

**IBM**

**1401**

**Data Processing System**

**Console Operator**

**Practice Problem**

## 1401 CONSOLE EXERCISE

This exercise was designed to assist you gain familiarity with the 1401 console. Before we get into the actual operation of the exercise, let's briefly discuss the events that will be occurring.

First you will "ready" the machines, then you will load the 1401 console exercise program deck and data cards. The program will now take control of card feeding - punching - and printing.

The student name card will read in and the information on it will be repetitively printed out on the 1403 in groups of 5 lines each as the carriage skips to channel I - each 5th printed line. You will stop the program and change the address register to bypass this portion of the program.

Now the system will begin reading data cards into the 1402 read unit and reproducing them in the 1402 punch unit. You will stop the program and turn on sense switch C. Upon restarting the program, the cards that have been reading and punching will now read and print on the 1403. Interrogation of sense switch C has sent us to a listing subroutine. During this phase of the operation, a reader check error will develop. You will locate the invalid character that read into storage and correct it. Restarting the program now results in the remainder of the cards in the 1402 read unit listing on the 1403.

As the cards run out of the hopper of the 1402 read unit, the program will stop. You will turn on the A (last card) switch. Running the cards out of the read feed entirely will cause the program to branch to a programmed halt. After the programmed halt, you will manually print out blocks of storage on the 1403. As you progress through this exercise, you may wish to follow the program block diagram.

### Ready the Machines

- I. Turn on the System
  - A. Press the 1401 Power on Button
- II. Ready the 1403
  - A. Insert blank continuous form paper into the 1403. Position the paper manually on the first printing line.
  - B. Mount the carriage tape provided by the instructor on the tape spindle of the 1403. Be sure that the numbers running along the bottom edge of the carriage tape are to the right as you face the front of the 1403. Thread the tape on rather loosely. Restore the tape to channel one and engage the feed clutch (the front cover must be down in order to energize the carriage drive mechanism).
  - C. Press the Printer Check Reset Button.

## 1401 CONSOLE EXERCISE

- III. Ready the 1402
- A. Press the "Punch On" button and the "Read On" button. (MAKE SURE THAT THE FILE FEED "GATE" IS UP).
  - B. Press the punch non-process run out switch and the read non-process run out switch. These switches are spring returned. Hold them down long enough to insure that there are no cards in either feed.
  - C. Press the 1402 check reset button.
- IV. Ready the 1401
- A. Main Console
    1. Set the mode switch to run.
    2. Turn the I/O check stop switch on (up).
    3. Turn the sense switches A-G off (down).
    4. Press the 1401 check reset button.
    5. Actuate the start reset switch (spring returned off).
    6. Set the manual tape select switch to N.
  - B. Auxiliary Console
    1. Turn all bit switches off (right).
    2. Turn the check stop switch on (up).
    3. Actuate the I/O check reset switch (spring returned off).
- V. Load the Program and Data Cards
- A. Place the 1401 console exercise program and data cards into the 1402 read unit hopper, 9 edge first face down.
  - B. Place blank cards into the 1402 punch unit hopper, 12 edge first face down.
  - C. Actuate the start reset switch on the 1401 console.
  - D. Press the load button on the 1402.

## 1401 CONSOLE EXERCISE

### Program Action

I. The program has caused the 1402 to read in the student's name card and is repetitively printing it out-skipping to channel 1 every 5th line.

### Student Exercise

#### Student Action

##### II. A

1. Press the 1403 carriage stop button.
2. Press the 1403 check reset button.
3. Press the 1402 stop button.

#### CHARACTER DISPLAY

##### III. A.

1. Set the manual Address switches to 0417.
2. Set the mode switch to character display.
3. Press the console start button. The character found in location 0417 will appear in the B character register.
4. Increment the manual address switch by one, through location 0420, displaying each character. Record this instruction.

#### ALTER AND RESTART

IV. A. Change the I address register to contain 0426.

1. Set the mode switch to alter.
2. Set the manual address switches to location 0426.
3. Press the I register key - light.
4. Press the start key.
5. Set Mode switch to run.
6. Actuate the console start reset switch.
7. Press start key.

### Results of Student Action

II. B. Printing will cease. The 1402 will stop idling.

III. B. The contents of core locations 0417 through 0420 have been displayed on the console. Record the instruction here

2 4 1 2

IV. B. Changing the I register will cause branching to another subroutine starting at 0426.

## 1401 CONSOLE EXERCISE

### Program Action

V. The program has restarted in location 0426. This subroutine is causing reproduction of 1402 read unit input cards.

VII. Because sense switch C is on, the program is branching to a subroutine that causes listing on the 1403 of the 1402 read unit input cards.

VIII. The system has stopped with a reader validity error.

### Student Action

#### SENSE SWITCH ACTION

##### VI. A.

1. Press the console stop button.
2. Turn sense switch C on.
3. Press the 1402 start button.
4. Do not press any stop buttons.

#### STORAGE SCAN

IX. A. Do a storage scan of the card input area:

1. Set the manual address switches at 0001.
2. Set the mode switch to storage scan.
3. Press the console check reset button.
4. Press the console start button.

#### ALTER

X. A. Enter an 8 in location 0060 (the location of the character in error) using the enter procedure.

1. Set the mode switch to alter.

### Results of Student Action

VI. B. Sense switch C acts as an alteration switch and causes branching to another subroutine.

IX. B. The scan has stopped in position \_\_\_\_\_. The address of this location is displayed in the storage address lights. Note that the content of this location; displayed in the B character register, fails parity.

X. B. The content of location 0060 has been changed to an 8. The check reset button has reset the error condition.

## 1401 CONSOLE EXERCISE

### Program Action

### Student Action

#### ALTER (cont'd)

2. Set the manual address switches to location 0060.
3. Set the bit switches (auxiliary console) to properly enter an 8.
4. Actuate the Enter switch (auxiliary console).
5. Press the console check reset button.

#### READER ERROR RE-START

##### XI. A.

1. Take the cards out of the 1402 reader hopper.
2. Press the read unit non-process run-out button until all of the cards have run out of the 1402 read unit.
3. Press the 1402 check reset button.
4. Remove the last three cards from the NR pocket. Note that the first of these is the card that has the invalid character in column 60. Normally, you would correct this card and restart processing from this point. Now, however, we will leave this card in the NR pocket and begin with the next card.
5. Place this card, and the one that followed it, into the 1402 read hopper.
6. Place on top of them the unprocessed deck removed from the read hopper a moment ago.

### Results of Student Action

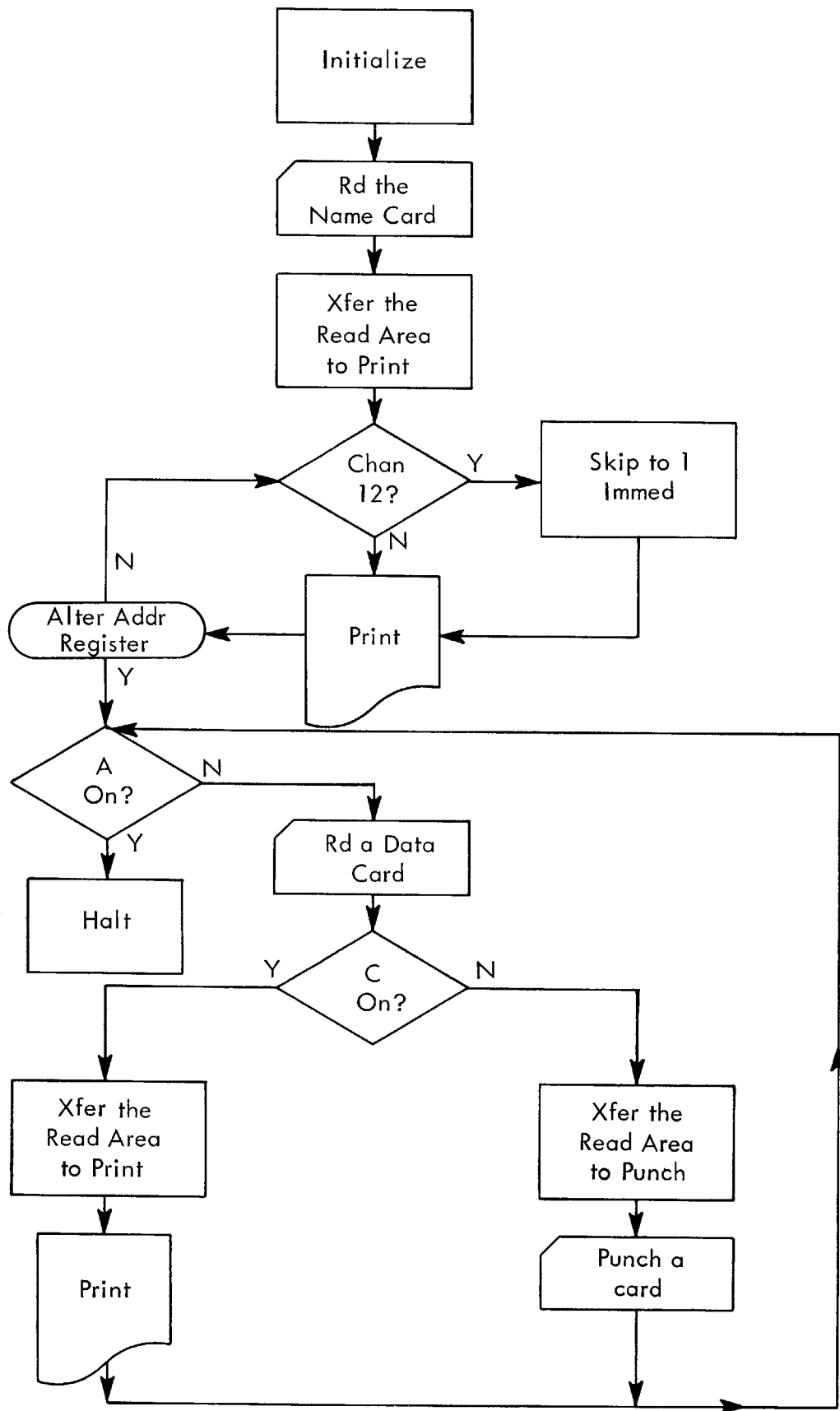
XI. B. The 1402 reader stopped as a result of a validity check. It has been possible to locate the position in error, correct the card that caused it, or as we have done, correct the position in storage. The restart procedure outlined under student action is necessary to restart the system.

## 1401 CONSOLE EXERCISE

<u>Program Action</u>	<u>Student Action</u>	<u>Results of Student Action</u>
	<p><u>PROGRAM RESTART</u> XII.A. 1. Restart in location 0432 using the console restart procedure IV.A.</p>	<p>XII.B. The program will restart at location 0432.</p>
<p>XIII. The program has restarted at location 0432 and is continuing to list, on the 1403, the cards read in by the 1402 read unit.</p>		
<p>XIV. The system has stopped because there are no more cards in the 1402 read unit hopper.</p>	<p><u>LAST CARD ROUTINE</u> XV.A. 1. Turn on the A sense switch. 2. Press the 1402 start button.</p>	<p>XV.B. This is the last card switch and will allow branching to a programmed halt. Display the I address register. It should read 0467. Notice the red light on the stop key.</p>
	<p><u>STORAGE PRINT OUT</u> XVI.A. 1. Set the mode switch to storage print out. 2. Set the manual address switches to 0000. 3. Press the console start button. 4. Increment the manual address switches by 100 through 0500 repeating the above. 5. Examine the output of the 1403.</p>	<p>XVI.B. Printing out of storage locations 0001 through 0600. Note that printed on line 1 are data from core locations 0001 through 0132. (Model 2 1403). On line 2 the word marks in core locations 0001 through 0132. On line 3, data from core positions 0101 through 0232. On line 4, word marks in core positions 0101 through 0232, etc.</p>

1401 CONSOLE EXERCISE

BLOCK DIAGRAM OF THE PROGRAM





## 1401 CONSOLE EXERCISE

<u>Seq.</u>	<u>No. of Cards</u>	<u>Name</u>	<u>Type of Punching</u>
1	2	Clear Routine	Page 165 of 1401 Reference Manual
2	3	Program Loading	Page 164 of 1401 Reference Manual
3	15	1401 Console Exer. Program Deck	Console Exercise
4	1	1401 Console Exer. Constants	1401 Console Exercise
5	1	Clear and Branch	Page 164 of 1401 Reference Manual Punched 397 in 61-63
6	1	Student Name	1-80 any valid data (Student name, org., etc.)
7	250 (variable)	Data (valid)	1-80 any valid data
8	1	Data (invalid)	1-80 (all punches in col.60)
9	50 (variable)	Data (valid)	1-80 any valid data

Each of the above groups of cards should be punched on different colored cards to facilitate arranging.

### Carriage Tape Description

The carriage tape is to be punched in channel 12 every 10th line from line 5 through 95, and in channel 1 every 10th line from line 0 through line 100. Glue line 100 to line 0.

# IBM 1401 PROGRAM CHART

FORM X24-6437-C  
PRINTED IN U.S.A.

Program: 1401 CONSOLE EXERCISE

Programmer: Education Planning

Date:

Step No.	Inst. Address	Instruction				Remarks	Effective No. of Characters		
		O P	A/I	B	d		Inst.	Data	Total
1	397	,	001	467		Initialize the input area			
2	404	1				Read name card			
3	405	M	080	299		Move name to print			
4	412	B	421		@	Test for overflow			
5	417	2	412			Print and branch to step 4			
6	421	F	417		1	Skip to channel 1 and branch to step 5			
7	426	B	463		A	Test for last card			
8	431	1				Read data card			
9	432	B	448		C	Test for switch C			
10	437	M	080	180		Move data to punch			
11	444	4	426			Punch and branch to step 7			
12	448	/	299			Clear print area			
13	452	M	080	299		Move data to print			
14	459	2	426			Print and branch to step 7			
15	463	.	463			Halt			
	548	You have completed the 1401 console exercise							