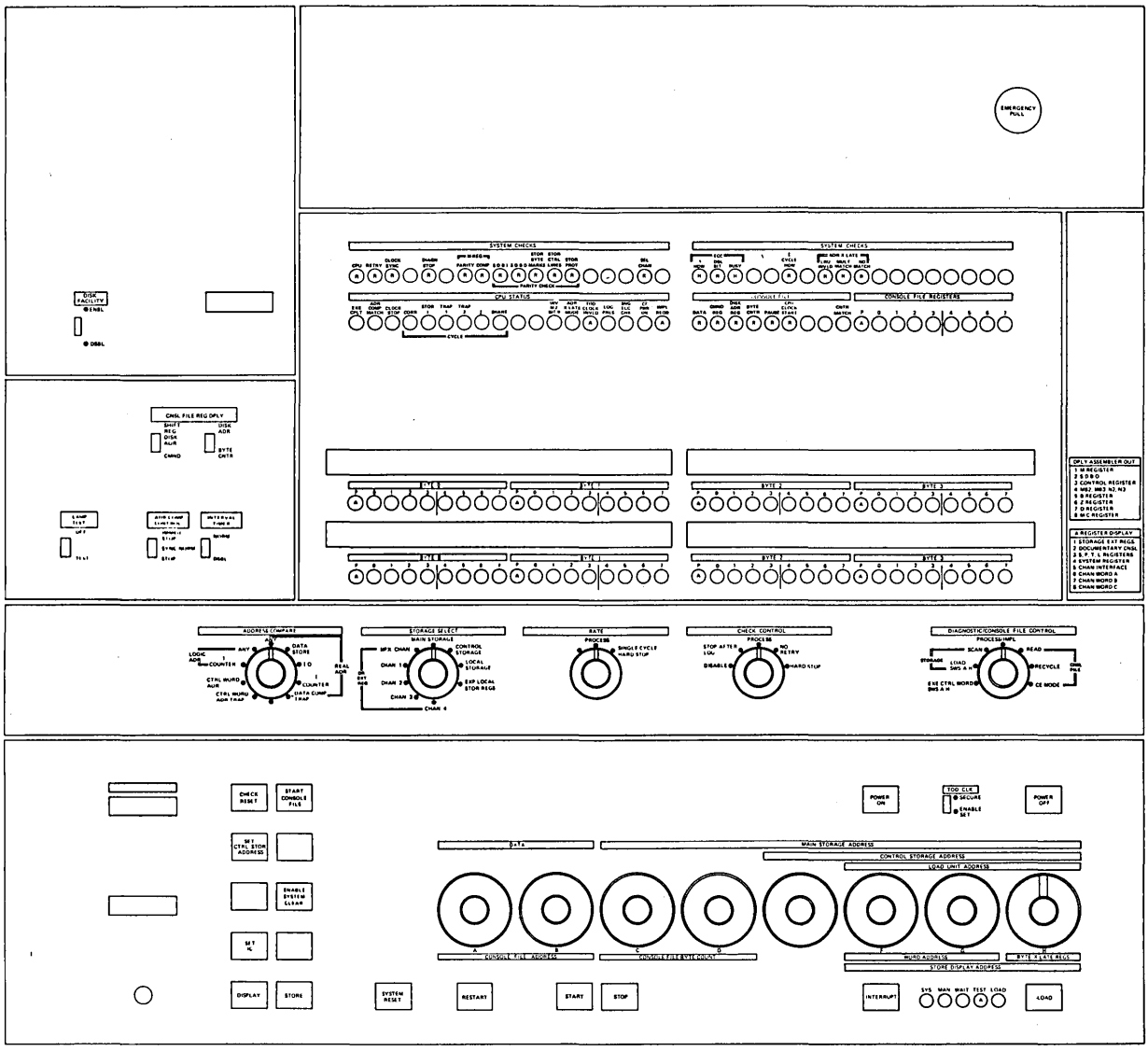


CONTENTS

ABBREVIATIONS

ADDR	Address
ASCP	Automatic System Checkout Program
CF	Console File
CPU	Central Processing Unit
DIAGN	Diagnostic
EPO	Emergency Power Off
EXE	Execute
GP	General Purpose
IC	Instruction Counter
IMPL	Initial Microprogram Program Load
INTV REQD	Intervention Required
I/O	Input/Output
IPL	Initial Program Load
MAN	Manual
PR-KB	Printer-Keyboard
PSW	Program Status Word
SDBO	Storage Data Bus Out
SYS	System
TOD CLK	Time of Day Clock

SYSTEM/370 MODEL 145 CONSOLE



INTRODUCTION

This is a graphic operating procedures manual. It contains only information necessary to operate the System/370 Model 145 Processing Unit and integrated devices.

Order number for manuals containing operating procedures for individual input/output devices can be found in the *IBM System/360 Bibliography,* GA22-6822.

This manual covers information required by the operator for normal system operation. An effort was made to eliminate unnecessary information. Controls and indicators used only by service personnel are not described in this manual but 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 Program Load (IMPL) disk contains the microprogram and is inserted into the Console File before power is applied to the system.

When power is applied to the system, the microprogram is loaded into control storage and the system is ready to load the operating system (OS, DOS, etc.) or a standalone program. These programs are loaded by using the Initial Program Load (IPL) procedure in this manual.

Operating procedures that are 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)

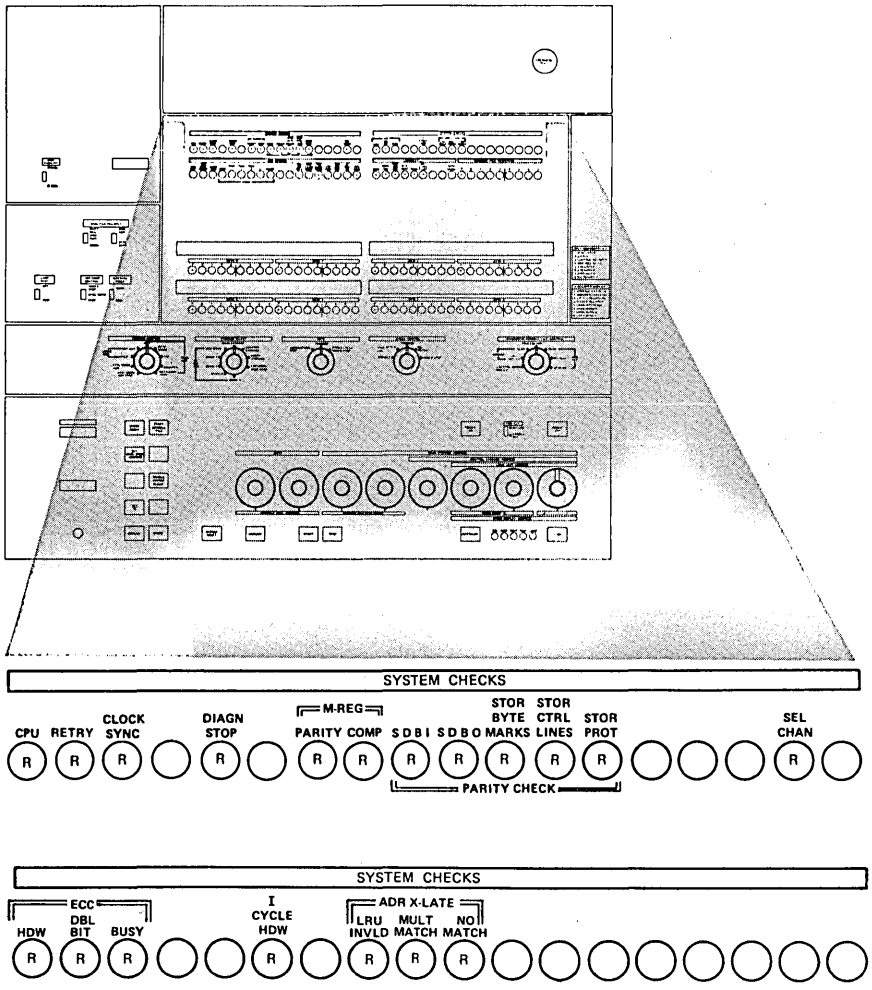
Whenever power is removed from the system these procedures must be followed. When power is dropped, both control storage and main storage are invalid.

A visual contents is provided to aid in quickly locating controls and indicators on the system control panel.

To evaluate the approach used in this manual, you are encouraged to use the Reader's Comment Form in the back of the manual. Your comments will help to provide better documentation in future manuals.

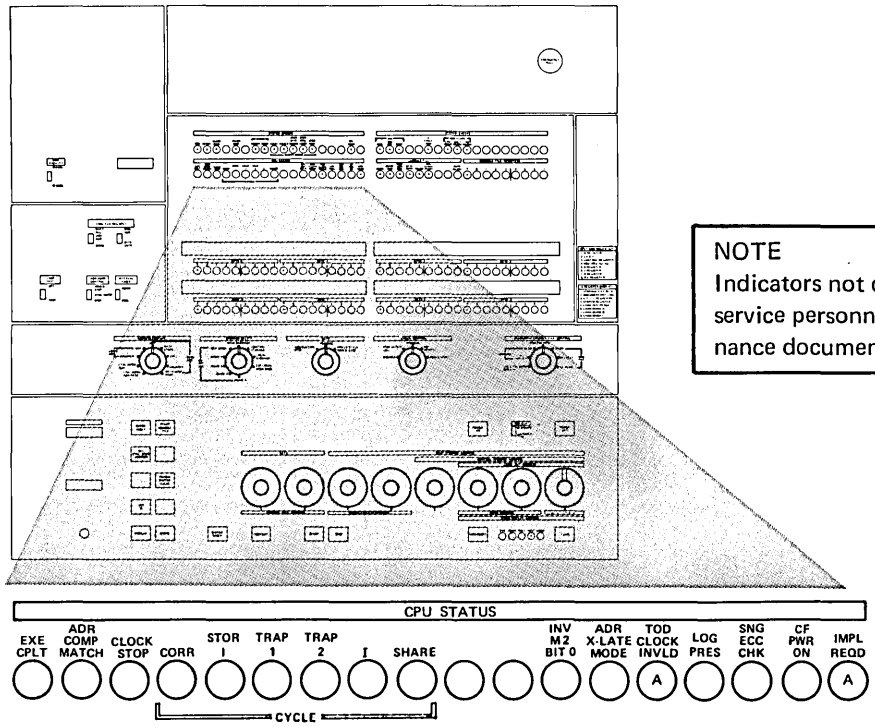
CONSOLE INDICATORS, SWITCHES, and KEYS

SYSTEM CHECK INDICATORS



If a system check indicator is on, refer to the system check error recovery procedure.

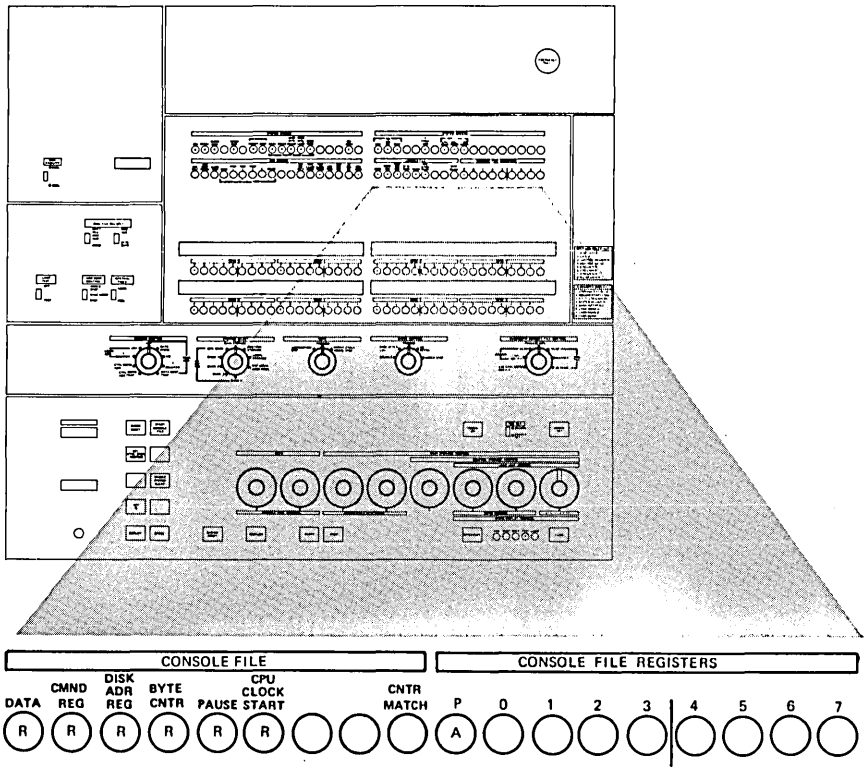
CPU STATUS INDICATORS



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

INDICATOR	CONDITION
EXE CPLT	Indicates CPU stopped state reached as a result of: 1. Pressing the STOP key. 2. The RATE switch in the INSTRUCTION STEP position. 3. A match being detected while in the address match mode of operation.
ADR COMP MATCH	Indicates that 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	Indicates that the CPU is in an immediate stop condition (CPU clock not running).
TOD CLOCK INVLD	Indicates that the time-of-day clock is invalid. The indicator is turned off by successfully executing a set clock instruction.
LOG PRES	Indicates that 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, run SEREP.
SNG ECC CHK	Indicates that one of the data or check bits from storage has been corrected.
CF PWR ON	Indicates that power is applied to the console file.
IMPL REQD	Indicates that an operation which resulted in a system reset has been initiated. The indicator is turned off when the system reset routine is executed. An IMPL is required if the indicator remains on.

CONSOLE FILE INDICATORS



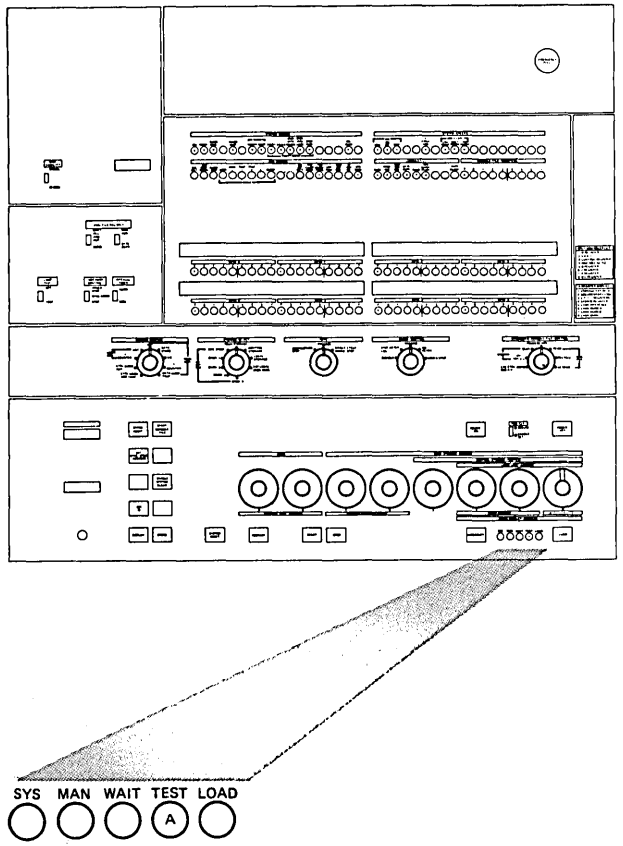
Console File Checks

Re-IMPL when any console file check indicator is on. If the error continues, record the indicators and notify your service representative.

Console File Register

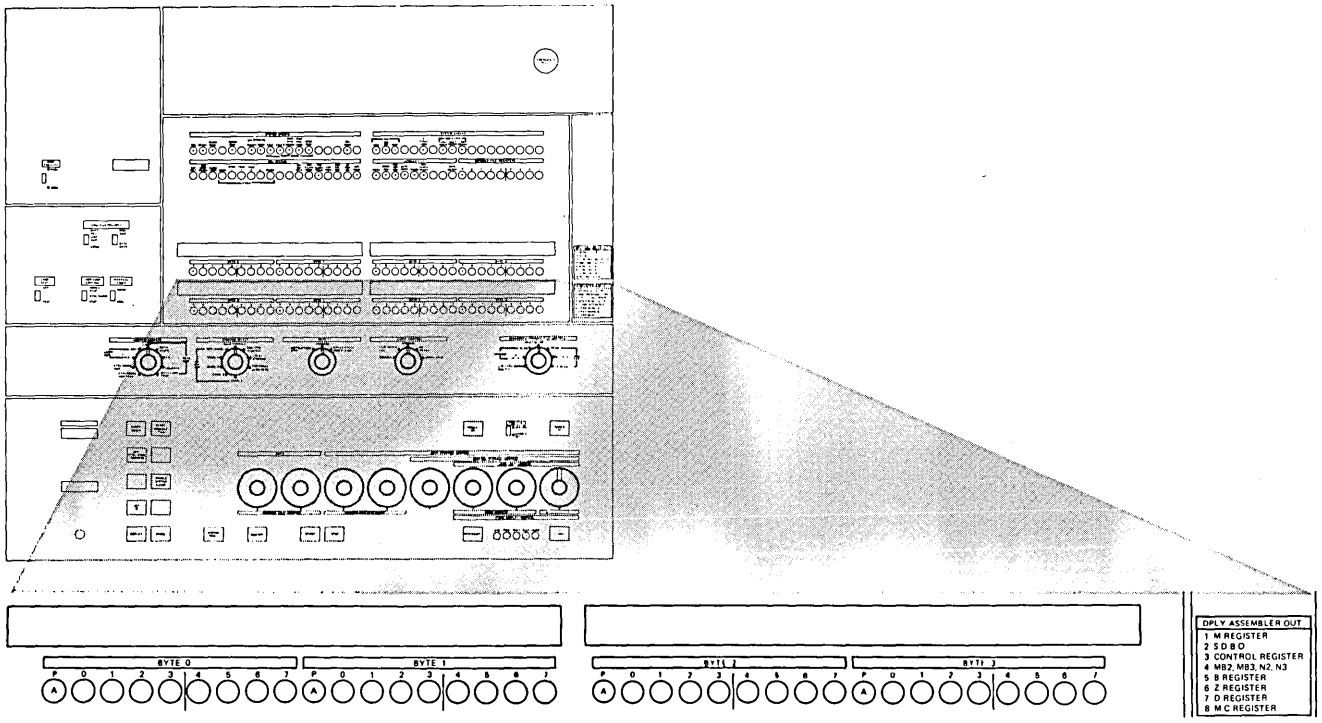
These indicators are used by service personnel.

SYSTEM INDICATORS



INDICATOR	FUNCTION
SYSTEM	The SYSTEM indicator is on when CPU operations are in progress and either use meter is running.
MANUAL	The MANUAL indicator is on when the 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 MANUAL indicator is on.
WAIT	The WAIT indicator is on when the 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	The TEST indicator is on when 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	The LOAD indicator is on when the Initial Program Load (IPL) is in progress. It turns on when the LOAD key is pressed and turns off when the initial PSW is loaded successfully.

DISPLAY ASSEMBLER OUT ROLLER SWITCH



The DISPLAY ASSEMBLER OUT roller switch provides a full-time display of the following.

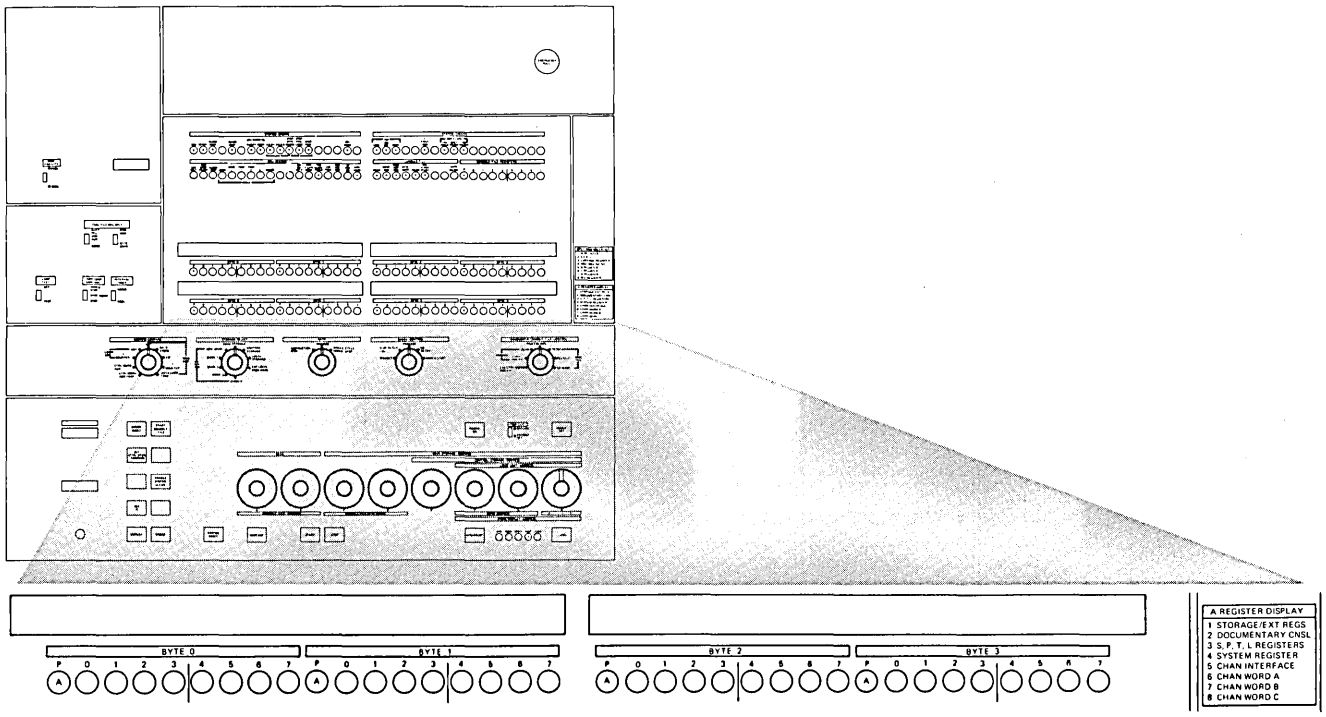
ROLLER POSITION	INFORMATION DISPLAYED			
	Byte 0	Byte 1	Byte 2	Byte 3
1	Note 1	Note 2	M-Register Bytes 1,2, and 3	
2	Storage Data Bus-Out			
3*	C-Register			
4*	MB-2	MB-3	N2	N3
5*	B-Register			
6*	Z-Register			
7*	D-Register			
8*	MCKA			

Note 1: Protect stack key associated with the address in bytes 1, 2, and 3.

Note 2: Displays the selected channel.

*Positions 3 through 8 are for service use.

A-REGISTER DISPLAY ROLLER SWITCH



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

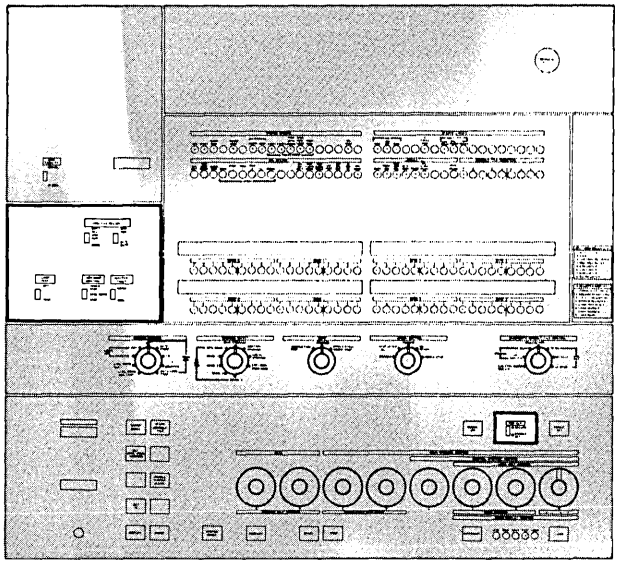
ROLLER POSITION	INFORMATION DISPLAYED			
	Byte 0	Byte 1	Byte 2	Byte 3
1	Storage or External Register (Store Select Sw)			
2*	TI-Register	TA-Register	TT-Register	TE-Register
3*	S-Register	P-Register	T-Register	L-Register
4*	System Register Bytes 0, 1, and 2			H-Register
5*	MPX Channel Registers or Selector Channel External Word GTAG			
6*	Channel Word A (External Word GSTAT)			
7*	Channel Word B (External Word GBS)			
8*	Channel Word C (External Word GBUF)			

Position 1 is described in the Store/Display section of this manual.

*Positions 2 through 8 are for service use.

When the CPU is in a soft-stopped state (MANUAL indicator on), the indicators display the next instruction address.

TOGGLE SWITCHES



Lamp Test

All console indicators should light when the LAMP TEST toggle switch is operated to the TEST position. The switch can be operated at any time without affecting system operation.

Interval Timer

NORMAL

This position enables the timer for use as described in the *IBM System/370 Principles of Operation,* GA22-7000.

DISABLE

This position disables the interval timer. The content of the timer is not available to the data flow for timer functions. Time location 80 (hexadecimal 50) in main storage is available for other program use.

Time of Day Clock

ENABLE SET

The switch must be in the ENABLE SET position for the set clock instruction to perform its function.

SECURE

Executing the set clock instruction with the switch in the SECURE position does not affect the clock value.

Address Compare Control

This switch is used with the ADDRESS COMPARE and the STORAGE SELECT rotary switches and determines the action taken by the CPU as a result of an address compare match.

SYNC/NORM

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

STOP

The STOP position is for customer use and 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.

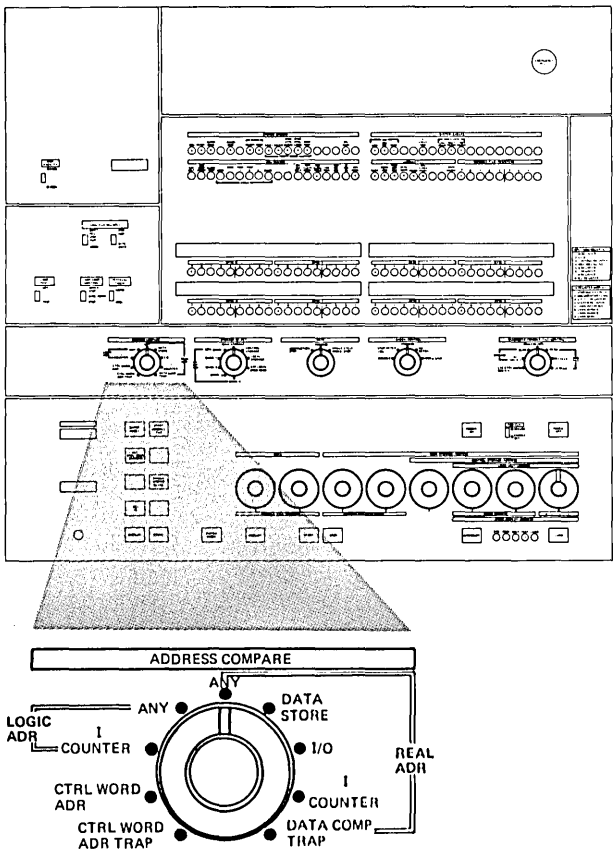
IMMED STOP

This position is for service use and is described in the 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 console 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.

Customer Use

ANY (Real Address)

This position of the switch is used 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 console switches CDEFGH.

DATA STORE

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

I/O (INPUT/OUTPUT)

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

I-COUNTER (Real or Logical Address)

This position causes a match when the real or logical main storage address matches the address in console switches CDEFGH, and the operation is an instruction fetch from main storage.

DATA COMPARE TRAP

This position is used to determine what instruction is causing a particular storage byte location to be modified. See the data compare trap procedure.

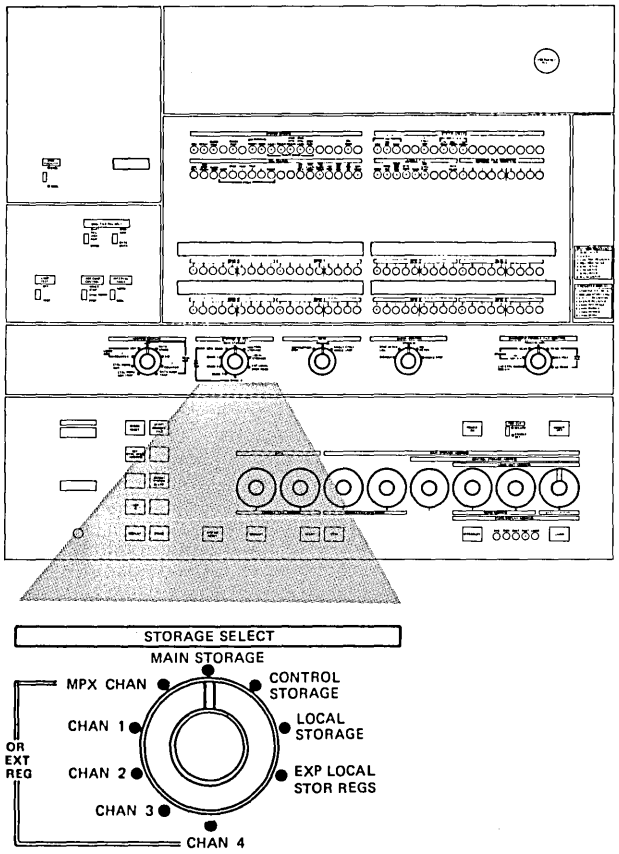
ANY (Logical Address)

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

Service Use

The remaining positions 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 the ADDRESS COMPARE switch and the ADDRESS COMPARE CONTROL toggle switch for address match functions.

Customer Use

MAIN STORAGE

This position of the switch is used for normal program processing and for manual store and display of main storage.

LOCAL STORAGE

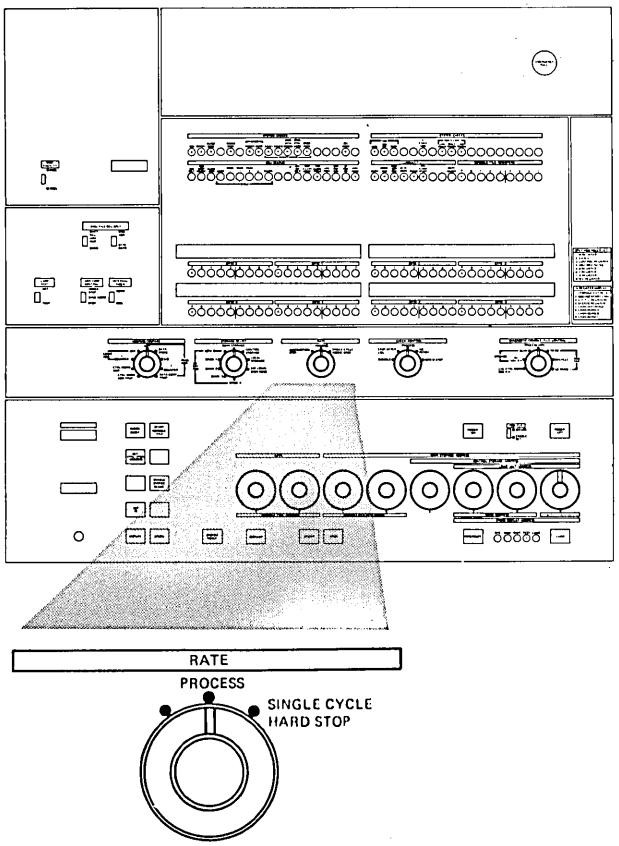
This position of the switch is used for manual store and display of General-Purpose and Floating-Point registers.

NOTE
Use the alter/display function of the PR-KB to alter/display main or local storage whenever possible.

Service Use

The remaining positions of the switch are for service personnel and are described in maintenance documentation.

RATE SWITCH



- The RATE switch controls the rate at which the CPU processes instructions.
- This switch, in any position other than PROCESS, causes the TEST indicator on the lower console panel to light.

Customer Use

PROCESS

This position of the switch is used for normal program processing.

INSTRUCTION STEP

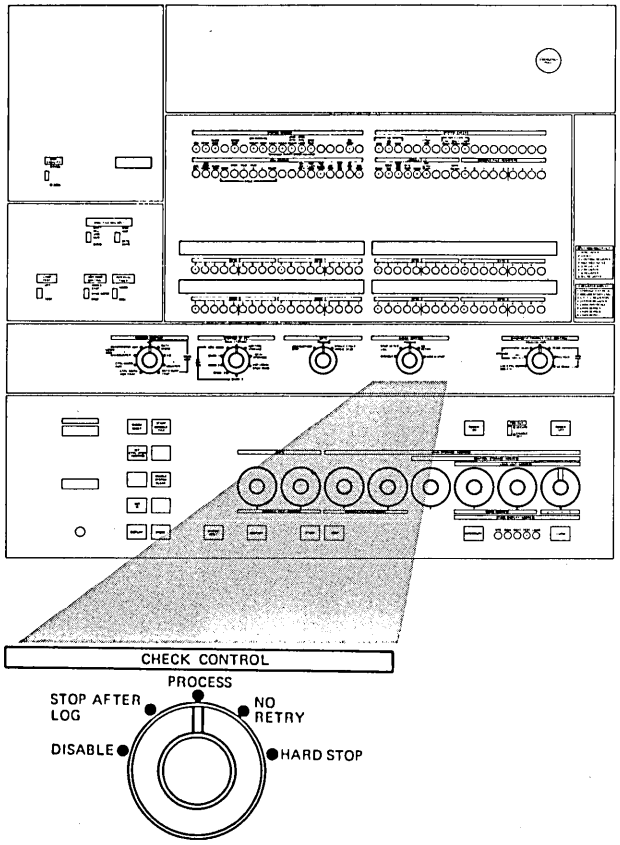
One complete machine language instruction (including all pending interrupts allowed by the system mask) is executed for each operation of the START key.

The machine enters the soft-stop state, and the EXE CPLT indicator is turned on.

Service Use

The remaining position of this switch is for use by service personnel and is described in maintenance documentation.

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, causes the TEST indicator on the lower console panel to light.

Customer Use

PROCESS

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

STOP AFTER LOG

This position of the switch is used 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 program storage (locations 128 through 704) stops processing and turns on the LOG PRES indicator. The diagnostic logout can contain information about a machine check, channel control check, or an interface check.

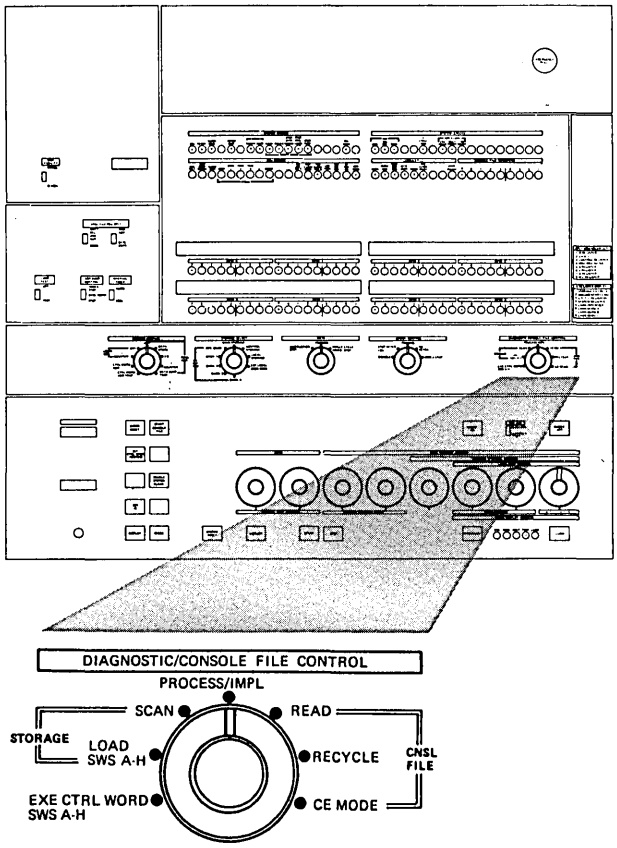
After a diagnostic logout, the operator runs the System Environment Recording and Edit Program (SEREP).

Service Use

The remaining positions of the switch are used by service personnel and are described in maintenance documentation.

NOTE
Programs using storage locations 128 through 704 are invalid after a diagnostic logout into program storage. To continue processing, the operator must re-IPL.

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, causes the TEST indicator on the lower console panel to light.

Customer Use

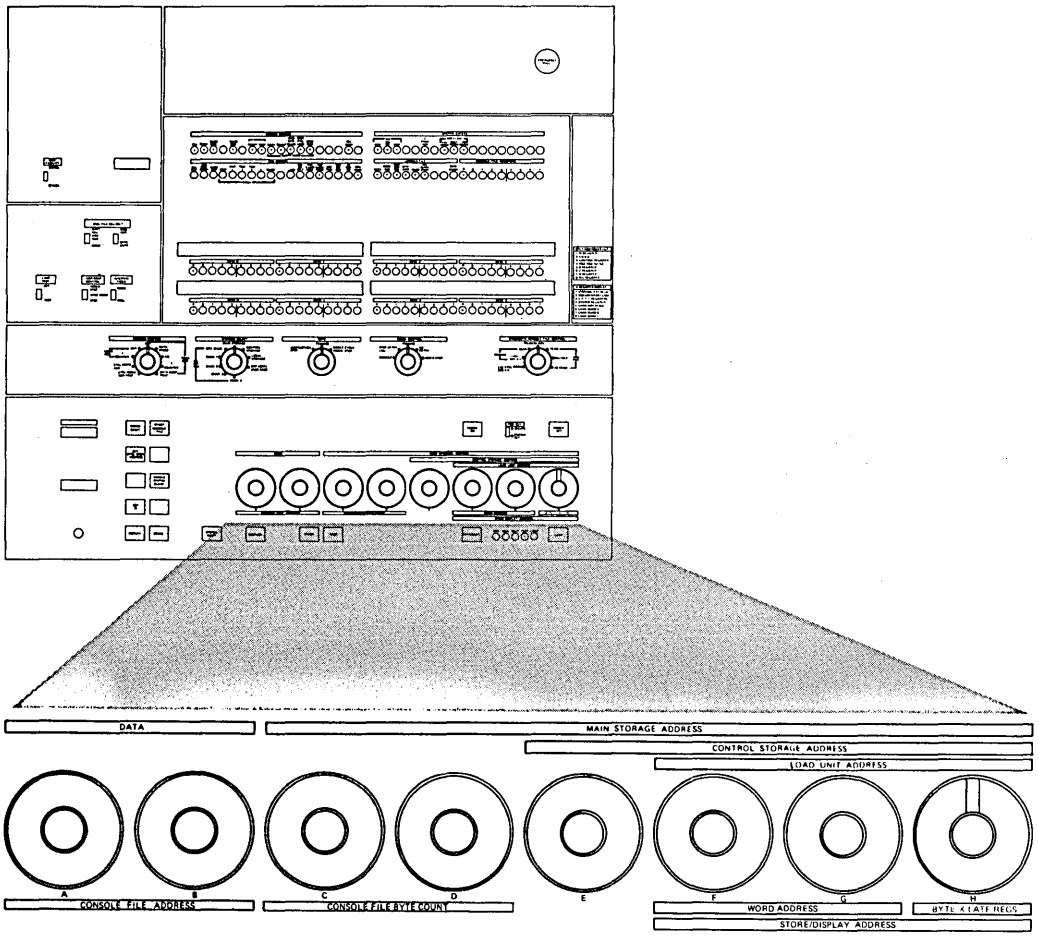
PROCESS/IMPL

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

Service Use

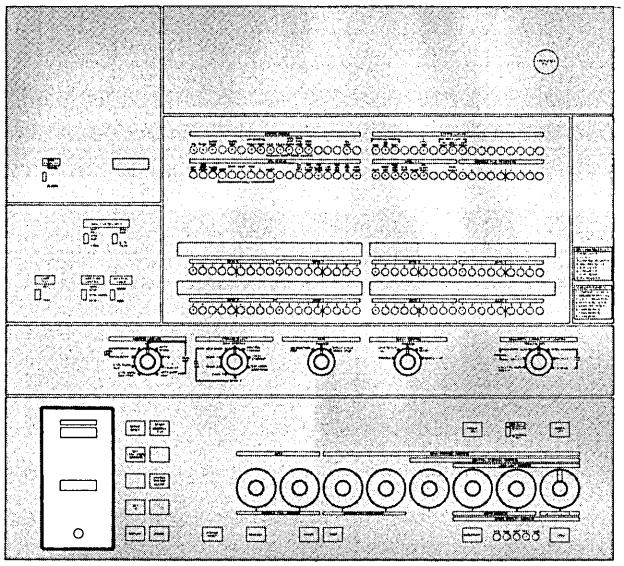
The remaining positions of the switch are for use by service personnel and are described in maintenance documentation.

ROTARY SWITCHES A THROUGH H



SWITCHES	LABEL	FUNCTION
AB	DATA	Specifies the value of data to be entered on manual store operations.
	CF ADDRESS	Specifies the track/sector address of the console file on certain diagnostic microprogram load operations.
CD	CONSOLE FILE BYTE COUNT	Provides a service function described in the 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	Used by service personnel to specify a control storage address for manual store/display and address compare functions.
FG	WORD ADDRESS	Used to display General-Purpose and Floating-Point Registers.
FGH	LOAD UNIT ADDRESS	Specifies the load-unit address for Initial Program Load (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

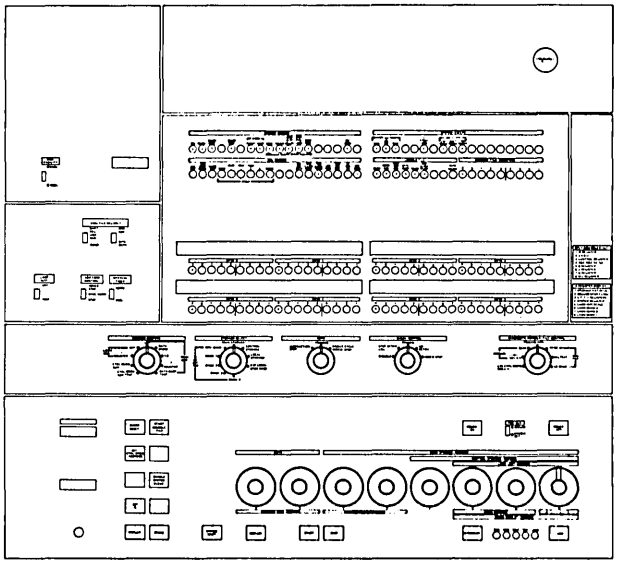
Key Switch

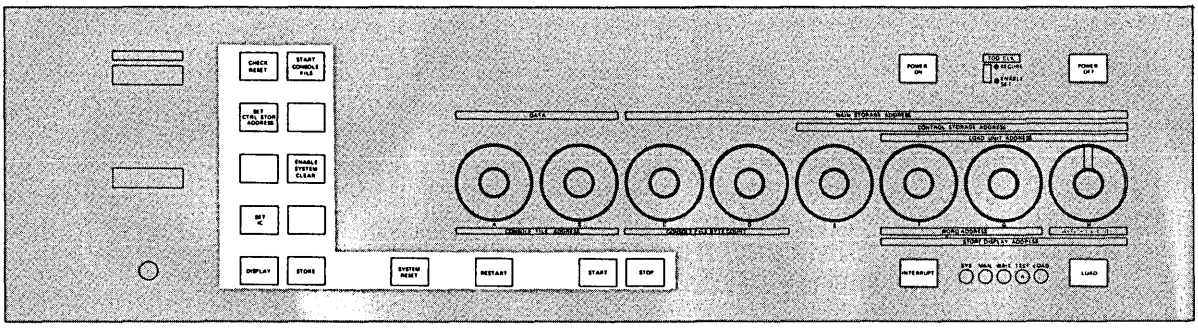
Two direct reading use meters record operating time. One meter records customer operating time and the other records service time. The position of the key switch determines which of the two meters is to record operating time. Your service representative has the key for this switch. Whenever he is performing scheduled or unscheduled maintenance in the CPU, he sets the switch to cause the service meter to run.

The meters record only CPU operating time. The meters run for manual store and display operations because these operations start the CPU clock. Either meter runs for a minimum of approximately one second each time the meter is started.

KEYS

The keys in this chart are further described in the operating procedures section of this manual.





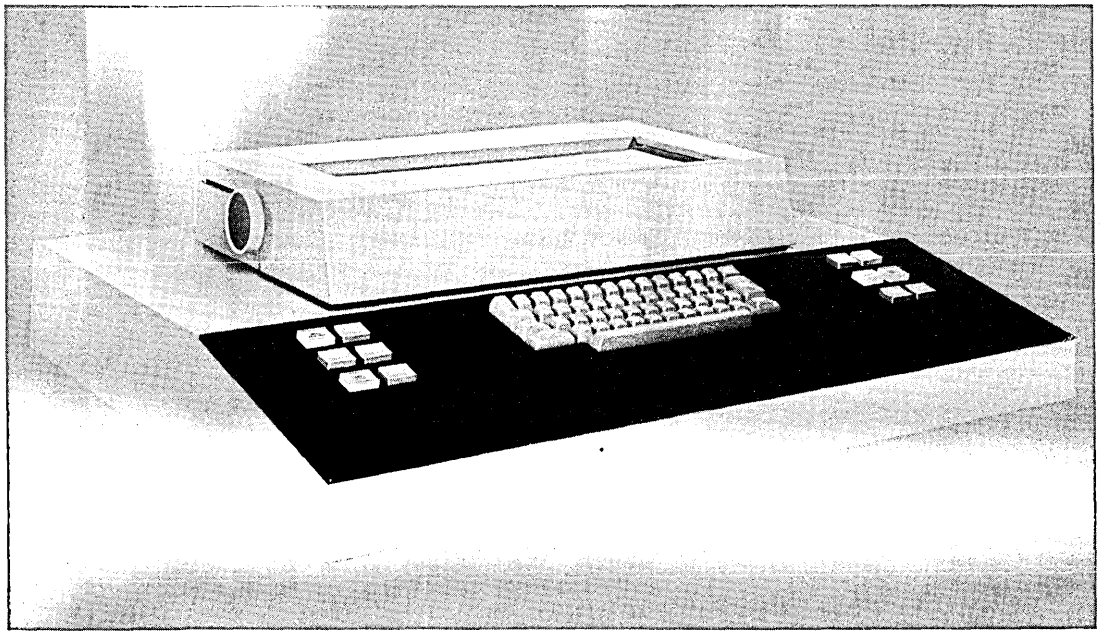
KEY	FUNCTION
CHECK RESET	Resets all machine check circuitry.
START CONSOLE FILE	Starts a console file read operation.
SET CONTROL STORAGE ADDRESS	Causes the value set in rotary switches EFGH to address control storage when the start key is operated. This is a service function.
ENABLE SYSTEM CLEAR	Used with SYSTEM RESET or LOAD key to clear program storage. See the Clear Storage Procedure.
SET IC	Loads the contents of switches CDEFGH into the instruction counter. Instruction processing starts from this address.
DISPLAY	Displays main storage, general-purpose registers, and floating-point registers. (See "Manual Store/Display Operations.")
STORE	Stores information into main storage or registers. (See "Manual Store/Display Operations.")
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 DIAGNOSTIC STOP indicator. A successful system reset turns off the IMPL REQD indicator and the system is in a soft-stop awaiting operator 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, the START key 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 Initial Program Load (IPL) operation.
POWER ON	Initiates a power-on sequence.
POWER OFF	Initiates a power-off sequence.

PRINTER-KEYBOARD

PRINTER-KEYBOARDS

The printer-keyboard (PR-KB) is an input/output device that provides alter/display and operator control functions.

3210-1 Console Printer-Keyboard



3215 Console Printer-Keyboard

PRINTER CONTROLS (3210)

Impression Control Lever

This lever is identified by its small red-ball handle, which 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. The operator can vary the density of print impression by placing the lever in the appropriate notch.

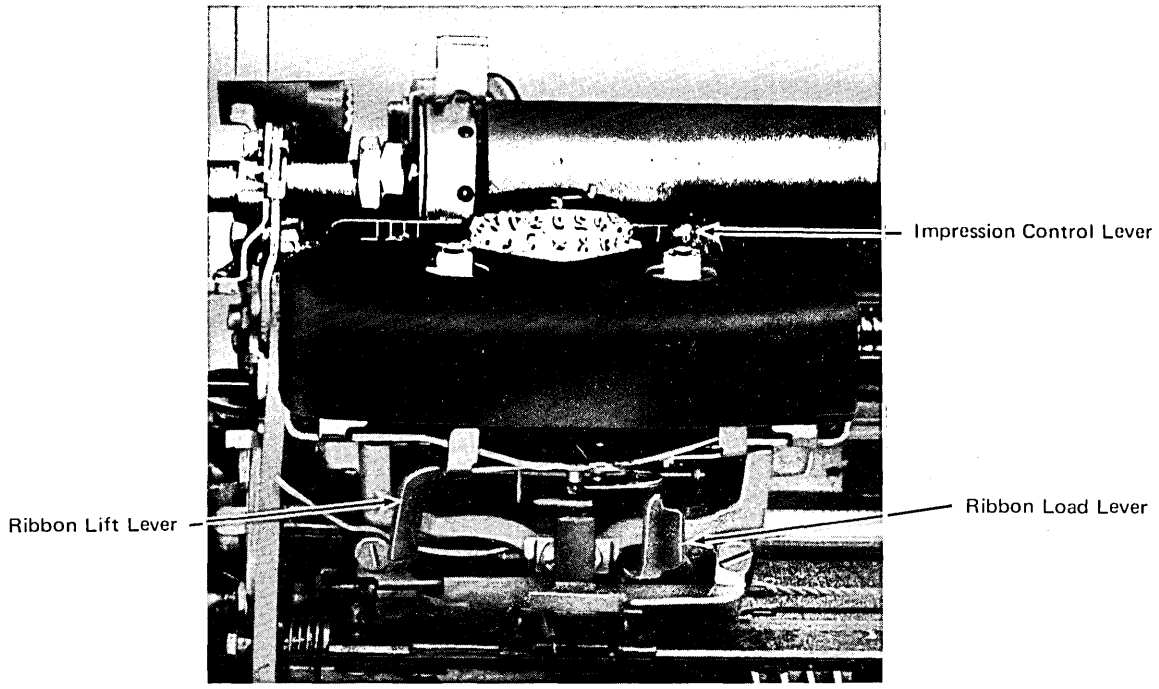
> NOTE
> When changing the position of the lever, first move it out of the notch before moving it forward or backward.

Ribbon Lift Lever

Provides for ribbon wear distribution by permitting the operator to 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

Raises the ribbon guide to a more accessible position for threading the ribbon. In its right-hand position, the lever latches to keep the ribbon guides raised.



CARRIAGE CONTROLS (3210 and 3215)

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.

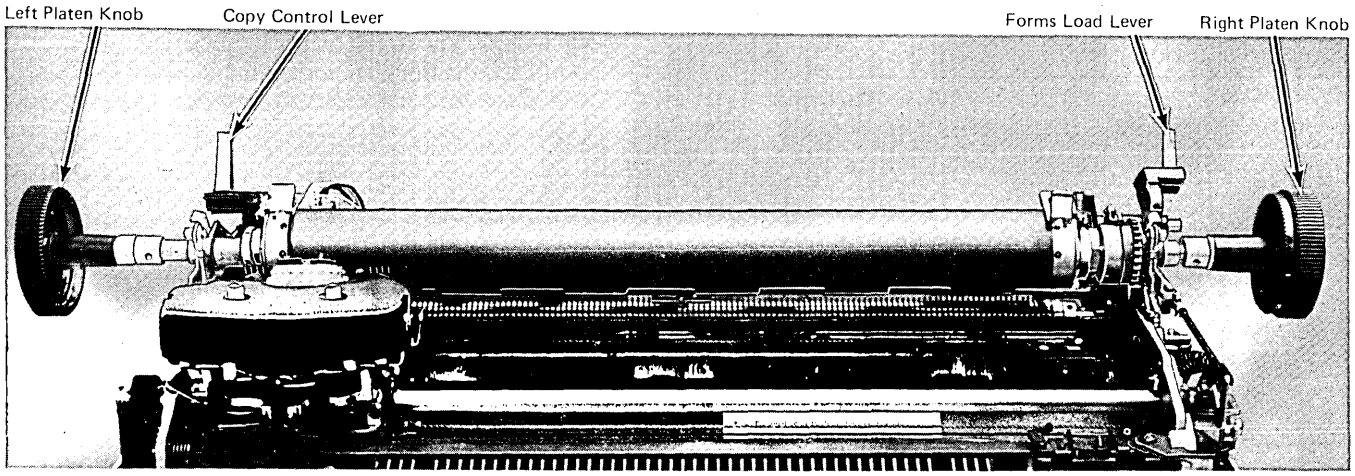
Copy Control Lever

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

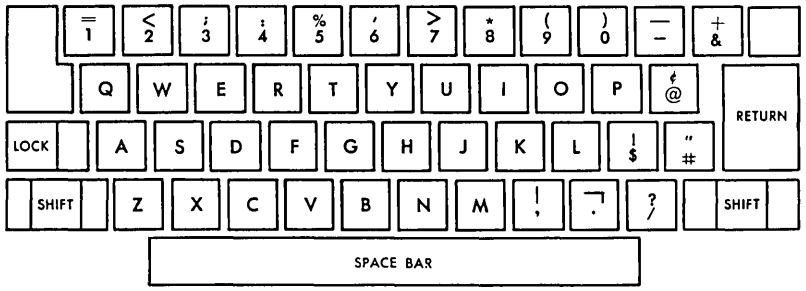
Platen Knobs

When either knob is rotated, the paper is indexed. 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.



CHARACTER AND FUNCTION KEYS (3210 and 3215)



Character Keys

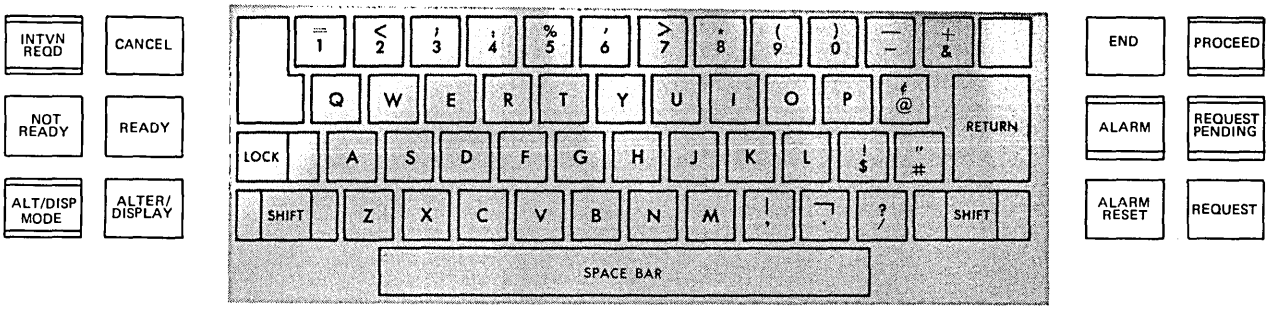
Forty-four character keys are provided. Upper or lowercase characters are determined by the SHIFT key.

Function Keys

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

INDICATORS AND CONTROL KEYS (3210 and 3215)

The following control keys and indicators are provided on the PR-KB.



Legend

INDICATORS KEYS

INDICATOR	CONDITION
INTVN REQD	The printer is out of forms or the PR-KB is not ready.
ALTER/DISPLAY MODE	A request for an alter/display operation was accepted.
ALARM	An alarm command was issued, and manual intervention is required by the operator.
PROCEED	The PR-KB is unlocked and ready to accept characters. This indicator is turned on by the ALTER/DISPLAY key, or by a read command.
REQUEST PENDING	A request operation was initiated. The indicator is turned off when the attention status is accepted by the CPU.

KEY	FUNCTION
NOT READY	Places the printer in a not ready condition.
CANCEL	Used to terminate a read command when the operator has made an error in data entry. Normally, the program will issue the same read command again.
READY	Places the PR-KB in the ready state when forms are in the printer.
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.
END	Terminates a read, write, or alter/display operation.
ALARM RESET	Resets the alarm indicator.
REQUEST	Requests the CPU to initiate a read command to the PR-KB. When programming, this allows the operator to enter data.

RIBBON REPLACEMENT

3210 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 extreme right.
4. Lift the ribbon cartridge straight 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 extreme left.

3215 Printer-Keyboard

- Use only 3215 ribbon cartridges in this machine; otherwise, the locating pin will be damaged.

To remove and replace a ribbon:

1. Press the NOT READY key.
2. Raise the top cover.
3. Remove the ribbon and cartridge.
4. Position the hole in the bottom of the cartridge over the 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 in the decal on the printer. 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.

A FORMS INSERTION (3210 and 3215)

- Do not use forms thicker than three part.

1. Place the forms on the lower rack of the forms stand.
2. Raise the top 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, making sure that the pins engage the margin holes in the forms.
7. Position the paper for correct vertical alignment of the first print line using the right platen knob.
8. Close the top cover.
9. Press the READY key.

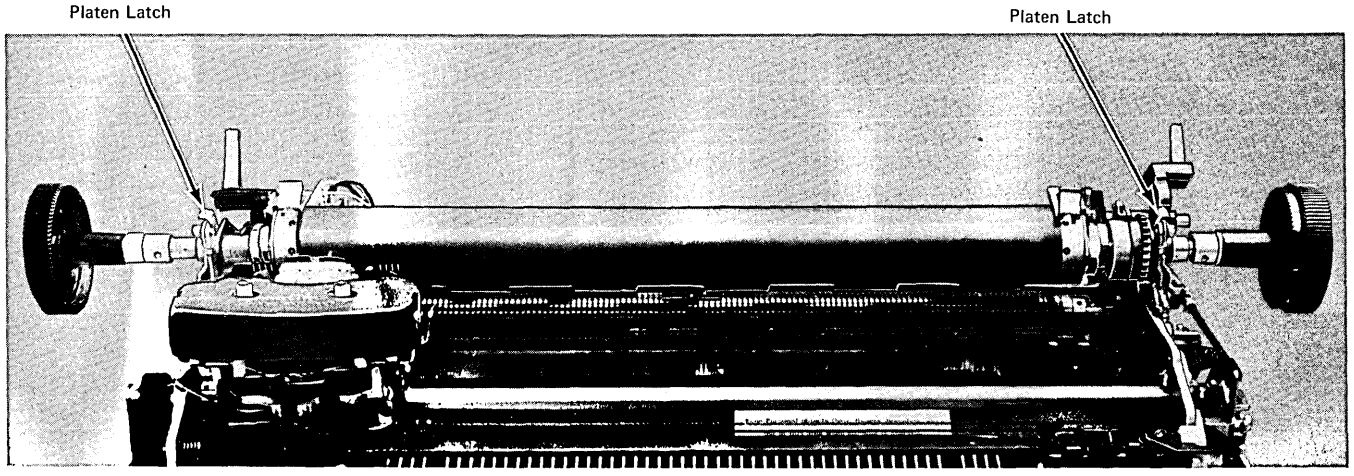
B PLATEN REMOVAL AND REPLACEMENT (3210 and 3215)

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.



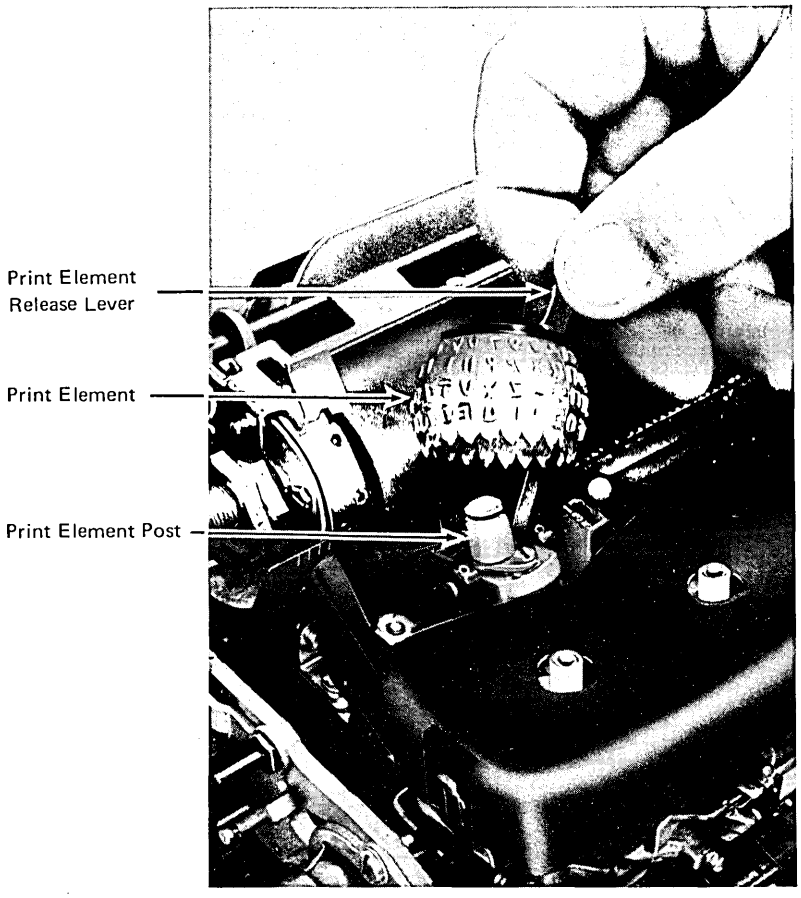
PRINT ELEMENT REMOVAL AND REPLACEMENT (3210)

Removal

1. Press the NOT READY key.
2. Raise the top 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 element post.

Replacement

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



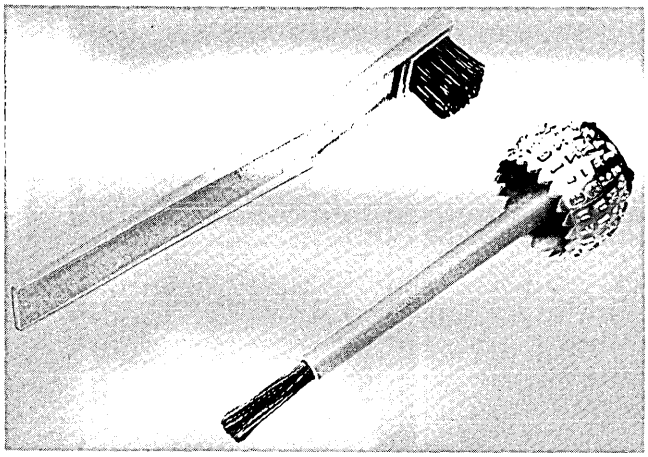
PRINT ELEMENT CLEANING (3210)

- Do not attempt to clean the 3215 wire matrix print element. Cleaning will be done as required by your service representative.

Brushes are supplied by IBM for cleaning the 3210 printers.

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



OPERATOR NOTES:

OPERATING PROCEDURES

A MAGNETIC DISK CARTRIDGE HANDLING

- Store the disk cartridges in the locations provided in the console file access door.
- Handle cartridges carefully because they contain information essential to system operation.
- Replace envelopes when they are defective.
- Keep the cartridge in its envelope when not in use.
- When the cartridge is in use, store the envelope in the storage compartment.
- Do not touch the exposed disk surface.
- Do not attempt to clean the disk surface.
- Keep the cartridge away from metallic materials and magnetic fields.
- Do not smoke when handling cartridges.

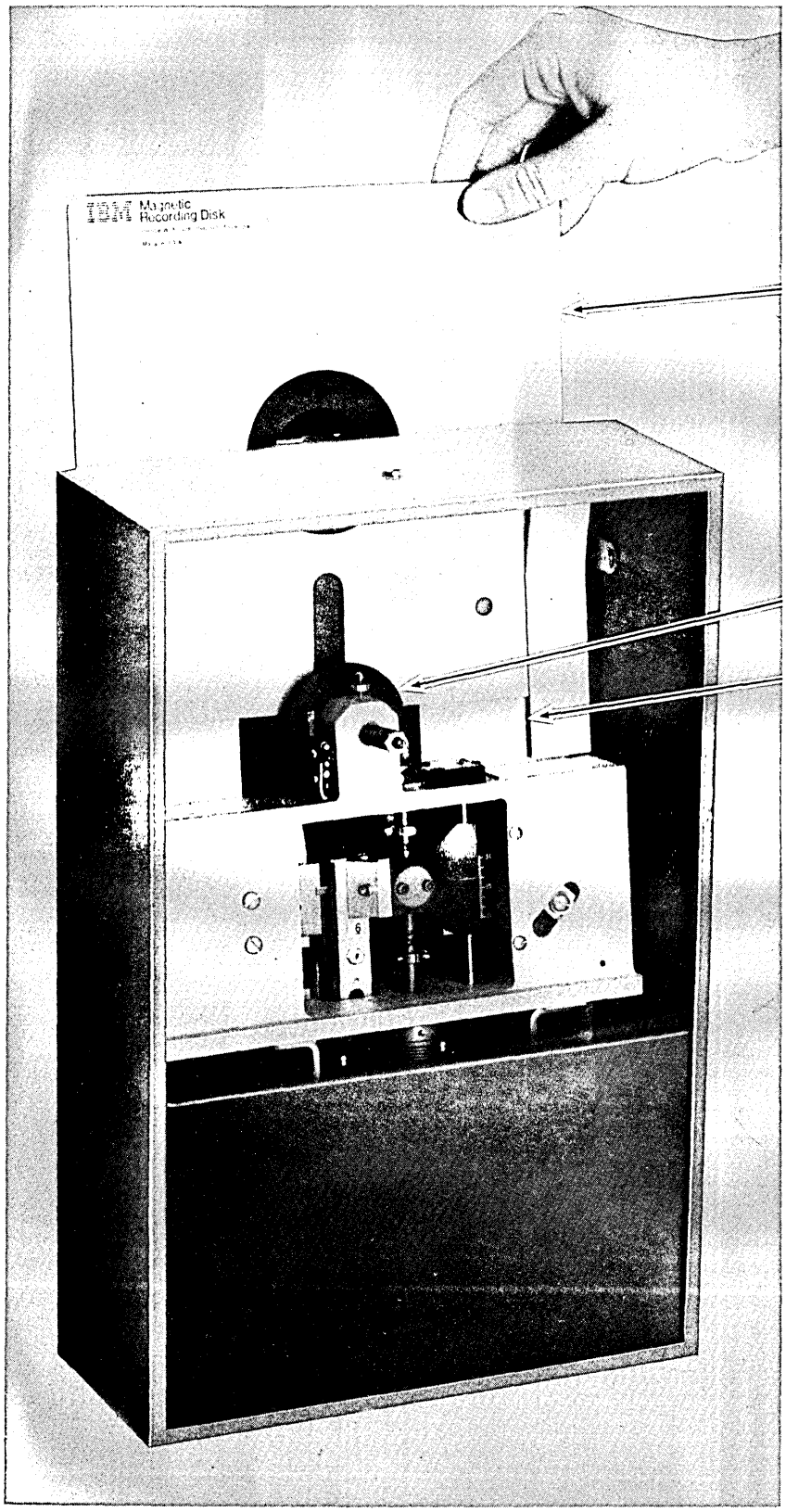
B DISK CARTRIDGE INSERTION AND REMOVAL

Insertion

1. Open the disk drive cover.
2. Remove the cartridge from its envelope and return the envelope to the storage compartment.
3. With the label facing you, lower the cartridge into the loading slots until it is stopped by the locating surfaces.
4. As a check on disk position, watch the centering cone as the cover is being closed. It should slide into the center of the disk without distorting the disk. If it does not, re-insert the disk.

Removal

1. Open the disk drive cover.
2. Lift the cartridge straight up and out of the console file.
3. Return the cartridge to its envelope and place it in the storage compartment.


IBM Magnetic Recording Disk
Disk Cartridge
Centering Cone
Loading Slot

PR-KB MANUAL OPERATIONS

Data Entry

During a program-controlled read operation, PROCEED is turned on when entry of data from the keyboard is required. This information is entered into the system by the operator. The operation is ended by pressing the END key.

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 inspection by the operator. The data is not changed.

Alter operations change the stored data.

Alter/Display Procedure

1. Press the CPU STOP key
2. Press the ALTER/DISPLAY key.
3. Wait for both ALTER/DISPLAY MODE and PROCEED to turn on.
4. Type the appropriate two-character mnemonic and address of the information or register to be altered or displayed from the following.

STORAGE AREA	ALTER MNEMONIC	DISPLAY MNEMONIC	ADDRESS RANGE
MAIN STORAGE	AM	DM	000000-03FFFF
STORAGE KEY	AK	DK	000000-03FFFF
GENERAL-PURPOSE REGISTER	AG	DG	0-F
FLOATING-POINT REGISTER	AF	DF	0, 2, 4, 6
CURRENT PSW	AP	DP	None required

Alter

Data may be entered, one digit at a time, using the spacebar 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 continues until the ALTER/DISPLAY or END key is pressed.

When zeros are typed to the left of the address, the operation is started automatically. When zeros are not inserted, press the RETURN key.

5. To continue program processing, press the CPU START key.

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

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

For alter/display of general-purpose and floating-point registers, a wraparound is performed (F to 0 for GP 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 Examples

In the following examples, the X's represent digits 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
The current PSW is not altered until a doubleword is typed.

Alter/Display Error Messages

INVAL CHAR

Prints when one of the following errors occurs.

1. The first character of a mnemonic is not A or D.
2. The second character is not M, S, L, K, C, G, F, or P. S, L, and C are used by service personnel.
3. An invalid digit is typed when addressing or altering data.
4. The CANCEL key is pressed.

INVAL ADDR

Prints when one of the following errors occurs.

1. Invalid starting address.
2. The updated address exceeds the capacity of specified storage.

A INITIAL MICROPROGRAM PROGRAM LOAD (IMPL)

1. Ensure that forms are inserted in the PR-KB and the IMPL disk is mounted in the console file.
2. Set all rotary switches to their normal operating positions. Ensure that the ADDRESS COMPARE CONTROL toggle switch is in the SYNC/NORM position.
3. If power is not on, press the POWER-ON key. An automatic IMPL occurs. If power is on, press the START CONSOLE FILE key.

- The IMPL REQD and CF PWR ON indicators are turned 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, is printed on the PR-KB.
- When control storage is loaded, power is removed from the console file and the CF PWR ON indicator and the START CONSOLE FILE key are turned off.
- The system reset routine is executed, the IMPL REQD indicator is turned off, and the CPU is in a soft-stop state (MANUAL indicator is on).
- The IMPL operation takes approximately one minute.

B IMPL ERROR RECOVERY

Switches Set Properly?

IMPL Disk Mounted?

Attempt to re-IMPL using the START CONSOLE FILE key. If unsuccessful, press the POWER-OFF key and re-IMPL using the POWER-ON key. If the error continues, notify your service representative.

INDICATOR			ERROR CONDITION	COMMENTS
START CONSOLE FILE KEY	IMPL REQD	CF PWR ON		
RED	ON	ON	Disk mounted improperly or not turning	
RED	ON	ON	Error during loading of control storage	A system check or a CF check indicator is on.
OFF	ON	OFF	Control storage loaded. Error in execution of system reset.	The DIAGN STOP indicator is on.

A INITIAL PROGRAM LOAD (IPL)

1. Load and ready the IPL device.
2. Dial the address of the IPL device into LOAD UNIT switches F, G and H.
3. Press the LOAD key.

- The system reset routine is performed and the IPL operation is started.
- The LOAD indicator turns on.
- When IPL is complete, the LOAD indicator is turned off and the system either executes the program or enters the soft-stop state awaiting operator action.

B IPL ERROR RECOVERY

Load Unit Switches Correct?

IPL Device Ready?

If setup is correct and IPL errors still occur, IPL using a different device and a backup tape or disk. If errors persist, call your service representative.

C POWER ON

The POWER-ON key, when pressed, initiates a power-on sequence for the CPU and on-line I/O units. The key turns red when pressed and 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. Storage is not valid after a power-on sequence: 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 in the SYNC/NORM position, and the IMPL disk is mounted on the console file.)

D POWER OFF

The POWER-OFF key, when pressed, removes power to the CPU and on-line I/O units. Main and control storage information is lost. Recommended power-off procedure:

1. Press the CPU STOP key.
2. Press the POWER-OFF key.

E POWER FAILURE RECOVERY

If a power supply failure or overtemperature condition occurs while the system is operating, a power-off sequence is initiated and the POWER-OFF key lights red to indicate the failure.

1. Press the POWER-OFF key (resets the indication and allows the POWER-ON key to be operative).
2. Press the POWER-ON key.

If the condition causing the failure was temporary, power will come up normally.

If power cannot be restored, call your service representative.

F EMERGENCY PULL SWITCH (EPO)

The EMERGENCY PULL switch, when pressed, turns off electrical power to the CPU and on-line I/O units and makes the POWER-ON key ineffective until the EMERGENCY PULL switch is reset by your service representative. The contents of main and control storage are invalid if this switch is operated.

G INSTRUCTION STEP

1. Press the STOP key.
2. Set the RATE switch to the INSTRUCTION STEP position.
3. Press the START key.

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

H SET IC (INSTRUCTION COUNTER)

1. Press the STOP key.
2. Dial the desired address into console switches CDEFGH.
3. Press the SET IC key.

The set instruction counter operation loads the address from switches CDEFGH into the instruction counter. Instruction processing starts from this address when the START key is pressed.

A 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; control storage is not affected.

B DATA COMPARE TRAP

1. Press the STOP key.
2. Set the ADDRESS COMPARE switch to the DATA COMPARE TRAP position.
3. Set the address of the storage byte location being modified in console switches CDEFGH.
4. Set data switches A and B to the desired byte match value.
5. Set the ADDRESS COMPARE CONTROL toggle switch to the STOP position.
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 is turned on and the CPU enters a soft-stop state. The instruction counter is displayed in the A-REGISTER DISPLAY roller switch indicators.

To determine the address of the instruction that modified the storage byte, subtract the current instruction length code (located in the current PSW) from the value in the instruction counter.

C 3210 MODEL 2 PRINTER-KEYBOARD

The 3210 Model 2 console functions the same as the console PR-KB for data entry and write operations. However, alter/display functions are not allowed.

A line switch is provided for turning on and turning off power.

D SYSTEM CHECK ERROR RECOVERY

If a system check indicator is on, re-IMPL and re-IPL. If errors continue, record the indicators and notify your service representative.

MANUAL STORE/DISPLAY OPERATIONS

- The MANUAL 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 MANUAL indicator. If the CPU is stopped and the MANUAL 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 MANUAL indicator.

Main Storage

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

1. Set the STORAGE SELECT switch to the MAIN STORAGE position.
2. Set the DISPLAY ASSEMBLER OUT roller switch to the SDBO position (position 2).
3. Dial the desired word address into rotary switches CDEFGH.
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 DISPLAY ASSEMBLER OUT roller switch indicators at the end of the store or display operation. Any byte stored is displayed in its stored condition.

General-Purpose and Floating-Point Registers

Store or display of the registers is performed as follows.

1. Set the STORAGE SELECT switch to the LOCAL STORAGE position.
2. Dial the word address of the desired register into console switches F and G (see chart).
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-Purpose Register 0
01	General-Purpose Register 1
02	General-Purpose Register 2
03	General-Purpose Register 3
04	General-Purpose Register 4
05	General-Purpose Register 5
06	General-Purpose Register 6
07	General-Purpose Register 7
08	General-Purpose Register 8
09	General-Purpose Register 9
0A	General-Purpose Register A
0B	General-Purpose Register B
0C	General-Purpose Register C
0D	General-Purpose Register D
0E	General-Purpose Register E
0F	General-Purpose 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

AUTOMATIC SYSTEM CHECKOUT PROGRAM (ASCP)

- The purpose of ASCP is to simulate system operation in a customer environment by maximum usage of all components of the system.
- ASCP provides a quick checkout of CPU channels and attached I/O devices as a system. The program can be used by both the customer and the service representative to obtain a reliability report on the condition of the total system.
- The program is loaded from the console file and communicates with the operator via some output device (preferably a printer). After the program is loaded, the operator readies the device selected as an output device and follows the step-by-step instructions that are printed out.
- ASCP requires a dedicated system and does not run under control of an operating system.
- ASCP provides automatic configuration and testing of ready devices. I/O devices that can be configured and tested are:

  Direct Access Devices – 2311, 2314, 2321

  Tapes – 2415, 2420, 2400

  Readers/Punches – 2540, 2520, 2501, 1442 Model N1

  Printers – 1403, 1404, 1443 Model N1

  Displays – 2250, 2260

  Consoles – 3210, 3215

  Terminal Adapters – 2701, 2702

  Magnetic Character Reader – 1419

Program Concepts

After the system has been initialized and the configuration is completed, the reliability run is started.

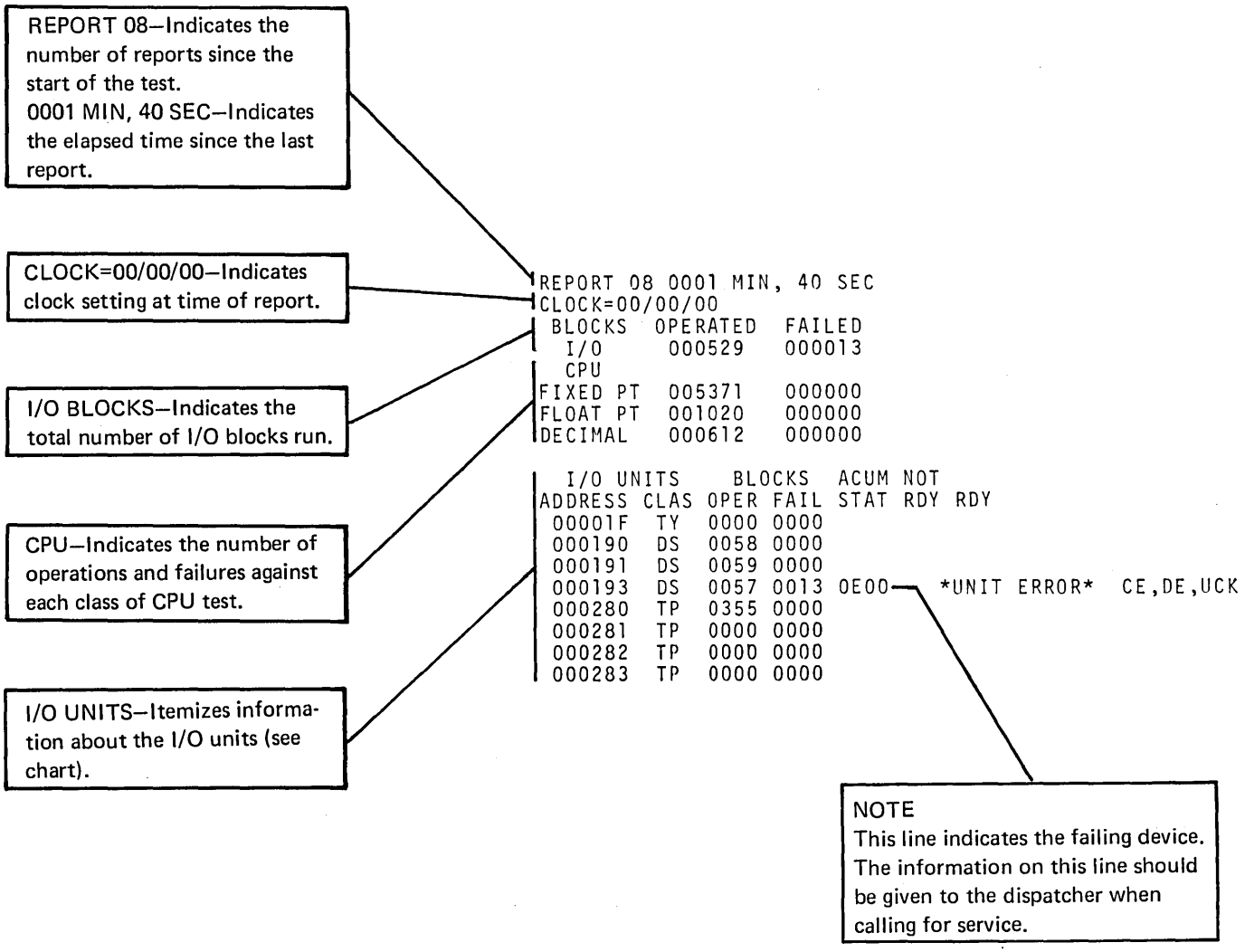
Each I/O device, attached to the system and readied before configuration, is tested. The program attempts to keep each device, control unit, or channel busy by initiating I/O commands to the devices. As soon as control units or channels reflect busy conditions, CPU tests are started to provide maximum use of the system.

The program attempts to keep the system on the threshold of system overrun without actually encountering an overrun condition. When all of the devices have been operated with each CPU test, a reliability report is printed. The test continues until the operator terminates the program.

Operating Instructions

1. Load the first ASCP disk on the console file.
2. Press the START CONSOLE FILE key.
3. Ready the device to be used as the output device. Instructions for running the program are printed out on the output device.
4. 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.
5. Press the INTERRUPT key to continue the program. Reliability reports are printed at intervals (see sample printout for interpretation of reports).

Reliability Report Illustration



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
C U ERROR	Error against the control unit
UNIT ERROR	Error against the unit

SYSTEM ENVIRONMENT RECORDING 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 MANUAL indicators are on and SEREP should be run. The error data is saved for the service representative.

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.

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, leaving 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 the output device. No other operator action is required.

After edit is complete, the operator writes the date and time on the first page of the logout.

Normal Program Waits

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

Error Waits

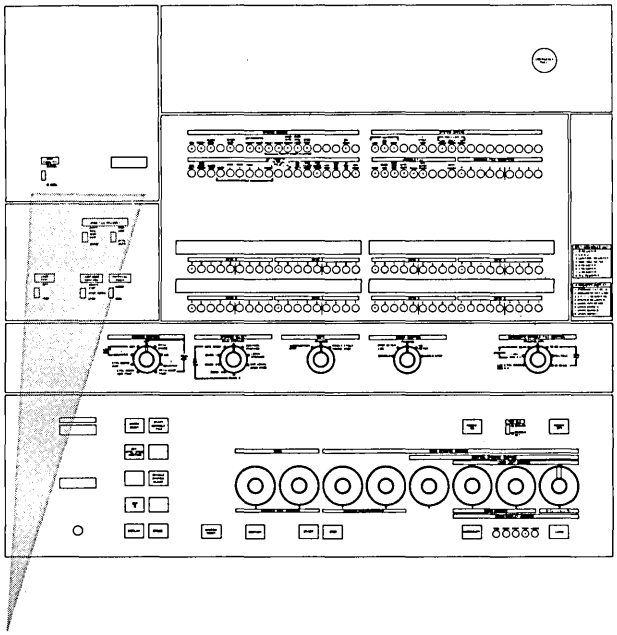
An unexpected program check during execution of SEREP causes a message to be printed, and the wait state is entered. Retry is attempted by pressing the RESTART key. Re-IPL should be avoided because alteration of PSWs by the SEREP program may cause the edit to be erroneous.

Termination

When logout is complete, a message is printed and the wait state is entered. If no log is found, a message is printed and the wait state is entered.

FEATURES

A INTEGRATED FILE ADAPTER



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

Disk Facility Toggle Switch

ENABLE

This position of the switch enables the Integrated File Adapter. The file can be selected by the program and its use meter will record time.

DISABLE

In this position the Integrated File Adapter cannot be accessed by the program and the use meter does not operate.

File Use Meter

This meter records operating time when the DISK FACILITY toggle switch is set to the ENABLE position and the file control unit is busy.

B EMULATORS

Two emulators are provided:

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. See the *IBM System/360 Bibliography,* GA22-6822 for a listing of these manuals.

GLOSSARY

Automatic System Checkout Program: A standalone program used for system diagnosis.

Hard Stop: A stop in which the CPU clock is stopped. No interrupts can be handled and the CLK STPD indicator is on.

Initial Microprogram Program Load (IMPL): An operation that provides for loading the control storage area of a microprogram-controlled CPU.

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

Soft Stop: A stop in which the CPU clock continues to run. Interrupts and timer updates are handled if requested and the MANUAL indicator is on.

System Environment Recording and Edit Program: A standalone program used on error conditions to edit and print hardware logout information from main storage.

Real Address: The actual physical address in main storage.

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IBM System/370 Model 145
Operating Procedures

Order No. GA24-3554-0

■ Rate this manual compared to other Operating Procedures manuals you have used.

- Very Good
- Good
- Fair
- Poor
- Very Poor

■ Is all the information you require as an operator included?

- Yes
- No (explain below)

■ Is the information you are looking for easy to find and use?

- Yes
- No (explain below)

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