IDENTIFICATION: PROD TEST ROUTINE

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PURPOSE: To test the PB250 control, memory, and arithmetic units.

SPACE: All sectors of line selected, sectors 000-004, and sector 015 of line 00.

LOADING THE PROGRAM: With the Octal Utility Package stored in line 01, type LLF (LL = number of line to fill).

Along with the normal tape of "Prod" (punched in binary to be filled with Octal Utility Package), there is another tape of the routine punched in Bootstrap format. This tape is filled in the normal Bootstrap method.

When tape is filled and stopped: With Enable and Breakpoint down strike the I key. Raise both Enable and Breakpoint and the routine will come to a halt and display Operand and Command line of 01. Depress both Enable and Breakpoint to clear parity and release both to continue the test.

This routine will run the same as the other routine except that it will run in line 01 only. There are no Index tags in this routine, and since it is in Bootstrap format there will be no way to start in locations other than 00001.

This routine loads a fixed number from 06701 of +2563253 and uses this number for the random number. Therefore, the contents of the registers will be the same as shown in the coding sheets.

TESTING OPTIONS:

Test line 02-17 - Initiate test with 351LL (LL is line that "Prod" is loaded into).

Testing a Reduced Group of Lines - Load "Prod" into any one of the lines to be tested. To specify the first line of the group, modify sectors 202 and 327 with +00000FF (FF = 1st line number). To specify the last line of the group, modify location 227 with +00000LL plus 1 (LL = last line to be tested).

327 gets FF+1!

Initiate test with 351XX (XX = line address of line containing "Prod" routine). If modification of 202 and 327 is not made, test will start in line 02. If modification of 227 is not made, test will terminate in line 17.

Test One Line - 1) If program is in desired line, address 000YY (YY = desired line) and program will halt with the operand lights containing the desired line address. Depress Enable and Breakpoint and release both to start.

2) If a line is suspected of being bad, or if test is hanging up in a particular line, modify location 072 of a line known to contain the routine with +00000ZZ (ZZ = suspected line), and then initiate a test of the suspected line by typing 034XX (XX = line containing program). Program will halt with the operand lights containing the desired line address. Depress Enable and Breakpoint and release both to start. To check out the balance of the lines refer to option "Testing a Reduced Group of Lines".

ERROR INDICATIONS: The Error Indications consist of Halt commands with an operand indicating the location of the failure. When an error occurs, the routine will loop on the test until it is completed correctly. There is a test breakpoint command located before each halt. If you wish to eliminate the halt on each loop, depress Breakpoint.

On each of the flow diagrams to follow there is a transfer command shown in a block with the error

indication beside it. In order to loop on an individual test, replace the command indicated above the block with the transfer command shown.

Error halt	Operations being tested
24 25	LDP-DPA-DPS
30 31 32 33	SBR-MAC-TCN
21 22 23	LSD-RSI-LRS
26	NAD-SAI
16 17	EBP-TAN-TBN
34	AOC-AMC-EXF
20	MUP-DIV-SQR*
27	IAM

*(DIV-SQR performed on alternate passes; location 050 indicates operation; NOP = SQR and TES = DIV.)

Carriage return or long tab will cause typewriter busy signal to be tested and a halt with operand of 37.

COMPLETE PROD ROUTINE

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000  305S3702I (000)  002S0402I (001)  046 2233I (002)  032 3200; (003)
     021 1200; (004)  006 0100; (005)  007 0200; (006)  010S4202I (007)

010  057S7777I (010)  020 1200; (011)  022 1200; (012)  023 1200; (013)
     024 1200; (014)  015 1200; (015)  041S3702I (016)  020S0400; (017)

020  022S0600; (020)  050S3200; (021)  027S4500; (022)  024S0502I (023)
     000 0000; (024)  026S0402I ( 025)  000 0045; (026)  056S2100; (027)

030  031S4400; (030)  032S4300; (031)  041S0600; (032)  064S0500; (033)
     057S4300; (034)  036S0502I (035)  052S2552; (036)  074S3702I (037)

040  042S0600; (040)  042S0700; (041)  071S3702I (042)  017S3702I (043)
     045S1602I (044)  052S2552; (045)  052S2552; (046)  053S1702I (047)

050  052S2400; (050)  100S3100; (051)  100S3000; (052)  052S2552; (053)
     052S2552; (054)  057S3702I (055)  105S2200; (056)  060S5600; (057)

060  072S0502I (060)  064 7502I (061)  041 7735; (062)  041S0024; (063)
     065S0200; (064)  114S3300; (065)  067S0100; (066)  053S1552I (067)

070  100S5600; (070)  120S2000; (071)  000 0040I (072)  075S2100; (073)
     076S2500; (074)  310S1137; (075)  103S5600; (076)  000 0000; (077)

100  115S0300; (100)  031 7502I (101)  041 7735; (102)  041S0025; (103)
     111S3702I (104)  106S5602I (105)  000 0000; (106)  113 7502I (107)

110  162S3702I (110)  154 7502I (111)  275S3702I (112)  114S0300; (113)
     146S3702I (114)  333 7102I (115)  160S5600; (116)  120S1500; (117)

120  145S3702I (120)  122S5602I (121)  000 0000; (122)  134 7502I (123)
     125S5602I (124)  000 0000I (125)  134 7502I (126)  130S5602I (127)

130  377S7777I (130)  134 7502I (131)  137 7735; (132)  137S0020; (132)
     050 0402I (134)  140S0702I (135)  000 0000; (136)  140S0600; (137)

140  051 7737; (140)  017S3702I (141)  050 1202I (142)  140 1002I (143)
     035S3702I (144)  174S2300; (145)  147S5602I (146)  000 0000; (147)

150  153 7502I (150)  031 7735; (151)  031S0030; (152)  163S0300; (153)
     156S2500; (154)  000 0000; (155)  157S5602I (156)  052S2552; (157)

160  274S3702I (160)  164 7502I (161)  020 7735; (162)  020S002I; (163)
     213S3320; (164)  166S5602I (165)  000 0000; (166)  224 7502I (167)

170  171S5602I (170)  000 0000I (171)  224 7502I (172)  211S3702I (173)
     175S5602I (174)  000 0000; (175)  201 7502I (176)  022 7735; (177)

200  264S3702I (200)  202S0100; (201)  000 0040; (202)  204S5602I (203)
     000 0000; (204)  210 7502I (205)  022 7735; (206)  264S3702I (207)

210  221S0300; (210)  031 7735; (211)  031S003I; (212)  214S5602I (213)
     000 0000; (214)  234 7502I (215)  217S5602I (216)  377S7777I (217)

220  234 7502I (220)  020 7735; (221)  020S0022; (222)  261S5600; (223)
     225S0502I (224)  220 4020I (225)  227S0000; (226)  000 0004; (227)

230  233 3402I (230)  031 7735; (231)  031S0032; (232)  234S1000; (233)
     235S0300; (234)  254S0500; (235)  243S0500; (236)  240S5600; (237)

240  244S0500; (240)  022 7502I (241)  020 7735; (242)  020S0023; (243)
     245S4300; (244)  246S0100; (245)  251S4400; (246)  250S4202I (247)

250  052S0152; (250)  252S0200; (251)  272S2200; (252)  265S3702I (253)
     327S0502I (254)  256S5602I (255)  220 4020I (256)  020 7502I (257)

260  031 7735; (260)  031S0033; (261)  236 7502I (262)  022 7735; (263)
     022S0026; (264)  266S4702I (265)  052S0152; (266)  270S4602I (267)

270  052S0152; (270)  275S0300; (271)  300 3602I (272)  313S2100; (273)
     371 7502I (274)  302 7735; (275)  302S0027; (276)  300S5600; (277)

300  320S2100; (300)  346S3702I (361)  303S0500; (302)  000 0000; (303)
     354S3702I (304)  306S0502I (305)  041S3702I (306)  016 1102I (307)

310  367S3702I (310)  312 7102I (311)  000S3702I (312)  314S4002I (313)
     376 0000; (314)  325 3502I (315)  240S3702I (316)  000 0000; (317)

320  321S4002I (320)  376 0000; (321)  240 3502I (322)  236 7735; (322)
     236S0016; (324)  236 7735; (325)  236S0017; (326)  000 0040; (327)

330  332 2100; (330)  332 1137; (331)  357S0502I (332)  327 0502I (333)
     374 1402I (334)  327 1102I (335)  227 5602I (336)  341 7502I (337)

340  041S3702I (340)  202 0502I (341)  327 1102I (342)  357 0502I (343)
     332 1102I (344)  041S3702I (345)  040 7502I (346)  240 7735; (347)

350  240S0034; (350)  254 0502I (351)  016 1102I (352)  363S3702I (353)
     355S1100; (354)  000 0000; (355)  035S3702I (356)  357S0502I (357)

360  332 1102I (360)  327 0502I (361)  336S3702I (362)  115 0502I (363)
     332 1102I (364)  372S3702I (365)  041S3702I (366)  372S0002I (367)

370  372S0037; (370)  370 7737; (371)  001 0500; (372)  374S1402I (373)
     000 0000I (374)  001 1100; (375)  001 0600; (376)  001S3702I (377)
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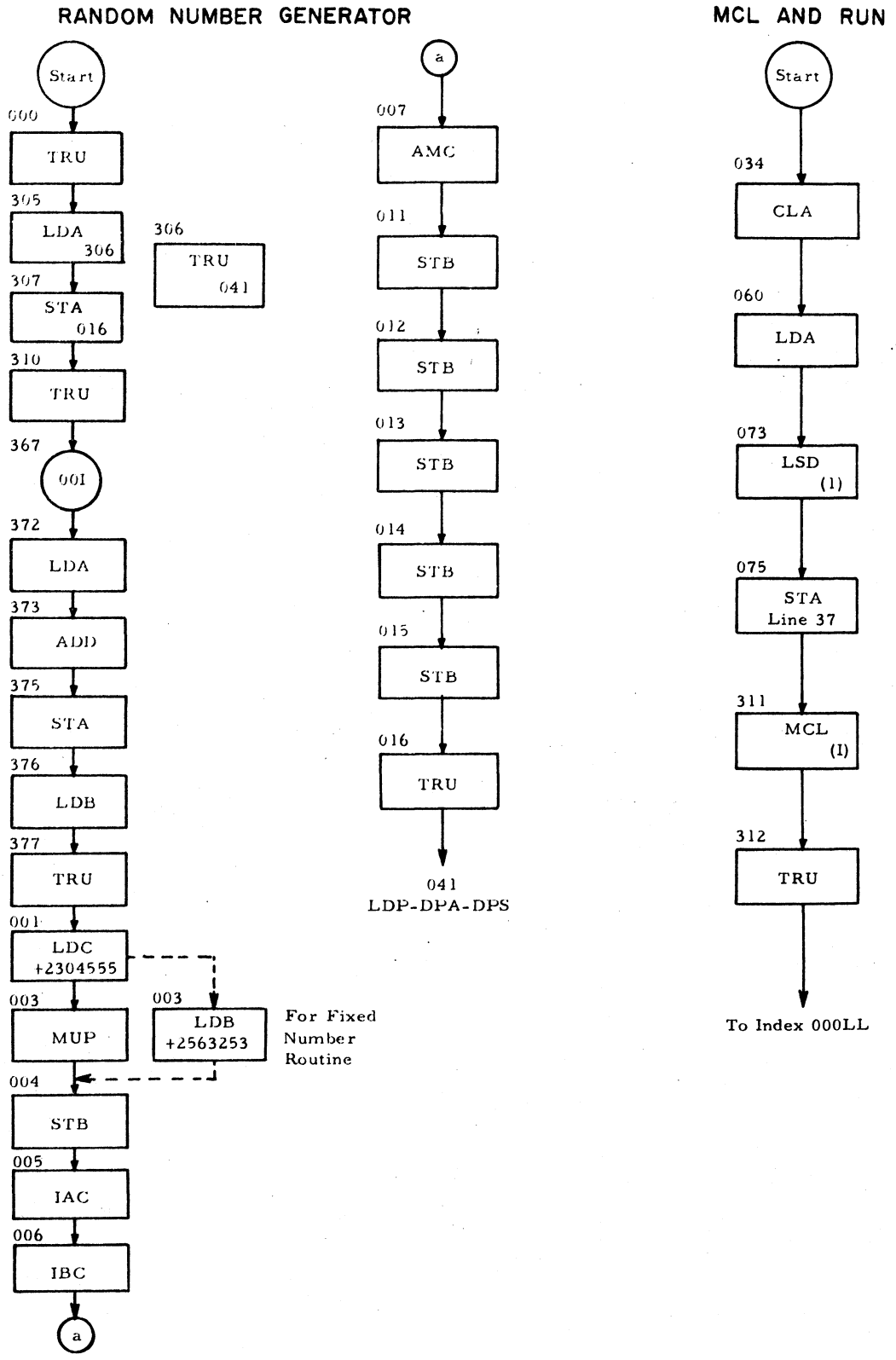
Flow Diagram

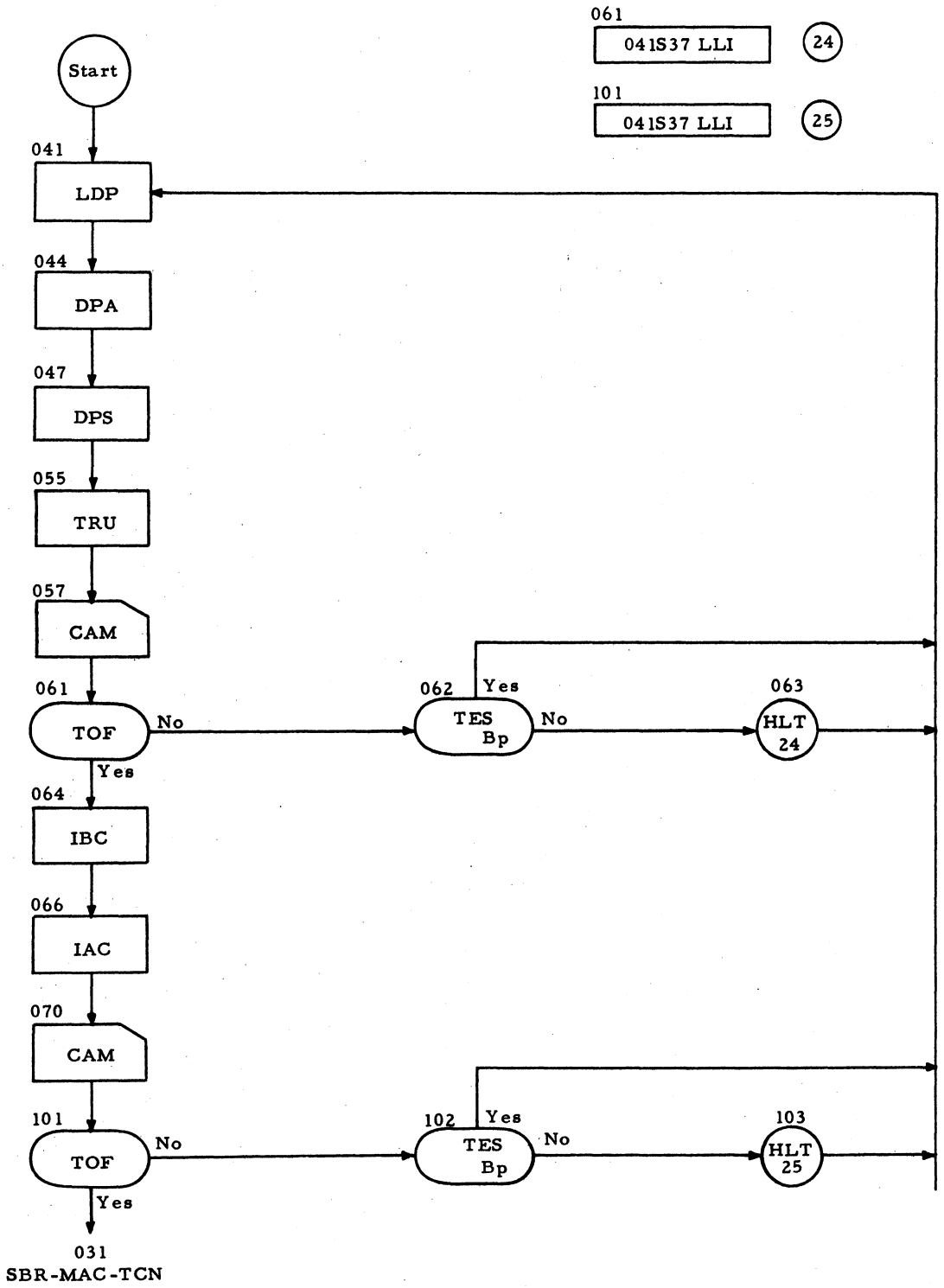
PROD TEST ROUTINE



Flow Diagram

PROD TEST ROUTINE

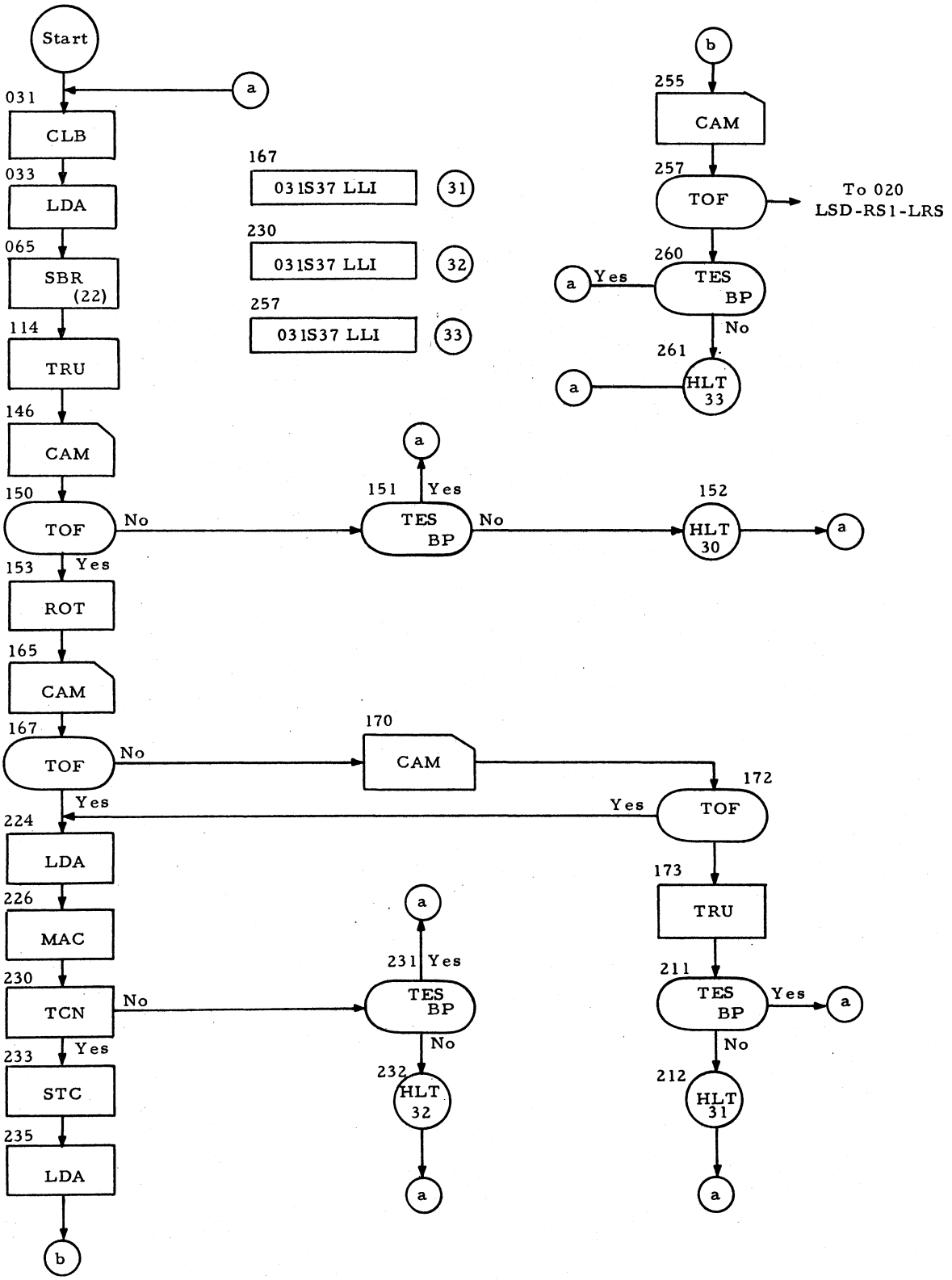
LDP-DPA-DPS



Flow Diagram

PROD TEST ROUTINE

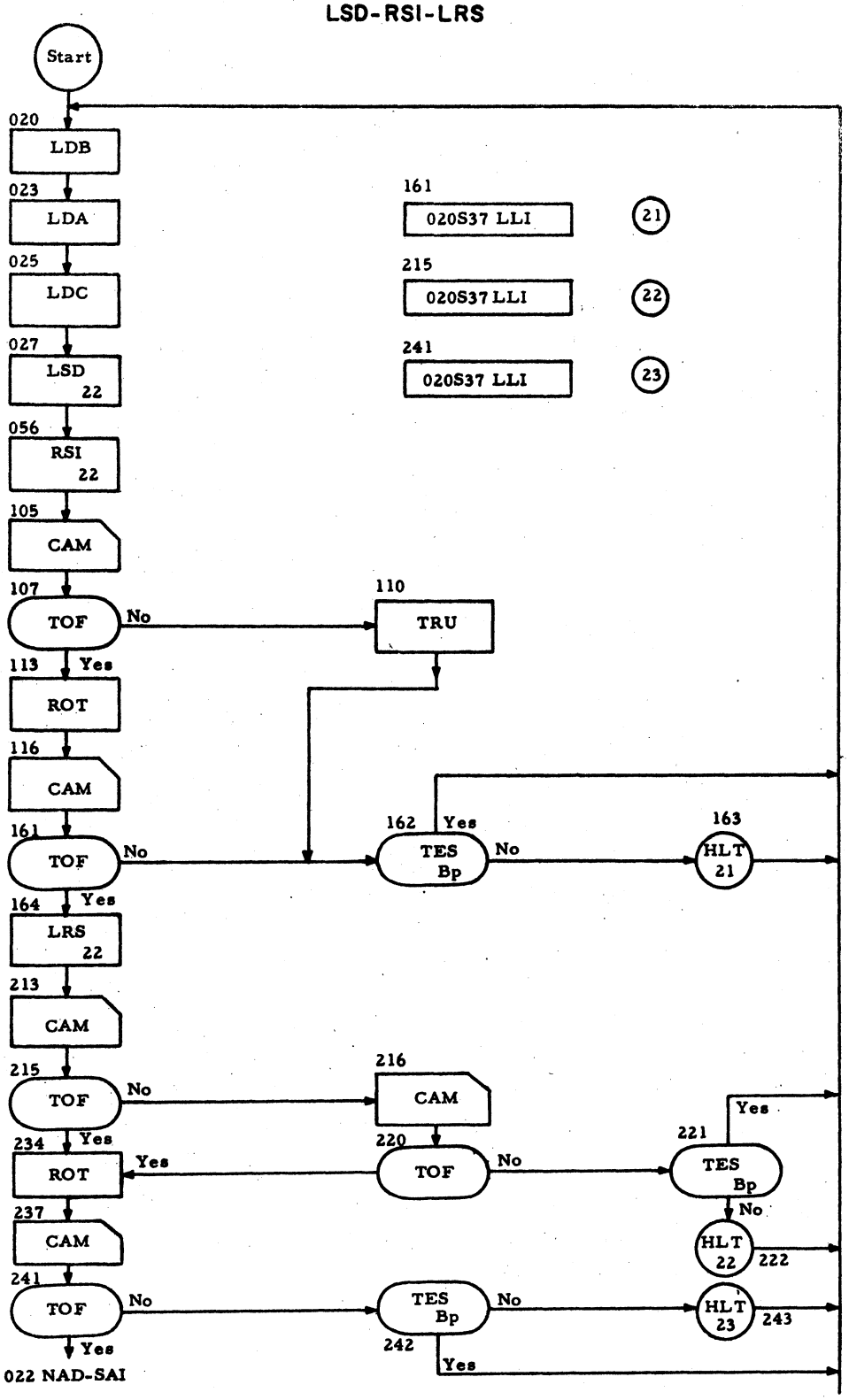
SBR-MAC-TCN



Flow Diagram

PROD TEST ROUTINE

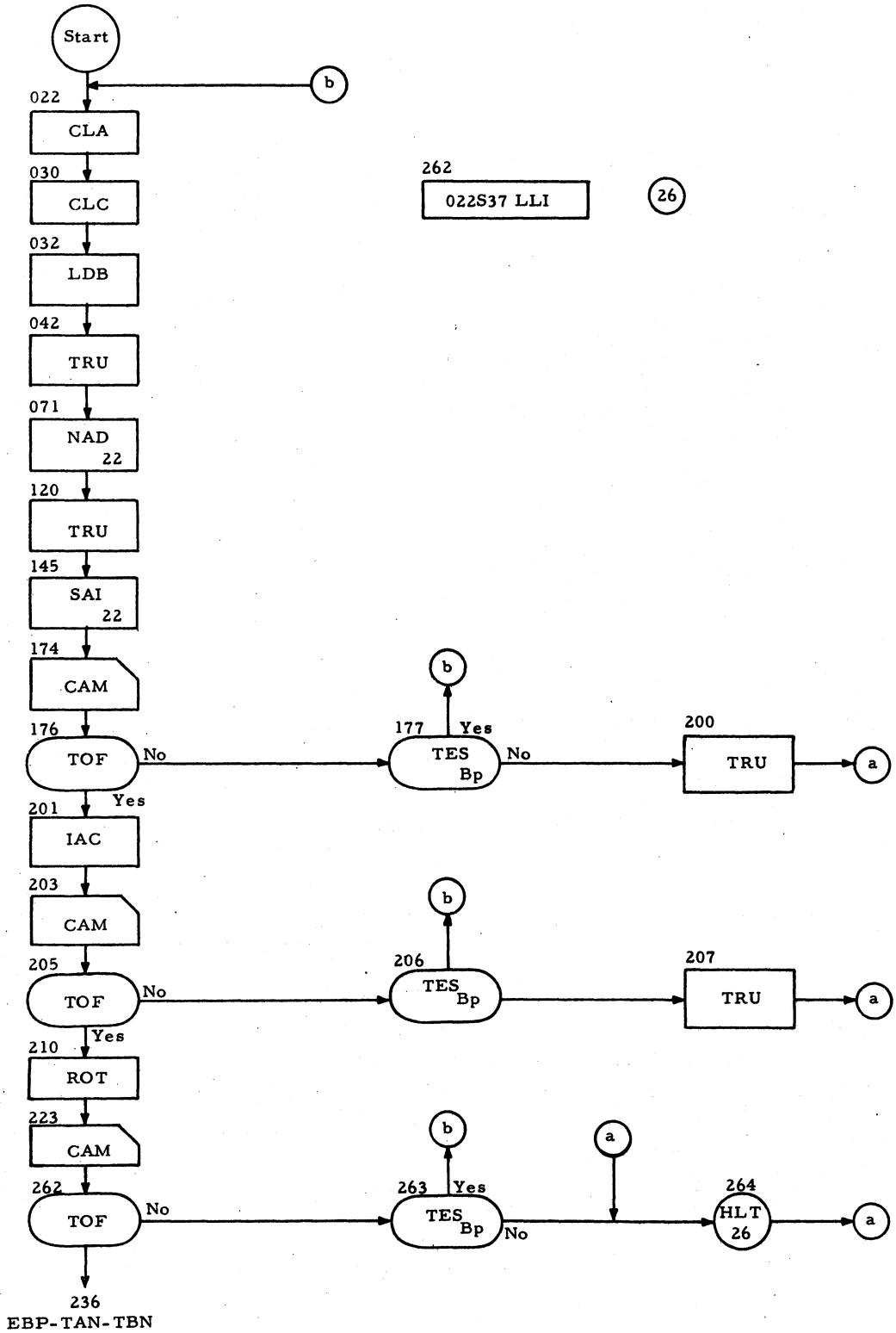
LSD-RSI-LRS



Flow Diagram

PROD TEST ROUTINE

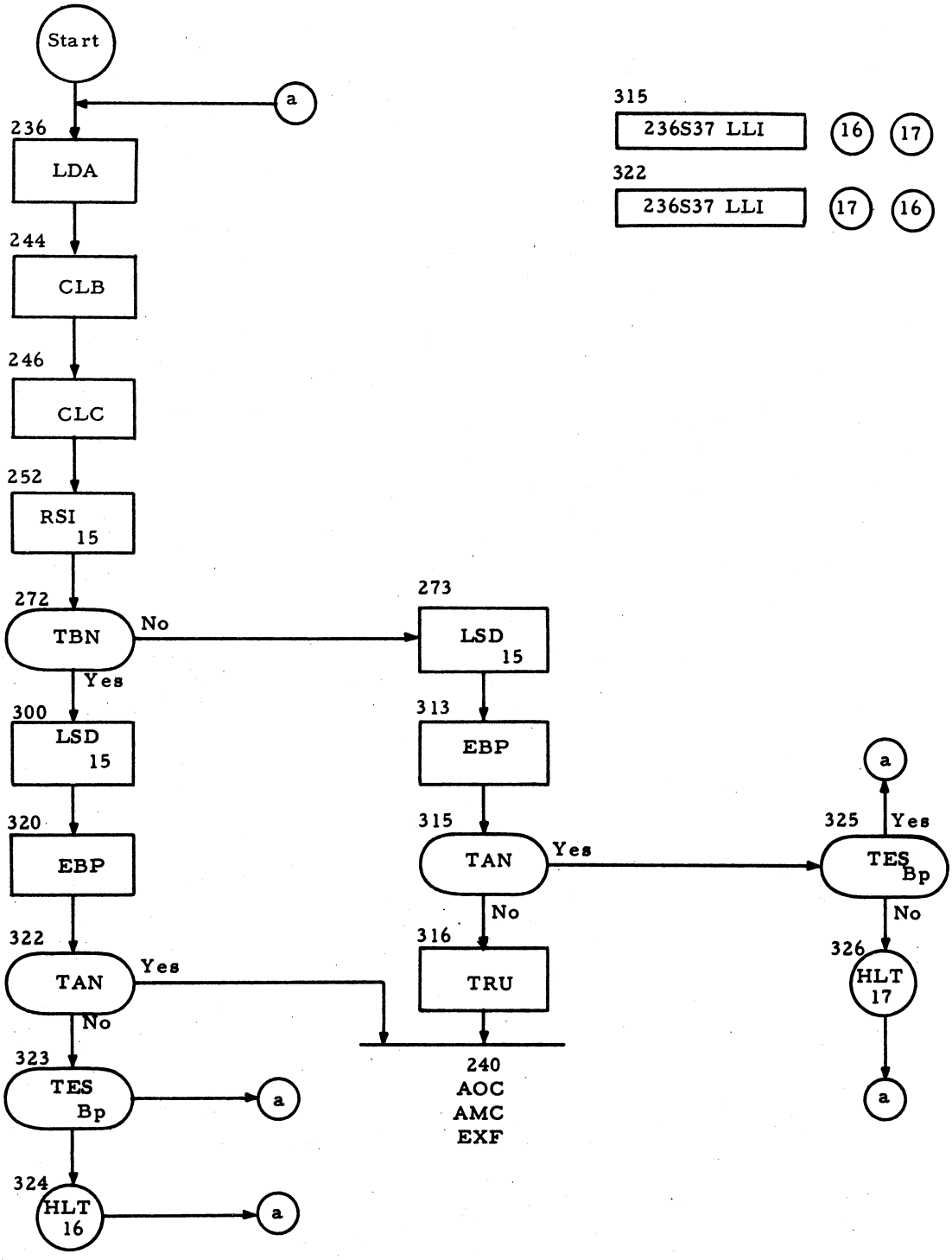
NAD-SAI



Flow Diagram

PROD TEST ROUTINE

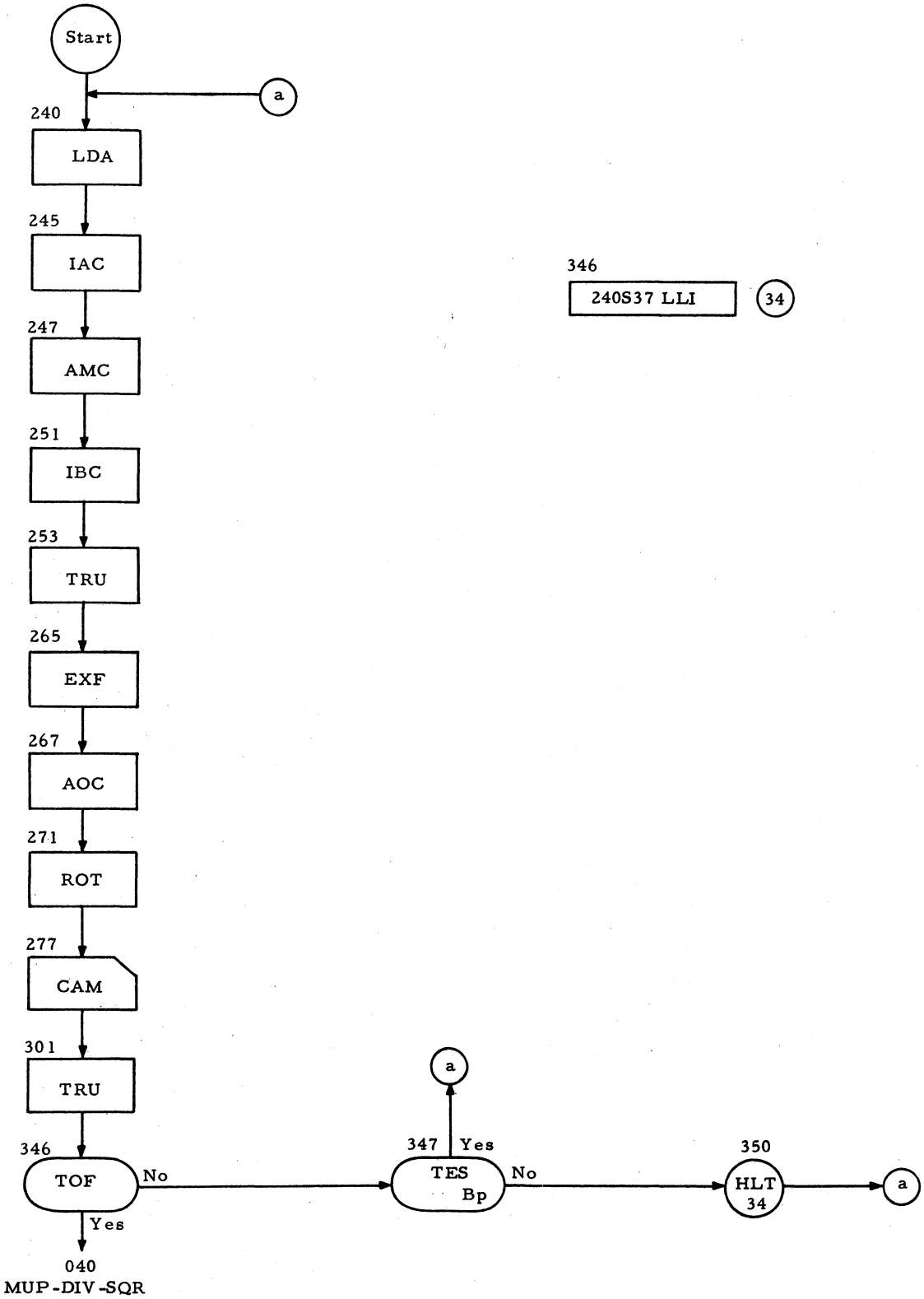
EBP-TAN-TBN



Flow Diagram

PROD TEST ROUTINE

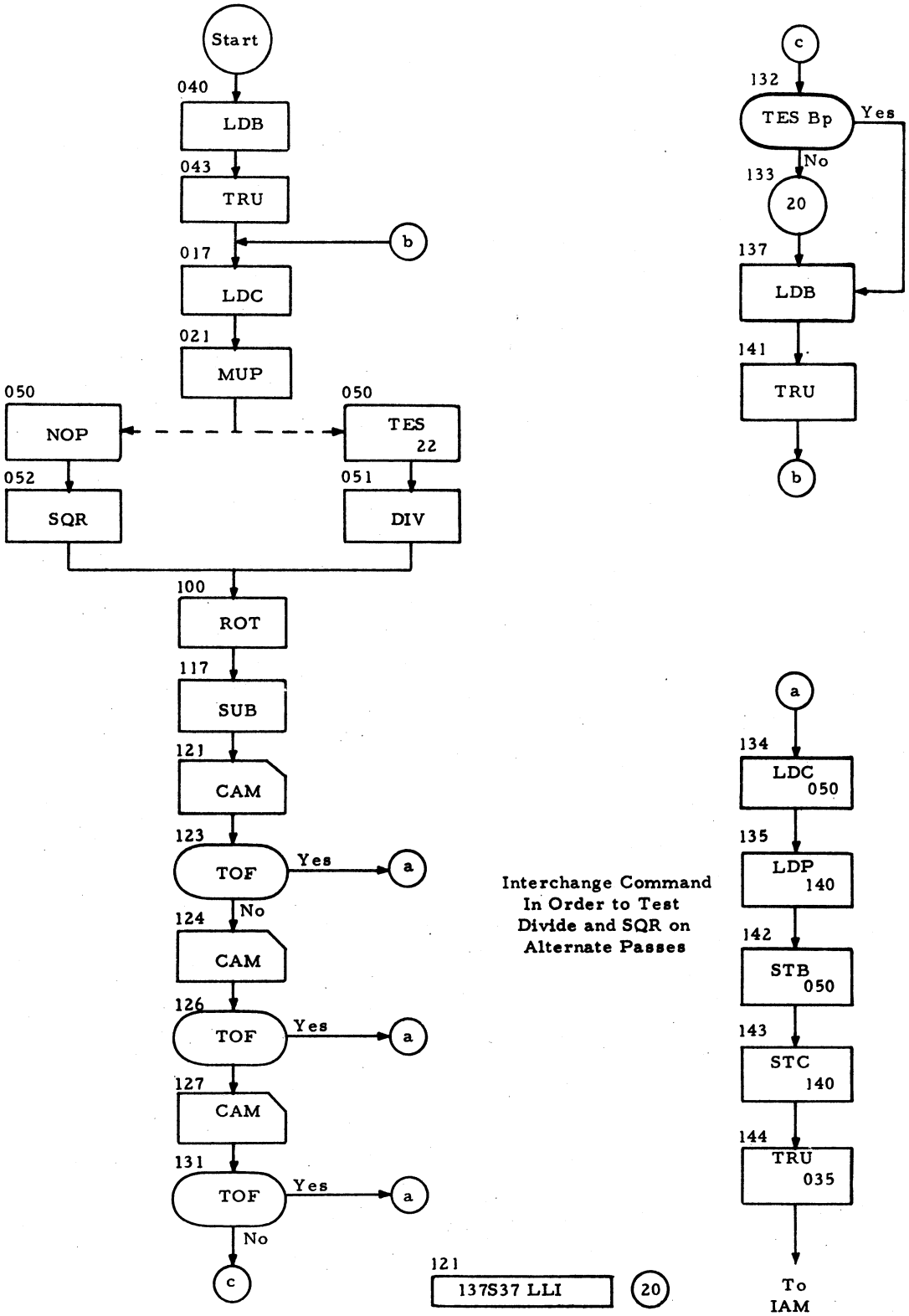
AOC-AMC-EXF



Flow Diagram

PROD TEST ROUTINE

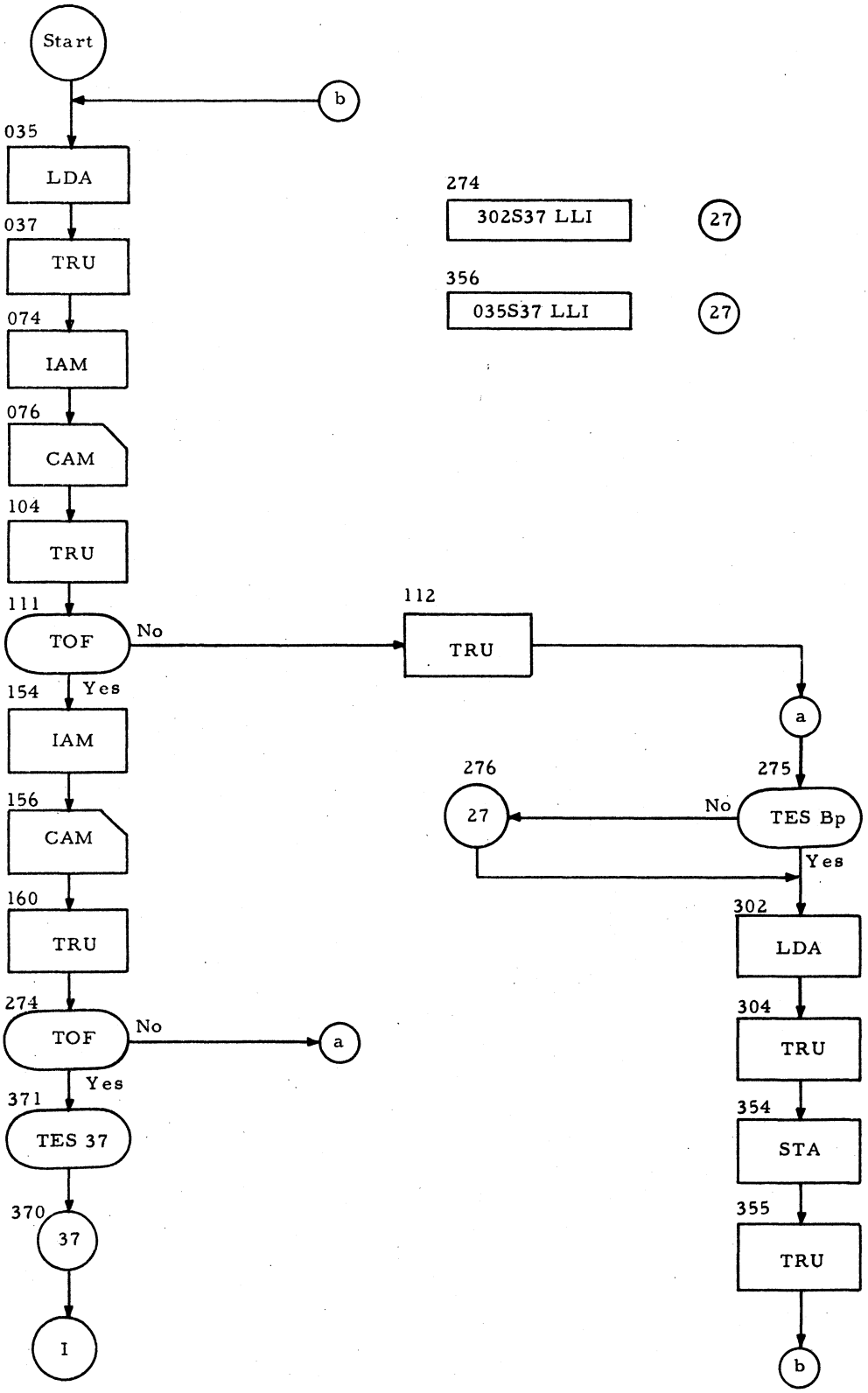
MUP/DIV/SQR



Flow Diagram

PROD TEST ROUTINE

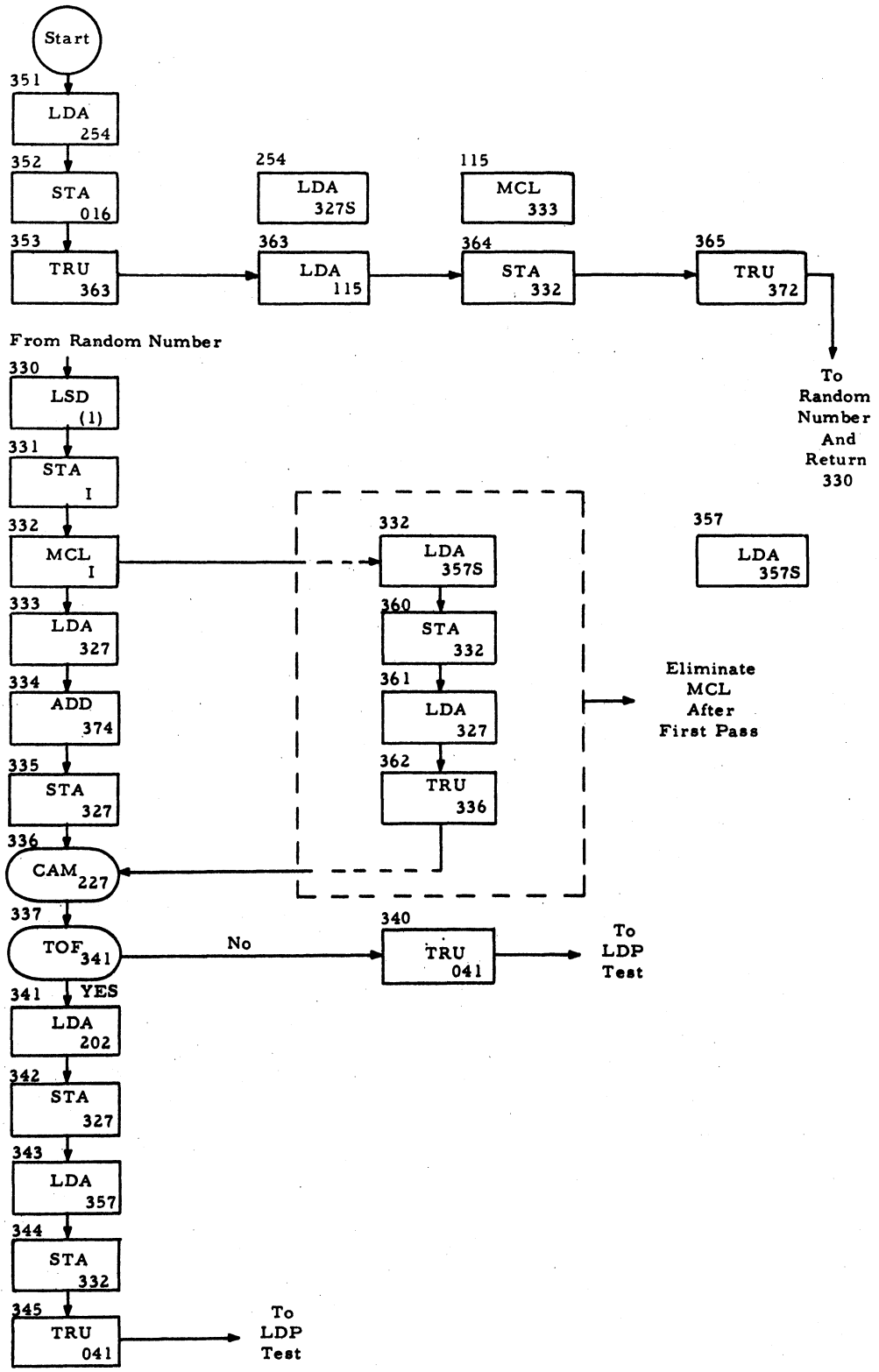
IAM



Flow Diagram

PROD TEST ROUTINE

MOVE COMMAND LINE FROM 02 TO LL



pb Packard Bell Computer

PB 250 PROGRAM LISTING

PROBLEM PROD TEST ROUTINE PAGE 1 OF 10

PROGRAMMER R. McINTURFF, C. CANNON DATE 4-27-62

LOCATION	INSTRUCTION	SYMBOLIC OP CODE	REMARKS
000	305s3702I	TRU	RANDOM NUMBER GENERATOR
305	306s0502I	LDA	
306	041s3702I	TRU	Exit command for random number generator
307	016 1102I	STA	
310	367s3702I	TRU	
367	372s0002I	HLT	operand = Index line
372	001 0500;	LDA	random number to A
373	374s1402I	ADD	+0000001
375	001 1100;	STA	random number
376	001 0600;	LDB	random number to B
377	001s3702I	TRU	
001	002s0402I	LDC	constant +2304555
003	032 3200;	MUP	random number multiplied by +2304555
004	021 1200;	STB	Store new random number
005	006 0100;	IAC	
006	007 0200;	IBC	moving random number to C
007	010s4202I	AMC	memory +2777777
011	020 1200;	STB	Store random number to work with
012	022 1200;	STB	
013	023 1200;	STB	
014	024 1200;	STB	
015	015 1200;	STB	
016	041s3702I	TRU	to LDP-DPA-DPS (when using 02-LL routine this command will be 327s0502I - this is done in order to generate a number and move to Move Command Line routine)
003	067 0602I	LDB	+2563253 to B to run known number

PROBLEM PROD TEST ROUTINE PAGE 2 OF 10

PROGRAMMER R. McINTURFF, C. CANNON DATE 4-27-62

LOCATION	INSTRUCTION	SYMBOLIC OP CODE	REMARKS
			MOVE COMMAND LINE AND RUN
034	057s4300;	CLA	
060	072s0502I	LDA	+00000LL
073	075s2100;	LSD	Left Shift one bit
075	310s1137;	STA	New line number to Index Register
311	312 7102I	MCL	Move command line to selected line
312	000s3702I	TRU	Transfer to random number generator of new command line
			MOVE COMMAND LINE FROM 02 TO LL AND RUN
351	254 0502I	LDA	command to modify random number exit
352	016 1102I	STA	327s0502I to 016
353	363s3702I	TRU	
363	115 0502I	LDA	MCL command to A
364	332 1102I	STA	333 7102I to 332
365	372s3702I	TRU	to random number generator
330	332 2100;	LSD	reenter from random number gen. LSD one bit
331	332 1137;	STA	new line number to Index Register
332	333 7102I	MCL	move command line - used first pass only
333	327 0502I	LDA	+00000LL to A
334	374 1402I	ADD	+0000001
335	327 1102I	STA	line number incremented by 1 and stored
336	227 5602I	CAM	compare with limit

LOCATION	INSTRUCTION	SYMBOLIC OP CODE	REMARKS
			MOVE COMMAND LINE FROM 02 TO LL AND RUN
337	341 7502I	TOF	test for last line
340	041s3702I	TRU	not last line, transfer to LDP-DPA-DPS
341	202 0502I	LDA	+0000002 to A
342	327 1102I	STA	set next line index to 02
343	357 0502I	LDA	357s0502I to A from loc 357
344	332 1102I	STA	store new command in 332 (prevents MCL after first pass of all lines)
360	332 1102I	STA	
345	041s3702I	TRU	transfer to LDP-DPA-DPS
361	327 0502I	LDA	this command in conjunction with the LDA command stored in 332 eliminates the MCL after the first pass and allows a check of memory while running this routine. In the event memory is changed, restart at 35102.
362	336s3702I	TRU	
254	327s0502I	LDA	
115	333 7102I	MCL	

"NOTE"

As previously explained, it is possible to replace the command in 003 with 067 0602I. This loads B with a known number, and therefore allows you to run the routine using the known number, and to predict what the result will be after each operation. In order to give you this known information we have traced the routine while using the known number stored in 067. It should be remembered that the contents of the registers will not

LOCATION	INSTRUCTION	SYMBOLIC OP CODE	REMARKS
			be the same, and test commands will cause different paths to be taken when using other numbers. All commands in the program will be listed as they appear, but the (ABC) may apply only when using the known number routine.
			LDP-DPA-DPS
041	042s0700;	LDP	+2563253 to A and B
044	045s1602I	DPA	+2525252 to A and B = +5310525 in A and B
047	053s1702I	DPS	+2525252 from (AB) = +2563253+ 2563253 (AB)
055	057s3702I	TRU	
057	060s5600;	CAM	(AB) = +2563253+2563253
061	064 7502I	TOF	no overflow = error
062	041 7735;	TES	Breakpoint on eliminates halt and loops
063	041s0024;	HLT	Error Halt with operand of 24
064	065s0200;	IBC	
066	067s0100;	IAC	to set up result in B for Test, B to A
070	100s5600;	CAM	test (B)
101	031 7502I	TOF	overflow = no error, go to SBR-MAC-TCN
102	041 7735;	TES	Breakpoint on causes loop without halt
103	041s0025;	HLT	Error halt with operand of 25
			SBR-MAC-TCN
031	032s4300;	CLB	clear B
033	064s0500;	LDA	+2563253 to A
065	114s3300;	SBR	22 bits (A)+0000000 (B)+0000001

LOCATION	INSTRUCTION	SYMBOLIC OP CODE	REMARKS
			SBR-MAC-TCN
114	146s3702I	TRU	
146	147s5602I	CAM	
150	153 7502I	TOF	no overflow = error
151	031 7735;	TES	Breakpoint on causes loop without halt
152	031s0030;	HLT	Error halt with operand of 30
153	163s0300;	ROT	(A)=+0000001
165	166s5602I	CAM	(M)=+0000000
167	224 7502I	TOF	
170	171s5602I	CAM	(M)=+0000001
172	224 7502I	TOF	no overflow = error
173	211s3702I	TRU	
211	031 7735;	TES	Breakpoint on causes loop without halt
212	031s0031;	HLT	Error halt with operand of 31
224	225s0502I	LDA	(A)=-1010101
226	227s0000;	MAC	(C)=-1010101
230	233 3402I	TCN	no transfer = error
231	031 7735;	TES	Breakpoint on causes loop without halt
232	031s0032;	HLT	Error halt with operand of 32
233	234s1000;	STC	(C)=-1010101
235	254s0500;	LDA	(A)=-1010101
255	256s5602I	CAM	(M)=-1010101
257	020 7502I	TOF	no overflow = error, should go to LSD-RSI-LRS
260	031 7735;	TES	Breakpoint on causes loop without halt
261	031s0033;	HLT	Error halt with operand of 33

LOCATION	INSTRUCTION	SYMBOLIC OP CODE	REMARKS
			LSD-RSI-LRS
020	022s0600;	LDB	(B)=+2563253
023	024s0502I	LDA	(A)=+0000000
025	026s0402I	LDC	(C)=+0000026
027	056s2100;	LSD	22 bits (A)+2563253 (B)+0000000 (C)+0000000
056	105s2200;	RSI	22 bits (A)+0000000 (B)+2563253 (C)+0000026
105	106s5602I	CAM	should overflow
107	113 7502I	TOF	no overflow = error
110	162s3702I	TRU	transfer to error halt
113	114s0300;	ROT	set up (B) for test
116	160s5600;	CAM	should overflow
161	164 7502I	TOF	no overflow = error
162	020 7735;	TES	Breakpoint on causes loop without halt
163	020s0021;	HLT	Error halt with operand of 21
164	213s3320;	LRS	22 bits (A)+0000000 (B)+2563253 (C)+0000000
213	214s5602I	CAM	should overflow when using known number (M)+0000000
215	234 7502I	TOF	
216	217s5602I	CAM	(M)-7777777
220	234 7502I	TOF	no overflow = error
221	020 7735;	TES	Breakpoint on for loop without halt
222	020s0022;	HLT	Error halt with operand of 22
234	235s0300;	ROT	set up (B) for test
237	240s5600;	CAM	should overflow (A) and (M) = random number

LOCATION	INSTRUCTION	SYMBOLIC OP CODE	REMARKS
241	022 7502I	TOF	no overflow = error, should go to 022
242	020 7735;	TES	Breakpoint on for loop without halt
243	020s0023;	HLT	Error halt with operand of 23
			NAD-SAI
022	027s4500;	CLA	
030	031s4400;	CLC	
032	041s0600;	LDB	(B)+2563253
042	071s3702I	TRU	
071	120s2000;	NAD	22 sectors, shift (B) into (A), (C)=7777752
120	145s3702I	TRU	
145	174s2300;	SAI	22 sectors, shift (A) into (B), (C)=+0000000
174	175s5602I	CAM	(M)+0000000
176	201 7502I	TOF	no overflow = error
177	022 7735;	TES	Breakpoint on for loop without halt
200	264s3702I	TRU	to error halt
201	202s0100;	IAC	set up (C) for test
203	204s5602I	CAM	(M)=+0000000
205	210 7502I	TOF	no overflow = error
206	022 7735;	TES	breakpoint on for loop without halt
207	264s3702I	TRU	transfer to error halt
210	221s0300;	ROT	set up (B) for test
223	261s5600;	CAM	compare with random number
262	236 7502I	TOF	no overflow = error, exit to EBP-TAN-TBN
263	022 7735;	TES	breakpoint on for loop without halt
264	022s0026;	HLT	Error halt with operand of 26

LOCATION	INSTRUCTION	SYMBOLIC OP CODE	REMARKS
			EBP-TAN-TBN
236	243s0500;	LDA	with random number
244	245s4300;	CLB	
246	251s4400;	CLC	(A)+2563253 (B)+0000000 (C)+0000000
252	272s2200;	RSI	15 sectors (A)+0000025 (B)-4652600 (C)+0000017
272	300 3602I	TBN	if B is negative A should be after LSD & EBP
273	313s2100;	LSD	15 sectors
313	314s4002I	EBP	extend bit from pulse time 16 into sign
315	325 3502I	TAN	if B was not negative A should not be negative
316	240s3702I	TRU	transfer to AOC-AMC-EXF
325	236 7735;	TES	Breakpoint on for loop without halt
326	236s0017;	HLT	Error halt with operand of 17
300	320s2100;	LSD	15 sectors (A)+2563253 (B)+0000000 (C)+0000000
320	321s4002I	EBP	extend bit from pulse time 16 into sign
322	240 3502I	TAN	if B was negative A should be negative
323	236 7735;	TES	breakpoint on for loop without halt
324	236s0016;	HLT	Error halt with operand of 16
			AOC-AMC-EXF
240	244s0500;	LDA	with random number (A)+2563253
245	246s0100;	IAC	(C)+2563253
247	250s4202I	AMC	(M)+2520252
251	252s0200;	IBC	(C)+2520252
253	265s3702I	TRU	

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LOCATION	INSTRUCTION	SYMBOLIC OP CODE	REMARKS
265	266s4702I	EXF	(M)+2520252 (B)+0043001 (C)+2520252
267	270s4602I	AOC	(M)+2520252 (B)+2563253 (C)+2520252
271	275s0300;	ROT	(A)+2563253 (B)+2520252 (C)+0000000
277	300s5600;	CAM	compare with random number
301	346s3702I	TRU	
346	040 7502I	TOF	with no error transfer to MUP-DIV-SQR
347	240 7735;	TES	breakpoint on for loop without halt
350	240s0034;	HLT	Error halt with operand of 34 34
			MUP-DIV-SQR
040	042s0600;	LDB	with random number (B)+2563253
043	017s3702I	TRU	
017	020s0400;	LDC	with random number (C)+2563253
021	050s3200;	MUP	22 sectors (A)+0733251 (B)-1666162 (C)+2563253
050	052s2400;		or 051 7737; changes each pass to check DIV and SQR
051	100s3100;	DIV	known number used with SQR
052	100s3000;	SQR	(A)+0000001 (B)+2563253 (C)+2563252
100	115s0300;	ROT	set up (B) for test
117	120s1500;	SUB	subtract random number
121	122s5602I	CAM	(M)+0000000
123	134 7502I	TOF	exit if result was +0000000
124	125s5602I	CAM	(M)+0000001
126	134 7502I	TOF	exit if result was +0000001
127	130s5602I	CAM	(M)-7777777
131	134 7502I	TOF	exit if result was -7777777
132	137 7735;	TES	breakpoint on for loop without halt

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PROGRAMMER R. McINTURFF, C. CANNON DATE 4-27-62

LOCATION	INSTRUCTION	SYMBOLIC OP CODE	REMARKS
133	137s0020;	HLT	Error halt with operand of 20
137	140s0600;	LDB	with random number
141	017s3702I	TRU	to beginning of test
134	050 0402I	LDC	with DIV or SQR command setup
135	140s0702I	LDP	with DIV or SQR command setup
142	050 1202I	STB	store new command setup
143	140 1002I	STC	store old command setup
144	035s3702I	TRU	to IAM test
035	036s0502I	LDA	(A)+2525252
037	074s3702I	TRU	
074	076s2500;	IAM	interchange (A) with random number
076	103s5600;	CAM	compare random number with random number
104	111s3702I	TRU	
111	154 7502I	TOF	no overflow = error
112	275s3702I	TRU	to error halt
154	156s2500;	IAM	restore random number
156	157s5602I	CAM	(M)+2525252
160	274s3702I	TRU	
274	371 7502I	TOF	no overflow = error
371	370 7737;	TES	halt if typewriter busy test, not busy = loop
370	372s0037;	HLT	halt and display 37
275	302 7735;	TES	breakpoint on for loop without halt
276	302s0027;	HLT	halt with operand of 27
302	303s0500;	LDA	random number to A
304	354s3702I	TRU	
354	355s1100;	STA	restore random number
356	035s3702I		transfer to beginning of IAM