

REPRODUCTION  
 MULTIPLY

A. PURPOSE

1. TO TEST THE MULTIPLY CIRCUITRY BY MULTIPLYING ONE FACTOR BY ANOTHER AND COMPARING THE PRODUCT WITH THE RESULT SHOULD BE FIELD.
2. TO TEST THE ABILITY OF THE AUXILIARY STARS TO ADDRESS ANY POSITION OF STORAGE. THE SYSTEM STORAGE SIZE WILL DICTATE THE ADDRESSING REQUIREMENTS OF THE AUXILIARY STARS.

B. LOADING PROCEDURE

1. WHEN RUNNING TEST FROM CARDS ENTER STORAGE SIZE IN LOCATION 1251, PLACE TEST IN 1402 READ HOPPER AND DEPRESS LOAD KEY.
2. WHEN RUNNING TEST FROM TAPE ENTER STORAGE SIZE IN 1251 AND ENTER A 1 IN 1258.

STORAGE SIZE TO BE TESTED

CHARACTER TO BE MANUALLY ENTERED IN LOCATION 551 (1251)

1.4 - 2K  
 4K  
 8K  
 12K  
 16K

BLANK  
 4  
 8  
 2  
 6

C. PROGRAM CONTROL

1. SENSE SWITCHES

- B. ON TO REPEAT FOR SCOPING  
 OFF TO CONTINUE
- C. ON TO PRINT CORRECT RESULTS  
 OFF TO CONTINUE
- D. ON TO REPEAT SAME DETAIL CARD  
 OFF TO CONTINUE
- E. ON TO STOP ON ERROR  
 OFF TO PRINT ERROR

2. COUNTER

A COUNTER (LOCATION 967-970) IS USED TO ALLOW THE PROGRAM TO REPEAT 90 TIMES FOR EACH DETAIL CARD. WHEN SENSE SWITCH C IS ON, ONLY ONE CORRECT PRINTOUT OCCURS PER DETAIL CARD. AN ERROR TEST IS MADE EACH TIME THE PROGRAM IS REPEATED. AN ERROR PRINTOUT OCCURS FOR EACH FAILURE.

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3. CHG. NO.	110378	110378G	117628	TA 1976				

DIAGNOSTIC FUNCTION TEST

PART NO. 451439  
 SHEET 2 OF 10  
 BLOCK NO. 3200D

REPRODUCTION

D. TEST PROCEDURE

THE MULTIPLICAND (A FIELD - COLUMNS 1-5), THE MULTIPLIER (B FIELD - COLUMNS 21-26), AND THE RESULT SHOULD BE FIELD (COLUMNS 41-52) ARE LOADED INTO THE PRINT AREA FOR PRINTING PURPOSES.

ON DETAIL CARDS OTHER THAN CARD NUMBERS 33 AND 34, A TEST IS MADE FOR 1-DIGIT FIELDS (A BLANK IN LOCATION 205). IF BLANK A 3-POSITION PRODUCT (1 POSITION IN THE MULTIPLICAND, 1 POSITION IN THE MULTIPLIER, PLUS 1) IS DEVELOPED IN LOCATION 771-773. IF NO BLANK A 12-POSITION PRODUCT (5 POSITIONS IN THE MULTIPLICAND, 6 POSITIONS IN THE MULTIPLIER, PLUS 1) IS DEVELOPED IN LOCATION 773-784.

ON DETAIL CARD NUMBER 33 A TEST IS PERFORMED TO DETERMINE THE MEMORY SIZE OF THE 1401 SYSTEM (1.4-2K, 4K, 8K OR 12-16K). THE PROGRAM THEN PERFORMS A SUBROUTINE WHICH DEVELOPS A 12-POSITION PRODUCT IN A MEMORY LOCATION SELECTED TO TEST SPECIFIC BIT POSITIONS IN THE A AUX AND B AUX STAR'S. ON DETAIL CARD NUMBER 34, A TEST IS PERFORMED TO DETERMINE IF MEMORY SIZE IS 12 OR 16K, IF 12 OR 16K A SECOND MULTIPLY SUB-ROUTINE IS PERFORMED.

THE PRODUCT IS THEN LOADED INTO THE PRINT AREA AND COMPARED WITH THE RESULT SHOULD BE FIELD. IF THE COMPARISON IS UNEQUAL, THE PROGRAM BRANCHES TO THE ERROR PRINT ROUTINE. THE POSITION OF SENSE SWITCH E THEN DETERMINES WHETHER THE MACHINE STOPS TO PERMIT CONSOLE CHECKING OR PRINTS THE RESULTS WITH AN "ERROR" INDICATION.

E. STOPS

920 IN STORAGE ADDRESS REGISTER: ERROR WITH SENSE E ON.

F. PRINTOUTS

1. CORRECT

A FIELD	B FIELD	RESULT SHOULD BE	RESULT IS
0246H	A	00000000246H	00000000246H
1234N	065M	00000807363&	00000807363&
R	8	07K	07K
R	R	08A	08A

2. ERROR

A FIELD	B FIELD	RESULT SHOULD BE	RESULT IS
0246H	A	00000000246H	00000000246Q ERROR
1234N	065M	00000807363&	000008073630 ERROR
R	8	07K	072 ERROR
R	R	08A	08J ERROR

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G. COMMENTS

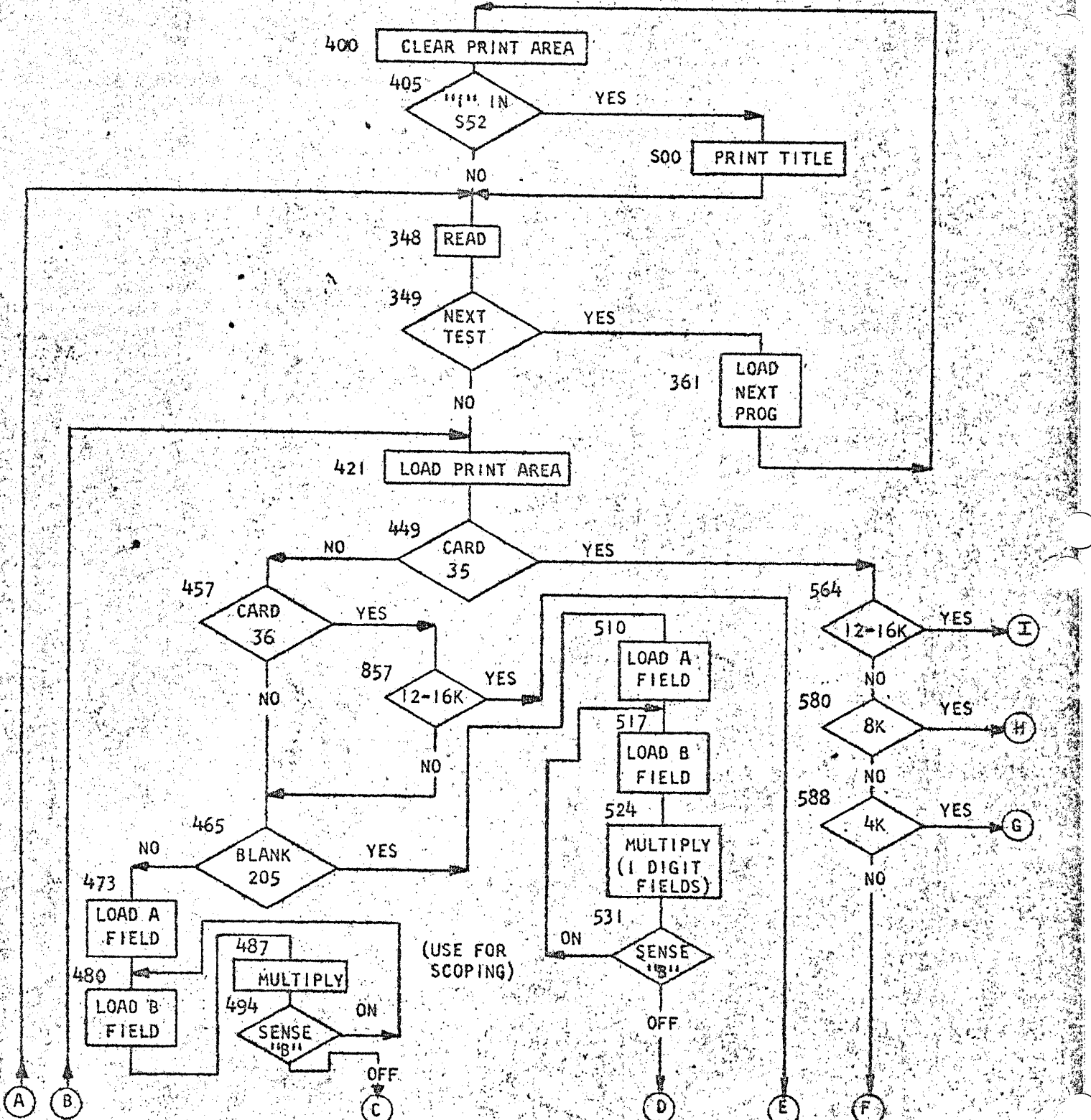
# REPRODUCTION

THE BRANCH INSTRUCTION AT LOCATION 927 CAN BE CHANGED MANUALLY TO CAUSE THE PROGRAM TO LOOP AS FEW AS 1 OR AS MANY AS 9,000 TIMES PER DETAIL CARD. THE PROGRAM CALLS FOR 90 LOOPS PER CARD.

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# DIAGNOSTIC FUNCTION TEST REPRODUCTION

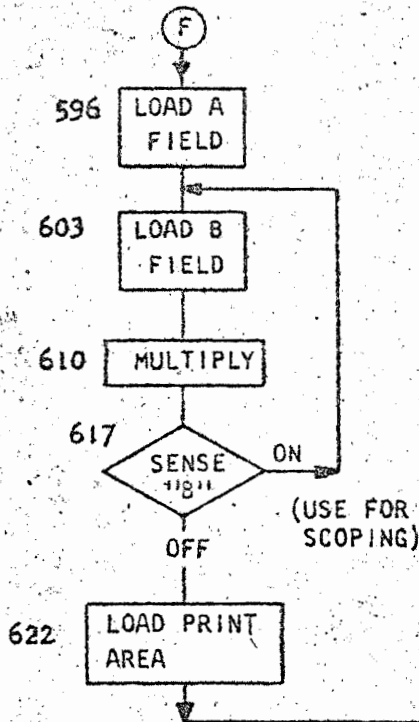
FLOW CHART



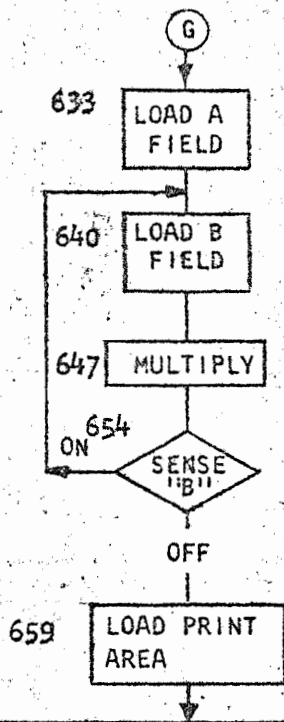
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REPRODUCTION

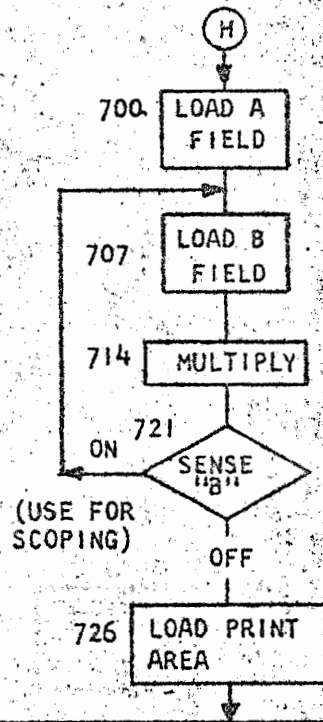
(1.4-2K ROUTINE)



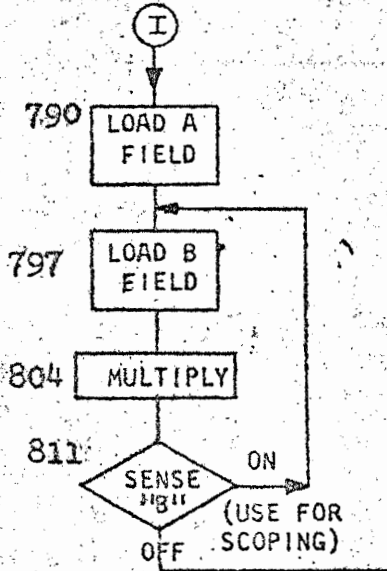
(4K ROUTINE)



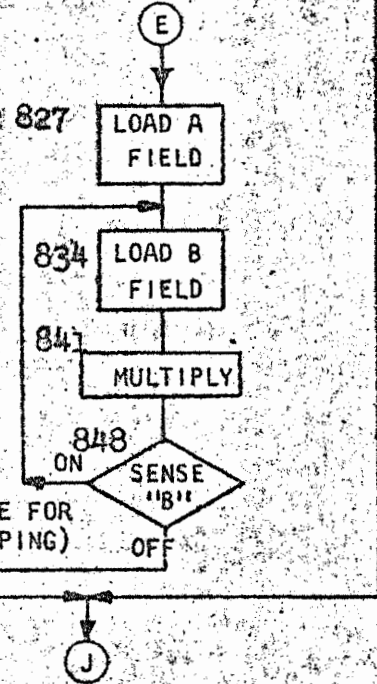
(8K ROUTINE)



(1ST 12-16K ROUTINE)

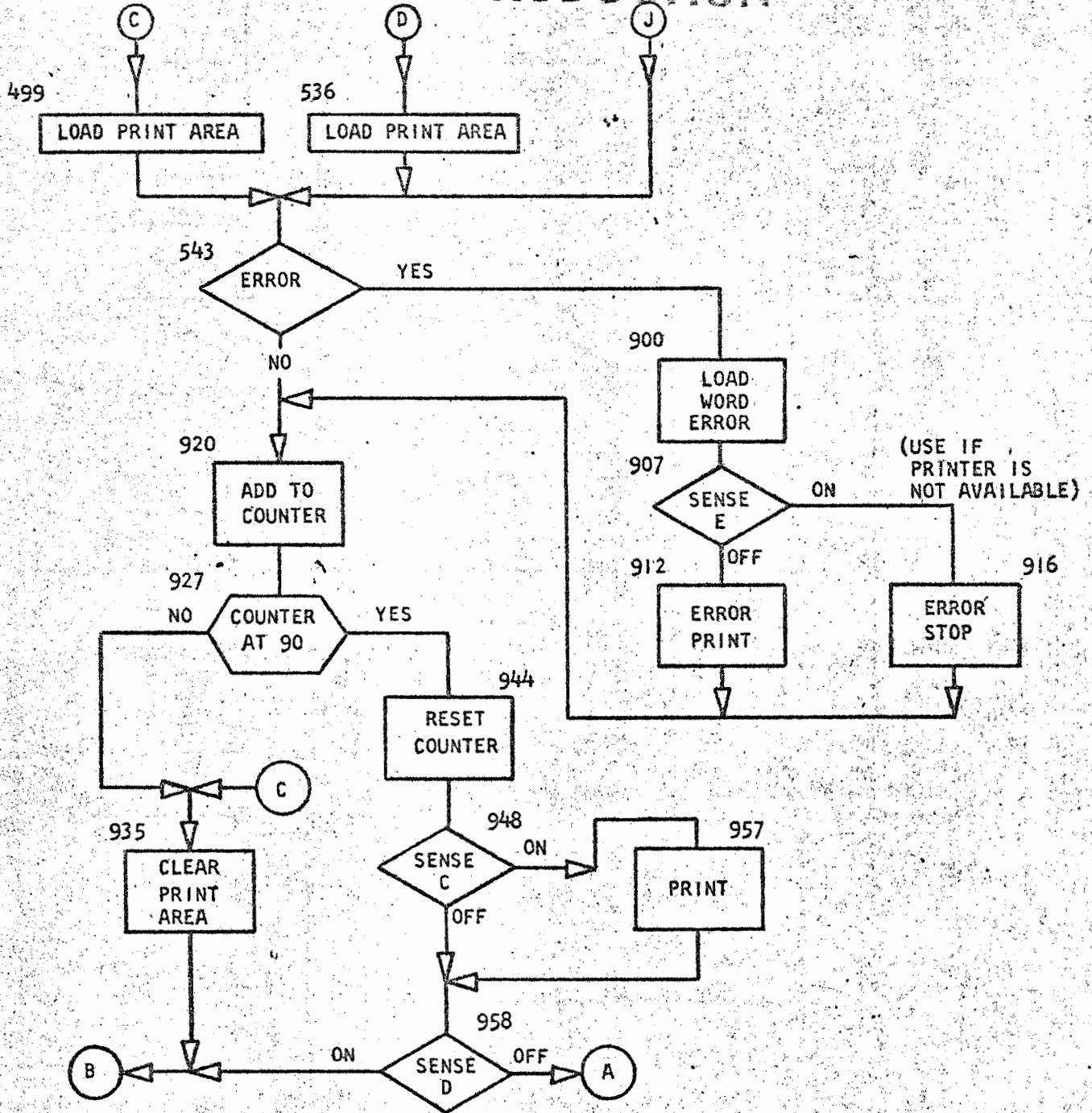


(2ND 12-16K ROUTINE)



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DIAGNOSTIC FUNCTION TEST

REPRODUCTION

PROGRAM LISTING FOR USE WITH FLOW CHART

MULTIPLY

3200D

INSTRUCTION

ADDRESS	OP	A	B	REMARKS
377	377	B	389 5561	USE WHEN TESTS ARE RUN FROM TAPE
385	385	B	588	USE WHEN TESTS ARE RUN FROM TAPE
389	389	N	000	USE WHEN TESTS ARE RUN FROM TAPE
393	393	M	360 392	USE WHEN TESTS ARE RUN FROM TAPE
400	400	/	332	START TEST
404	404	/		
405	405	B	500 5521	BR TO TITLE PRINT ROUTINE IF 1 IN 552
413	413	/	080	CLEAR READ AREA
417	417	B	348	BRANCH TO PROGRAM CHAINING ROUTINE
421	421	,	001 078	LOAD PRINT AREA
428	428	L	080 299	LOAD PRINT AREA
435	435	L	072 272	LOAD PRINT AREA
442	442	,	221 241	LOAD PRINT AREA
449	449	B	564 0720	BR TO TEST MEMORY SIZE IF A 0 IN COL 072
457	457	B	857 0721	BR TO TEST MEMORY SIZE IF A 1 IN COL 072
465	465	B	510 205	BR TO MULT 1 DIGIT FLD IF 205 IS BLANK
473	473	L	205 888	LOAD A FIELD
480	480	L	232 784	LOAD B FIELD
487	487	@	888 784	MULTIPLY
494	494	B	480 B	SENSE B ON TO SCOPE SS
499	499	L	784 272	LOAD PRINT AREA
506	506	B	543	BRANCH TO TEST FOR ERROR
510	510	L	201 677	LOAD A FIELD
517	517	L	223 773	LOAD B FIELD
524	524	@	677 773	MULTIPLY WITH 1 DIGIT FIELDS
531	531	B	517 B	SENSE B ON TO SCOPE
536	536	L	773 263	LOAD PRINT AREA
543	543	C	272 252	TEST FOR ERROR
550	550	B	900 /	BR TO ERROR PRINT ROUTINE IF UNEQUAL
555	555	B	920 C	SENSE C ON TO CORRECT PRINT ROUTINE SS
580	560	B	958	BRANCH TO SENSE D
564	564	B	790 5516	TEST FOR 16K
572	572	B	790 5512	TEST FOR 12K
580	580	B	700 5518	TEST FOR 8K
588	588	B	633 5514	TEST FOR 4K
596	596	L	205 /05	BEGIN 1.4-2K MULTIPLY ROUTINE
603	603	L	232 #02	
610	610	@	/05 #02	MULTIPLY
617	617	B	603 B	SENSE B ON TO SCOPE SS
622	622	L	#02 272	LOAD PRINT AREA
629	629	B	543	BRANCH TO TEST FOR ERROR
633	633	L	205 605	BEGIN 4K MULTIPLY ROUTINE

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DIAGNOSTIC FUNCTION TEST

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640	640	L 232	E22	MULTIPLY	
647	647	a G05	E22	SENSE B ON TO SCOPE	SS
654	654	B 640	B	LOAD PRINT AREA	
659	659	L E22	272	BRANCH TO TEST FOR ERROR	
666	666	B 543		BEGIN 8K MULTIPLY ROUTINE	
700	700	L 205	A0V		
707	707	L 232	+0S	MULTIPLY	
714	714	a A0V	+0S	SENSE B ON TO SCOPE	
721	721	B 707	B	LOAD PRINT AREA	
726	726	L +0S	272	BRANCH TO TEST FOR ERROR	
733	733	B 543		BEGIN 1ST 12-16K MULTIPLY ROUTINE	
790	790	L 205	10N		
797	797	L 232	00K	MULTIPLY	
804	804	a 10N	00K	SENSE B ON TO SCOPE	SS
811	811	B 797	B	LOAD PRINT AREA	
816	816	L 00K	272	BRANCH TO TEST FOR ERROR	
823	823	B 543		BEGIN 2ND 12-16K MULTIPLY ROUTINE	
827	827	L 205	A0V		
834	834	L 232	00K	MULTIPLY	
841	841	a A0V	00K	SENSE B ON TO SCOPE	SS
848	848	B 834	B	BRANCH TO LOAD PRINT AREA	
853	853	B 816		TEST FOR 16K	
857	857	B 827	SS16	TEST FOR 12K	
865	865	B 827	SS12	BRANCH TO MAIN ROUTINE	
873	873	B 465		BEGIN ERROR PRINT ROUTINE	
900	900	L /14	285	E ON TO ERROR STOP	SS
907	907	B 916	E	ERROR PRINT	
912	912	2 920		ERROR STOP	
916	916	2 920		ADD ONE TO OPERATION COUNTER	
920	920	A 920	970	BRANCH AFTER 90 OPERATIONS	C FOR TA
927	927	B 944	9699	CLEAR PRINT AREA	
935	935	/ 332			
939	939	/		BRANCH TO REPEAT	
940	940	B 421		RESET OPERATION COUNTER	
944	944	S 970		C ON FOR CORRECT PRINT	SS
948	948	B 957	C	BRANCH TO SENSE D	
953	953	B 958		PRINT CORRECT RESULTS	
957	957	2		D ON TO REPEAT	SS
958	958	B 421	D	BRANCH TO PROG. CHAINING ROUTINE	
963	963	B 348		OPERATION COUNTER	
967	967	0 00+		LOOP ON SW B	SS
971	971	B 935	B	GO TO ERROR ROUTINE	
976	976	B 900		CONSTANTS	
1110	/10	E RRO	R	CONSTANTS	
1115	/15			CONSTANTS	
1120	/20	A FI	ELD	CONSTANTS	
1140	/40	B FI	ELD	CONSTANTS	
1160	/60	R ESU	LT SHOULD BE	CONSTANTS	
1180	/80	R ESU	LT IS	CONSTANTS	

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# REPRODUCTION

## TABLE OF UNPRINTABLE CHARACTERS

LP-LEFT PARENTHESIS	12 5 8	SE-SEMICOLON	11 6 8	DE-DELTA	11 7 8
WS-WORD SEPARATOR	0 5 8	LT-LESS THAN	12 6 8	PZ-PLUS ZERO	12 0
TS-TAPE SEGMENT MARK	0 7 8	GT-GREATER THAN	6 8	TM-TAPE MARK	7 8
GM-GROUP MARK	12 7 8	MZ-MINUS ZERO	11 0	CO-COLON	5 8
RP-RIGHT PARENTHESIS	11 5 8	AP-APOSTROPHE	0 6 8		

,008015,022029,033033N	1001	MULTIPLY	32000	0A
,008015,022029,033033N	1001	SET WORDMARK CARD	32000	02
L067367,340344,348349,357361	1001,008012,001100119361080AB421/340080		32000	03
L069404,377385,389393,400404	1001	B38955818588N000M360392/332/	32000	04
L069441,413417,421428,435442	1001B8005521/080B348,001078L080299L072272		32000	05
L070479,449457,465473,480480	1001,22124185640720B85707218510205 L205888		32000	06
L069516,487494,499506,510517	1001L232784@888784B480BL7842728543L201677		32000	07
L070554,524531,536543,550555	1001L223773@677773B517BL773263C272252B900/		32000	08
L065587,560564,572580,588588	1001B920CB9588790S5168790S5128700S518		32000	09
L066621,596603,610617,622622	1001B633S514L205/05L232+02@/05+02B603B		32000	10
L069658,629633,640647,654659	1001L+022728543L205G05L232E22@G05E22B640B		32000	11
L072698,666666,666666,666666	1001LE222728543		32000	12
L070737,707714,721726,733733	1001L205A0VL232POS@A0VPOS8707BLPOS2728543		32000	13
	Z			
L069826,797804,811816,823827	1001L20510NL23200K@10N00KB797BL00K2728543		32000	14
L070864,834841,848853,857865	1001L205A0VL23200K@A0V00KB834BB8168827S516		32000	15
L067899,873900,900900,900900	1001B827S512B465		32000	16
L071938,907912,916920,927935	1001L/142858916E2920.920A920970B9449699/332		32000	17
L056962,940944,948953,957958	1001/8421S970B957CB95828421D		32000	18
L072+02,967971,980988,992999	1001B348000PB935BB900		32000	19
	Z			
L069/19@+83+83,/10/15,/20/20	1001	ERROR	32000	20
L072/59,/40/60,/60/60,/60/60	1001A FIELD	B FIELD	32000	21
L072/99,/80S00,S00S00,S00S00	1001RESULT SHOULD BE	RESULT IS	32000	22
L057S24,601S05,S12S13,S17S18	10012,049L0772772/2772@/40/60		32000	23
L052S44,S29S36,S37S41,S45S45	1001@/80L/892702/2702413		32000	24
/333080N		CLEAR WORDMARK CARD	32000	25
,019027,031,038042B031T98GB400L046352BW048S88		MULTIPLY	32000	26

### DETAIL CARDS

13579	000000	00000000000P	32000	27
		Z		
0246H	A	0000000246H	32000	28
1234V	Z	00000002469P	32000	29
		Z		
67890	Y	00000054312P	32000	30
		Z		
13579	OR	00000012221J	32000	31
0246Q	087	000000214710	32000	32
1234N	065M	00000807363P	032000	33
		Z		

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1401 DATA PROCESSING SYSTEM  
DIAGNOSTIC FUNCTION TEST

PART NO. 451439  
SHEET 10 OF 10  
BLOCK NO. 3200D

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FPY90	TKA0	00021792690P	
		Z	132000 34
		00P	32000 35
		Z	
1	0	00P	32000 36
		Z	
B	/	00B	32000 37
R	8	07K	32000 38
Y	B	01F	32000 39
O	R	00M	32000 40
		Z	
R	R	08A	32000 41

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