

ELECTRONIC DATA-PROCESSING MACHINES

TYPE 705 PRACTICE PROBLEMS

Problem 1. Input-Output (Card to Tape)

Input - Card Reader
Output - Tape Unit

- (a) Read the record into memory from card reader.
- (b) Write the record on a tape from memory.

Field	No. of Characters	Example	Memory Address
Employee Number	5	AE498	1201-1205
Social Security Number	9	206972986	1214
Withholding Tax Class	2 .	04	1216
Rate	3	115	1219
Group Mark (Control Pane	el)		1220

Problem 2. Input-Output (Tape to Card)

Input - Tape Unit Output - Card Punch

- (a) Read the record into memory from tape unit.
- (b) Write the record on a card punch.

Field	No. of Characters	Example	Memory Address
Part Number	6	A432-1	17001-17006
Description	12	Generatorbbb	17018
Quantity	3	123	17021
Cost	6	003950	17027

Note: Assume that a Group Mark has been placed in memory location 17028.

Input - Card Reader
Output - Tape and Printer

- (a) Read the record into memory.
- (b) Write complete record on tape.
- (c) Write partial record on printer starting with customer number.

Field	No. of Characters	Example	Memory Address
Name	16	JohnbAdamsbbbbbb	11001-11016
Customer Number	7	1359670	11023
Amount	6	001359	11029
Group Mark (Control	Panel)		11030

Problem 4. Addition

⁽c) Write the completed record on tape.

Field	No. of Characters	Example	Memory Address
		b	7000
Α	5	0732	7005
В	7	0321150	7012
T	7	bbbbbbb	7019

Note: Assume that a Group Mark has been placed in memory location 7020.

⁽a) Factors A and B are on tape record. Read this record into memory and add factors in Acc. 00 to produce total.

⁽b) Place total in memory area as shown below.

Problem 5. Addition/Subtraction

- (a) Read the record from tape.
- (b) Using Auxiliary Storage Unit (ASU) 01 compute:

 Base Pay + Overtime Pay Deductions = Net Pay
- (c) Write the completed record on tape.

Field	No. of Characters	Example	Memory Address
Employee Number	5	55475	13988-13992
Base Pay	6	$03152\overline{5}$	13998
Overtime Pay	5	02450	14003
Deductions	5	05050	14008
Net Pay	6	bbbbbb	14014

Note: Assume that a Group Mark has been placed in memory location 14015.

Problem 6. Multiplication

- (a) Read a record containing factors A and B into memory from Tape Unit 0203.
- (b) Using Acc. 00, compute Product and place in memory area as shown below.
- (c) Write the completed record on Tape Unit 0200.

Field	No. of Characters	Example	Memory Address
		b +	10705
A	3	140	10708
В	4	$044\overline{5}$	10712
P	7	bbbbbbb	10719

Note: Assume that a Group Mark has been placed in memory location 10720.

Read a record into memory from tape and make the following calculations:

- (a) Quantity per Assembly X Assemblies Required = Total Quantity Required.
- (b) Total Quantity Required X Unit Cost = Total Cost.
- (c) Adjust Total Cost to the nearest cent.
- (d) Adjust Total for storage in memory.

Write the completed record from memory on tape.

Field	No. of Characters	Example	Memory Address
Part Number	6	5 T 813 A	0403-0408
Quantity per Assembly	3	021	0411
Unit Cost (3 decimals)	5	01691	0416
Assemblies Required	2	5 9	0418
Quantity Required	5	bbbbb	0423
Total Cost	6	bbbbbb	0429

Note: Assume that a Group Mark has been placed in memory location 0430.

Problem 8. Partial Payroll Problem

- (a) Read a record into memory from Tape Unit 0200.
- (b) Compute gross pay, current withholding tax, and net pay.
- (c) Store results in memory.
- (d) Write completed record on Tape Unit 0201

Gross Pay = Hours worked X rate.

Current With. = (Gross Pay - (Tax CL X 13.00)) X 18% Net Pay = Gross Pay - Current With. - Deductions

Field	No. of Characters	Example	Memory Address
Name	16	John J. Doe	9030
Dept. No.	2	οţ	9032
Tax CL.	1	+ 3	9033
Rate per Hour (3 decima	ls) 4	+ 1.547	9037
Hours Worked (1 decima	1) 3	425	9040
Deductions (2 decimals)	5	01020	9045
Current With.	5	bbbbb	9050
Gross Pay	5	bbbbb	9055
Net Pay	5	bbbbb	9060
Constant			-
Exemption Amt.	4	1300	0503
Tax Percentage	2	18	0505

Note: Assume that a Group Mark has been placed in memory location 9061.

Problem 9. Division

- (a) Read a record into memory from tape.
- (b) Divide A by B to develop Q (quotient).
- (c) Write the completed record on tape.

Field	No. of Characters	Example	Memory Address
•		þ	16020
A (4 decimals)	6	176085	16026
B (2 decimals)	2	21	16028
Q (1 decimal)	3	bbb	16031

Note: Assume that a Group Mark has been placed in memory location 16032.

Problem 10. Division

- (a) Read the record into memory from tape.
- (b) Compute % Material Accepted.

Quantity Accepted
Quantity Received = % Accepted

Adjust % to nearest 1/10 of one percent

(c) Write the completed record on tape.

Field	No. of Characters	Example	Memory Address
Part No.	6	032615	1290
Quantity Received	4	110₫	1294
Quantity Accepted	3	90₫	1297
% Accepted	3	bbb	1300

Note: Assume that a Group Mark has been placed in memory location 1301.

Memory	Accumulator Before	Acc. Sign	Accumulator After	Acc. Sign
ADD 3265	a55	+	a 3., 0	+ //
ь79	a33	+	a 114	+ 3.8.3
A650	a320	-	a 330	+·;
SUB 53276	a200	+	st. 116	
b3 8	a38	+	a & E	in Justine &
A8 [†]	al4	-	2/0/	4 - Legack
R ADD 3721	a0	+	277	
AB12 [‡]	a91	-	a 174	en te A
b318	aCA4	-	2318	2 1 16 D' 57
R SUB A127	a0	+	, .	+ - uguet
6322	al279	-	a 3 , r	+-
1837653	a6273	+	a 837653	- 7X
MPY 525	a4	+	n 100	<u></u> ~
b330	a02	-	1 ic660 -	+ Jugish ox
\$ 5	a 6	-	l 41 30	+ 1
DIV 222	a088	_	a 4	+ recliffendon
b20	a600	+	N a c	+ reciplement
A [‡]	a0295	+	1 2 × 19	+ ox
STORE 37298	a22	-	1. 1. X. X. I	
65421	a321	+	2234	
ABC215	a216	+	216	

Problem 12. Load/Compare

- (a) Part No. A-123 as a constant in ASU 01.
- (b) Read a record into memory from tape.
- (c) Compare the constant part no. against the part no. read from the record.

If constant is higher than record read, write the record on tape.

If constant is equal to record read, write the record on printer.

If constant is lower than record read, stop the machine.

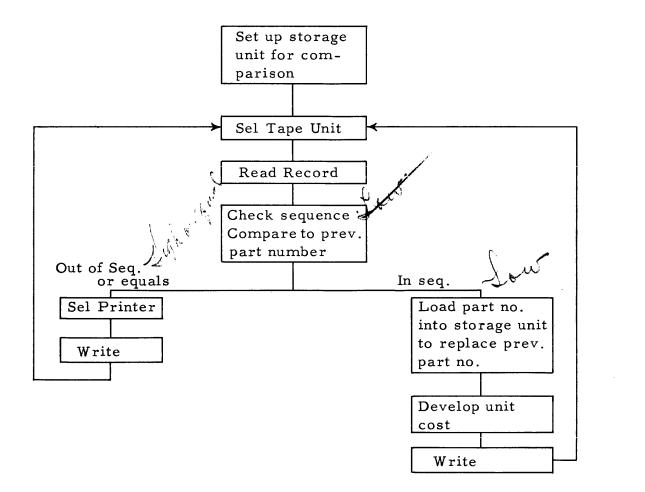
Field	No. of Characters	Example	Memory Address
Part No.	5	B9765	19541-19545
Part Location	3	327	19548
Unit Cost	5	03750	19553
Constant			
Part No.	5	A-123	13000-13004

Note: Assume that a Group Mark has been placed in memory location 19554.

- (a) Read a record from tape unit 0200.
- (b) Check the file for ascending part number sequence.
- (c) If out-of-sequence or equals, write record on printer and read in next record.
- (d) If in-sequence, develop unit cost, write completed record on tape and read next record.

Field	No. of Characters	Example	Memory Address
		+	
Part No.	5	12345	15504
Total Cost (2 decimals)	6	01600₫	15510
Total Qty.	5	00500	15515
Unit Cost (3 decimals)	5	bbbbb	15520

Note: Assume that a Group Mark has been placed in memory location 15521.



- (a) Read the record from tape.
- (b) Check for end of input file.
- (c) If end of file, develop a sub-routine to do the following:
 - 1. Rewind input tape.
 - 2. Put T.M. on output tape.
 - 3. Rewind output tape.
 - 4. Type instructions to the operator.
 - 5. Stop.
- (d) If not end of file, compute Total Cost (Quantity X Unit Cost) and write the completed record on tape.

Field	No. of Characters	Example	Memory Address
Part No.	6	137001	19000-19005
Qty.	4	0125	19009
Unit Cost	4	0050	19013
Total Cost	8	bbbbbbbb	19021
Constants			
Remove No. 1	and 2 Tapes		0156-0179
Group Mark			0180

Problem 15. End of File

- (a) Read a record from tape unit 0200.
- (b) Compute:

$$\frac{Y-T-D Issues}{Months} = Monthly Usage$$

- (c) Write the record on Tape Unit 0201.
- (d) Check for end of file on input and output tapes.

If end of file on input:

- 1. Rewind input tape.
- 2. Put TM on output tape.
- 3. Rewind output tape.
- 4. Stop.

If end of file on output tape:

- 1. Put TM on output tape.
- 2. Rewind output tape.
- 3. Stop.

Field	No. of Characters	Example	Memory Address
Part No.	6	D36501	12073-12078
Y-T-D Issues	6	076325	12084
Months	2	+ 02	12086
Monthly Usage	5	bbbbb	12091
Constant			
Group Mark			2000

Problem 16. Receive and Transmit Using Acc. 00

- (a) Read the record into memory locations 6000-6499 from Tape Unit 0200. There is a R/M as the last character of each record.
- (b) Transmit each record to the output area starting with memory location 11560.
- (c) Write the record on Tape Unit 0201.

Constant

Memory Address

Group Mark

1505

Problem 17. Receive and Transmit Using ASU 01-15

- (a) Read the record from Tape Unit 0200.
- (b) Transmit each field to output area.
- (c) Write the record on Tape Unit 0201.

Field	No. of Characters	Example	Memory Address
Input Area			<i>~</i>
A	4	AB36	1017-1020
В	7	0017510	1027
С	4	369J	1031
Output Area			
С	4	369J	6212-6215
Α	4	AB36	6219
В	7	0017510	6226
Constant			
Group Mark			0905

<u>ASU</u>	Set L
13	4 positions
14	7 positions

- (a) Read master record from Tape Unit 0200 into memory location 16035.
- (b) Read variation record from Tape Unit 0201 into memory location 19361.
- (c) Compare employee number in variation record against employee number in master record.

If equal:

Replace rate in master record with new rate from variation record. Move corrected master record to output work area 5050-5064.

Write the record on Tape Unit 0202.

If variation record is low:

Write variation record on typewriter.

If master record is low:

Move master record to output work area 5050-5064.

(d) Write the record on Tape Unit 0202.

Field	No. of Characters	Example	Memory Address
Master Input Area			
Employee No.	5	32561	16035-16039
Rate	4	1650	16043
Tax Class	2	03	16045
Std. Hrs.	3	400	16048
R/M	1	‡	16049
Variation Input Area			
Employee No.	5	32561	19361-19365
Rate	4	1735	19369
Constant			
Group Mark			10000
ASU Set L			

Problem 19. Read While Writing

- (a) Read a record into memory location 6000-6479 from Tape Unit 0200. There is a R/M as the last character of each record.
- (b) Transmit each record to the output work area starting with memory location 11580.
- (c) Read While Writing.
- (d) Write the record on Tape Unit 0201.

Constant	Memory Address	
Group Mark	1505	

Problem 20. Read While Writing

- (a) Read the record from Tape Unit 0200.
- (b) Transmit the fields to output work area leaving two blanks between fields.
- (c) Read While Writing.
- (d) Write the record on Tape Unit 0201 for later Tape-Printer conversion.

Field	No. of Characters	Memory Address	
		Input	Output
Payroll No.	3	1000-1002	15063-15065
Employee No.	6	1008	15068-15073
Insurance Benef	its 5	1013	15076-15080
Advances	5	1018	15083-15087

Constant

Group Mark 2005

<u>ASU</u>	Set L
12	3 positions
13	5 positions
14	6 positions

Problem 21. Page 1 of 2

M	emory	Acc. Storage Before	Acc. Sign	Acc. Storage Before	Acc. Sign	Check Indicators
			3-8	<u> </u>		5×.
ADD	6573	a61	-	1 512	+	
-	b82V	al34	+	a 959	+-	Lign ck th
	62243	a3765	+	A 1547	+	<i>a</i> -7
SUB	A827	a28	_	129 A	_	Sign (& s
	7376	a12781	+	A Luca	-	۶
	73274	a3274	- -	a scoo	+	ε
R ADD	b83S	a7215	_	j.) 2 v	+	signak
	K375	al6	+	2 375	+	
	5438Ī	a9654	+	a 381		
R SUB	‡2ī	a521	+	a 21	4-	
	ъ5 3 8Х	a151		a 3 87	<u> </u>	Legar Co
_	53743	a9	+	a 143	·	
MPY	560	a5	-	a 3.00	+	
	D120	a003	+ .	a 000340	+	
	b15	a325	-	m (4875	_	
DIV	7 ₆ 5	a70	+	u 1)0	+	
	b [‡]	a075	+	130 J 4	. +	
	b5	a75	+	a 0	+	shipm was
	A9	a81	+	a 9	+	Adyn info
LOAD	A36	a9	-	is t	+	
	DOEbJ	a65431	+	BUELT	+	
	563AB5	a32761	+	aben Bi	+	

Problem 21. Page 2 of 2

	Accumulator Storage	Acc. Sign	Memory Before	Memory After
STORE	. a37	-	+ + 643382 + + +	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	a37982	+	+ + + A 65213 A	+ 37987 Fb
	a21	+	DOEb15	A beautiful and the second
	a7	-	bA76532	· 10 10 10 10 10 10 10 10 10 10 10 10 10
UNLOAD	a219	+	bAB5600	LRCT
	aDOEbJ	+	DOEbM56	4 5 5 6 7
	a 15	-	77B4681	Agriculture of the second

Instruction	Accumulator Storage Before	Acc. Sign	Accumulator Storage After	Acc. Sign	
SHOR 0001	a3976	+	a 397	+	
LENG 0002	a7653	+	a 76:300	+-	
SHOR 0002	a375	-	i. A	الأشهرين بيد	
LENG 0000	a5762	+	1 - h :	+	
SET L 0004	a006512	+	a (11)	+	
SET L 0005	a372	-	A 66307	_	
ROUND 0001	a796	+	x 45	+-	
ROUND 0003	a37352	+	6 20		
ROUND 0004	a68712	-	,	-	

- (a) Read the record from tape and transmit to output area.
- (b) Compute: 1. Withholding Tax = (Gross - (Tax Class x 1300)) x 18% If no tax, store zeros.
 - 2. F.I.C.A. = 2% of current gross that is taxable. (No earnings over \$4200.00 are taxable.) If no tax, store zeros.
 - 3. Net Pay = Gross Withholding F.I.C.A.
- (c) Adjust Y-T-D Withholding and Earnings and quarterly F.I.C.A.
- (d) Read While Writing.
- (e) Write the record on tape.
- (f) Check for end of file. Assume one reel of input records.

• •			
Field	No. of Characters	Example	Memory Address
Input			
Pay Period	2	13	1150-1151
Man No.	5	48962	1156
Tax Class	1	† 5 +	1157
Y-T-D Earnings	6	415000	1163
Y-T-D With.	6	052074	1169
Quarterly F.I.C.A.	4	3945	1173
Gross Pay	5	18575	1178
Record Mark	1	‡	1179
Output			
Pay Period	2	13	12020-12021
Man No.	5	48962	12026
Tax Class	1	5	12027
Y-T-D Earnings	6	415000	12033
Y-T-D With.	6	$05207\overset{+}{4}$	12039
Quarterly F.I.C.A.	4	3945	12043
Gross Pay	5	18575	12048
Current With.	4	bbbb	12052
Current F.I.C.A.	3	bbb	12055
Net Pay	5	bbbbb	12060
Constants			
1300			1000-1003
18			1005
½			1006
420000			1012
Group Mark	19		1013

- (a) The cost of each labor ticket is to be applied against its Shop Order No. Each labor ticket (a punched card) has a seven digit S.O. No. and a four digit suffix no. The suffix no. is the number of the drum section where the S.O. No. and the cumulative labor cost are stored.
- (b) In each drum section there are 13 S.O. Nos with their associated cumulative costs arranged in ascending sequence. A control number of 9999999 is stored on each section following the last S.O. No. and Cost. The D/M will be in the 190th position of each drum section.
- (c) Read the card record and read the proper drum section into memory.
- (d) Search memory for the matching S.O. No. and adjust the cumulative cost. If the S.O. No. is not found (comparing against 9999999), stop the machine.
- (e) Write the adjusted information back on the drum.

Field	No. of Characters	Example	Memory Address
Card Record			
Man No.	5	07163	4001- 4005
Shop Order No.	7	QR7170B	4012
S.O. Suffix	4	1206	4016
S.O. Cost	5	ъ0941	4021
Drum Record	•		
S.O. No.	7	Q R5133A	2001- 2007
Cost	7	0012395	2014
S.O. No.	7	Q R7170B	2021
Cost	7	0048636	2028
Other S.O. Nos.	& Cost		2029- 2182
Control No.	7	9999999	2189
Constants			
Address of 1st S. No. from Drum	O. 5	b200 [†] 7	5004
Adjust for next			
S.O. No.	4	0014	5008
Adjust for Cost	4	0007	5012
Group Mark			5013

Problem 24. Reading Program Instructions from Drum

- (a) A program containing 1596 instructions is stored on the drum.
- (b) 1596 instructions are equal to 7980 characters. The instructions are arranged in four groups of 399 instructions. A drum mark is at the end of each group.
- (c) The first 399 instructions (1995 characters) are on drum sections 1014-1023. The next 399 instructions are on drum sections 1024-1033, etc.
- (d) Read each group of instructions into memory starting with location 7750.
- (e) Adjust the Sel instruction address to bring in the next group of 399 instructions. When the fourth group is brought to memory, provision should be made to restore the Sel instruction address to the first group. The first instruction of the last group should accomplish this.

Constants	Memory Address
ы0	1531-1533
1014	1537

Problem 25. Error Correction Routine

- (a) Read the record from Tape Unit 0200.
- (b) Check for Read-Write error.
- (c) If error, backspace tape and read again. Third error, backspace tape and read one more time. If error persists, stop the machine.
- (d) If no error, compute salesmen's commissions.
- (e) Write completed record on tape.

Field	No. of Characters	Example	Memory Address
Salesman No.	3	369	8014-8016
Sales Amt.	7	0037650	8023
Commission %	2	03	8025
Commission Ar	nt. 5	bbbbb	8030
Constants			
bŽ			1001-1002
†			1003
Group Mark			1004

Problem 26. Tr Any to Detect End of File and Reading Errors Using Normalize and Transfer Counter

- (a) Read a record from tape into memory location 19000-19105 and check for end of file and reading errors.
- (b) If end of file, rewind input tape and stop.
- (c) If a read error occurs, re-read record two more times. If error persists, stop.
- (d) If not end of file or read error, write the record on the printer.
- (e) Develop programs only to interrogate for end of page, R/W error and P/P error indications.
- (f) Use Normalize and Transfer counter.

Constants

Memory Address

Group Mark

17003

V.

I.	Two signed fields are to be compared in Memory. What instructions would be necessary to execute the comparison?
II.	It is desired to compare a field which has been placed in memory by a store instruction against an unsigned field in memory. What instructions would be necessary to place the signed field in accumulator storage and execute the comparison?
III.	Show the instructions necessary to divide Inventory Value (XXXXX.XX) located at 4063 by Inventory Quantity (XXXX) located at 4067 to arrive at unit cost (XX.XXX). Round to nearest mil and store cost in memory at 4072. All fields are signed.
IV.	Under what conditions will the overflow check indicator be turned ON? How is it turned OFF?

Explain the differences between the Unload and Store instructions.

VI. What is the factor that stops the execution of the following instructions?

R ADD

Read (from tape)

Unload

Subtract

Write 00

Write 01

Read (from card)

Store

Load

Read (from drum)

Compare

Multiply

ADD Memory (signed field)

ADD Memory (unsigned field)

Transmit 00

Transmit 01-15

VII. As the result of multiplication, how many digits result in the product?

As the result of division, how many digits result in the quotient?

VIII. Accumulator Storage Unit 00 contains the factor 0145638. Issue the necessary shift instructions to arrive at factor 1500.

IX. What conditions turn on Input or Output Indicators on the following units?

Tape (Write Status)

Tape (Read Status)

Card Reader

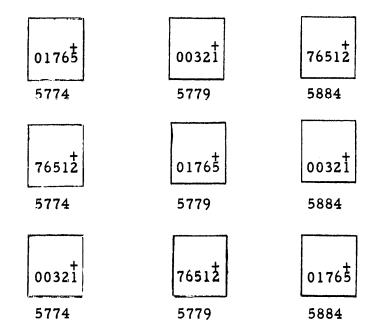
Printer

Drum

- X. How is it possible to differentiate between the various auxiliary storage units?
- XI. What causes the Tr Any instruction to be effective?
- XII. (a) What causes the R/W check indicator to turn on when writing from memory to the printer?
 - (b) What causes the Printer/Punch check indicator to turn on when writing on the printer?

Three five-digit numbers are stored in memory as signed numerical fields. By programming determine which is the lowest number. Store it in memory location 9004 and stop the machine. None of the numbers will be equals.

Field	Example	Memory Address
lst Number	01765	5774
2nd Number	00321	5779
3rd Number	76512	5884



- (a) Assume that during the processing of a problem 100 three-digit factors have been developed in memory starting with location 1001. 100 six-digit totals have also been developed and are in memory starting with location 1301.
- (b) Add each three-digit factor to a corresponding six-digit total. All of the fields are signed.

Constants	Example	Memory Address
	ь0003	1900-1904
	0006	1908
Add. of 1st 3-digit total	1003	1912
Add. of 1st 6-digit total	1306	1916
Add. of last 3-digit total	1300	1920

xx	t XX	xxx	xxx	xxx	x} {x}	xxx	xxx
	l	1	1	1]	1	1
	0	0	0	0	2	2	3
1	0	0	0	1	ç	9	0
	3	6	9	2	4	. 7	0

L	******	(xx)	(* x:	xxxxxxx	xxx
	1	1	1	1	1
	3	3	8	8	9
	0	1	8	9	0
	6	2	8	4	0

Problem 30. Change Tape Address on End of File

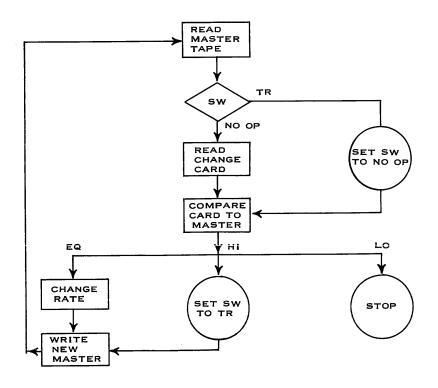
- (a) Read a record and check for end of file.
- (b) If end of input file, rewind tape and change to alternate tape address (0201 or 0206).
- (c) Write a record and check for end of file.
- (d) If end of output file, record TM, rewind and change to alternate tape address (0203 or 0208).

Constants	Memory Address
ь ‡	3065

- (a) A master payroll record is on Tape Unit 0200. Rate change cards affecting this record are on Card Reader 0100.
- (b) Match the change cards against the master record by employee number.

 There is only one rate change card for any one employee.
- (c) If the card is low (unmatched), stop the machine.
- (d) If the card record is high (no rate change), write out the master record on Tape Unit 0201 and read another master record.
- (e) If the card and master records are equal, place the new rate in the master record, write on Tape Unit 0201, and read another master record and change card.

Field	No. of Charact	ers Example	Memory Address
Master Record			
Employee No.	5	64027	3001 - 3005
Name	16 F	fbJbJONESbbbbbbb	3021
S.S. No.	. 9	094612397	3030
Rate	3	150	3033
Change Card			
Employee No.	5	64027	2021-2025
Rate	3	158	2028
Constant			
Group Mark			1560



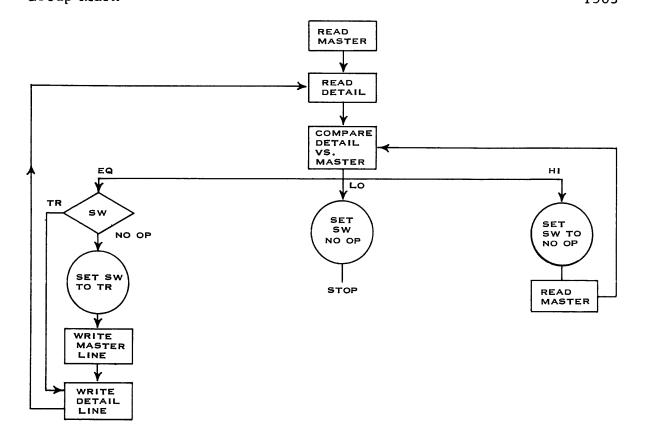
- (a) A master inventory record is on Tape Unit 0200. Detail transactions affecting this file are on Tape Unit 0201.
- (b) Match the master and detail records.

If detail is low, stop the machine.

If detail is high, read another master record and compare. (Only write records on which there is activity.)

If detail and master are equal, write the master record and the following detail transactions on Tape Unit 0202.

Field	No. of Characters	Example	Memory Address
Master Record			
Product No.	4	A149	2001-2004
Product Descrip.	15	Gasket	2019
Unit Cost	7	0013500	2026
Quantity	5	00132	2031
Value	8	00017820	2039
Detail Record			
Product No.	4	A149	1502-1505
Quantity	5	00050	1510
Unit Cost	7	0013500	1517
Constant			
Group Mark			1563



Problem 33. Digit Selection; Variable Interval Code

- (a) A transaction record can contain one of five 2-digit codes.
- (b) Develop a program to transfer to a different sub-routine for each of the five codes.

Field	No. of Characters	Example	Memory Address
State Code	2	ъ09	0908- 0910
Constants		01 04	0611- 0612 0614
		09 2 6	0616 0618
		34	0620

Problem 34. Digit Selection; Uniform Interval Code

- (a) A transaction record can contain codes 0-7.
- (b) Transfer to a sub-routine for the eight codes and stop if codes 8 or 9 are present.
- (c) Use the method of modifying a transfer instruction to direct the program to the proper sub-routine.

Constants	Example	Memory Address
Code	b6	0909-0910
Instruction Interval	005	0913
Address of 1st Code	9979	0917

(a) Search the table of items given below for the number 14, using the formula:

1.
$$\frac{N_0 + 1}{2} = N_1 \text{ (rounded)}$$
 3.

3.
$$\frac{N_2}{2}$$
 = N_3 (rounded)

2.
$$\frac{N_1}{2}$$
 = N_2 (rounded)

The formula is repeated until the number is located. N_{0} is equal to the number of items in the table.

- (b) Certain facts about the table look-up procedure must be established:
 - 1. The reference portion of the items in the table must be in ascending sequence.
 - 2. The length of all the items in the table, including the reference facts within each item, must be equal.
 - 3. The number of factors in the table must be known.
 - 4. The address in memory of both the first and last items in the table must be known.
- (c) Items: 08, 12, 14, 16, 21, 26, 32, 34.

Item	Example	Memory Address
1	08	0401
2	12	0403
3	14	0405
4	16	0407
5	21	0409
6	26	0411
7	32	0413
8	$3\overset{+}{4}$	0415

Constant Data

Number items in table plus	ь †	
one	69	0500
Constant . 5	1 5	0501
Length of items	οŻ	0603
Calculating address for searching table	0399	0507
Number to be located in table	14	0509
Minus one	οī	0511
Constant one	01	0513
Address of first item	0401	0517
Address of last item	0415	0521

Problem 36. Sales Discount Problem (Symbolic Solution)

- (a) The following sales record is on Tape Unit 0200.
- (b) Calculate discount percent, amount and net sales.
- (c) When gross sales exceed \$100.00, allow 3% discount.
- (d) When gross sales are \$100.00 or less, allow 2% discount.
- (e) Write record onto tape 0201.

Sales Record	No. of Characters	Example	Symbolic Address
Invoice No.	6	12849B	06010
Date	5	06105	06020
Cust. Name &	Address 33	A.B.JONES	06030
Gross Sales	6	004995	06040
Discount %	2	bb	06050
Discount Amt.	5	bbbbb	06060
Net Sales	6	bbbbbb	06070
Group Mark	1	‡	06080
Constant data			
2 percent	2	b\$	05010
3 percent	1	3	05020
One hundred	6	01000δ	05030
Group Mark	1	‡	05040

- (a) Read record from tape unit 0200 into block 10.
- (b) Calculate quantity X unit cost = value.
- (c) Store all fields in block 11 for printing with one space between each field, decimal points in unit cost and value fields, and comma in value field as follows:

Block 11	Item	Item	Qty.	Unit Cost	Value	
	Code	Descript	XXXXX	XX. XXX	X, XXX, XXX, XX	ŧ
	0	0	0	0	0	Ó
	1	2	3	4	5	6
	0	0	0	0	0	0

(d) Write out record on tape unit 0201, restore commas, and read in new records.

Fields	No. of Characters	Example S	Symbolic Address
Input Record			
Item Code	6	493DUX	10010
Description	30	POWER UNIT CHAS	SIS 10020
Quantity	5	01640	10030
Unit Cost (3 de	ecimals) 5	1046	10040
Constant Data			
Decimal Point	1		09010
Comma	1	,	09020
Group Mark	1	‡	09030

- (a) A record is read from Tape Unit 0200 into block 12.
- (b) In case of reading error, re-read record. If error occurs on second read, stop the machine.

Field		N	o. of Cl	naracte	ers	Example	Symbolic Address
Constant Data							
b1			2			b1	06010
5			1			5	06020
Block 12 xxxx	+ xxxx	+ xxxxx	+ :xxxxxx	+ xxxxx	xxxx		
(0	0	0	0	0		
	1	2	3	4	5		
	0	0	0	0	0		

- (a) A sales record is on tape unit 0200. The record includes sales value by salesman, state and district.
- (b) Arrange the record for printing on printer 0400 as shown below.
- (c) Write the program to recognize a change in district and state number. Print each different district and state number only once as follows:

District	State	Salesman	Sales
01	04	Jones	6784.63
		Lawson	15562.18
		Monet	965.42
	09	Askins	8641.89
		Thomas	3562.17
02	03	Bell	9852.65
Field	No. of Characters	Example	Symbolic Address
Input Record			
District	2	01	08010
State	2	04	08020
Salesman	20	Jones	08030
Sales	7	0678463	08040
Field	No. of Characters	Example	Symbolic Address
Print Record			
District	2	01	09010
Blanks	3	bbb	09020
State	2	04	09030
Blanks	3	bbb	09040
Salesman	20	Jones	09050
Blanks	3	bbb	09060
Sales	8	b6784.63	09070
Blank	1	Ъ	09080
	are for spacing betw	een fields.	
Constants			
Decimal Poi			07010
District (pre	•	00	07020
State (prev.)		00	07030
Group Mark	1	‡	07040

(a) Write additional instructions to Problem 39 to double space between districts and skip to channel 1 on overflow. Additional constant data is available as follows:

Field	No. of Characters	Example	Symbolic Address
Zero	1	ò	07050
One	1	†	07060

Problem 41. Normalize and Transfer

- (a) A six position amount field in ASU 01 is to be stored for printing at memory address 07090.
- (b) Place dollar sign (\$) and decimal point (.) in proper positions in memory for printing amount.
- (c) Replace insignificant zeros to the left of the decimal point with asterisks (*).

Field	No. of Characters	Example	Symbolic Address
Constant Data			
\$	1		06010
•	1		06020
*	l	, .	06030
1	1	Ţ	06040
Address of \$	4	07010	06050
Control Address of *	4	07050	06060
Calc. Address	4	0000	06070
Control counter			
Block 0	7 \$ * * *	* . 7) b

	Block 07	\$	*	*	*	*		7	9	b	
		0	0	0	0	0	0	0	0	0	
		1	2	3	4	5	6	7	8	9	
		0	0	0	0	0	0	0	0	0	
Constants	Block 06	\$		*	†	A	ddr. \$	of	Ctrl.		Calc. Addr.
		0	0	0	0			0		0	0
		1	2	3	4			5		6	7
		0	0	0	0			0		0	0

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705 INPUT-OUTPUT STATISTICS

TAPE

200 characters per inch density; 3/4" gap between records. This gap signifies end of record when reading from tape. In writing on tape this gap is made in place of group mark in memory.

75 i.p.s. tape speed (forward or backspacing).

500 i.p.s. average rewind speed.

2400 ft. of tape per maximum reel.

50 ft. approx. per minimum reel.

10 tape units maximum for one control unit.

0200-0299 possible range of tape unit addresses.

10.0 milliseconds access time.

.067 milliseconds to read or write one character.

CARD READER

250 c.p.m. speed in continuous operation.

Information read determined by control panel.

2.78 milliseconds to read record from record storage to memory.

240 milliseconds to read one card into record storage.

CARD PUNCH

100 c.p.m. speed in continuous operation.

600 ms. to punch one card record from record storage.

 $2.78\ \text{ms.}$ to write maximum of $80\ \text{characters}$ into record storage.

Records of 80 characters or less.

Group mark in memory is not punched but stops the writing into the record storage.

PRINTER

Model	717	719	720	730
Lines per minute	150	1000	500	1000
Print cycle time	400 ms.	60 ms.	120 ms.	60 ms.
Characters per line	120	60	120	120
Type of printer	print wheel	wire matrix	wire matrix	wire matrix

DRUM

60,000 character capacity in full drum.

300 addressable sections.

200 characters per section.

1000-1299 available addresses for first drum.

Writes up to memory group mark.

Reads up to drum mark.

8.0 ms. access time.

.040 ms. to read or write one character

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