

IBM CCC KINGSTON

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OPERATING PROCEDURES

7030 DPS (STRETCH)

SYSTEMS TEST PROGRAMS

Diagnostic Engineering

August 25, 1961

S T R E T C H

SYSTEM CERTIFICATION

August 25, 1961

TABLE OF CONTENTS

1. INTRODUCTION
2. PROGRAM LIST
3. LOADING PROCEDURES
 - 3.1 Initial Setup
 - 3.2 Loading From Cards
 - 3.3 Loading From Tape
 - 3.4 Recovery From Loss Of Control
 - 3.5 Selection Chart
4. PROGRAM DESCRIPTIONS

1. INTRODUCTION

This schedule is set forth as a guide to persons conducting acceptance tests on the 7030 Data Processing System.

The sequence set forth is recommended although not mandatory. The latest version of each program, as determined from the current program status report, should be used.

Since the test programs heavily exercise one major area of the system at a time, discretion should be used in not extending the length of time to run each program, and instead, emphasize a well balanced mix of programs which tend to cover or review, in as short a time as possible, the entire system.

1. INTRODUCTION

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2. PROGRAM LIST

<u>Program</u>	<u>Maint. Sw. Sequence No.</u>	<u>Equipment Tested</u>	<u>Suggested Run Time</u>
JA AX1	0	I-Box	
JA UA1	1	SSIP-Utility Routines	
JB AX2	2	I-Box	
JB AX3	3	I-Box	
JB AX4	4	I-Box	
JB AX5	5	I-Box	
JB AF1C	6	Floating Point Circuitry	
JB AV1C	7	Variable Field Length Cktry	
KA BT1	8	Mem Timer	
KA AT1	9	Raw Speed 1	
JB AC1	10	I-Box, I-Checker	
JA BM6A	11	Memory Addressing	
JA BB6B	12	Memory Worst Pattern	
JA CE2	13	Tape 7 (All Channels)	
JA EE3	14	BX/TAPE	
JA NE6	15	Punch	

JA NE5	16	Reader
JA NE4	17	Printer/BX
JA ES1D	18	I/O Single Channel (Operators Console)
JA CE1	19	Tape 0-6
JA AT1		Basic Timing Test (Livermore)
KA SS1		SEVA-Systems

Note - In order for the maintenance switch settings to apply, the tape must be loaded with the programs in that sequence. Refer to writeup TP LD, JA UD1 for procedure.

SEVA-Systems Evaluation is on a separate tape.

Basic Timing Test (Livermore) - This program is card loaded only.

3. LOADING PROCEDURES

3.1 INITIAL SETUPS

<u>At Unit</u>	<u>Perform</u>
CPU Maintenance Console	<ol style="list-style-type: none">1. Set to Maintenance Mode2. Set to Normal all other switches3. Turn Marginal Check Pots to OFF
BX Maintenance Console	<ol style="list-style-type: none">1. Set Mode Select Rotary Switch to Normal2. Set to Normal all other switches3. Turn Marginal Check Pots to OFF
Power Distribution Frame	<ol style="list-style-type: none">1. Set all Memory Control Switches to Normal2. Turn Marginal Check Pots to OFF
Peripheral Equipment	<ol style="list-style-type: none">1. Setup for Normal Operation.

3.2. Loading From Cards

1. Press IPL button on the CPU Maintenance Console, or the Operator's Console.
2. Perform all preliminary preparations for the program to be run.
3. Place the program deck in the Card Reader.
4. Press the Start Button on the Reader.

3.3. Loading From Tape

1. Press IPL button on the CPU Maintenance Console, or the Operator's Console.
2. Perform all preliminary preparations for the first program to be run.
3. Set Maintenance Switches 0-31 according to the selection chart (Par 3.4) to select the program/s to be run.
4. Load the file protected Maintenance Tape on any Channel, Tape Unit 0.
5. Press the Start Button on the Tape Unit.
6. A loop within the control routine, location (8) 163* with (8) 135* displayed in the upper boundary registers indicates that a manual intervention is necessary prior to giving control to the selected program. Perform this manual intervention as specified in the program description and alter maintenance switch 63.
7. A loop in the control routine with location (8) 160* displayed indicates that one program is selected, it has completed a pass, and no repeat is requested. Make another selection, or set maintenance switch 37 for continuous repeat, or make no changes for a single repeat, and alter maintenance switch 63 to carry out the operator's decision.

* These locations are approximate. Refer to MNT TPI listing for exact locations.

3.4. Recovery from loss of control if for any reason, known or unknown, the program is hung up or halted and recovery is desired, perform the following actions.

1. Press the IPL button on the CPU Maintenance Console, or the Operator's Console.
2. If running a selected series of programs deselect those that have already run.

3. Press the signal button on the Maintenance Tape Adapter to cause a channel signal.
4. If this should fail, rewind the Maintenance tape and try again.

3.5. Selection Chart

<u>Action Desired</u>	<u>Perform</u>	
Operate one program	Set 1 of 32 Maint. Switches	0-31
Loop on one program	Set as above, plus set maint switch	37
Loop on several programs	Set the corresponding switches	0-31
Loop on all programs	Clear maintenance switches	0-31
Continue from control loop	Alter maintenance switch	63

4. PROGRAM DESCRIPTIONS

Each program deck has an associated program writeup and listing.

The card deck format, except for SEVA and Basic Timing Test which are PUNNOR or PUNID, is PUNFUL which means that they are loaded with the normal IPL scheme independent of a special loader program.

All PUNFUL decks can be loaded onto, and operated from a maintenance tape using the Tape Load program TP LD1, JA UD1. The control cards needed for each program is at the back of each deck; the description for the control card is included as an addendum to the program writeup.

I-BOX 1 PROGRAM

SMFI-1

File No. JA AX1A

Purpose

Basic test of Central Processor I-Box. The following instruction categories are tested:

1. Unconditional branch.
2. Direct index arithmetic except RNX, LVE, SVA.
3. Immediate index arithmetic except LVS.
4. Index ~~branching~~ branching.
5. Store instruction counter If (SIC)

Operation

This program contains the initial instruction tests to produce a semi-reliable set of I-Box instructions. It is run in disabled mode.

Success Indication

No program hangs.

Failure Indication

Program will hang at various locations within the program. Refer to program listing to diagnose the ~~the~~ trouble.

SENSE SWITCH INTERROGATION PROGRAM

SSIP

File No. JA UA1

Purpose

Provides standard utility routines for various maintenance programs.

Operations

This is a passive program which is activated and used by the user program to perform various utility functions. It also provides an interrupt table and routines.

Options are provided as below:

<u>Option</u>	<u>Set Sense Switch</u>
Suppress Error Printout	32
Stop on Error	33
Loop 100 times and print errors	34
Loop indefinitely	35
Print selection identity	36
Repeat block of tests	37
Start each test enabled	38

Success Indications

No error printouts or halts

Failure Indications

Console type outs or error halt.

I-BOX 2 PROGRAM

SMFI-2

File No. JA AXZA

Purpose

Basic test of the following I-Box instruction categories:

1. Store Zero in index interval and external memory.
2. Compare value and compare count in internal, external, and index memories.
3. Proper index selection.

Operation

This program is logically run after I-Box 1. Utility routines within SSIP are used and therefore SSIP should be loaded first.

Success Indications

No error printouts or halts

Failure Indications

Console typeouts, or error halts

I-BOX 3

SMFI-3

File No. JB AX3A

Purpose

Tests the ability of I-Box to load and store index registers.

Operations

This program is run after I-Box 2. SSIP is used for utility functions and should be loaded first.

Success Indications

No error printouts or halt.

Failure Indications

Console typeouts, or error halts.

I-BOX 4

SMFI-4

File No. JA AX4B

Purpose

Basic tests of direct index arithmetic instructions, transmit, and swap.

Operation

This program is run after I-Box 3. SSIP provides utility functions and therefore must be loaded first.

Success Indications

No error printouts or halts.

Failure Indications

Console typeouts, or error halts.

I-BOX 5

SMFI-5

File No. JA AX5B

Purpose

Test the operation of the time clock, interval timer, mask and indicator registers, interrupt system, boundary control, execute instructions, look-ahead forwarding, and the proper truncation of addresses for those instructions which use only part of their address field.

Operation

This program is next in sequence after I-Box 4. SSIP provides utility function and should be loaded first.

Success Indications

No error printouts or halts.

Failure Indications

Console Typeouts, or error halts.

I-CHECKER PROGRAM

I-264

File No. JB AC1

Purpose

Test the Central Processor I-Checker to insure that word parity is checked, errors are corrected, and error indications given.

Operation

To be run after the I-Box programs. SSIP is used and should be in core. Error inject mode is used.

Success Indications

No error printouts or halts, and error inject mode trigger (UB 58) alternately on and off.

Failure Indications

Console typeouts, or error halt, or error inject mode trigger on and loss of control.

FLOATING POINT PROGRAM

SMFF-1

File No. JB AF1B

Purpose

This program tests the Parallel Arithmetic Unit and associated control circuitry using floating point instructions.

Operation

SSIP is used for utility functions and must be in core.

Success Indications

No error printouts or halts.

Failure Indications

Console typeouts, or error halt.

VARIABLE FIELD LENGTH

SMFV-1

File No. JB AVIB

Purpose

This program tests the Serial Arithmetic Unit and associated control circuitry using Variable Field length instructions.

Operation

SSIP is used for utility functions and must be in core.

Success Indications

No error printouts or halts.

Failure Indications

Console typeouts, or error halts.

MEMORY ADDRESS TESTS

MM 06

File No. JA BM6

Purpose

To check the memory addressing mechanism.

Operation

Upper memory is tested from lower memory and then the test routine is relocated in order to test the lower portion. All addresses are tested.

Success Indication

Continuous operation with success printout every 100 passes.

Failure Indications

Error typeout is given for each error.

MEMORY WORST PATTERN TESTS

M 06A

File No. JA BB6

Purpose

To check data storage capabilities of external core storage using regular and inverted checkerboard patterns.

Operation

A checkerboard pattern, regular and inverted, is stored and checked.

Error injection can be used to test single error correction.

Program should be run twice. Once without error inject and in Stop ~~on~~ on Single error mode, and once with error injection and stop on double error.

Success Indication

Continuous operation

Failure Indications

Program halts using stop on single error, and stop on double error with error inject.

I/O SINGLE CHANNEL (CONSOLE)

I/O SGL CHAN

File No. JA ESI

Purpose

To test for proper operation of the Operator's Console.

Operation

Only the test involving the Operator's Console is selected. The other units are tested with other programs.

Maintenance switches are used to control program selection and mode of operation.

Success Indications

No error halts, or hangs, and correct type out.

Failure Indications

Program hangs at the (8) 1000 area. The exact location defines the error. The point ~~of~~ at which the ~~xxx~~ error occurred is stored in location (8) 100. The typeouts should agree with those in the program listing.

729-IV TAPE TESTS

Tape 0-6

File No. JA CE1

Purpose

Basic reliability test of tape units.

Operation

All tape drives on each channel should be tested in all routines. This involves one run through for each tape channel.

Tape control plus information transfer is tested.

Program selection and control is from maintenance switches.

Interrupt system is enabled.

Success Indications

Lack of error printouts or hangs.

Failure Indications

Console typeouts of errors, error halts and hangs.

729-IV TAPE TEST

Tape 7

File No. JA CE2

Purpose

To perform a basic reliability test of all I/O channels by switching a tape unit into each channel.

Operation

A tape drive on each I/O channel should be tested. This involves manually switching a tape unit into each channel.

Tape control plus information transfer is tested.

Program selection and control is from maintenance switches.

Interrupt system is enabled.

Success Indications

Lack of error printouts or hangs.

Failure Indications

Console typeouts of errors, error halts and hangs.

BASIC EXCHANGE/TAPE TEST

BX TAPE

File No. JA EE3

Purpose

To perform a preliminary test of one and two channel operation of the Basic Exchange utilizing two tape channels.

Operation

The proper operation of the two tape channels and basic exchange is checked by exercising ~~two~~ two tape units and utilizing the interrupt system.

Success Indications

No error printouts or hangs. The program ~~loop~~ loops at location BXTAPA after a pass.

Failure Indications

Console typeouts, programmed loops, or BX hangs.

CARD PUNCH TESTS

PN CH-E-SER

File No. JA NE6

Purpose

Check data and control paths of the card punch in the ECC and Non-ECC modes. Also tests the error detection circuitry and other control functions of the card punch.

Operation

Various combinations of control words are used to punch various patterns producing set of cards for each pass.

The tests are run with the interrupt system enabled.

The output deck should be used as an input to the RDR-E-SER program run in the same mode.

Success Indications

No error printouts, or hangs. The program loops at location PNCH 1 after an end of a pass.

Failure Indications

Console typeouts, programmed loops, or error hangs.

CARD READER TEST

RDR-E-SER

File No. JA NE5

Purpose

Check data and control paths of the card reader in the ECC and Non-ECC modes.

Operation

Various combinations of control words are used to read various patterns of cards.

The tests are run with the interrupt system enabled.

The output deck from the PNCH-E-SER program should be used as an input deck to complete the punch test.

Success Indications

No error printouts, or hangs, the program loops at location REDR4 after a pass.

Failure Indications

Console typeouts, programmed loops, or error hangs.

CHAIN PRINTER/BX TEST

PRT/BX
File No. JA NE4

Purpose

To test character decoding and hammer firing on the chain printer, and basic controls of the basic exchange.

Operation

All tests should be run on the printer. Different patterns of characters are printed out and must be visually inspected and compared to intended output.

Interrupt system is enabled.

Selection is from maintenance switches.

Success Indication

Correct printer output and no hang ups.

Failure Indications

Variance of printout to intended patterns, or program halts or hangs.

MEM TIMER

MEM TIMER

File No. KA BT1

Purpose

Times core memory operand fetch cycles.

Operation

Use successive unnormalized floating point adds with consecutive operands in a specific memory to time that memory. Times A0, A1, B0, B1, B2, B3.

The system is Enabled Maint Console key 38 up.

Success Indications

Printout of memory times on the operators console typewriter.

Failure Indications

Hang up in interrupt table with location of failing instruction in the left accumulator.

RAW SPEED 1

RAW SPEED 1

File No. KA AT1

Purpose

Time instructions in given environments.

Operation

Inserts floating point instructions ADD, Subtract, Multiply, Divide, Load and Store in specific program environments, and calculates average execution times of the instructions for each environment.

The interrupt system is enabled - Maint Switch 38 is up.

Success Indications

Printout of execution times, instructions, and corresponding environments on the operators console typewriter.

Failure Indications

Hang up in the interrupt table with location of failing instruction +1 in the left accumulator.

BASIC TIMER (Livermore Program)

BASIC TIMER

File No. JA-AT1

Purpose

Gives average execution times of various sets of instructions.

Operation

Runs a given set of instructions many times, and calculates the average execution time per instruction. Operates under control of STPPK (STRETCH Primitive Package).

Success Indications

Printouts of unlabeled times on the chain printer, program writeup must be referred to for interpretation.

Failure Indications

Under control of the FAILSAFE interrupt table in STPPK.

SYSTEM EVALUATION

SEVA

File No. KA SS1

Purpose

To exercise the STRETCH System according to its intended purpose to ascertain the condition of the system.

Operation

The arithmetic units are checked against each other by comparing results of a mathematical problem computed separately with both floating point and variable field length instructions.

The instruction units are checked by varying the instruction mix and checking results.

The I/O units are operated simultaneously and asynchronously. Random patterns are used for disk and tapes. Messages entered via console typewriter are punched on cards which are fed into the reader which is read and the data returned to the console typewriter.

Control should be exercised from the operator's console. No routines should be bypassed. Error printout option should be selected.

Success Indication

Progress report appears at the hi-speed printer.

7030 DPS

MNT TP 1
File No. JA UC 1A

MAINTENANCE TAPE

Stores J Series Programs on tape with ability to select and operate one, or more, or all programs.

1. Programs becoming obsolete - JA UC1
2. Used to control the selection of one, or more, programs on the Maintenance Tape.

TABLE OF CONTENTS

	Page
1. Environment	
1.1. Equipment Used	1
2. Operating Procedure	
2.1. Equipment Setup	1
2.2. Loading Procedure	1
2.3. Options	1
3. Program Indicators	2
4. Supplementary Information	2
5. Program Flow	

1. ENVIRONMENT

1.1 Equipment Used

Tape Unit 0, any channel (input)
Memory Locations 64-192
Refer also to writeup (s) of individual programs

2. OPERATING PROCEDURE

2.1 Equipment Setup

- 1) Set the CPU in Maintenance Mode.
- 2) Place the Maintenance Tape on Tape Unit 0, any channel.
- 3) Refer also to writeup (s) of individual programs.

2.2 Loading Procedure

- 1) Make the selection of the desired program(s) as per Options, par. 2.3.
- 2) Depress the IPL button on the Operator's Console, or on the CPU.
- 3) Cause a Channel Signal to emanate from Tape Unit 0 of the channel used. (Make Tape Unit Not Ready then Ready.)
- 4) Refer to the writeup (s) of the selected programs for additional procedures.
- 5) Should loss of control occur, repeat steps 2.2.1 - 2.2.4 to recover.

Note: If this should prove unsuccessful, rewind Tape Unit 0 of the channel used and then repeat steps 1-4.

2.3 Options

<u>Action Desired</u>	<u>Perform</u>
Operate one program	Set one of 32 Maintenance Switches 0-31
Loop on one program	Set as above, plus set Maint Switch 37
Loop on several programs	Set the corresponding Switches 0-31
Loop on all programs	Clear Maintenance Switches 0-31
Continue after Hang	Alter Maint Switch 63

Note: For individual program options, refer to the individual writeups.

2.3 Options

<u>Action Desired</u>	<u>Perform</u>
Continue after loop	Alter Maint. Switch 63
Bypass Console Printout	Set Maint. Switch 32, or make Operator's Console not ready

3. PROGRAM RESULTS

3.1 Success Indications

As each program is operated, its ID number (as defined by TP LD1) will be typed out. Refer also to the individual program write-up.

3.2 Failure Indications

Refer to the individual program write-up.

4. SUPPLEMENTARY INFORMATION

4.1 Program Restrictions

Each program must operate at a location greater than (8) 1000. The lower portion 100 - 777 is reserved for the Tape Loader.

The sequence number, (8) 0 - 37, assigned to each program has been defined by TP LD1.

Each program has been modified at the locations specified in the control card by TP LD1.

A loop within the control routine, at location WAIT 63, before the program has operated indicates that a manual intervention is required for the selected program prior to its start. Location OUT is displayed in the Upper Boundary Register.

A loop at location WAIT 63 after a program has operated indicates that the selected program has completed the requested pass(es) and another selection may be made. Location WTAFT is displayed in the Upper Boundary Register.

4.1 Program Restrictions (Cont'd)

The control routine is read each time a program is loaded, and occupies locations 64-192.

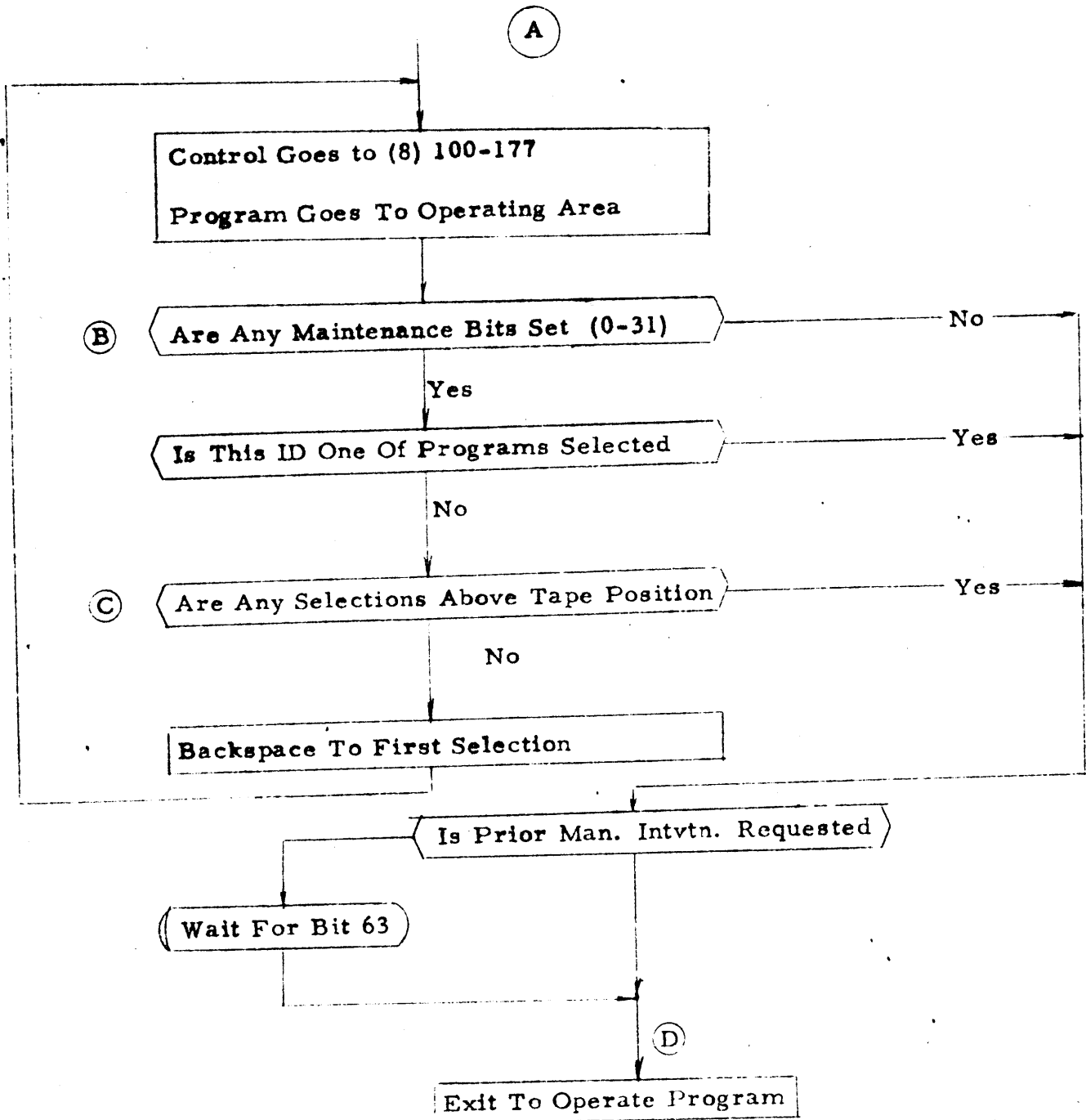
Each Maintenance Switch from 0 to 31 corresponds to one program on the Maintenance Tape.

Forward movement of tape causes that record to be loaded into memory. Backward movement is by Backspace or Rewind.

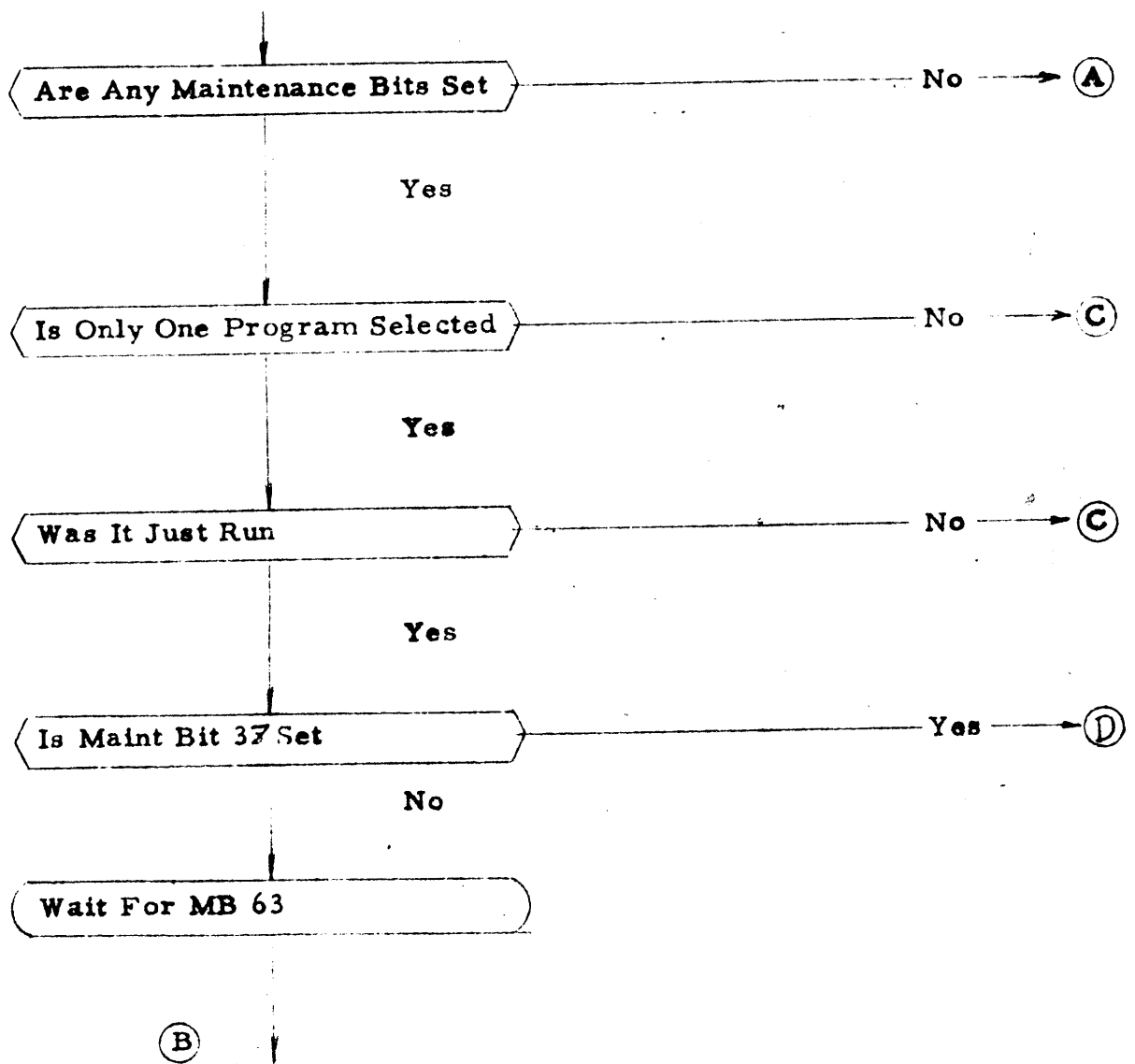
The control routine interrogates the maintenance switches, searches the tape for the corresponding sequence number and gives control to the main program. The main program after it completes its operation gives control back to the control routine which makes the next determination according to the setting of the Maintenance Switches.

When more than one program is requested, the selection will be from left to right, 0-31, and then back to the first.

CONTROL RECORD



RETURN FROM PROGRAM



7030 DPS

Tp Ld 1
File No. JA UD 1A

TAPE LOAD
LOADS J SERIES PROGRAMS

1. Programs becoming obsolete - JA UD1
2. Used to load Punched card loaded programs onto tape from which they can be operated. Also used to update any existing tape written by TP LD1.

See also, writeup Mnt Tp 1, JA UC 1.

TABLE OF CONTENTS

	Page
1. INITIAL LOAD	1
1.1 Environment	1
1.1.1 Equipment Used	1
1.2 Operating Procedure	1
1.2.1 Equipment Setup	1
1.2.2 Loading Procedure	1
1.3 Program Results	2
1.3.1 Success Indications	2
1.3.2 Failure Indications	2
1.4 Supplementary Information	2
1.4.1 Program Restrictions	2
1.4.2 Control Card Format	3
1.4.3 End Card Format	3
2. UPDATING AN EXISTING MASTER	3
2.1 Environment	3
2.1.1 Equipment Used	3
2.2 Operating Procedure	3
2.2.1 Equipment Setup	3
2.2.2 Loading Procedure	4
2.3 Program Results	4
2.3.1 Success Indications	
2.3.2 Failure Indications	
2.4 Supplementary Information	4
2.4.1 Program Restrictions	4
2.4.2 Control Card Format	4
2.4.3 End Card Format	4
3. RECOMMENDATIONS	4

1. INITIAL LOAD

1.1 Environment

1.1.1 Equipment Used

Card Reader (Input)
Central Processing Unit
Core Memory 64 - Maximum
Tape Unit 0, Channel 32 (Output)
Console Typewriter (Optional)

1.2 Operating Procedure

1.2.1 Equipment Setup

1. Set the CPU in Maintenance Mode.
2. Place a blank, non-file protected reel of tape on Tape Unit 0, Channel 32 and make it ready.
3. Place in front of each deck to be loaded its control card. (See paragraph 4.1, Control Card Format.)
4. Make ready the Operator's Console Typewriter (if used).

1.2.2 Loading Procedure

1. Read TP LD1, JA UD1 into memory. (Either IPL mode for Punful deck or STPPK for Punnor deck.) TP LD1 operates in locations (8) 100 - (8) 777.
2. Place, in the Reader, the program decks to be loaded onto tape. Insure that each deck is complete (i. e., no cards are missing from the deck).
3. Make the Reader ready and keep feeding cards thru the reader until the last program is loaded. (If any deck runs out of cards before the program identity is printed out, place any number of blank cards in the reader and make it ready.) Reading an END card (see 1.4.3), will terminate the initial load.

1.3 Program Results

1.3.1 Success Indications

The program decks will all be loaded. The tape will be rewound. A list of program identifications with their corresponding sequence numbers will be printed on the Console Typewriter (if requested) followed by the word END.

1.3.2 Failure Indications

The program will loop within the program if a manual intervention is required; e. g. , card reader not ready. An error print on the typewriter may indicate the requested intervention. Refer also to the program listing for explanation of error loops or hangs.

1.4 Supplementary Information

1.4.1 Program Restrictions

Each record on the Maintenance Tape consists of the control routine and the maintenance program, and is of the IPL format.

1.4.2 Control Card Format

Col. 1 L - Identifying Column

Col. 2 M (Hollerith) - Manual intervention required prior to program load.

Col. 4 and 5 - Used only in updating an existing master. (Will not affect the initial load.)

Col. 7, 8 and 9 - The number (octal) of passes of the program to be made each time it is selected.

Col. 12 - 19	Locations of half words into which a Branch
21 - 28	can be inserted from which the program will
30 - 37	exit to the control routine when it is completed.
39 - 46	This is if the form (xxxxxxx.x). The period
48 - 55	is required. The field will be omitted if any-
57 - 62	thing but a period is in this column.
Col. 73 - 79	Program Identification - Hollerith characters

1.4.3 End Card Format

The end of programs to be loaded is signified by a card with an "E" punched in column 1.

2. UPDATING AN EXISTING MASTER

2.1 Environment

2.1.1 Equipment Used

Card Reader (Input)
Central Processor Unit
Core Memory 64 - Maximum
Tape Unit 0, Channel 32 (Output)
Tape Unit 0, Channel 33 (Input)
Console Typewriter (Optional)

2.2 Operating Procedure

2.2.1 Equipment Setup

1. Set the CPU in maintenance mode.
2. Place a blank, non-file protected reel of tape on Tape Unit 0, Channel 32 and make it ready.

3. Place the existing maintenance tape on Tape Unit 0, Channel 33 and make it ready.
4. Place in front of each deck to be loaded its control card.
5. Make ready the Operator's Console typewriter (if used).
6. Set bit 40 of the Maintenance Console.

2. 2. 2 Loading Procedure

Same as 1. 2. 2.

2. 3 Program Results

Same as 1. 3.

2. 4 Supplementary Information

2. 4. 1 Program Restrictions

Same as 1. 4. 1.

2. 4. 2 Control Card Format

Col. 4-5 - These columns give the ID no. (as was defined by TP LD1) that the program is to replace on the master tape. These columns are never checked during the initial load.

The rest of the card is identical to that described in 1. 4. 2.

3. RECOMMENDATIONS

3. 1 Use the best tape available. Because of space limitations imposed upon JA UC1, the most reliable tape available should be used. A manual intervention will be required any time an error occurs during a read in from tapes. (See 2. 2. 5, JA UC1.)

3. 2 Terminating the Update Routine. TP LD1 will continue to update the tape until the last record on the existing master is read, and an END card is read from the reader. If programs are to be added to the end of an existing tape, as long as the ID no. (Col. 4-5) of the first to be added is greater than the last ID on the tape, all decks will be loaded until an END card is read.

3.3 Because of improper control words in the punful decks to be loaded, it is advisable to place one deck in the reader at a time. When TP LDI has completed loading this record on tape, it will type out the program identity. If the reader goes out of material and TP LDI does not type out the identity: (1) place blank cards in the reader if the program is completely loaded, or (2) place the remainder of the punful deck in the reader. Make the reader ready and TP LDI will continue and signify that it has completed by typing out the program identity.