FIELD MAINTENANCE PRINT SET

TABLE OF CONTENTS

UNIT VARIATIONS COVERED BY THIS PRINT SET

FPP8-A
Field Maintenance
Print Set

Digital Equipment Corporation
PRINT SET ORDER NO
MPØØØ57

REVISIONS	
REV.	
CHG. NO.	
DATE	

USED ON OPTION/MODEL

SHEET 1 OF 1

DRN. ROBICHAUD	DATE 3MAR76	TITLE: FPP8-A FIELD MAINTENANCE PRINT SET
CHK'D [signature]	DATE [illegible]	
PROJ. ENG. [signature]	DATE [illegible]	SIZE B · CODE TC · NUMBER FPP8-A-5 · REV.
FIELD SERV. B Eas[illegible]	DATE 5/26/76	DIST.

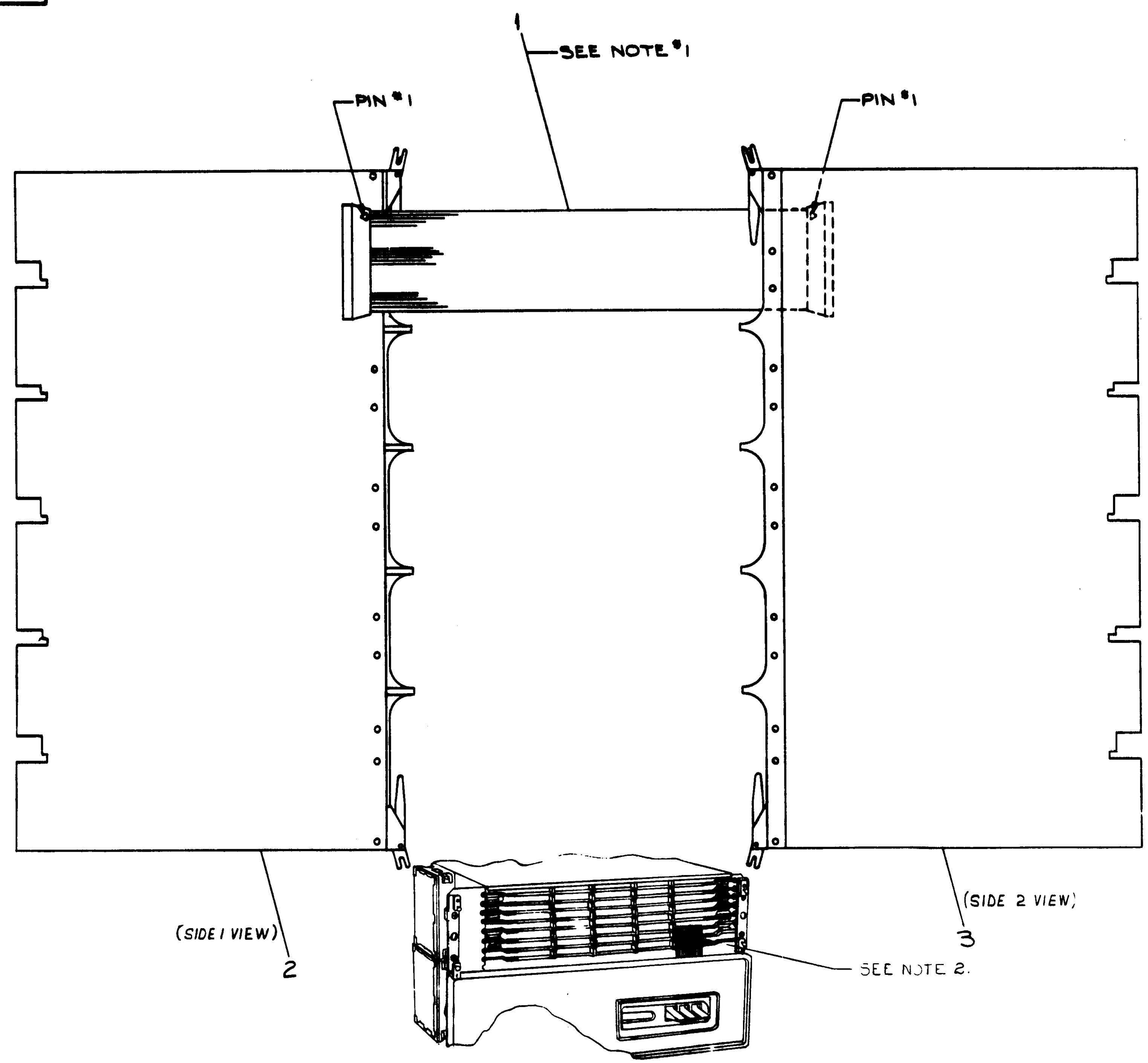
digital

EN-01124-16-N676-(327)

DRB 124

NOTES:

1. CONNECTION OF "CABLE" (ITEM #1) TO BE FROM J1 ON THE "M841Ø BD" (ITEM #2) TO J1 ON THE "M8411 BD" (ITEM #3).
2. BCØ2D PLACEMENT: DOWNWARD, FLUSH AGAINST MODULE HANDLES.



1	MODULE (M8411)	D-UA-M8411-Ø-Ø	3
1	MODULE (M841Ø)	D-UA-M841Ø-Ø-Ø	2
1	50 COND SIGNAL CABLE (BCØ2D)	D-IA-BCØ2D-Ø1	1
QTY	DESCRIPTION	DWG./PART NO.	ITEM NO.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES

QUANTITY & VARIATION

THIRD ANGLE PROJECTION

REMOVE BURRS AND BREAK SHARP CORNERS

DO NOT SCALE DWG

MATERIAL: SEE PARTS LIST

FINISH: —

NEXT HIGHER ASSY.: B-DO-FPP8-A

SCALE: NONE

SHEET OF 1

FIRST USED ON: FPP8-A

TITLE: FPP8-A UNIT ASSY

SIZE	CODE	NUMBER	REV.
D	UA	FPP8-A-Ø	

DIGITAL EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

ENGINEERING SPECIFICATION DATE 5/27/76

TITLE FPP8A FIELD SERVICE INSTALLATION & ACCEPTANCE PROCEDURE

REVISIONS

REV	DESCRIPTION	CHG NO	ORIG	DATE	APPD BY	DATE

ENG	APPD	SIZE	CODE	NUMBER	REV
Bill Eash		A	SP	FPP8-A-1	

DEC 16-(392)-1079A-R873
DRA 107A

SHEET 1 OF 3

ENGINEERING SPECIFICATION [redacted] CONTINUATION SHEET

TITLE FPP8A FIELD SERVICE INSTALLATION & ACCEPTANCE PROCEDURE

I. General

This procedure defines the performance standards required of the FPP8A. The acceptance tests are the same for both system installation or add-on of an FPP8A.

II. Inspection

After removing the FPP8A from the packing material (if add-on), inspect the following:

1. Inventory the hardware against shipping list.
2. Inventory the software against the software list, if ordered.
3. Inventory prints against shipping list, if ordered.
4. Check modules (M841Ø, M8411) for loose or broken components.
5. Inspect the cable for cuts or breaks.

III. Installation Procedure

There are no switches and/or jumpers on either of the FPP8A modules.

Install the modules in the top most slots available, below the memories. Connect the BC02D from the M841Ø to the M8411. The cable can be folded and laid against the front of the other modules as shown below.

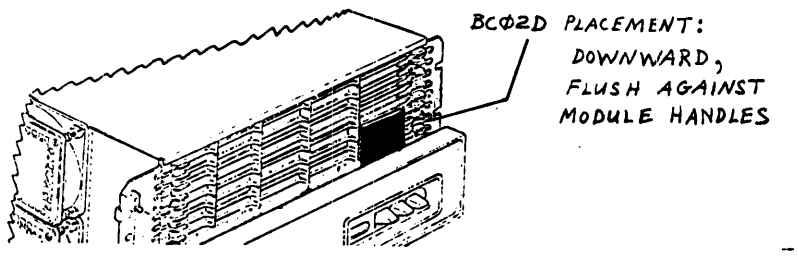
	SIZE	CODE	NUMBER	REV
	A	SP	FPP8-A-1	

DEC FORM NO EN-01022-16-N370-(381)
DRA 108

SHEET 2 OF 3

ENGINEERING SPECIFICATION [redacted] CONTINUATION SHEET

TITLE FPP8A FIELD SERVICE INSTALLATION AND ACCEPTANCE PROCEDURE



IV. Acceptance Procedure

Minimum Requirements

1. PDP8A with minimum 8K memory or PDP8E with FPP8E and 8K memory with programmers console.*
2. Paper tape input device
3. Maindec-08-DJFPA and listing
4. Maindec-08-DJFBB and listing
5. Terminal (03-04 device code)

If the FPP8A is an add-on, run the CPU and memory diagnostics to insure that there are no problems.

Run Maindec-08-DJFPA for 5 passes, no errors are acceptable.

Run Maindec-08-DJFBB for 20 minutes, no errors are acceptable. Type B for both instruction test and exercisor.

If there is a means to build DEC X8, a system exercisor should be built and run. This will be a more complete exercise of the system.

* Programmers console is required only when program loading is via paper tape. The CL8 packages will have the Maindecs with the diagnostic console package. Switch register settings are done via 03, 04 terminal. See Maindec listings.

	SIZE	CODE	NUMBER	REV
	A	SP	FPP8-A-1	

DEC FORM NO DEC 16-(381)-1022-N370
DRA 108

SHEET 3 OF 3

DIGITAL EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

PARTS LIST

MADE BY ROBICHAUD DATE 3 MAR 76	CHECKED W. Kershner 27 MAY 76 DATE	SECTION 1
ENG DATE [illegible] 5/27/76	PROD R. X. [illegible] DATE 5/28/76	ISSUED SECT. 1

ITEM NO.	DWG NO. / PART NO.	DESCRIPTION	QUANTITY / VARIATION
1	MPØØØ57	*FPP8-A MAINTENANCE PRINT SET	Ø
2	B-PL-FPP8-A-3	*FPP8-A SOFTWARE LIST	Ø
3	EK-FPP8-A-MM-ØØ1	*FPP8-A USER'S MANUAL	Ø

*THIS ITEM IS AN OPTION AND IS TO BE SHIPPED ONLY WHEN PURCHASED AS A SEPARATE ITEM.

TITLE	ASSY NO.	SIZE	CODE	NUMBER	REV	ECO NO.
FPP8-A SHIPPING LIST	B-DD-FPP8-A	A	PL	FPP8-A-2		
	SHEET 1 OF 1	DIST.				

DEC FORM DEC 16-(325) 1031 N870
DRA 110

DIGITAL EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

PARTS LIST

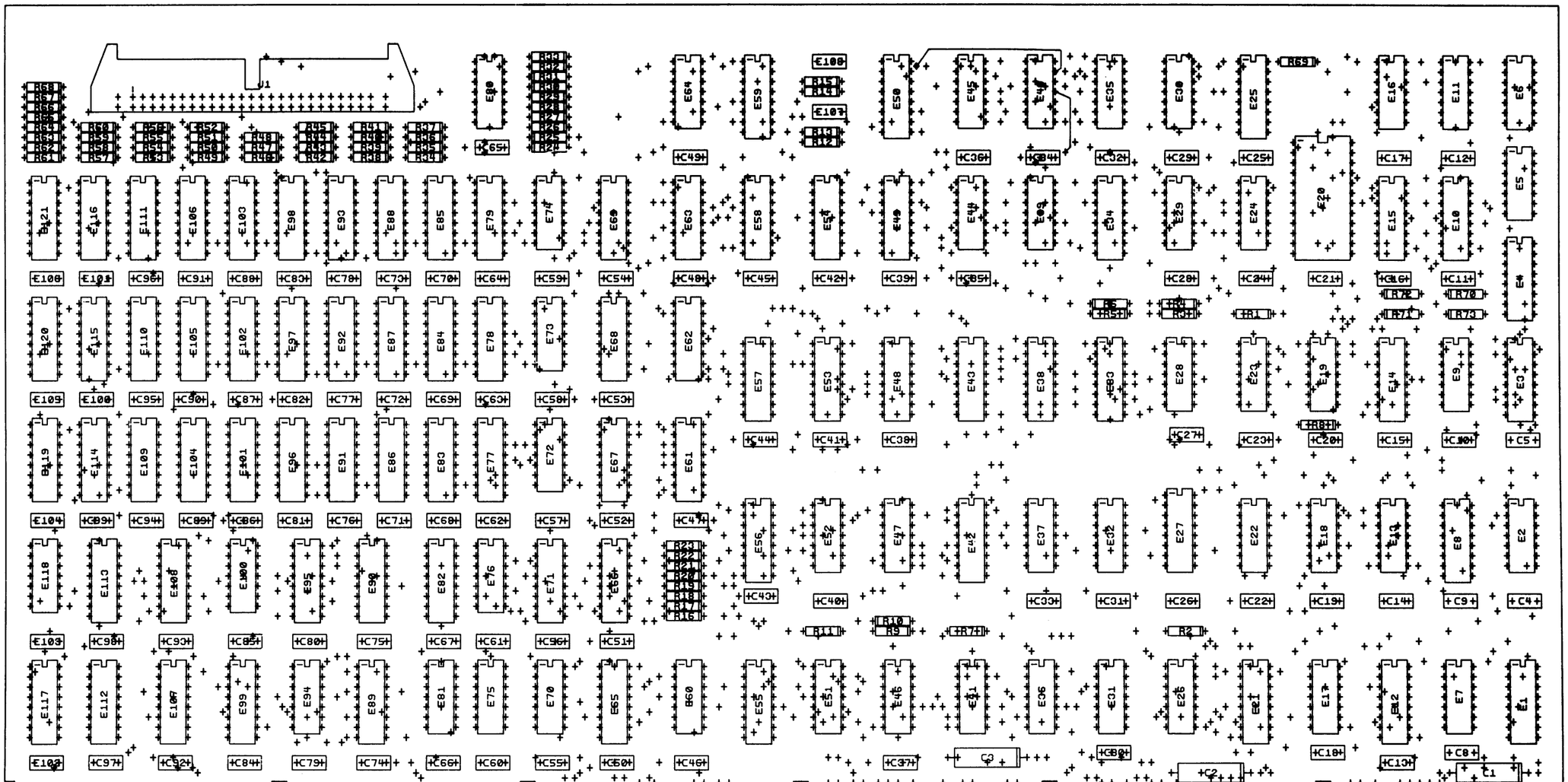
MADE BY ROBICHAUD	CHECKED	SECTION
DATE 3 MAR 76	DATE 11 MAY 76	1
ENG	PROD R. K. Gilson	ISSUED SECT.
DATE	DATE 5/28/76	1

ITEM NO.	DWG NO. / PART NO.	DESCRIPTION	QUANTITY / VARIATION
1	ZF226-RB	FPP8-A DIAGNOSTIC KIT	1
		(DOCUMENTS AND PAPER TAPES)	

TITLE	ASSY NO.	SIZE	CODE	NUMBER	REV.	ECO NO.
FPP8-A SOFTWARE LIST	B-DD-FPP8-A	A	PL	FPP8-A-3		
	SHEET 1 OF 1	DIST.				

DEC FORM DRA 110 DEC 16-(325) 1031 N870

COMPONENT SIDE VIEW



NOTES: JUMPER LIST: 1 FEED THRU
BETWEEN PINS 15 & 16 OF E50
3 PIN 13 OF E40
2 E40 PIN 11 & FEED THRU NEAR C34
3 CUT ETCH-PINS 11, 13 OF E40 ON SIDE 2

CHK	CHANGE NO	REV
	M8410-00001	B

ETCH REV. B
P.C. DESIGN DATA BASE REV. B

SIGNATURES	DATE
DRN.	7-31-74
CHK'D.	8-31-74
ENG.	11/14/74
PROJ.ENG.	9/11/74
PROD.	9-19-74
SCALE 2/1	
SHT. 1 OF 3	
NEXT HIGHER ASSY.	

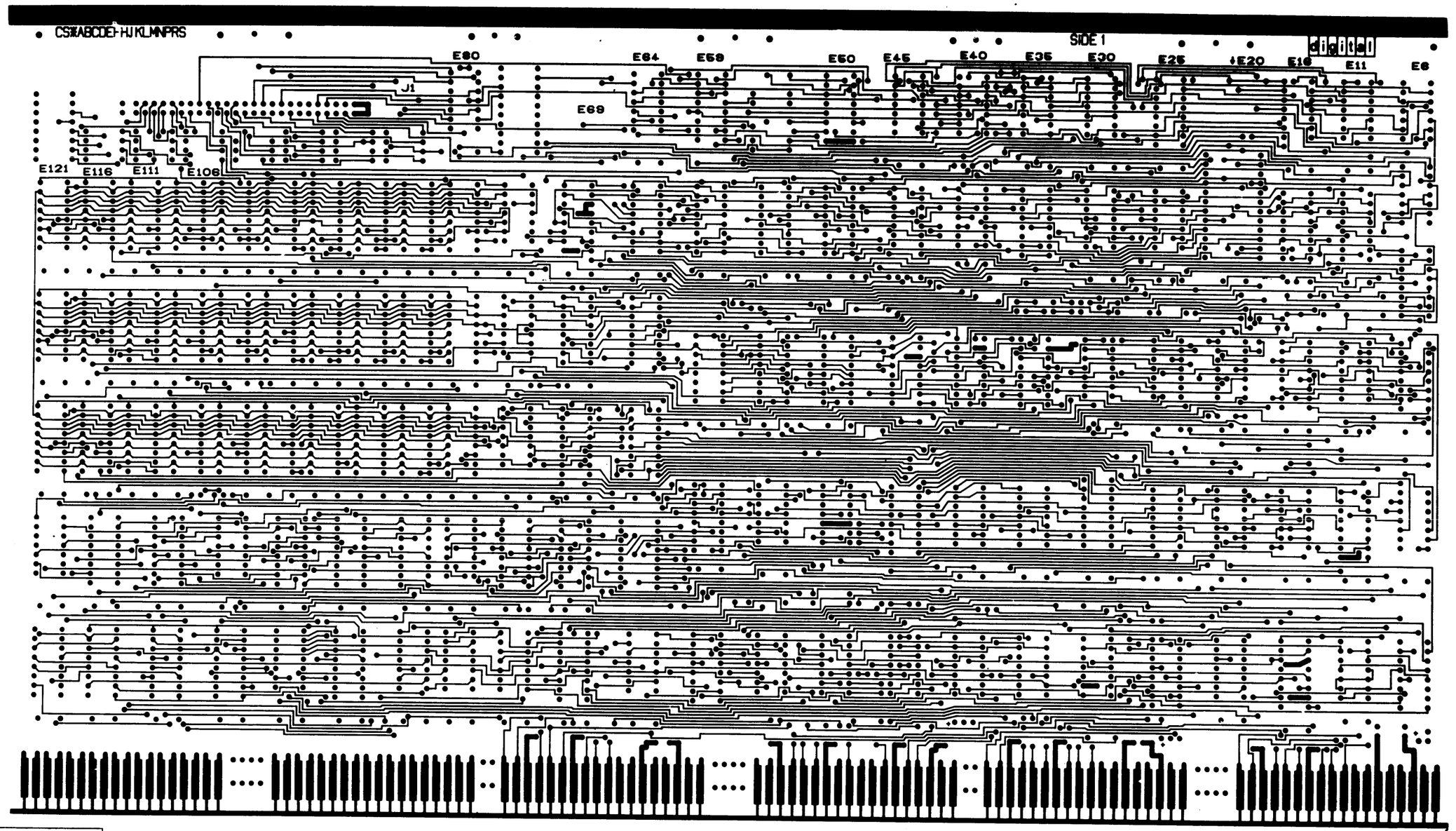
digital

TITLE
FPP8-A CONTROL

SIZE	CODE	NUMBER	REV
D	DUA	M8410-0-0	B

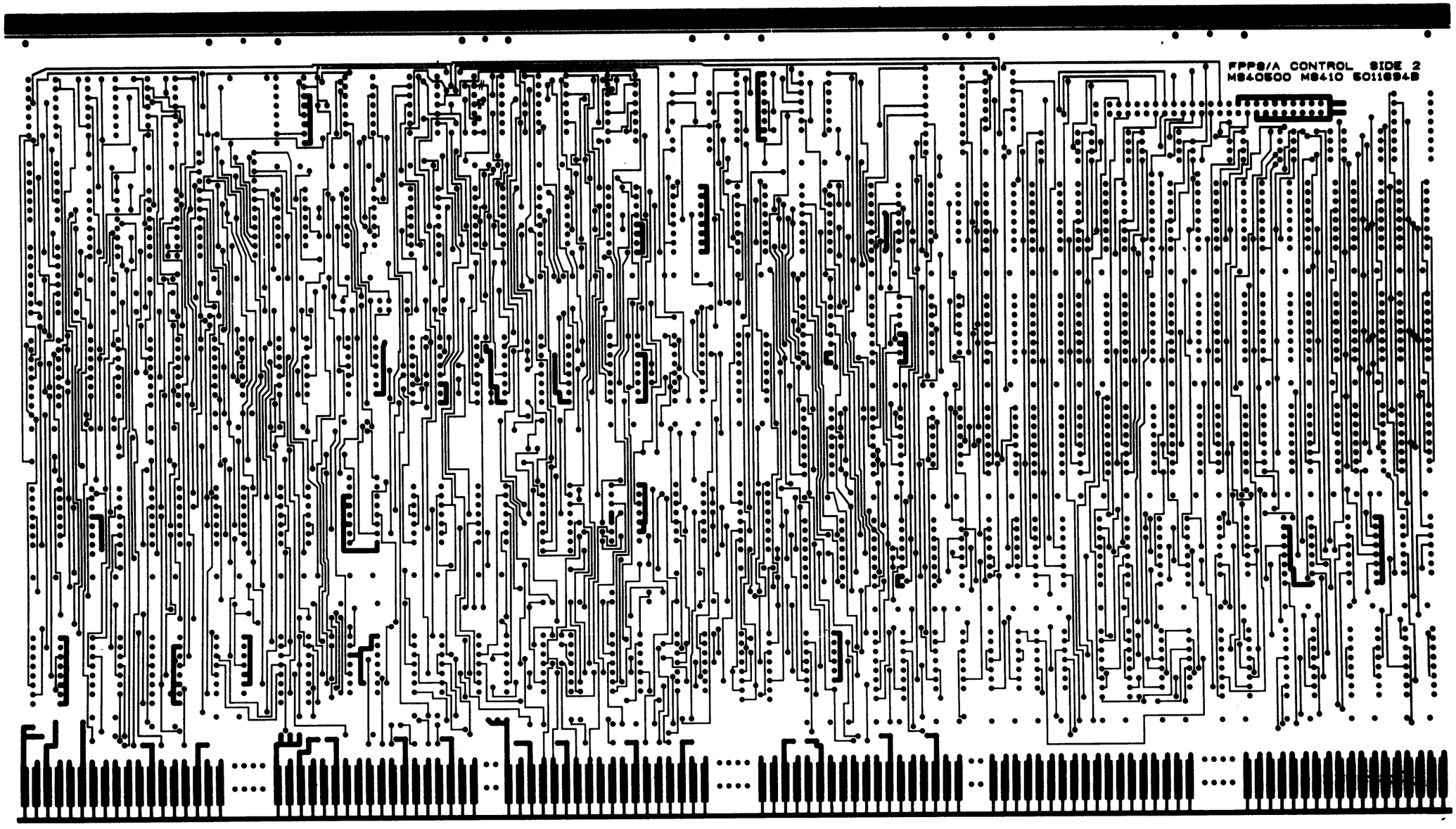
1 MS#40500

LAYER 1



REVISIONS		
NO.	CHANGE NO.	REV.

TITLE	SIZE	CODE	NUMBER	REV.
FPF8/A CONTROL	D	DUA	M8410-0-0	B
SCALE	SHEET 2 OF 3	DIST		



REVISIONS		
CHK	CHANGE NO	REV

TITLE	SIZE	CODE	NUMBER	REV.
FPP8/A CONTROL	D	UA	M8410-7-0	B
SCALE 2/1 SHEET 3 OF 3	DIST			

DUA M8410-0-0 B

DIGITAL EQUIPMENT CORPORATION

PARTS LIST

MADE BY	JACK MASON	CHECKED	SECTION 1
DATE	4-8-76	DATE 5/14/76	
ENG		PROD	ISSUED SECTION 1
DATE	19 MAY 76	DATE 5-15-76	

ITEM NO.	DRAWING NO.	PART NO.	DESCRIPTION	QUANTITY/VARIATION M841Ø-Ø-Ø	REF DESIGNATION
1	D-MD-5011694-0-0	5011694	ETCHED CIRCUIT BD.	1	
2		1000011	CAP, 47 Mmf, 1ØØV	1	C1Ø8
3		1001610*	CAP, .Ø1 Uf	101	C4, C5, C8 - C1Ø6
4		1002608	CAP, 18 Mmf, 1ØØV	1	C1Ø7
5		1005306	CAP, 6.8 Uf 35V, 10% TANT	3	C1, C2, C3
6		1300316	RES., 47Ø OHMS, 1/4W, 5%	67	R2-R6, R8-R12, R16-R22, R24-R73
7		1300391	RES., 1.5K OHMS, 1/4W, 5%	4	R1, R7, R13, R23
8		1304854	RES., 5.11K OHMS, 1/4W, 1%	2	R14, R15
9		1905547	I.C., DEC 7474	1	E44
10		1909486	IC., DEC 384	4	E5, E13, E22, E26
11		1909686	I.C., DEC 74Ø4	8	E2, E19, E24, E35, E46, E8Ø, E1ØØ, E118
12		1909704	IC., DEC 314	1	E17
13		1909705	I.C., DEC 8881	3	E28, E29, E32
14		1909929	IC., DEC 7417	2	E31, E39
15		1909934	I.C., DEC 8266	3	E54, E62, E66
16		1910091	I.C., DEC 7437	4	E6, E72, E73, E76
17		1910155	I.C., DEC 74Ø8	4	E11, E23, E36, E64
18		1910393	I.C., DEC 7384	1	E47
19		1910436	IC., DEC. 74123	1	E5Ø
20		1910956	I.C., DEC 74S 151	1	E59
21		1911315	I.C., DEC 8234	3	E1, E21, E65

NOTES:

* ANY VARIATION FOR THE .OI CAPS

E.C.O. NO. COOOT

TITLE	ASSY NO.	SIZE	CODE	NUMBER	REV.
FPP8-A CONTROL	D-UA-M841Ø-Ø-Ø	B	PL	M841Ø-Ø-Ø	B
	SHEET 1 OF 4	INSERTION PARTS LIST DATA BASE REV B			

DIGITAL EQUIPMENT CORPORATION
PARTS LIST

MADE BY JACK MASON | DATE 4/8/76 | CHECKED [signature] | DATE 5/18/76 | SECTION 1
ENG W. Herchner | DATE 19 MAY 76 | PROD R.K. [signature] | DATE 5-18-76 | ISSUED SECTION 1

QUANTITY/VARIATION

NOTES:

ITEM NO.	DRAWING NO.	PART NO.	DESCRIPTION	M841Ø-Ø-Ø	REF DESIGNATION
22		1911469	I.C., DEC 864Ø	3	E7, E41, E6Ø
23		1911521	I.C., DEC 7432	1	E37
24		1911983	I.C., DEC 74S133	1	E34
25		1912395	I.C., DEC 8136	1	E12
26		1912643	I.C., DEC 8613	6	E3, E14, E89, E99, E1Ø7, E112
27		1912697	I.C., DEC 74LS174	5	E8, E27, E48, E82, E95
28		1912799	I.C., DEC. 74LSØØ	4	E18, E4Ø, E52, E75
29		1912801	I.C., DEC 74LSØ2	3	E9, E3Ø, E7Ø
30		1912807	I.C., DEC 74LS1Ø	2	E81, E94
31		1912815	I.C., DEC 74LS3Ø	2	E51, E74
32		1912819	I.C., DEC 74LS42	4	E1Ø, E15, E9Ø, E117
33		1912824	I.C., DEC 74LS74	2	E16, E45
34		1912843	I.C., DEC 74LS139	1	E113
35		1912844	I.C., DEC 74LS151	2	E42, E61
36		1912847	I.C., DEC 74LS157	2	E33, E1Ø8
37		1912848	I.C., DEC 74LS158	1	E38
38		1912849	I.C., DEC 74LS161	7	E25, E49, E58, E63, E67, E68, E71
39		23124A1	I.C., DEC 32 X 8 PROM	1	E43
40		23125A1	I.C., DEC 32 X 8 PROM	1	E53
41		23126A1	I.C., DEC 32 X 8 PROM	1	E57
42		23127A1	I.C., DEC 32 X 8 PROM	1	E55

E.C.O. NO.

TITLE: FPP8-A CONTROL | ASSY NO. D-UA-M841Ø-Ø-Ø | SHEET 2 OF 4 | SIZE B | CODE PL | NUMBER M841Ø-Ø-Ø | REV. B

INSERTION PARTS LIST DATA BASE REV B

DIGITAL EQUIPMENT CORPORATION
PARTS LIST

MADE BY JACK MASON
DATE 4/8/76
ENG W. Kershner
DATE 14 MAY 76

CHECKED Robert Glass
DATE 5/19/76
PROD R K Allen
DATE 5 19-76

SECTION 1
ISSUED SECTION 1

NOTES:

ITEM NO	DRAWING NO.	PART NO.	DESCRIPTION	M841Ø-Ø-Ø	REF DESIGNATION
43		23128A1	I.C., DEC 32 X 8 PROM	1	E56
44		23270A2	I.C., DEC 256 X 4 PROM	1	E77
45		23271A2	I.C., DEC 256 X 4 PROM	1	E83
46		23272A2	I.C., DEC. 256 X 4 PROM	1	E86
47		23273A2	I.C., DEC 256 X 4 PROM	1	E91
48		23274A2	I.C., DEC 256 X 4 PROM	1	E96
49		23275A2	I.C., DEC 256 X 4 PROM	1	E101
50		23276A2	I.C., DEC 256 X 4 PROM	1	E104
51		23277A2	I.C., DEC 256 X 4 PROM	1	E109
52		23278A2	I.C., DEC 256 X 4 PROM	1	E114
53		23279A2	I.C., DEC 256 X 4 PROM	1	E119
54		23280A2	I.C., DEC 256 X 4 PROM	1	E79
55		23281A2	I.C., DEC 256 X 4 PROM	1	E85
56		23282A2	I.C., DEC 256 X 4 PROM	1	E88
57		23283A2	I.C., DEC 256 X 4 PROM	1	E93
58		23284A2	I.C., DEC 256 X 4 PROM	1	E98
59		23285A2	I.C., DEC 256 X 4 PROM	1	E103
60		23286A2	I.C., DEC 256 X 4 PROM	1	E106
61		23287A2	I.C., DEC 256 X 4 PROM	1	E111
62		23288A2	I.C., DEC 256 X 4 PROM	1	E116
63		23289A2	I.C., DEC 256 X 4 PROM	1	E121

E.C.O. NO.

TITLE: FPP8-A CONTROL

ASSY NO. D-UA-M841Ø-Ø-Ø
SHEET 3 OF 4

SIZE B | CODE PL | NUMBER M841Ø-Ø-Ø | REV. B

INSERTION PARTS LIST DATA BASE REV B

DIGITAL EQUIPMENT CORPORATION

PARTS LIST

MADE BY J. MASON
DATE 4/18/76
ENG W. Kershner
DATE 19 MAY 76

CHECKED [signature]
DATE 5/19/76
PROD R.K. Allen
DATE 5-12-76

SECTION 1
ISSUED SECTION 1

NOTES:

ITEM NO.	DRAWING NO.	PART NO.	DESCRIPTION	QUANTITY / VARIATION M8410-0-0	REF DESIGNATION
64		23290A2	I.C., DEC 256 X 4 PROM	1	E78
65		23291A2	I.C., DEC 256 X 4 PROM	1	E84
66		23292A2	I.C., DEC 256 X 4 PROM	1	E87
67		23293A2	I.C., DEC 256 X 4 PROM	1	E92
68		23294A2	I.C., DEC 256 X 4 PROM	1	E97
69		23295A2	I.C., DEC 256 X 4 PROM	1	E102
70		23296A2	I.C., DEC 256 X 4 PROM	1	E105
71		23297A2	I.C., DEC 256 X 4 PROM	1	E110
72		23298A2	I.C., DEC 256 X 4 PROM	1	E115
73		23299A2	I.C., DEC 256 X 4 PROM	1	E120
74		23300A2	I.C., DEC 256 X 4 PROM	1	E69
75		23301A2	I.C., DEC 256 X 4 PROM	1	E4
76		23001C5	I.C., DEC 14 X 48 X 8 FPLA	1	E20
77		1209941-07	CONN., 50 PIN RT. ANG HEADER	1	J1
78		1210711-02	HANDLE ASSY HEX BOARD	1	
79		9006732	EYELET	12	
80		9105740-55	#30 AWG GREEN WIRE	A/R	

E.C.O. NO.

EN-01140A-16-R276(325) DRB 125

TITLE: FPP8-A CONTROL

ASSY NO. D-UA-M8410-0-0
SHEET 4 OF 4

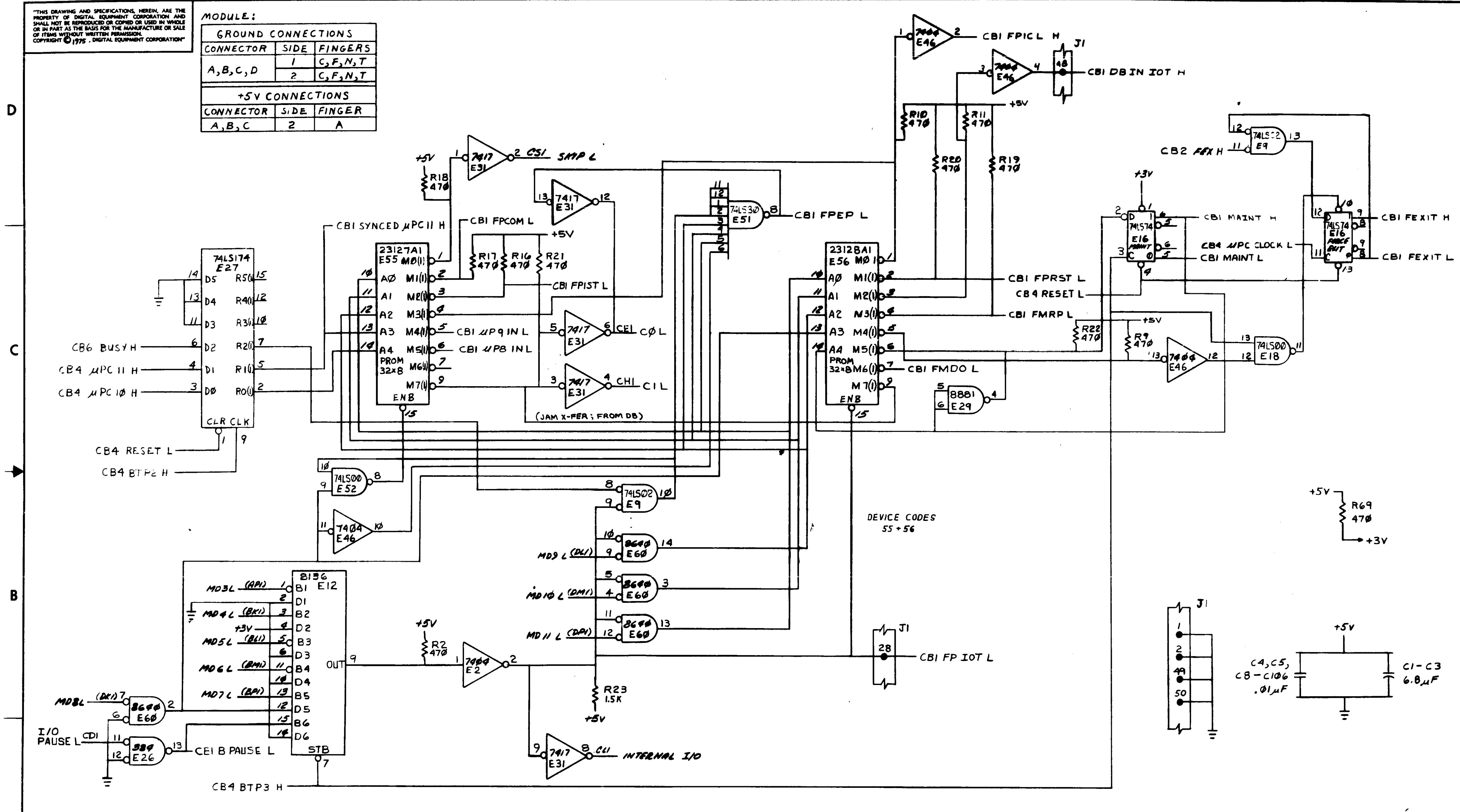
SIZE B | CODE PL | NUMBER M8410-0-0 | REV. B

INSERTION PARTS LIST DATA BASE REV B

MODULE:

GROUND CONNECTIONS		
CONNECTOR	SIDE	FINGERS
A, B, C, D	1	C, F, N, T
	2	C, F, N, T

+5V CONNECTIONS		
CONNECTOR	SIDE	FINGER
A, B, C	2	A

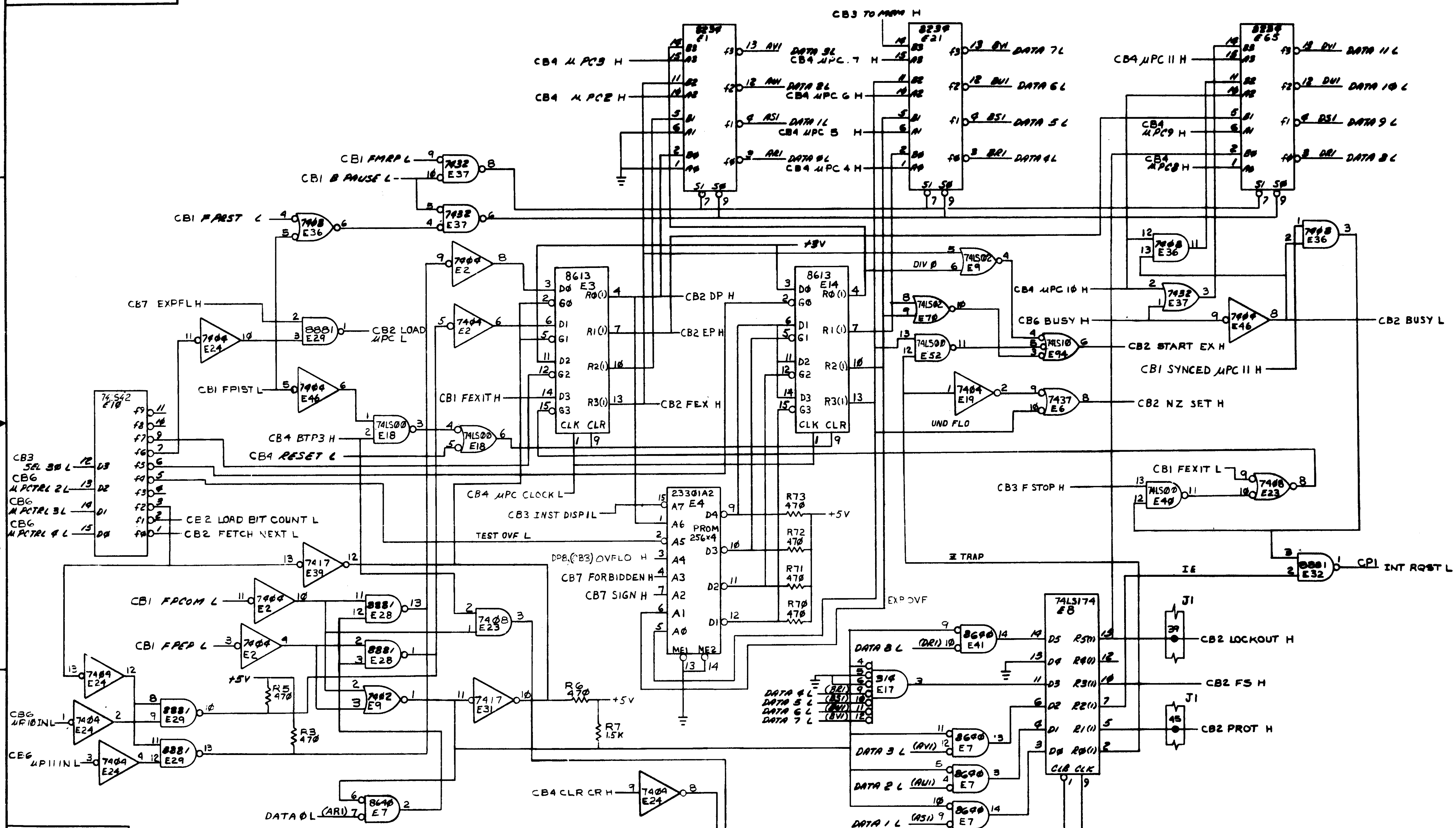


(I O DECODERS)(CB1)

FIRST USED ON	FPP8A
TITLE	FPP8-A CONTROL BD (CB1)
NEXT HIGHER ASSY.	D-UA-M8410-0-0
SIZE / CODE / NUMBER / REV.	D CS M8410-0-1 B
SHEET	1 OF 7

REVISIONS: A M8410-00001 6-29-76

DEC FORM NO. DRD 102-D

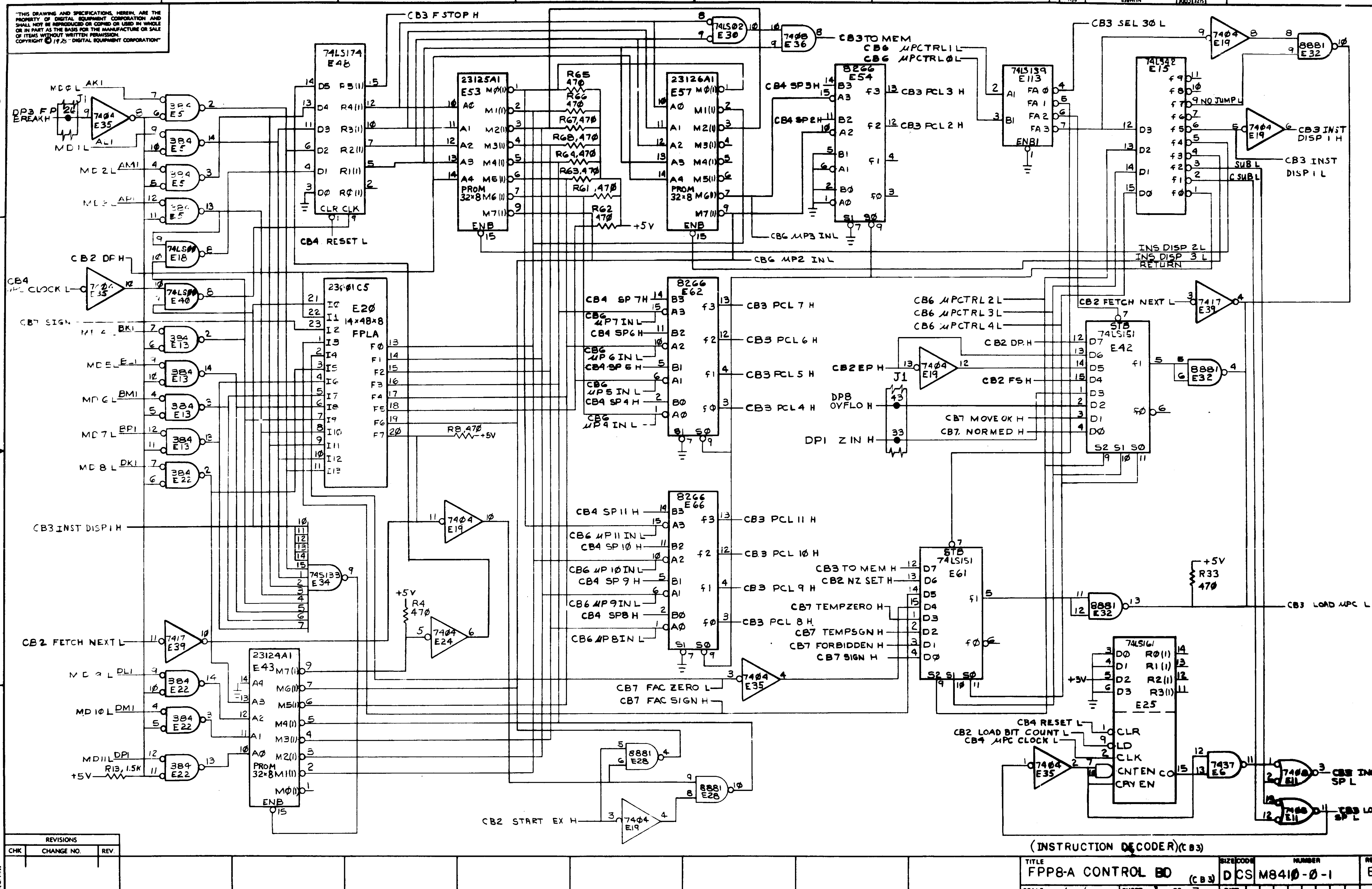


(COMMAND & STATUS REGISTERS)(CB2)

TITLE	SIZE	CODE	NUMBER	REV.
FPP8-A CONTROL BD (CB2)	D	CS	M8410-0-1	B

SCALE —/— SHEET 2 OF 7 DIST.

REVISIONS		
CHK	CHANGE NO.	REV.



TITLE FPP8-A CONTROL BD (CB3)
SIZE D CODE CS NUMBER M841Ø-Ø-1 REV. B
SCALE — SHEET 3 OF 7

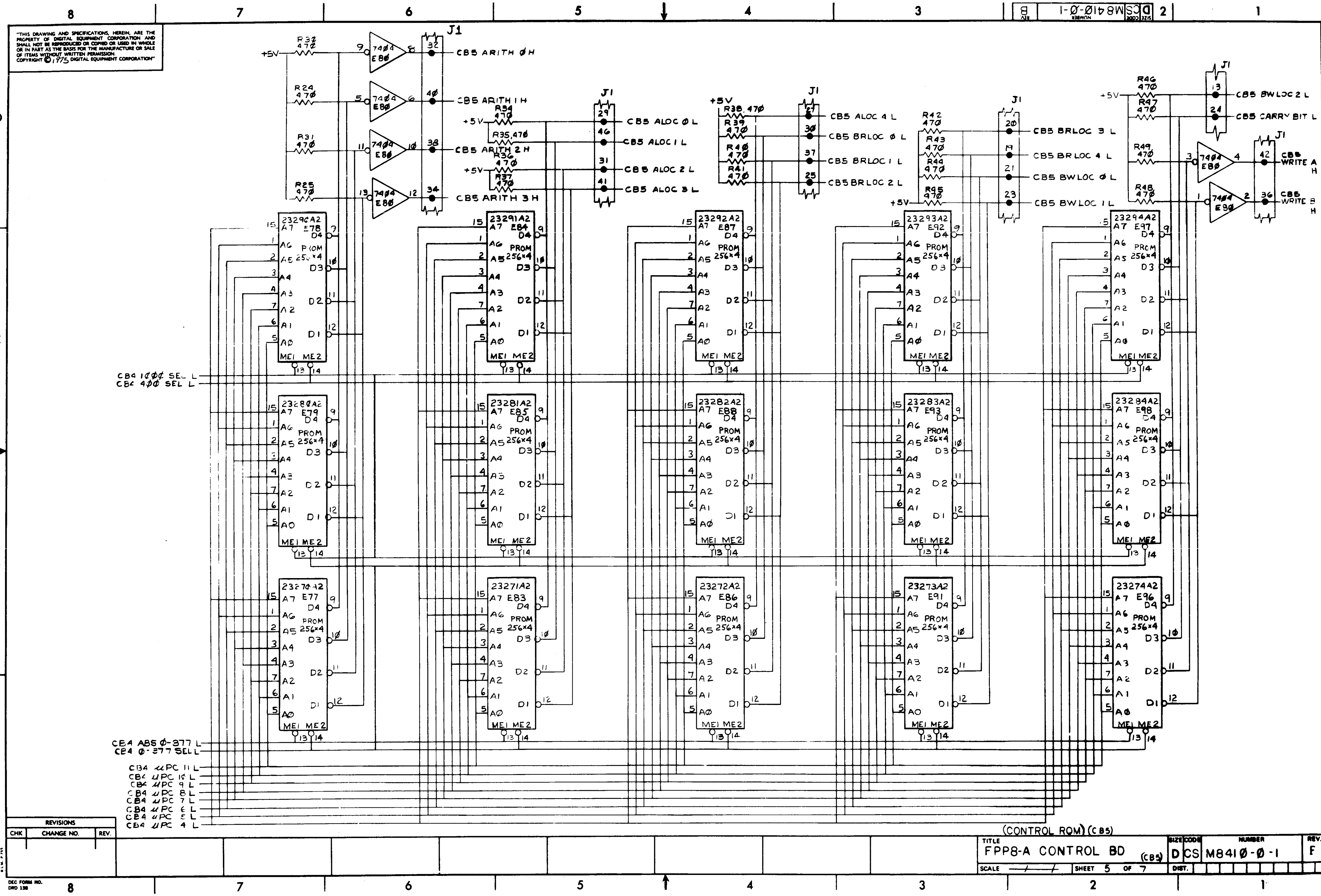
CB1 FPICL H
INITIALIZE H
CB1 MAINT H
CB1 FMDO L
TP4 H CE2
TP3 H CH2
CB2 BUSY L
TP2 H CE2
DP3 FP BREAK H
TP1 H CD2
CB4 BTP 3 H
CB4 BTP2 H
CB4 RESET L
CB3 PCL 3 H
CB3 PCL 2 H
CB3 LOAD μPC L
CB4 TICK H
CB4 μPC CLOCK L
CB3 LOAD SP L
CB3 PCL 7 H
CB3 PCL 6 H
CB3 PCL 5 H
CB3 PCL 4 H
CB4 μPC 2 H
CB4 μPC 3 H
CB4 SP 3 H
CB4 SP 2 H
CB3 PCL 11 H
CB3 PCL 10 H
CB3 PCL 9 H
CB3 PCL 8 H
CB4 μPC 11 H
CB4 μPC 10 H
CB4 μPC 9 H
CB4 μPC 8 H
CB3 INCR SP L
CB4 SP7 H
CB4 SP6 H
CB4 SP5 H
CB4 SP4 H
CB4 SP11 H
CB4 SP10 H
CB4 SP9 H
CB4 SP8 H
CB4 μPC 4 H
CB4 μPC 5 H
CB4 μPC 6 H
CB4 μPC 7 H
CB4 BRK RQ H
CB4 μPC 8 L
CB4 μPC 9 L
CB4 μPC 10 L
CB4 μPC 11 L
CB4 400 SEL L
CB4 Ø-377 SEL L
CB4 1000 SEL L
CB4 ABS Ø-377 L
CB4 μPC 4 L
CB4 μPC 5 L
CB4 μPC 6 L
CB4 μPC 7 L
RESYNC H
+5V
+3V
R1, 1.5K
R15 5.11K
R19 5.11K
R26, 470
R27, 470
R28, 470
R29, 470
R32 470
150 NS
100 NS
47PF
18PF
J1

REVISIONS		
CHK	CHANGE NO.	REV.

(PULSE GATING & μPC)(CB4)

TITLE: FPP8-A CONTROL BD (CB4)
SIZE: D CODE: CS NUMBER: M8410-0-1 REV: B
SCALE: 1/1 SHEET 4 OF 7 DIST.

DEC FORM NO. DRD 138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J1
CB5 ARITH Ø H
CB5 ARITH 1 H
CB5 ARITH 2 H
CB5 ARITH 3 H
CB5 ALOC Ø L
CB5 ALOC 1 L
CB5 ALOC 2 L
CB5 ALOC 3 L
CB5 ALOC 4 L
CB5 BRLOC Ø L
CB5 BRLOC 1 L
CB5 BRLOC 2 L
CB5 BRLOC 3 L
CB5 BRLOC 4 L
CB5 BWLOC Ø L
CB5 BWLOC 1 L
CB5 BWLOC 2 L
CB5 CARRY BIT L
CB5 WRITE A H
CB5 WRITE B H
7404 E8Ø
PROM 256×4
23290A2 E78
23291A2 E84
23292A2 E87
23293A2 E92
23294A2 E97
23280A2 E79
23281A2 E85
23282A2 E88
23283A2 E93
23284A2 E98
23270A2 E77
23271A2 E83
23272A2 E86
23273A2 E91
23274A2 E96
CB4 1000 SEL L
CB4 400 SEL L
CB4 ABS Ø-377 L
CB4 Ø-377 SEL L
CB4 uPC 11 L
CB4 uPC 1Ø L
CB4 uPC 9 L
CB4 uPC 8 L
CB4 uPC 7 L
CB4 uPC 6 L
CB4 uPC 5 L
CB4 uPC 4 L
REVISIONS
CHK
CHANGE NO.
REV.
(CONTROL ROM) (CB5)
TITLE
FPP8-A CONTROL BD (CB5)
SIZE D
CODE CS
NUMBER M841Ø-Ø-1
REV. F
SCALE
SHEET 5 OF 7
DIST.
DEC FORM NO. DRD 138

RB1 470Ω
RB0 470Ω
RB6 470Ω
RB2 470Ω
74Ø4 E118
J1
CBG EXTEND H
CBG DB CTRL 1 L
CBG DB CTRL 2 L
CBG READ A H

+5V
RB8 470Ω
RB7 470Ω
RB1 470Ω
RB9 470Ω
CBG B SEL L
CBG μPCTRL 4 L
CBG μP 2 IN L
CBG μP 3 IN L
CBG μP 4 IN L
CBG μP 5 IN L
CBG μP 6 IN L
CBG μP 7 IN L

RB4 470Ω
RB3 470Ω
RB4 470Ω
RB5 470Ω
CBG μPCTRL Ø L
CBG μPCTRL 1 L
CBG μPCTRL 2 L
CBG μPCTRL 3 L

23295A2 A7 E102 — PROM 256×4 — D4 D3 D2 D1 — MEI ME2
23296A2 A7 E105 — PROM 256×4 — D4 D3 D2 D1 — MEI ME2
23297A2 A7 E108 — PROM 256×4 — D4 D3 D2 D1 — MEI ME2
23298A2 A7 E115 — PROM 256×4 — D4 D3 D2 D1 — MEI ME2
23299A2 A7 E120 — PROM 256×4 — D4 D3 D2 D1 — MEI ME2
CBG μP8 IN L
CBG μP9 IN L
CBG μP 10 IN L
CBG μP11 IN L

CB4 1000 SEL L
CE4 400 SEL L

23285A2 A7 E103 — PROM 256×4 — D4 D3 D2 D1 — MEI ME2
23286A2 A7 E106 — PROM 256×4 — D4 D3 D2 D1 — MEI ME2
23287A2 A7 E111 — PROM 256×4 — D4 D3 D2 D1 — MEI ME2
23288A2 A7 E116 — PROM 256×4 — D4 D3 D2 D1 — MEI ME2
23289A2 A7 E121 — PROM 256×4 — D4 D3 D2 D1 — MEI ME2

CB4 Ø-377 SEL L

23275A2 A7 E101 — PROM 256×4 — D4 D3 D2 D1 — MEI ME2
23276A2 A7 E104 — PROM 256×4 — D4 D3 D2 D1 — MEI ME2
23277A2 A7 E109 — PROM 256×4 — D4 D3 D2 D1 — MEI ME2
23278A2 A7 E114 — PROM 256×4 — D4 D3 D2 D1 — MEI ME2
23279A2 A7 E119 — PROM 256×4 — D4 D3 D2 D1 — MEI ME2

J1
7417 E39 — CB6 BK CMD Ø L
7417 E39 — CB6 BK CMD 1 L
7417 E39 — CB6 BK CMD 2 L

CB4 ABSØ-377 L

CE4 μPC 1 L
CB4 μPC 10 L
CB4 μPC 9 L
CB4 μPC 8 L
CB4 μPC 7 L
CB4 μPC 6 L
CB4 μPC 5 L
CB4 μPC 4 L

NC36 E74 — CB6 BUSY H

REVISIONS		
CHK	CHANGE NO.	REV.

(CONTROL ROM)(CB6)

TITLE: FPP8-A CONTROL BD (CB6)
SIZE/CODE: D CS
NUMBER: M8410-0-1
REV: B
SCALE: 1/1
SHEET 6 OF 7
DIST.

DEC FORM NO. DRD 138

CB7 FACZERO L

DP4 ZEROS L

DP4 SGN L

CB4 RESET L

CB4 4 PC CLOCK L

CB2 EP H

DP4 EXSGN H

CB7 FACSIGN H

CB7 EXPFL H

CB7 FORBIDDEN H

CB7 TEMPZERO H

CB7 NORMED H

CB7 TEMPSGN H

CB7 MOVE OK H *

SCRATCH L

TEMP L

FAC L

CB7 SIGN H

CB5 A LOC 3 L

CB5 A LOC 2 L

CB5 A LOC 1 L

CB5 A LOC 0 L

CB5 WRITE B H

CB5 WRITE A H

CB6 B SEL L

CB6 BW LOC 2 L

CB6 BW LOC 1 L

CB6 BW LOC 0 L

CB5 A LOC 4 L

DP4 NMD H

DP4 ONES L

FLAGS' CHART

IC	PIN#	FUNCTION
E89	4	FAC M = 0
	7	FAC N = 0
	10	FAC P = 0
	13	FAC R = 0
E99	4	FAC S = 0
	13	SCRAT.M OR TEMP 1 = 0
E112	4	SCRAT.N OR TEMP 2 = 0
	7	SCRAT.P OR TEMP 3 = 0
	10	SCRAT.R OR TEMP 4 = 0
	13	SCRAT.S OR TEMP 5 = 0

* IE: BITS 0-12 OF FRACTION ARE ALL ZEROS OR ALL ONES

REVISIONS

CHK	CHANGE NO.	REV.

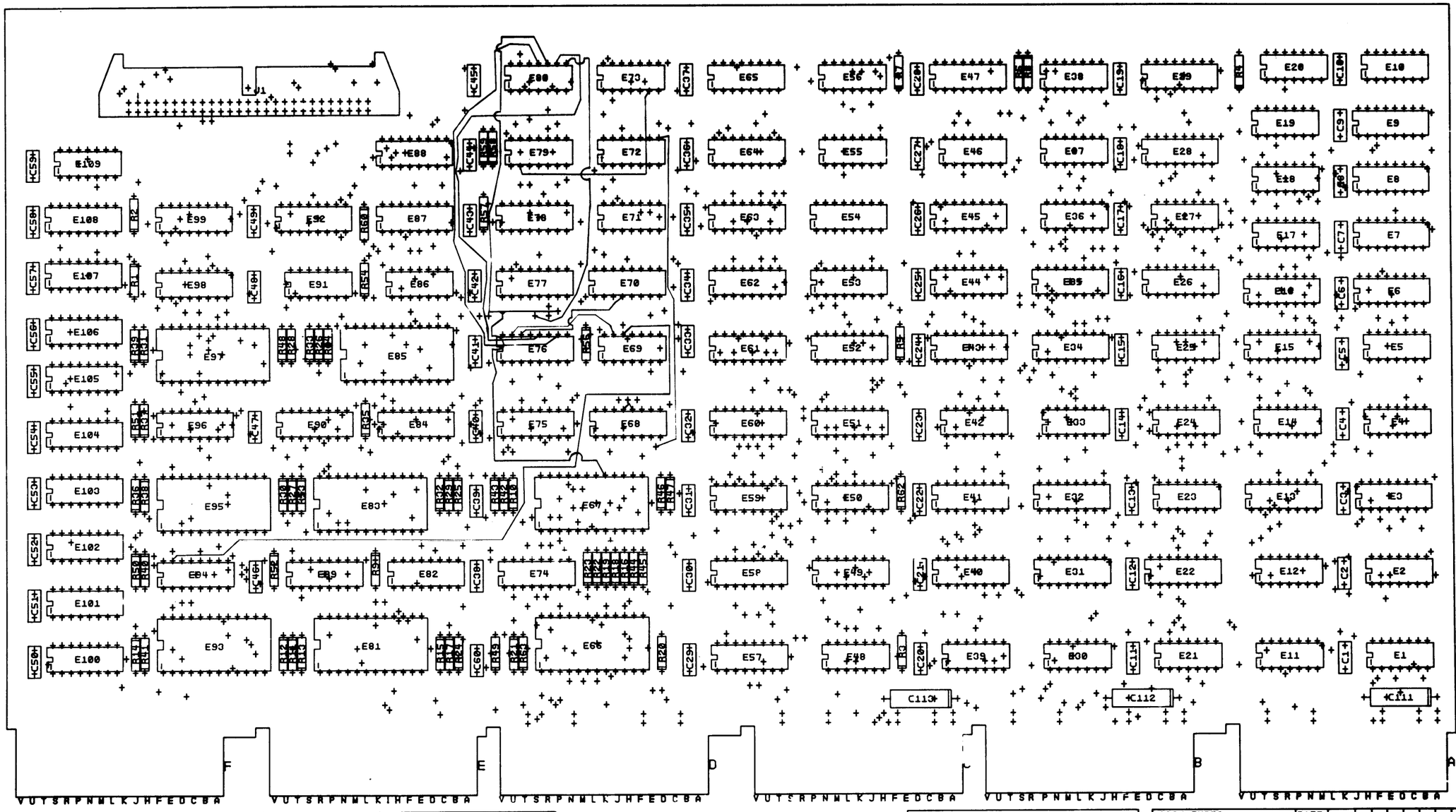
(REGISTER FLAGS) (CB7)

TITLE FPP8-A CONTROL BD (CB7)

SIZE D | CODE CS | NUMBER M8410-0-1 | REV. B

SCALE — | SHEET 7 OF 7 | DIST.

COMPONENT SIDE VIEW



NOTES:
1. JUMPER LIST: CONNECT E73-6 TO E79-2
2. CONNECT E72-8 TO FEED THRU BETWEEN E68-7 &
3. " E66-12 & 13
4. CUT ETCH BETWEEN E68-13 & FEED THRU UNDER E68
5. " " " E79-2 & " " AS SHOWN-SI
6. " " " E71 & E72-9 AS SHOWN-SIDE 1
7. CONNECT E80-10 TO FEEDTHRU OFF E76-10, THEN FROM FEEDTHRU TO E67-17

CHK	CHANGE NO	REV

JUMPER LIST (CONT.)

1. CUT ETCH BETWEEN E76-12 & FEED THRU-SIDE 1
2. CUT ETCH BETWEEN E76-10 & FEEDTHRU-SIDE 1
3. CUT ETCH BETWEEN E76-15 & FEEDTHRU-SIDE 2
4. CUT ETCH BETWEEN E76-14 & C91 " CONNECT E80-8 TO FEEDTHRU OFF E76-12
5. CUT ETCH BETWEEN E76-15 & FEEDTHRU NEAR R56-S2
6. CONNECT E76-15 TO E69-13
7. " E69-12 TO E94-15
8. " E76-4 TO E76-14
9. " E76-12 TO E80-9
10. " E76-10 TO E80-11

ETCH REV. D
P.C. DESIGN DATA BASE REV. D

SIGNATURES	DATE
DRN.	7-23-76
CHK'D.	7-27-76
ENG.	10/21/76
PROJ. ENG.	
PROD.	8-30-76

digital

TITLE: FPP8-A DATA PATH

SCALE 2/1 | SHT. 3 OF 3 | NEXT HIGHER ASSY.

SIZE	CODE	NUMBER	REV
D	UA	M8411-0-0	C

MS# 40501

M8411-0-0 DUA

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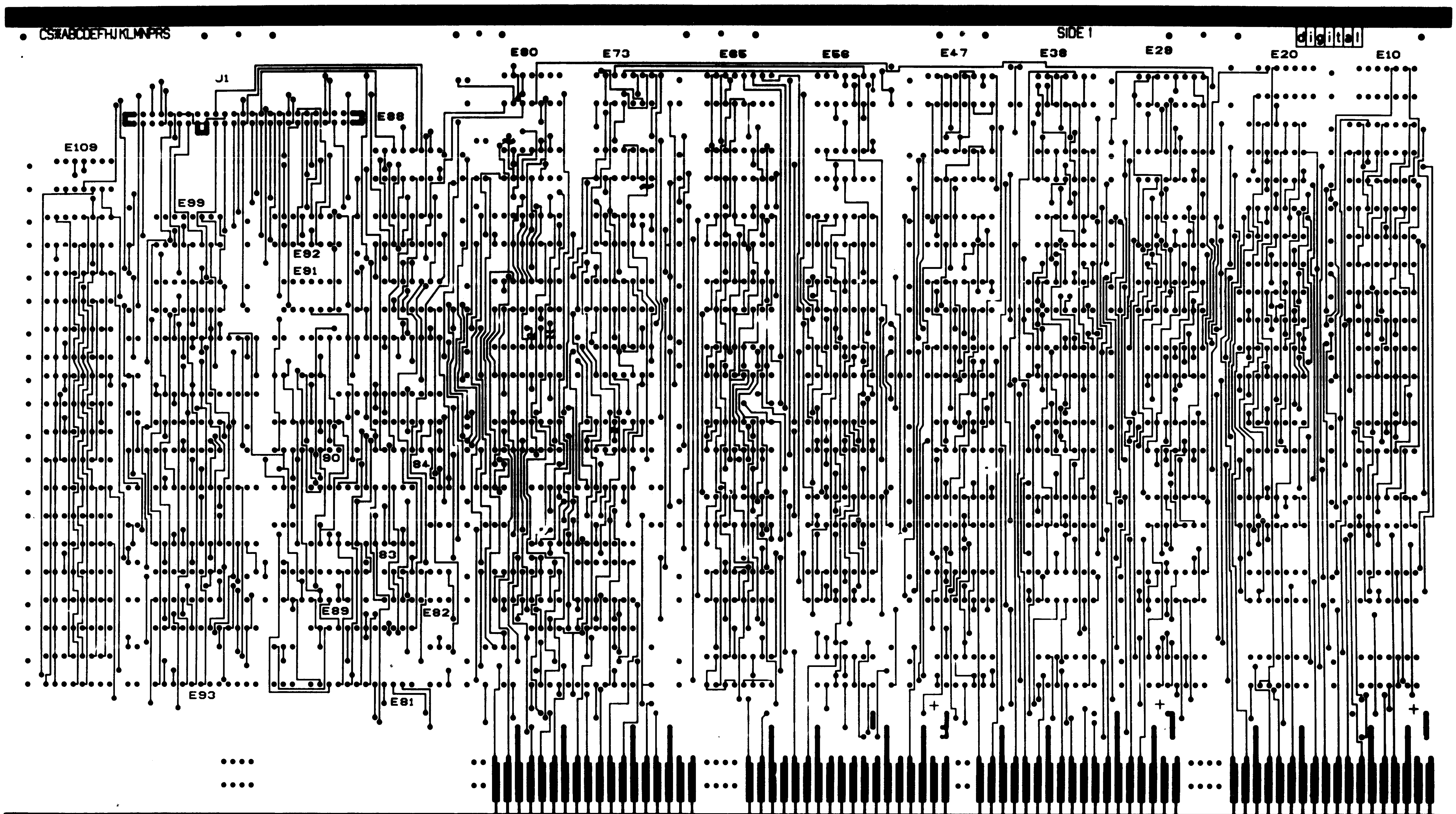
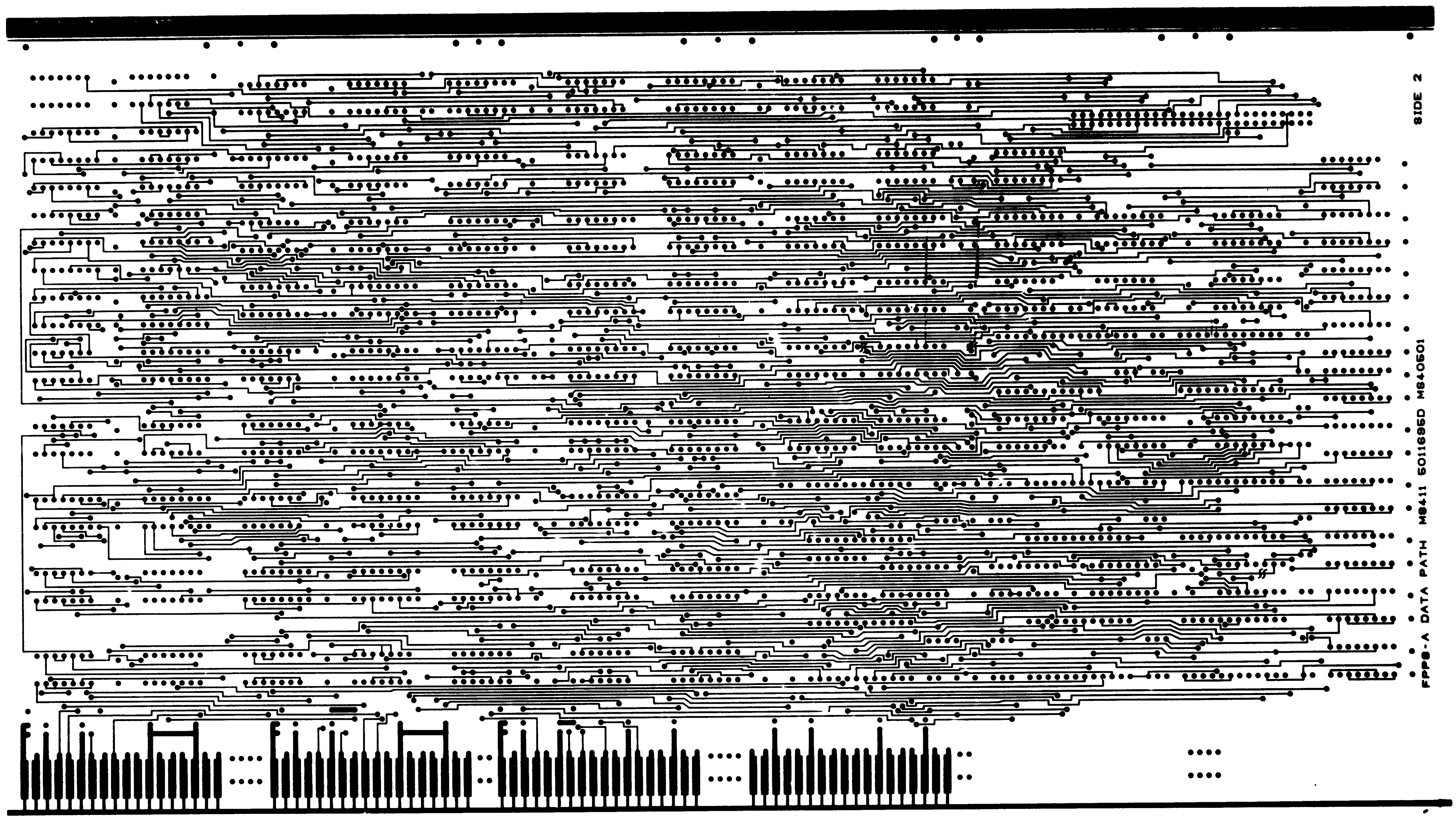
D UA M8411-0-0 C



REVISIONS		
CHK	CHANGE NO	REV

TITLE	SIZE	CODE	NUMBER	REV
[illegible]	D	UA	[illegible] -7-7	
SCALE	SHEET 2 OF 3	DIST		

DEC FORM NO DRD 137



D | UA | M8411-0-0 | C

REVISIONS		
CHK	CHANGE NO	REV

TITLE

SIZE	CODE	NUMBER	REV.
D	A	-7-0	

SCALE | SHEET 3 OF 3 | DIST

DIGITAL EQUIPMENT CORPORATION

PARTS LIST

MADE BY JACK MASON	CHECKED [illegible]	SECTION 1
DATE 4/7/76	DATE 5/19/76	
ENG W.K. [illegible]	PROD R.X. [illegible]	ISSUED SECTION 1
DATE 19 MAY 76	DATE 5-15-76	

NOTES:

* ANY VARIATION FOR THE .01 CAPS

ITEM NO.	DRAWING NO.	PART NO.	DESCRIPTION	QUANTITY/VARIATION M8411-Ø-Ø	REF DESIGNATION
1	D-MD-5011695-0-0	5011695	ETCHED CIRCUIT BOARD	1	
2		1001610 *	CAP. .Ø1 Uf,	6Ø	C1-C6Ø
3		1005306	CAP. 6.8 Uf, 35V, 1Ø% TANT	3	C111, C112, C113
4		1300316	RES. 470 OHMS, 1/4W, 5%	59	R1, R2, R5-R54, R56-R6Ø, R62, R63
5		1300391	RES. 1.5K OHMS, 1/4W, 5%	2	R3, R4
6		1909486	I.C., DEC 384	1	E39
7		1909686	I.C., DEC 74Ø4	5	E27, E55, E69, E73, E8Ø
8		1909704	I.C., DEC 314	1	E4
9		1909705	I.C., DEC 8881	6	E11, E17, E25, E3Ø, E33, E42
10		1910091	I.C., DEC 7437	1	E56
11		1910155	I.C., DEC 74Ø8	2	E12, E36
12		1910532	I.C., DEC 74SØØ	2	E86, E1Ø9
13		1910550	I.C., DEC 74S174	3	E76, E98, E1Ø8
14		1912097	I.C., DEC 74S182	1	E82
15		1911315	I.C., DEC 8234	5	E49, E51, E52, E53, E54
16		1911469	I.C., DEC 864Ø	8	E1, E2, E5, E1Ø, E14, E19, E21, E48
17		1911527	I.C., DEC 8Ø97	3	E5Ø, E89, E9Ø
18		1911711	I.C., DEC 8T1Ø	5	E3, E13, E22, E29, E31
19		1911983	I.C., DEC 74S133	1	E8
20		1912395	I.C., DEC 8136	2	E32, E41
21		1912646	I.C., DEC 74LS253	10	E57 - E64, E68, E74

E.C.O. NO.

TITLE	ASSY NO.	SIZE	CODE	NUMBER	REV.
FPP8-A DATA PATH BD.	D-UA-M8411-Ø-Ø	B	PL	M8411-Ø-Ø	C
	SHEET 1 OF 3	INSERTION PARTS LIST DATA BASE REV D			

DIGITAL EQUIPMENT CORPORATION

PARTS LIST

MADE BY JACK MASON	CHECKED	SECTION
DATE 4/7/76	DATE 5/19/76	1
ENG	PROD R.K Allen	ISSUED SECTION
DATE 19 MAY 76	DATE 5-19-76	1

ITEM NO.	DRAWING NO.	PART NO.	DESCRIPTION	M8411-Ø-Ø	REF DESIGNATION
22		1912649	I.C., DEC 74LS75	2	E43, E45
23		1912695	I.C., DEC 74LS181	4	E66, E81, E83, E95
24		1912696	I.C., DEC 74LS194	3	E26, E35, E44
25		1912697	I.C., DEC 74LS174	4	E47, E87, E92, E99
26		1912741	I.C., DEC 82S112	4	E67, E85, E93, E97
27		1912786	I.C., DEC 82S21	8	E1ØØ - E1Ø7
28		1912799	I.C., DEC 74LSØØ	3	E37, E38, E46
29		1912801	I.C., DEC 74LSØ2	2	E18, E91
30		1912807	I.C., DEC 74LS1Ø	2	E2Ø, E71
31		1912808	I.C., DEC 74LS11	1	E23
32		1912819	I.C., DEC 74LS42	1	E28
33		1912824	I.C., DEC 74LS74	2	E4, E72
34		1912829	I.C., DEC 74LS86	1	E79
35		1912834	I.C., DEC 74LS112	2	E4Ø, E7Ø
36		1912847	I.C., DFC 74LS1	1	E84
37		1912848	I.C., DEC 74LS158	6	E6, E7, E9, E15, E16, E34
38		23129A1	I.C., 32 X 8 PROM	1	E94
39		2313ØA1	I.C., 32 X 8 PROM	1	E96
40		23131A1	I.C., 32 X 8 PROM	1	E78
41		23132A1	I.C., 32 X 8 PROM	1	E77
42		23133A1	I.C., 32 X 8 PROM	1	E65

QUANTITY / VARIATION

NOTES:

E.C.O. NO.

TITLE	ASSY NO.	SIZE	CODE	NUMBER	REV.
FPP8-A DATA PATH BD.	D-UA-M8411-Ø-Ø	B	PL	M8411-Ø-Ø	C
	SHEET 2 OF 3	INSERTION PARTS LIST DATA BASE REV D			

DIGITAL EQUIPMENT CORPORATION

PARTS LIST

MADE BY JACK MASON	CHECKED	SECTION 1
DATE 4/7/76	DATE 5/19/76	
ENG M. Kinchen	PROD R. X Allen	ISSUED SECTION 1
DATE 19 MAY 76	DATE 5-25-76	

ITEM NO.	DRAWING NO.	PART NO.	DESCRIPTION	QUANTITY / VARIATION M8411-Ø-Ø	REF DESIGNATION
43		23134A1	I.C., 32 X 8 PROM	1	E75
44		23135A1	I.C., 32 X 8 PROM	1	E88
45		1210711-Ø2	HANDLE ASSY HEX BOARD	1	
46		9006732	EYELET #C54-7	12	
47		1209941-07	CONN, 5Ø PIN RT. ANG HEADER	1	J1

NOTES:

E.C.O. NO.

TITLE	ASSY NO.	SIZE	CODE	NUMBER	REV.
FPP8-A DATA PATH BD.	D-UA-M8411-Ø-Ø	B	PL	M8411-Ø-Ø	C
	SHEET 3 OF 3	INSERTION PARTS LIST DATA BASE REV D			

	IF	C (OBUS) LOADED INTO
(CB5)	WRITE A = H	A ACCUMULATOR SPECIFIED BY A LOC <Ø:4>
(CB5)	WRITE B = H	TEMPORARY SPECIFIED BY BWLOC <Ø:2>
(CB6)	DB CTRL 1 L = H AND DB CTRL 2 L = L	DATA BUFFER

	CB5				
SIGNAL	ARITH Ø	ARITH 1	ARITH 2	ARITH 3	FUNCTION
J1 PIN #	32	4Ø	38	34	
ADDRESS CALCULATION (15-BIT ARITHMETIC)	L	L	L	L	A+B+CARRY (15 BITS) TO OBUS
	L	L	L	H	(A+B+CARRY)*2 TO OBUS (2*B)
	L	L	H	L	(A+B+CARRY) LOGICALLY RIGHT ROTATED 3 PL. TO OBUS
*	L	L	H	H	(3*B+CARRY) (15 BITS) TO OBUS (3*B)
*	L	H	L	L	(3*B+CARRY)*2 TO OBUS (6*B)
DATA MANIPULATION (12-BIT ARITHMETIC)	L	H	L	H	A+B+CARRY (12 BITS) TO OBUS
	L	H	H	L	Ø TO OBUS (15 BITS)
	L	H	H	H	A SIGN (ØØØØ OR 7777) TO OBUS
	H	L	L	L	B TO OBUS (12 BITS)
	H	L	L	H	A+B̄+CARRY (12 BITS) TO OBUS (A-B)
	H	L	H	L	EXP SIZE
	H	L	H	H	OVFLO RECOVERY (COMPLEMENT OF SIGN → SIGN, SHIFT RT)
	H	H	L	L	(A+B+CARRY)*2+SHIFT BIT^{x} (12 BITS) TO OBUS
	H	H	L	H	(A+B+CARRY) ÷ 2 + SHIFT BIT^{x} (12 BITS) TO OBUS
	H	H	H	L	DIV FINAL
	H	H	H	H	MUL/DIV STEP

* A READ MUST BE DISABLED

x SHIFT BIT IF EXTEND IS H; SIGN BIT IF EXTEND IS L AND RIGHT SHIFT; Ø IF EXTEND IS L AND LEFT SHIFT

EXTEND = LOW: CARRY BIT TO ALU, ZERO OR SIG.1 TO VACATED BIT POSITION

EXTEND = HIGH: CARRY FROM LAST OPERATION TO ALU, SHIFTED BIT FROM LAST OPERATION TO VACATED BIT

A LOC <Ø:4> DEFINE ONE OF 32 15-BIT ACCUMULATORS USED FOR READ AND/OR WRITE, IF READ A=1, IF READ A=Ø, A INPUT TO ADDER = Ø

BR LOC <Ø:4> DEFINE ONE OF 8 TEMPORARIES, Ø, ONE OF 3 WORDS FROM DB OR FIR, CONSTANTS AS INPUTS TO ALU.

	CB5					
SIGNAL	BRØ	BR1	BR2	BR3	BR4	TO ALU
J1 PIN #	3Ø	37	25	2Ø	19	
	L	H	X	X	X	TEMPORARY DEFINED BY BR <2:4>
	L	L	H	H	H	TEMP <1:3>, DB
	L	L	H	H	L	BITS <1:3> = Ø, BITS <4:15> = DATA BUFFER
	L	L	H	L	H	IF FIR 4 = Ø : Ø, FIR <9:11> IF FIR 4 = 1 : Ø, FIR <5:11>
	L	L	H	L	L	Ø, FIR <6:8>
	L	L	L	H	H	NOT USED
	L	L	L	H	L	NOT USED
	L	L	L	L	H	BITS <1:3> OF A TO BITS, <13:15>
	L	L	L	L	L	BITS <1:3> OF A TO BITS, "103" TO BITS <4:12>
	H	H	H	H	H	Ø
	H	H	H	H	L	+1
	H	H	H	L	H	+2
	H	H	H	L	L	+3
	H	H	L	H	H	-1
	H	H	L	H	L	-2
	H	H	L	L	H	-27
	H	H	L	L	L	-73
	H	L	H	H	H	BITS <1:3> OF TEMP Ø. OTHER BITS Ø.
	H	L	H	H	L	+14
	H	L	H	L	H	-14
	H	L	H	L	L	-5
	H	L	L	H	H	-6
	H	L	L	H	L	2000
	H	L	L	L	H	4000
	H	L	L	L	L	-30

FILE ASSIGNMENTS

ADDRESS	FILE A	FILE B
Ø	FPC	TEMP
1	XØ	TEMP 1
2	BR	TEMP 2
3	OPADD	TEMP 3
4	APTP	TEMP 4
5	TEMA	TEMP 5
6	FIELD	TEMP 6
7		TEMP 7
1Ø	FACE	
11	FAC M (FAC <Ø:11>)	
12	FAC N (FAC <12:23>)	
13	FAC P (FAC <24:35>)	
14	FAC R (FAC <36:47>)	
15	FAC S (FAC <48:59>)	
16		
17	SC	
2Ø	SCRATCH E	
21	SCRATCH M	
22	SCRATCH N	
23	SCRATCH P	
24	SCRATCH R	
25	SCRATCH S	
26	SCRATCH T	
27		
3Ø	MQE	
31	MQM	
32	MQN	
33	MQP	
34	MQR	
35	MQS	
36		
37		

A LOC <Ø:4> ALL "H" → address Ø; B LOC ALL "H" → TEMP; B LOC ALL "L" → TEMP 7; A LOC <Ø:4> ALL "L" → address 37

TRIANGLE INDICATES PIN 1

J1-CABLE SIGNALS

Signal	Pin	Pin	Signal
GND	1	2	GND
CB6 EXTEND H	3	4	DP4 NMD H
CB6 DB CTRL 2 L	5	6	DP4 ONES L
DP4 ZEROS L	7	8	DP4 SGN L
CB6 DB CTRL 1 L	9	10	DP4 EXSGN H
CB6 READ A H	11	12	GND
CB5 BW LOC 2 L	13	14	GND
GND	15	16	CB4 TICK H
GND	17	18	CB4 BRK RQ H
CB5 BR LOC 4 L	19	20	CB5 BR LOC 3
CB5 BW LOC Ø L	21	22	GND
CB5 BW LOC 1 L	23	24	CB5 CARRY BIT L
CB5 BR LOC 2 L	25	26	DP3 FP BREAK H
CB5 A LOC 4 L	27	28	CB1 FP IOT L
CB5 A LOC Ø L	29	30	CB5 BR LOC Ø L
CB5 A LOC 2 L	31	32	CB5 ARITH Ø H
DP1 Z IN H	33	34	CB5 ARITH 3 H
CB6 BK CMD Ø L	35	36	CB5 WRITE B H
CB5 BR LOC 1 L	37	38	CB5 ARITH 2 H
CB2 LOCKOUT H	39	40	CB5 ARITH 1 H
CB5 A LOC 3 L	41	42	CB5 WRITE A H
DP8 OVFLO H	43	44	CB6 BK CMD 1 L
CB2 PROT H	45	46	CB5 A LOC 1 L
CB6 BK CMD 2 L	47	48	CB1 DB IN IOT H
GND	49	50	GND

DB CONTROL

(CB6)		
DB CTRL 1 L	DB CTRL 2 L	TO DB
H	H	NO OP
H	L	DB ← Ø
L	H	DB ← ALU
L	L	DB ← MD

MODULE:

GROUND CONNECTIONS		
CONNECTOR	SIDE	FINGERS
A, B, C, D	1	C, F, N, T
A, B, C, D	2	C, F, N, T

+5V CONNECTIONS		
CONNECTOR	SIDE	FINGER
A, B, C	2	A

FIRST USED ON FPP8-A

TITLE FPP8-A DATA PATH BD.

NEXT HIGHER ASSY. D-UA-M8411-Ø-Ø

SIZE D CODE CS NUMBER M8411-Ø-1 REV. C

SCALE — SHEET 1 OF 9

DIST.

digital

DATA Ø L (ARI) — MD Ø L AKI — DATA 1 L (ASI) — MD 1 L ALI — DATA 2 L (AUI) — MD 2 L AMI — DATA 3 L (AVI) — MD 3 L API — DATA 4 L (BRI) — MD 4 L BKI — DATA 5 L (BSI) — MD 5 L BLI — DATA 6 L (BUI) — MD 6 L EMI — DATA 7 L (BVI) — MD 7 L BPI — DATA 8 L (DRI) — MD 8 L DKI — DATA 9 L (DSI) — MD 9 L DLI — DATA 10 L (DUI) — MD 10 L DMI — DATA 11 L (DVI) — MD 11 L DPI

8640 E19 · 8640 E2 · 8640 E19 · 8640 E2 · 8640 E19 · 8640 E2 · 8640 E19 · 8640 E2 · 8640 E5 · 8640 E1 · 8640 E5 · 8640 E1 · 8640 E5 · 8640 E1 · 8640 E14 · 8640 E21 · 8640 E14 · 8640 E21 · 8640 E14 · 8640 E21

74LS158 E9 · 74LS158 E6 · 74LS158 E15 · 74LS158 E34 · 74LS158 E16 · 74LS158 E7

DP6 OBUS 4 L · DP6 OBUS 5 L · DP6 OBUS 6 L · DP6 OBUS 7 L

DP7 OBUS 8 L · DP7 OBUS 9 L · DP7 OBUS 10 L · DP7 OBUS 11 L

DP7 OBUS 12 L · DP7 OBUS 13 L · DP7 OBUS 14 L · DP7 OBUS 15 L

DP8 ALU TO DB EN L · DP8 DB RT EN H · DP8 DB LFT EN H · DP8 DB BIT H

74LS133 E8 · 7404 E27 · 74LS02 E18 — DPI PRIORITY OK L

74LS194 E26 · 74LS194 E35 · 74LS194 E44 — DP8 ZERO DB L

DPI DB Ø H · DPI DB 1 H · DPI DB 2 H · DPI DB 3 H · DPI DB 4 H · DPI DB 5 H · DPI DB 6 H · DPI DB 7 H · DPI DB 8 H · DPI DB 9 H · DPI DB 10 H · DPI DB 11 H

DP3 MAC (1) H — DP3 PRIORITY TEST L — 74LS00 E37

J1 — DPI Z IN H

DPI B INITIALIZE H — 7404 E27 — 7437 E56 — DPI B INITIALIZE L

DP3 MAC (1) H — 74LS02 E46 — 7404 E55 — 74LS112 E70 — +3V

DP3 BTP3 H — 7404 E55 — 74LS112 INT ON E40

INITIALIZE H — CRI — 8640 E48 — +5V — R3 1.5K

INT RQST L — CPI — 8640 E48 — 74LS112 INT SER E49

74LS02 E18 — 7408 E12 — 3 SKON+10 F H

319 E4 — 74LS11 E23 — 12 ION+RTF H

7404 E27 — I/O PAUSE L CDI — 74LS00 E46 — DPI ALLOW B-B BREAKS L

8640 E10 — DPI G PAUSE H

CB2 LOCKOUT H — CB1 FPIOT L — J1 — 7408 E36 — R4 1.5K +5V

CB4 TICK H — R1 470Ω — R2 470Ω — 74S00 E109 — DPI FILE CLOCK L

+5V — R41 470 — +3V

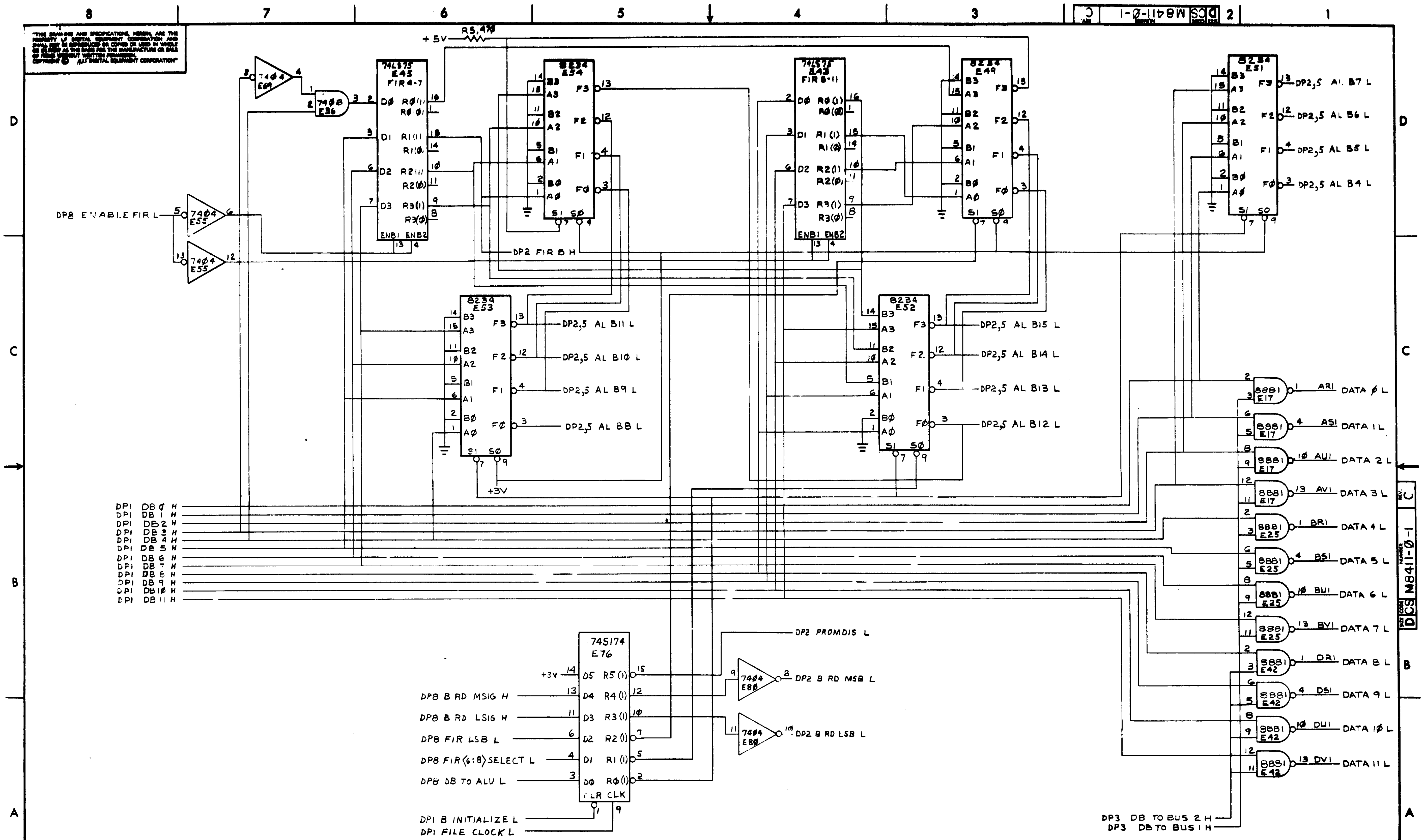
DP3 MAC (1) H — 74LS00 E37

(DATA BUFFER) (DPI)

REVISIONS		
CHK	CHANGE NO.	REV.

TITLE	SIZE	CODE	NUMBER	REV.
FPP8-A DATA PATH BD (DPI)	D	CS	M8411-Ø-1	C
SCALE —	SHEET 2 OF 9	DIST.		

DEC FORM NO. 990 138



REVISIONS

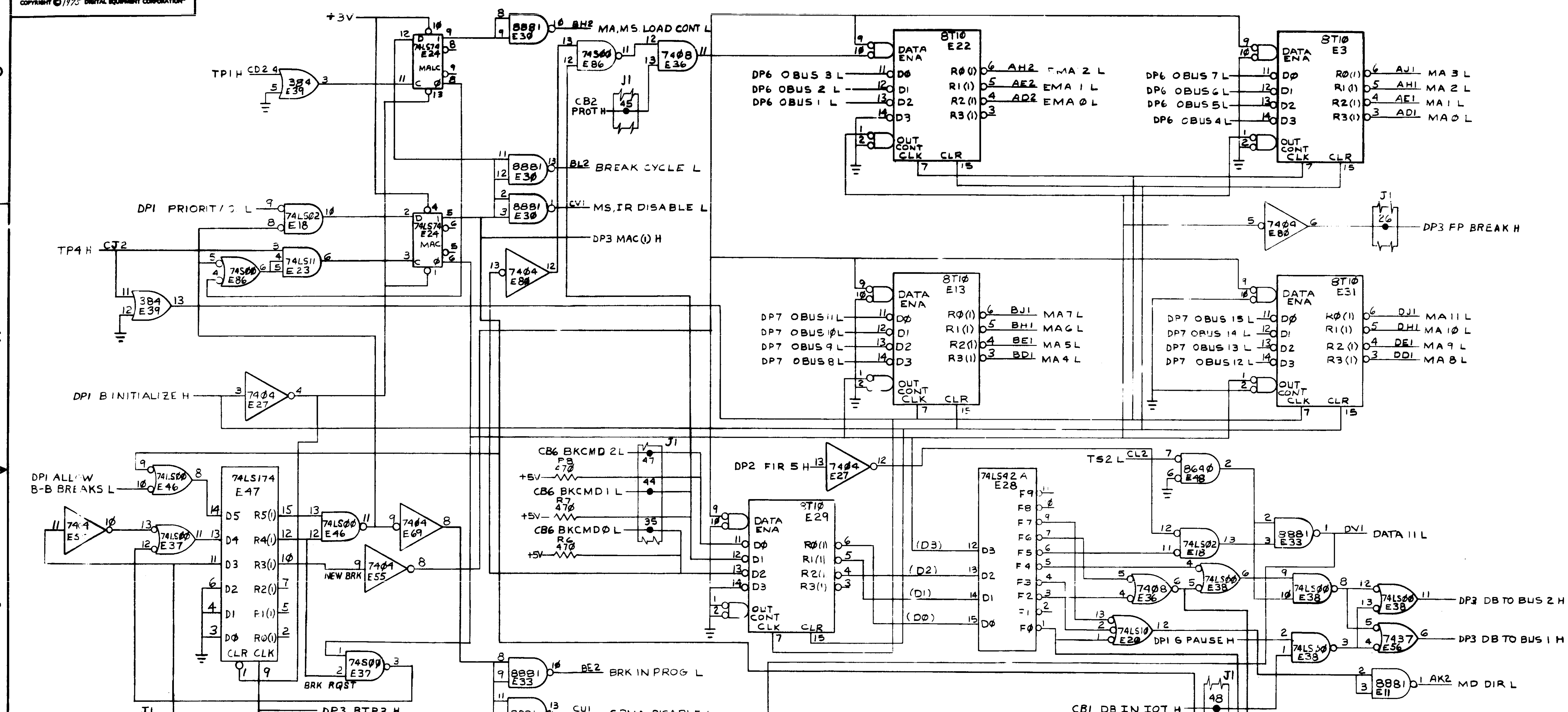
CHK	CHANGE NO.	REV.

(DATA PATH INPUT MUX) (DP2)

TITLE FPP8-A DATA PATH BD (DP2)

SIZE D CODE CS NUMBER M8411-Ø-1 REV. C

SCALE — SHEET 3 OF 9



FUNCTION TABLE FOR E28 DECODER

INPUT DATA				FUNCTION —— OUTPUT
DØ	D1	D2	D3	
X	X	X	H	NO OP
H	H	H	L	READ (F7) *
L	H	H	L	WRITE (F6) *
H	L	H	L	INCREMENT IF FIR 5=1 (F5) *
L	L	H	L	ADM (F4) *
H	H	L	L	READ, IGNORING PROT BIT (F3) **
L	H	L	L	WRITE (F2) **
H	L	L	L	NOT USED
L	L	L	L	INSTR FETCH - READ, DATA TO FIR (FØ)

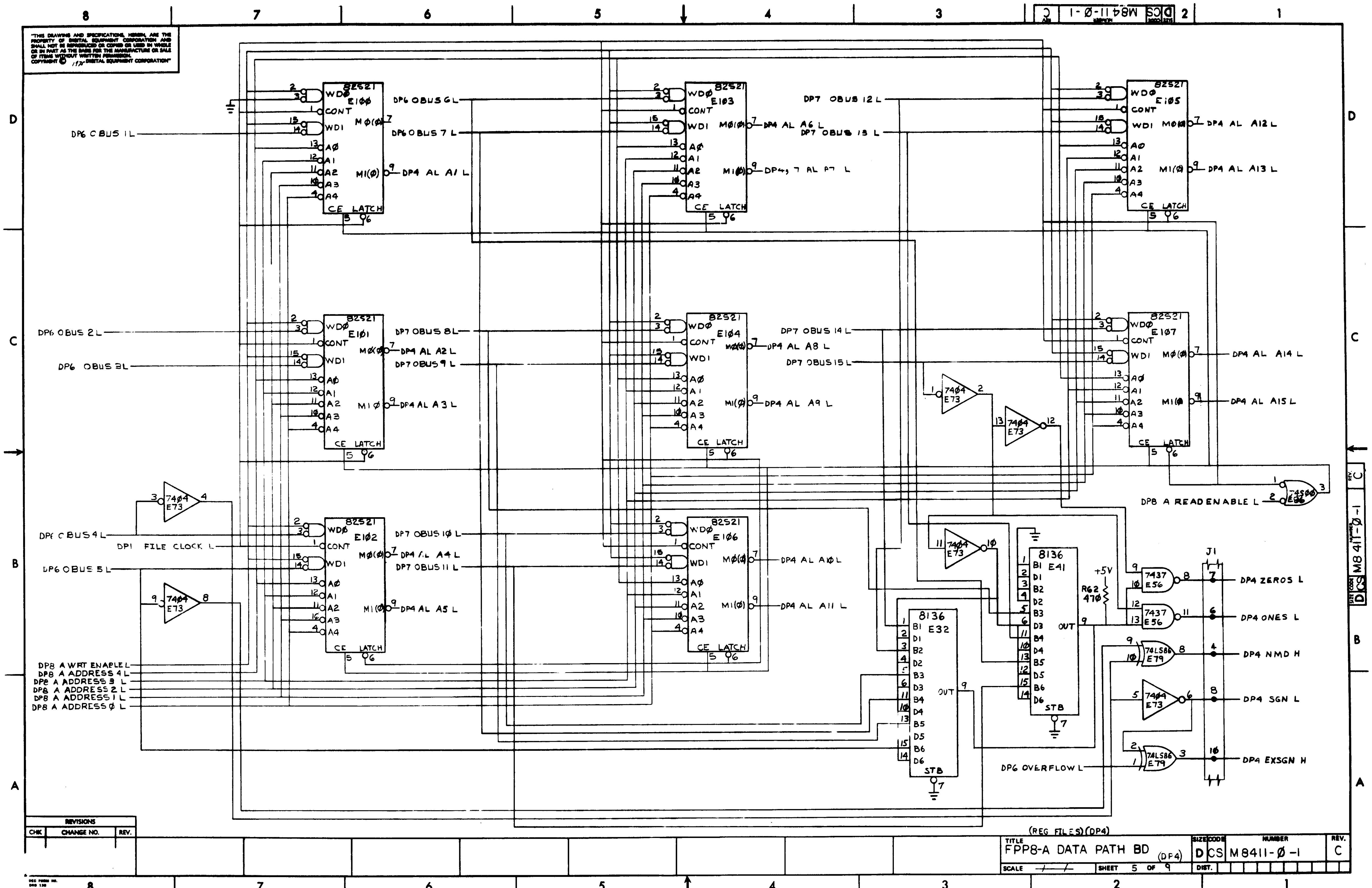
* IF PROT=1, BK EMA NOT LOADED

** USED FOR APT GET & PUT

REVISIONS		
CHK	CHANGE NO.	REV.

(DATA BREAK CTRL)(DP3)

TITLE	SIZE	CODE	NUMBER	REV.
FPP8-A DATA PATH BD (DP3)	D	CS	M8411-Ø-1	C
SCALE —/—	SHEET 4 OF 9	DIST.		

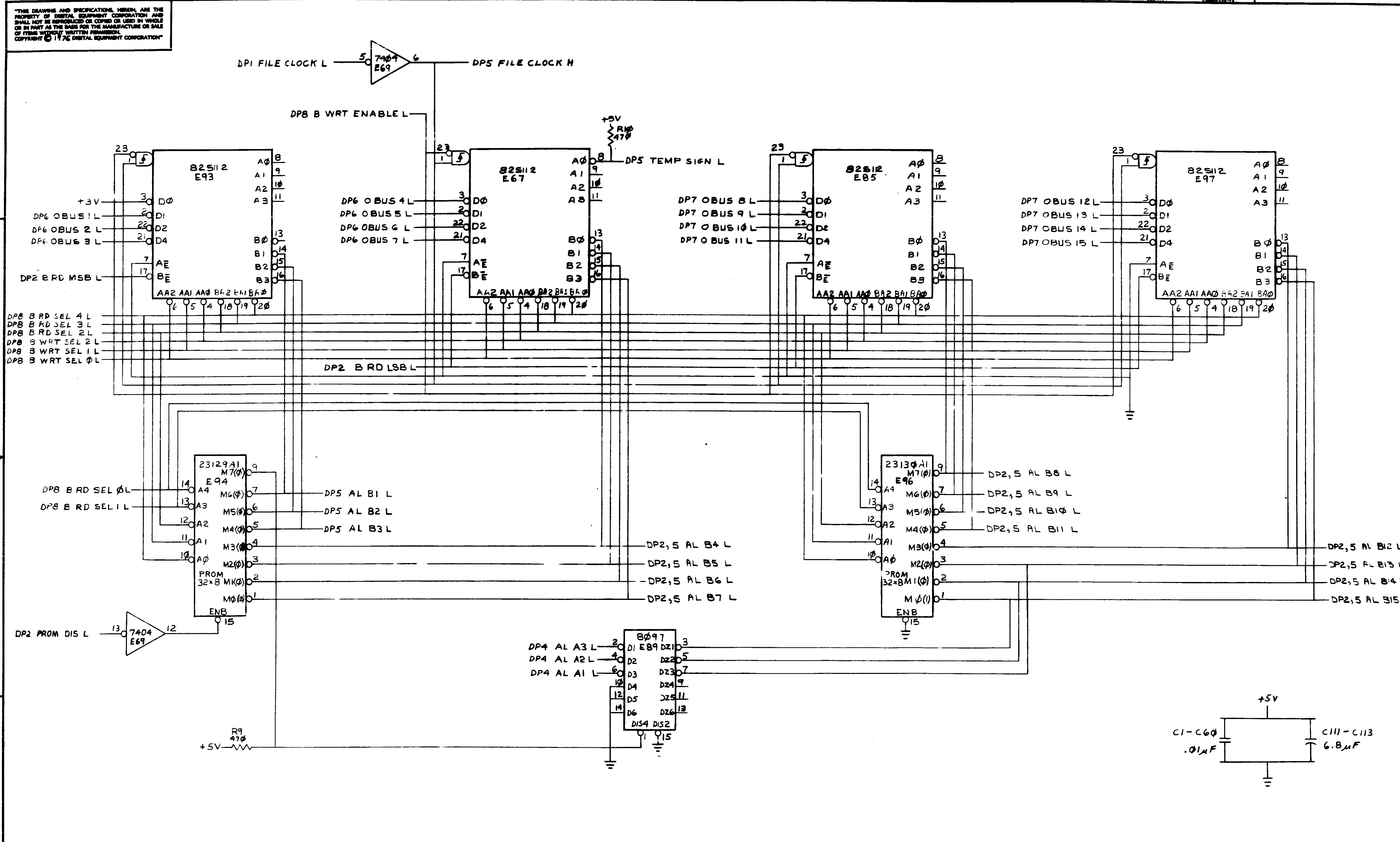


(REG FILES)(DP4)

TITLE FPP8-A DATA PATH BD (DP4)

SIZE	CODE	NUMBER	REV.
D	CS	M8411-Ø-1	C

SCALE —/— SHEET 5 OF 9



(MULTI PORT RAMS & FILES)(DP5)

TITLE	SIZE	CODE	NUMBER	REV.
FPP8-A DATA PATH BD (DP5)	D	CS	M8411-0-1	C

SCALE — SHEET 6 OF 9

+5V
R13 470
R12 470
R11 470
DP2,5 AL B1 L
DP2,5 AL B2 L
DP2,5 AL B3 L
74LS181 E81
A=B COUT P F3 F2 F1 F0
B3 B2 B1 B0 A3 A2 A1 A0
S3 S2 S1 S0 M CIN
DP4 AL A1 L
DP4 AL A2 L
DP4 AL A3 L
+5V
R16 470
R15 470
R14 470
DP8 ALUM15 L
ALU S0L
74LS86 E79
74S00 E86
DP7 ALU13 L
DP7 CLINKH
74LS253 CONT1 CONT0 E74
DP6 OBUS1 L
DP6 12 BIT CARRY H
DP6 OVERFLOW L
DP7 ALU15 L
74LS253 E58
DP6 OBUS 3 L
DP6 OBUS 2 L
DP7 ALU 14 L
DP8 LSB SHFT SEL 0 H
DP8 MSB SHFT SEL 1 H
P2 COUT2 74S182 E82
8097 E58 D1 D2 D3 D4 DZ1 DZ2 DZ3 DZ4 DIS4
DP8 X3 L
+5V
R20 470
R19 470
R18 470
R17 470
DP2,5 AL B4 L
DP2,5 AL B5 L
DP2,5 AL B6 L
DP2,5 AL B7 L
74LS181 E66
A=B COUT P G F3 F2 F1 F0
B3 B2 B1 B0 A3 A2 A1 A0
S3 S2 S1 S0 M CIN
DP4 AL A4 L
DP4 AL A5 L
DP4 AL A6 L
DP4,7 AL A7 L
+5V
R24 470
R23 470
R22 470
R21 470
DP8 ALUS3 L
DP8 ALUS2 L
DP8 ALUS1 L
DP8 ALUS0 L
DP8 ALUM L
DP7 LACRY YIN H
DP7 SHFBK L
74LS253 CONT1 CONT0 E57
DP6 OBUS 4 L
DP8 LSB SHFT SEL 0 H
DP8 MSB SHFT SEL 1 H
74LS253 CONT1 CONT0 E59
DP6 OBUS 6 L
DP6 OBUS 5 L
DP7 ALU 8 L
74LS253 CONT1 CONT0 E60
DP6 OBUS 7 L
DP6 ALU6 L
DP6 ALU5 L
DP6 ALU4 L
DP6 ALU7 L

REVISIONS		
CHK	CHANGE NO.	REV.

(ALU & SHIFT 1) (DP6)

TITLE: FPP8-A DATA PATH BD (DP6)		SIZE/CODE: D CS	NUMBER: M8411-Ø-1	REV: C
SCALE: —	SHEET 7 OF 9	DIST.		

DCS M8411-0-1 C

R28,47Ø
R26 47Ø
R27 47Ø
R28 47Ø

DP2,5 AL B8 L
DP2,5 AL B9 L
DP2,5 AL B10 L
DP2,5 AL B11 L

DP4 AL A8 L
DP4 AL A9 L
DP4 AL A10 L
DP4 AL A11 L

R29 47Ø
R30 47Ø
R31 47Ø
R32 47Ø
+5V

8097 DIS2 E50

DP8 X3L

74LS181 E83

DP4,7 AL A7 L

COUTX 74S182 E82

74LS181 E95

R33 47Ø
R34 47Ø
R35 47Ø
R36 47Ø
+5V

DP2,5 AL B12 L
DP2,5 AL B13 L
DP2,5 AL B14 L
DP2,5 AL B15 L

DP4 AL A12 L
DP4 AL A13 L
DP4 AL A14 L
DP4 AL A15 L

R37 47Ø
R38 47Ø
R39 47Ø
R40 47Ø
+5V

8097 DIS4 DIS2 E90

DP8 ALU S3 L
DP8 ALU S2 L
DP8 ALU S1 L
DP8 ALU S0 L
DP8 ALU M L

DP8 X3L

DP7 ALU 8 L
DP6 ALU7 L
DP6 ALU6 L

74S182 E82 COUTY

DP7 LACRY YIN H

74LS253 E60

DP7 O BUS 8 L

DP8 LSb SHFT SEL 1 H
DP8 LSB SHFT SEL ØH

74LS253 E61

DP7 O BUS 10 L
DP7 O BUS 9 L

DP6 ALU5 L

DP7 ALU 15 L
DP7 ALU 14 L
DP7 ALU 13 L

74LS253 E62

DP7 O BUS 12 L
DP7 O BUS 11 L

74LS253 E63

DP7 O BUS 14 L
DP7 O BUS 13 L

74S182 E82

74LS253 E64

DP7 SHF BIT L
DP7 O BUS 15 L

74LS157 E84

+3V
DP8 SLINK L
DP8 CLINK H
DP8 CARRY IN H
DP8 OVF RECOVER H
DP6 ALU 4 L

74LS86 E79

DP7 SHFBK L

DP8 MULTOP H

(ALU&SHIFT 2) (DP7)

REVISIONS		
CHK	CHANGE NO.	REV.

TITLE	SIZE	CODE	NUMBER	REV.
FPP8-A DATA PATH BD (DP7)	D	CS	M8411-Ø-1	C
SCALE —	SHEET 8 OF 9		DIST.	

DEC FORM NO. DOD 126

DCS M8411-0-1 C

DP8 OVFLO H

DP5 FILE CLOCK H

DP8 ALU TO DB EN H

DP8 ZERO DB L

DP8 DB RT EN H

DP8 DB LFT EN H

DP8 B WRT ENABLE L

DP8 A WRT ENABLE L

DP8 SLINK L

DP8 CLINK H

DP8 CARRY IN H

DP8 LSB SHFT SEL 1 H

DP8 LSB SHFT SEL Ø H

DP8 MSB SHFT SEL 1 H

DP8 MSB SHFT SEL Ø H

DP8 OVF RECOVER H

DP8 ALUMIS L

DP8 ENABLE FIR L

DP8 A READ ENABLE L

DP8 ALU SØ L

DP8 ALU S1 L

DP8 ALU S2 L

DP8 ALU S3 L

DP8 ALU M L

DP8 X3 L

8 MUL/DIV L

DP8 DB BIT H

DP5 TEMP SIGN L

DP8 A ADDRESS 4 L

DP8 A ADDRESS 3 L

DP8 A ADDRESS 2 L

DP8 A ADDRESS 1 L

DP8 A ADDRESS Ø L

DP8 MULTOP H

DP8 B WRT SEL 2 L

DP8 B WRT SEL 1 L

DP8 B WRT SEL Ø L

DP8 DB TO ALU L

DP8 FIR<6:8> SELECT L

DP8 FIR LSB L

DP8 B RD LSIG L

DP8 B RD MSIG L

DP8 B RD SEL 4 L

DP8 B RD SEL 3 L

DP8 B RD SEL 2 L

DP8 B RD SEL 1 L

DP8 B RD SEL Ø L

DP3 FP FETCH H

DP1 FILE CLOCK L

DP1 B INITIALIZE L

CB6 READ A H

DP6 ALU 4 L

DP1 DB11 H

DP1 DBØ H

DP1 DB 4 H

DP1 DB 3 H

DP1 DB 2 H

DP1 DB 1 H

DP1 DBØ H

CB5 CARRY BIT L

DP6 OVERFLOW L

CB5 ARITH 3 H

CB5 ARITH 2 H

CB5 ARITH 1 H

CB5 ARITHØ H

DP7 SHF BIT L

DP6 12 BIT CARRY H

CB6 DB CTRL 2 L

CB6 DB CTRL 1 L

CB5 WRITE B H

CB5 WRITE A H

CB5 ALOC 4 L

CB5 ALOC 3 L

CB5 ALOC 2 L

CB5 ALOC 1 L

CB5 ALOC Ø L

CB6 EXTEND H

CB5 BWLOC 2 L

CB5 BWLOC 1 L

CB5 BWLOC Ø L

CB5 BRLOC 4 L

CB5 BRLOC 3 L

CB5 BRLOC 2 L

CB5 BRLOC 1 L

CB5 BRLOC Ø L

R47, 47Ø

R46, 47Ø

R45, 47Ø

R44, 47Ø

R43 47Ø

R48 47Ø

R49, 47Ø

R53, 47Ø

R52, 47Ø

R51, 47Ø

R5Ø, 47Ø

R42 47Ø

R43 47Ø

R56, 47Ø

R57, 47Ø

R58, 47Ø

R59, 47Ø

R6Ø, 47Ø

+5V

+3V

(PIPE LINE REGISTER) (DP8)

REVISIONS		
CHK	CHANGE NO.	REV.

TITLE	SIZE	CODE	NUMBER	REV.
FPP8-A DATA PATH BD (DP8)	D	CS	M8411-Ø-1	C
SCALE —	SHEET 9 OF 9		DIST.	

DCS M8411-Ø-1 REV C

K CS M8410-Ø-8

FIRST USED ON OPTION MODEL
M841Ø

QTY.	DESCRIPTION	PART NO.	ITEM NO.
	PARTS LIST		

REVISIONS	
REV.	
CHANGE NO.	
CHK	

DRN. K. Lewis	DATE 3-4-76
CHK'D.	DATE 5/14/76
ENG. W. Kerchner	DATE 19 MAY 76
PROJ. ENG.	DATE 5/19/76
PROD. R. X. Allen	DATE 5-15-76
NEXT HIGHER ASSEMBLY B-DD-M841Ø-Ø	
SCALE —	
SHEET 1 OF 18	

digital EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS

TITLE

CONTROL ROM TRUTH LIST

SIZE	CODE	NUMBER	REV.
K	CS	M841Ø-Ø-8	*

DIST.

DEC FORM NO. DRB 109

ROM NUMBER 23-XXXA2-00

UPC ADDR	270 AAAA	271 BBBB	272 BCCC	273 CCDD	274 DEFH	275 JJKL	276 MMMM	277 MNPP	278 PPPP	279 PPPP	300 RRRR
0,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	LHHH	HHHH	HHLL	HHHH
1,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	LHHH	HHHH	HHHL	HHHH
2,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	LHHH	HHHH	HHLH	HHHH
3,	HHHH	HHLL	HHHH	HHHH	HHHL	LLHL	HHHH	LHHH	HHHH	HHHH	HLLL
6,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	LHHH	HHHL	HHHH	HLLL
7,	HHLH	HHLL	HLLH	HLXX	XHLH	HHHH	HHHH	LHHH	HHHH	HHHH	HLLL
10,	HHHH	HHLH	HLLH	HHXX	XHLH	HHHH	HHHH	LHHH	LLHH	HHHH	HLLL
16,	HHHH	HHHH	HHHL	HHXX	XHLH	HHHL	HHHH	LHLH	HHHH	HHHH	HLLL
17,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	LHLL	LLHH	HHHH	HLLL
4,	HHHH	HHHH	HHHH	HLXX	XHLH	HHHL	HHHH	HHHH	HHHH	HHHH	HLLL
5,	HHHH	XXXX	XHHH	HHXX	XHHH	LLHH	HHLL	LHHH	HHHH	HHHH	HLHH
10,	HHHH	HHHL	LHHH	HLXX	XHLH	HHHL	HHHH	HHHH	HHHH	HHHH	LLLH
11,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	HHHH	HHHH	HHHH	HLLL
12,	HHHH	XXXX	XHHH	HHXX	XHHH	LLHH	HHLL	LHHH	HHHH	HHHH	HLHH
14,	HHHH	HHHH	HHHH	HHXX	XHHH	HHHL	HHLH	LHHH	HHHH	HLHH	LLLH
15,	HHHH	HHHH	HLLH	HHXX	XHLH	HHHH	LLLL	LHHH	HHHH	HHHH	HLHL
20,	HHHH	HHHH	HHHH	HHXX	XHHH	HHHL	HHHH	HHHH	HHHH	HHHH	LLLH
21,	LHLH	HLHH	HHLL	LLXX	XHHH	HHHL	HHHH	HHHH	HHHH	HLLL	HLLL
22,	HHHH	HHHH	HHHH	HLXX	XHLH	LLHL	HHHH	HHHH	HHHH	HHHH	HLHH
23,	HHHH	XXXX	XLLH	LHHH	HHHL	HHHH	HHHL	HHHH	HHHH	HHHH	HLHL
24,	HHHH	HHHH	HHHH	HLXX	XHLH	HHHL	HHHH	LHHH	HHHL	HHHL	LLLH
25,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	LLLL	LHHH	HHHH	HHHH	HLHL
26,	HHHH	HHHH	LLLH	LLXX	XHHH	HHHL	HHLH	LHHH	HLHH	HLHL	LLLH
27,	HHHH	HHHH	HHHH	HHXX	XHHH	HHHL	HHHH	HHHH	HHHH	HHHH	LLLH
30,	HHHH	HHHH	HHHH	HLXX	XHLH	HHHL	HHHH	HHHH	HHHH	HHHH	HLLL
31,	HHHH	XXXX	XHHH	HHXX	XHHH	LLHH	HLLH	HHHH	HHHL	HLHL	HLHH
32,	HHHH	HHHH	HLLH	HHXX	XHLH	HHHH	LLLL	LHHH	HHHH	HHHH	HLHL
34,	HHHH	HHHH	HHHH	HHXX	XHHH	HHHL	HHLH	LHHH	HHHH	HLHH	LLLH
35,	HHHH	HHHH	LLLH	HHXX	XHLH	HHHH	LLLL	LHHH	HHHH	HHHH	HLHL
36,	HHHH	HHHH	HHHH	HHXX	XHHH	HHHL	HHLH	LHHH	HHHH	HLHH	LLLH
37,	HHHH	HHHL	HLLH	HHXX	XHLH	HHHH	LLLL	LHHH	HHHH	HHHH	HLHL
40,	HHHH	HHHH	HHHH	HHXX	XHHH	HHHL	HHLH	LHHH	HHHH	HLHH	LLLH
41,	HHHH	HHHH	LLLH	LHHH	HHHL	HHHL	HHHH	HHHH	HHHH	HHHH	LLLH
42,	HHHH	HHHL	LLHH	HHXX	XHLH	HHHH	HHHH	HHHH	HHHH	HHHL	HLLL
43,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	LLLL	LHHH	HHHH	HHHH	HLHH
44,	HHHH	HHHH	HHHH	HHXX	XHHH	HHHL	HHLH	LHHH	HHHH	HLHH	LLLH
45,	HHHH	HHHH	LLLH	LHHH	HHHL	HHHL	HHHH	HHHH	HHHH	HHHH	LLLH
46,	HHHH	HHHL	LLHH	HHXX	XHLH	HHHH	HHHH	HHHH	HHHH	HHLL	HLLL
47,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	LLLL	LHHH	HHHH	HHHH	HLHH
50,	HHHH	HHHH	HHHH	HHXX	XHHH	HHHL	HHLH	LHHH	HHHH	HLHH	LLLH
51,	HHHH	HHHL	LLLH	HHXX	XHLH	HHHH	HHHH	HHHH	HHHH	HHHH	HLHL
52,	HHHH	HHHL	LHHH	HHXX	XHHH	HLHL	HHHH	HHHH	HHHH	HHHH	LLLH
53,	LHHH	HHHH	HLLL	LLXX	XHHH	LHHL	HHHH	HHHH	HHHH	HHHL	HLLL
54,	HHHH	HHHH	HHHH	HHXX	XHHH	LHHL	HHHH	HHHH	HHHH	HHHH	HLHH
55,	HHHH	HHHL	LHHH	HLXX	XHLH	HHHL	HHHH	HHHH	HHHH	HHHH	LLLH

H=HIGH, L=LOW, X="DON'T CARE"
(X IS ENCODED IN ROM AS L)

COLUMN	SIGNALS DRIVEN (TO J1)
A	C85 ARITH 0 H--C85 ARITH 3 H (INVERTED)
B	C85 ALOC 0 L--C85 ALOC 4 L
C	C85 BRLOC 0 L--C85 BRLOC 4 L
D	C85 BWLOC 0 L--C85 BWLOC 2 L
E	C85 CARRY BIT L
F	C85 WRITE A H (INVERTED)
H	C85 WRITE B H (INVERTED)
J	C86 DB CTRL 1 L--C86 DB CTRL 2 L
K	C86 EXTEND H (INVERTED)
L	C86 READ A H (INVERTED)

COLUMN	SIGNALS DRIVEN (USED INTERNALLY)
M	C86 UPCTRL 0 L--C86 UPCTRL4 L
N	C86 B SEL L
P	C86 UP2 IN L--C86 UP11 IN L
R	(USED ON DWG. CB4 TO CONTROL PULSE GATING AND TO GENERATE CB4 BRK RQ H

ROM NUMBER 23-XXXA2-00

UPC ADDR	270 AAAA	271 BBBB	272 BCCC	273 CCDD	274 DEFH	275 JJKL	276 MMMM	277 MNPP	278 PPPP	279 PPPP	300 RRRR
56,	HHHH	HHHL	LHHH	HLHH	HHHL	HHHL	HHHH	HHHH	HHHH	HHHL	HLLL
57,	HHHH	HHHH	HLHH	HHXX	XHLH	HHHH	LLLL	LHHH	HHHH	HHHH	HLHH
60,	HHHH	HHHH	HHHH	HHXX	XHHH	HHHL	HHLH	LHHH	HHHH	HLHH	LLLH
61,	HHHH	XXXX	XLLH	HHHH	LHHL	HHHH	HHHH	HHHH	HHHH	HHHH	HLHL
62,	HHHH	HHHL	HHHH	HLXX	XHHH	HLHL	HHHH	HHHH	HHHH	HHHH	LLLH
63,	LHHH	HHHH	HLLL	LLXX	XHHH	LHHL	HHHH	HHHH	HHHH	HHHL	HLLL
64,	HHHH	HHHH	HHHH	HHXX	XHHH	LHHL	HHHH	HHHH	HHHH	HHHH	HLHH
65,	HHHH	HHHL	HHHH	LHXX	XHHH	HHHL	HHHH	HHHH	HHHH	HHHH	LLLH
66,	HHHH	HHHL	LLHH	HLXX	XHLH	HHHH	HHHH	HHHH	HHHH	HHHL	HLLL
67,	HHHH	HHHH	HLHH	HLXX	XHLH	HHHH	LLLL	LHHH	HHHH	HHHH	HLHH
70,	HHHH	HHHH	LLLH	LHHH	HHHL	HHHL	HHLH	LHHH	LHHL	LLHL	LLLH
71,	HHHH	XXXX	XLLH	HLLL	LHHL	HHHH	HHHH	LHLH	HHHL	LHHL	HLHL
72,	HHHH	HHHH	LLLH	LHHH	HHHL	HHHL	HHLH	LHHH	LHHL	LLHL	LLLH
73,	HHHH	HLHL	HLLH	HLXX	XHLH	HHHH	HHHH	LHLH	HLHH	HHLL	HLHL
74,	HHHH	HHHH	HHHH	HHXX	XHHH	HHHL	HHHH	HHHH	HHHH	HHHH	LLLH
75,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	HHHH	HHHH	HHHH	HLLL
76,	HHHH	HHHH	HHHH	HLXX	XHLH	LLHL	LLHH	HHHH	HHHH	HHHH	HLHH
77,	HHHH	HHHL	LLLH	HHXX	XHLH	HHHH	HHHH	LHLH	HHHH	HHHH	HLHL
100,	HHHH	HHHL	HLHH	HHHH	LHHL	HLHL	HHHL	LHHH	HHHH	HHHH	LLLH
102,	HHHH	HHHL	HLHH	HHHH	LLHL	HLHL	HHHL	LHHH	HHHH	HHHH	LLLH
103,	HHHL	XXXX	XLLH	HLHL	HHHL	HHHH	HHHH	HHHH	HHHH	HHHH	HLLL
104,	HHHH	HHHH	HHHH	HLXX	XHLH	LLHL	HHHH	LHHH	HLLH	LLLH	HLHH
105,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	HHHH	HHHH	HHLH	HLLL
106,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHLL	LHHH	HHHH	HHHH	HLHH
107,	HHHH	HHHL	LLHL	LLXX	XHLH	HHHH	HHHH	LHHH	HHHL	HHHL	LLLH
110,	HHHH	HHHH	LLLH	LLXX	XHHH	HHHL	HHHH	LHHH	HLHH	LLLH	LLLH
112,	HHHH	HHHH	LHHH	HHXX	XHHH	HHHL	HHLH	LHHH	HLHH	HLHL	LLLH
113,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	LHHH	HLHH	LLHH	HLHL
114,	HHHH	HHHH	HHHH	HHXX	XHHH	HHHL	HHLH	LHHH	HHHH	HLHH	LLLH
115,	HHHH	XXXX	XLLH	HHHH	LHHL	HHHH	HHHH	LHHH	HLLH	HHHL	HLHL
116,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	HHHH	HHHH	HHLH	HLLL
117,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	HHHH	HHHH	HHHH	HLHH
120,	HHHH	XXXX	XHHH	HHXX	XHHH	LLHH	HLHL	HHHH	HLHL	HLHH	HLHL
121,	HHHH	HHHH	HHHH	HHXX	XHHH	HHHL	HHHH	HHHH	HHHH	HHHH	LLLH
122,	HLHH	XXXX	XLLH	HLHL	HHHL	HHHH	HHHH	HHHH	HHHH	HHHH	HLLL
123,	HHHH	HHHH	HHHH	HLXX	XHLH	LLHL	HHHH	LHHH	HLLH	LLLH	HLHH
124,	HHHH	HHHH	HHHH	HHXX	XHHH	HHHL	HLHH	HHHH	H[illegible]H	HHLL	LLLH
125,	HHLL	XXXX	XLLH	HLHL	HHHL	HHHH	HHHH	HHHH	HH[illegible]H	HHHH	HLLL
126,	HHHH	HHHH	HHHH	HLXX	XHLH	LLHL	HHHH	LHHH	HLLH	LLLH	HLHH
130,	HHHH	HHHH	LLLH	LLXX	XHHH	HHHL	HHHH	LHHH	HLLH	HLLL	LLLH
132,	HHHH	HHHH	LHHH	HHXX	XHHH	HHHL	HHLH	LHHH	HLHH	HLHL	LLLH
133,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	LHHH	HLHL	LLHH	HLHL
134,	HHHH	HHHL	HLHH	HHHH	LLHL	HHHL	HHHH	HHHH	HHHH	HHHH	LLLH
135,	HHHH	HHHL	LLHH	HLXX	XHLH	HHHH	HHHH	HHHH	HHHH	HHHH	HLLL
136,	HHHH	XXXX	XHHH	HHXX	XHHH	LLHH	HHHH	HHHH	HHHH	HHHH	HLHH

ROM NUMBER 23-XXXA2-00

UPC ADDR	270 AAAA	271 BBBB	272 BCCC	273 CCDD	274 DEFH	275 JJKL	276 MMMM	277 MNPP	278 PPPP	279 PPPP	300 RRRR
137,	HHLH	XXXX	XLLH	HLHH	HHHL	HHHH	HHLH	LHHH	HHHH	LHHH	HLHL
140,	HHHH	XXXX	XLLH	HHHH	LHHL	HHHH	HHHH	HHHH	HHHH	HHHH	HLHL
141,	HHHH	XXXX	XLHH	HLXX	XHHH	HLHH	HHHL	LHHH	HHHH	HHHH	LLLH
142,	HHHL	XXXX	XLLH	HLHL	HHHL	HHHH	HHHH	HHHH	HHHH	HHHH	HLLL
143,	HHHH	XXXX	XHHH	HHXX	XHHH	LLHH	HHHH	LHHH	HLLH	LLHL	HLHH
144,	HHHH	HHHL	LLH[illegible]	HLXX	XHLH	HHHH	HHHH	HHHH	HHHH	HHHH	LLLH
145,	HLHH	XXXX	XLL[illegible]	HLHL	HHHL	HHHH	HHHH	HHHH	HHHH	HHHH	HLLL
146,	HHHH	XXXX	XHHH	HHXX	XHHH	LLHH	HHHH	LHHH	HLLH	LLHL	HLHH
147,	HHHH	HHHL	HLHH	HHHH	LLHL	HHHL	HHHH	HHHH	HHHH	HHLH	HLLL
150,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	HHHH	HHHH	HHHH	[illegible]LHH
151,	HHHH	XXXX	XHHH	HHXX	XHHH	LLHH	HLHH	LHHH	HLLH	HLHH	HLHL
152,	HHHH	HHHL	LLHH	HLXX	XHLH	HHHH	HLHH	HHHH	HLLH	HHLH	LLLH
153,	HHLL	XXXX	XLLH	HLHL	HHHL	HHHH	HHHH	HHHH	HHHH	HHHH	HLLL
154,	HHHH	XXXX	XHHH	HHXX	XHHH	LLHH	HHHH	HHHH	HHHH	HHHH	HLHH
155,	HHLH	XXXX	XLLH	HLHH	HHHL	HHHH	HHLH	LHHH	HHHH	LHHH	HLHL
156,	HHHH	HHHL	LLLH	HHXX	XHLH	HHHH	HHHH	HHHH	HHHH	HHHH	HLHL
157,	HHHH	HHHL	LLHH	LHHH	LHHL	HLHL	HHHL	LHHH	HHHH	HHHH	LLLH
160,	HHHH	HHLH	HHHH	HHXX	XHHH	HLHL	HHHH	HHHH	HHHH	HHHH	LLLH
161,	HHHH	HHHH	HHHH	HHXX	XHHH	LHHL	HHHH	HHHH	HHHH	HLHL	HLLL
162,	LHHH	HHHH	HLLL	LHXX	XHHH	LHHL	HHHH	HHHH	HHHH	HHHH	HLHH
163,	HHHH	HHLH	HHHL	HHXX	XHLH	HHHL	HHLH	LHHH	HLLL	HLLH	LLLH
164,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	LHHH	HHHH	HHHL	HLHL
165,	HHHH	HHLH	HHHH	HLXX	XHLH	HHHL	HHHH	HHHH	HHHH	HHHH	LLLH
166,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	HHHH	HHHH	HLHL	HLLL
167,	HHLH	HHLH	LHLH	HHXX	XHLH	HHHL	HHLL	LHHH	HHHH	HHHH	HLHH
170,	HHHH	HHLH	HHHL	HHXX	XHLH	HHHL	HHHH	HHHH	HHHH	HHHH	LLLH
171,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	HHHH	HHHH	HHHL	HLLL
172,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHLL	LHHH	HHHH	HHHH	HLHH
200,	HHHH	HHHL	LLHH	HLXX	XHLH	HHHH	HHHH	HHHH	HHHH	HHHH	HLLL
201,	HHHH	XXXX	XHHH	HHXX	XHHH	LLHH	HLHH	HHHH	LHHH	HHLL	HLHH
202,	HHHH	HLHH	HLLH	HLXX	XHLH	HHHH	HHLH	LHHH	HHHH	LHHH	HLHL
203,	HHHH	HLHH	LLLH	HLXX	XHLH	HHHH	HHHH	HHHH	HHHH	HHHH	HLHL
204,	HHHH	HHHL	LHHH	HLXX	XHLH	HHHL	HHHH	HHHH	HHHH	HHHH	LLLH
205,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	HHHH	HHHH	HHHH	HLLL
206,	HHHH	XXXX	XHHH	HHXX	XHHH	LLHH	HLHL	HHHH	LHHH	LLLH	HLHH
207,	HHHH	HLHL	HLLH	HLXX	XHLH	HHHH	HHHH	HHHH	HHHH	HHHH	HLHL
210,	HHHH	HHHL	LHHH	HLXX	XHHH	HHHL	HHLH	LHHH	HHHH	LHHL	LLLH
211,	HHHH	HLHL	LLLH	HLXX	XHLH	HHHH	HHHH	HHHH	HHHH	HHHH	HLHL
212,	HHHH	HHHL	LHHH	LHXX	XHHH	HHHL	HHLH	LHHH	HHHH	LHHL	LLLH
213,	HHHH	HLLH	HLLH	HLXX	XHLH	HHHH	HHHH	HHHH	HHHH	HHHH	HLHL
214,	HHHH	HHHL	LHHH	LLXX	XHHH	HHHL	HHLH	LHHH	HHHH	LHHL	LLLH
215,	HHHH	HLLH	LLLH	HLXX	XHLH	HHHH	LLLL	LHHH	HHHH	HHHH	HLHL
216,	HHHH	HLHL	HLLH	HLXX	XHLH	HHHH	LLLL	LHHH	HHHH	HHHH	HLHL
220,	HHHH	HLHH	HHHH	HHXX	XHHH	LHHL	HHHH	HHHH	HHHH	HHHL	HLLL
221,	HHHH	HHHL	LLHH	HLXX	XHLH	HHHH	HHHH	HHHH	HHHH	HHHH	HLHH

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UPC ADDR	270	271	272	273	274	275	276	277	278	279	300
	AAAA	BBBB	BCCC	CCDD	DEFH	JJKL	MMMM	MNPP	PPPP	PPPP	RRRR
222,	HHHH	HHHL	LHHH	HLXX	XHLH	HLHL	HHHH	LHHH	LHHL	HLHH	LLLH
223,	HHHH	HHHL	LLHH	HLXX	XHLH	HHHH	HHHH	LHHH	LHHL	HLLH	HLHL
224,	HHHH	HLHH	LHHH	HHXX	XHHH	LHHL	HHHH	HHHH	HHHH	HHHL	HLLL
225,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HLHH	HHHH	LHHL	HHLL	HLHH
226,	HHHH	HHHL	LHHH	HLHH	HHLL	HLHL	HHHH	HHHH	HHHH	HHHH	LLLH
227,	HHHH	HLHL	HHHH	HHXX	XHHH	LHHL	HHHH	HHHH	HHHH	HHHL	HLLL
230,	HHHH	HHLH	LLHH	HHXX	XHLH	HHHH	HLHL	HHHH	HHHL	HLHL	HLHH
231,	HHHH	HLHL	LHHH	HHXX	XHHH	LHHL	HHLH	LHHH	LLLL	LHHH	HLHL
232,	HHHH	HLLH	HHHH	HHXX	XHHH	LHHL	HHLH	LHHH	LLLL	LHHH	HLHL
233,	HHHH	HLLH	LHHH	HHXX	XHHH	LHHL	HHLH	LHHH	LLLL	LHHH	HLHL
234,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	LLLL	LHHH	HHHH	HHHH	HLHL
235,	HHHH	HHHL	LLHH	HHXX	XHLH	HHHH	HHHH	HHHH	HHHH	HHHH	HLLL
236,	HHHH	XXXX	XHHH	HHXX	XHHH	LLHH	HHLL	LHHH	HHHH	HHHH	HLHH
240,	HHHH	HHHL	LLHH	HLXX	XHLH	HHHH	HHHH	HHHH	HHHH	HHHH	HLLL
241,	HLLH	XXXX	XHHH	HHHL	LHHL	LLHH	HLHH	HHHH	LHLH	HHLL	HLHH
242,	HHHH	XXXX	XLLH	HLLL	HHHL	HHHH	HHLH	LHHH	HHHH	LHHH	HLHL
243,	HHHH	XXXX	XLLH	HLHH	LHHL	HHHH	HHLH	LHHH	HHHH	LHHH	HLHL
244,	HHHH	XXXX	XLLH	HLHL	HHHL	HHHH	HLHL	HHLH	HHHL	LLLL	HLHL
245,	HHHH	HHHL	LHHH	HLXX	XHHH	HHHL	HHLH	LHHH	HHHH	LHHL	LLLH
246,	HHHH	XXXX	XLLH	HLHL	LHHL	HHHH	HHHH	HHHH	HHHH	HHHH	HLHL
247,	HHHH	HHHL	LHHH	LHXX	XHHH	HHHL	HHLH	LHHH	HHHH	LHHL	LLLH
250,	HHHH	XXXX	XLLH	HLLH	HHHL	HHHH	HHHH	HHHH	HHHH	HHHH	HLHL
251,	HHHH	HHHL	LHHH	LLXX	XHHH	HHHL	HHLH	LHHH	HHHH	LHHL	LLLH
252,	HHHH	XXXX	XLLH	HLLH	LHHL	HHHH	HHHH	LHLH	HHHL	LLLL	HLHL
253,	HHHH	HHHL	LHHH	HHXX	XHHH	HLHL	HHHH	HHHH	HHHH	HHHH	LLLH
254,	HHHH	LHHL	HHHH	HHXX	XHHH	LHHL	HHHH	HHHH	HHHH	HHHL	HLLL
255,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	LLLL	LHHH	HHHH	HHHH	HLHH
256,	HHHH	HHHL	LLHH	HLXX	XHLH	HHHH	HHHH	HHHH	HHHH	HHHH	HLLL
257,	HLHL	HLHL	HLHH	HLXX	XHLH	LHHH	HHHH	LHLH	HHLL	HHHH	HLHH
260,	HHHH	HHHL	LLHH	HLXX	XHLH	HHHH	HHHH	HHHH	HHHH	HHHH	HLLL
261,	HHHH	XXXX	XHHH	HHXX	XHHH	LLHH	HLHH	HHHH	LHLL	HHLL	HLHH
262,	HHHH	XXXX	XLLH	HLLL	HHHL	HHHH	HHLH	LHHH	HHHH	LHHH	HLHL
263,	HHHH	XXXX	XLLH	HLHH	HHHL	HHHH	HHHH	HHHH	HHHH	HHHH	HLHL
264,	HHHH	HHHL	LHHH	HLXX	XHLH	HHHL	HHHH	HHHH	HHHH	HHHH	LLLH
265,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	HHHH	HHHH	HHHH	HLLL
266,	HHHH	XXXX	XHHH	HHXX	XHHH	LLHH	HLHH	LHHH	L[illegible]L	LHHH	HLHH
267,	LHHL	XXXX	XLLH	HLHL	HLHL	LHHH	HHHH	LHLH	HHHL	HLLL	HLHL
270,	HHHH	XXXX	XLLH	HLHH	LHHL	HHHH	HHHH	HHHH	HHHH	HHHH	HLHL
271,	HHHH	HHHL	LHHH	LLXX	XHHH	HHHL	HHLH	LHHH	HHHH	LHHL	LLLH
272,	LHHL	XXXX	XLLH	HLLH	LLHL	LHHH	HHHH	HHHH	HHHH	HHHH	HLHL
273,	HHHH	HHHL	LHHH	LHXX	XHHH	HHHL	HHLH	LHHH	HHHH	LHHL	LLLH
274,	LHHL	XXXX	XLLH	HLLH	HLHL	LHLH	HHHH	HHHH	HHHH	HHHH	HLHL
275,	HHHH	HHHL	LHHH	HLXX	XHHH	HHHL	HHLH	LHHH	HHHH	LHHL	LLLH
276,	LHHL	XXXX	XLLH	HLHL	LLHL	LHLH	HHHH	LHLH	HHHL	HLHL	HLHL
300,	HHHH	HHLH	HHHH	HHXX	XHHH	HHHL	HHHH	HHHH	HHHH	HHHH	LLLH

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UPC ADDR	270	271	272	273	274	275	276	277	278	279	300
	AAAA	BBBB	BCCC	CCDD	DEFH	JJKL	MMMM	MNPP	PPPP	PPPP	RRRR
301,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	HHHH	HHHH	HLHH	HLLL
302,	HHHH	XXXX	XHHH	HHXX	XHHH	LLHH	HLHL	LHHH	LLHH	LLLL	HLHH
303,	HHHH	HHLH	LLLH	HLXX	XHLH	HHHH	HHLH	LHHH	LLHL	HHHL	HLHL
304,	HHHH	HHHH	HLLH	HHLL	LHLL	HHHH	HHLH	LHHH	LLHL	HHHL	HLHL
305,	HHHH	HHHH	LLLH	HHXX	XHLH	HHHH	HHLH	LHHH	LLHL	HHHL	HLHL
306,	HHHH	HHHL	HLLH	HHXX	XHLH	HHHH	HHHH	HHHH	HHHH	HHHH	HLHL
307,	HHHH	HHLH	HHHH	LHXX	XHLH	HHHL	HHLH	LHHH	LLHL	HHLH	LLLH
310,	HHHH	HLHH	HLLH	HLXX	XHLH	HHHH	HHLH	LHHH	LLHL	HHHL	HLHL
311,	HHHH	HLHH	LLLH	HLXX	XHLH	HHHH	HHLH	LHHH	LLHL	HHHL	HLHL
312,	HHHH	HLHL	HLLH	HLXX	XHLH	HHHH	HLHL	HHHH	HLHH	HLLL	HLHL
313,	HHHH	HHHL	LHHH	HLXX	XHLH	HHHL	HHLH	LHHH	HHHH	LHHL	LLLH
314,	HHHH	HLHL	LLLH	HLXX	XHLH	HHHH	HHLH	LHHH	HHHH	LHHH	HLHL
315,	HHHH	HLLH	HLLH	HLXX	XHLH	HHHH	HHLH	LHHH	HHHH	LHHH	HLHL
316,	HHHH	HLLH	LLLH	HLXX	XHLH	HHHH	HHHH	LHHH	HLHH	HLLL	HLHL
317,	HHHH	HHLH	LLLH	HLXX	XHLH	HHHH	HHLH	LHHH	LLHL	HHHL	HLHL
320,	HHHH	HHHH	HLLH	HHLL	LHLL	HHHH	HHHH	LHHH	HLHH	HLLL	HLHL
321,	HHHH	HHLH	HHHH	HLHH	LHLL	HHHL	HHHH	HHHH	HHHH	HHHH	LLLH
322,	HHLH	HHLH	LHHH	HHHH	HHLL	HHHL	HHHH	HHHH	HHHH	HLHH	HLLL
323,	HHHH	HHHL	LLHH	HLXX	XHLH	LLHH	HHLL	LHHH	HHHH	HHHH	HLHH
324,	HHHH	HHLH	HHHH	HHXX	XHHH	HLHL	HHHH	HHHH	HHHH	HHHH	LLLH
325,	HHHH	HLHL	HHHH	HHXX	XHHH	LHHL	HHHH	HHHH	HHHH	HHHL	HLLL
326,	HHHH	HLLH	LHHH	HHXX	XHHH	LHHL	HLHL	HHHH	LLHL	LLHL	HLHH
327,	HHHH	HHLH	HHHH	LLXX	XHLH	HHHL	HHLH	LHHH	HLLL	LHHL	LLLH
330,	HHHH	HLLH	HHHH	HHXX	XHHH	LHHL	HHLH	LHHH	HLLL	LHHH	HLHL
331,	HHHH	HLHL	LHHH	HHXX	XHHH	LHHL	HHHH	HHHH	HHHH	HHHH	HLHL
332,	HHHH	HHLH	HHHL	HHXX	XHLH	HHHL	HHHH	HHHH	HHHH	HHHH	LLLH
333,	HHHH	HHLH	HHHL	HHXX	XHLH	HHHL	HHHH	HHHH	HHHH	HHHL	HLLL
334,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	HHHH	HHHH	HHHH	HLHH
335,	HHHH	HLHH	LHHH	HHXX	XHHH	LHHL	HHHH	HHHH	HHHH	HHHH	HLHL
336,	HHHH	HHLH	HHHL	HHXX	XHLH	HHHL	HHHH	HHHH	HHHH	HHHH	LLLH
337,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	HHHH	HHHH	HLHL	HLLL
340,	HHHH	HLHH	HHHH	HHXX	XHHH	LHHL	HHHH	HHHH	HHHH	HHHH	HLHH
341,	HHHH	HHLH	HHHL	HHXX	XHLH	HHHL	HHHH	HHHH	HHHH	HHHH	LLLH
342,	HHHH	HHLH	HHLH	LLXX	XHLH	HHHL	HHHH	HHHH	HHHH	HLHL	HLLL
343,	HLLH	HHLH	LHHH	HHXX	XHLH	HHHH	HHHH	HHHH	HHHH	HHHH	HLHH
344,	HHHH	HHHH	HHHH	HHHH	HHHL	LHHL	HHLH	LHHH	HLLL	HLHL	HLHL
345,	HHHH	HHHH	LHHH	HHHH	HHHL	LHHL	HHLH	LHHH	HLLL	HLHL	HLHL
346,	HHHH	HHHL	HHHH	HHHH	HHHL	LHHL	HHLH	LHHH	HLLL	HLHL	HLHL
347,	HHHH	HHHL	LHHH	HHHH	HHHL	LHHL	HHLH	LHHH	HLLL	HLHL	HLHL
350,	HHHH	HHLH	LHHH	HHXX	XHHH	LHHL	HHHH	HHHH	HHHH	HHHH	HLHL
351,	HHHH	HHLH	HHLH	LLXX	XLLH	HHHL	HHLH	LHHH	HLLL	HLLH	LLLH
352,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	LHHH	HHHH	HHHL	HLHL
353,	HHHH	HHHL	LHHL	HHXX	XHHH	HLHL	LHLH	HHHH	LLLL	LHLL	LLLH
354,	HHHH	LHHH	LHHH	HHXX	XHHH	LHHL	HHHH	HHHH	HHHH	HHHL	HLLL
355,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HLHH	HHHH	LLLL	HHHH	HLHH

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UPC	276	271	272	273	274	275	276	277	278	279	280
ADDR	AAAA	BBBB	BCCC	CCDD	DEFM	JJKL	MMMM	MNPP	PPPP	PPPP	RRRR

1035,	HHHH	XXXX	XHHH	HXX	XHLM	LHHH	HHHH	HLRM	LLLM	HLLL	LHLL
1036,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	HHLR	LLLM	HLLL	LHLL	HLRM
1037,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	HLRM	LLLM	HHHH	HLRM	HHHH
1040,	HHHH	HHHH	LLLM	LHHH	HHHL	HHHH	LLLM	HLRM	HHHH	HHHH	HHHH
1041,	HHHH	HHHL	LLHH	HXX	XHLM	LHHH	HHHH	HLRM	HHHH	HHHH	HHHH
1042,	HHHH	HLRM	HHHH	HHHL	LHHL	LHHL	HHHH	HLRM	HHHH	HHHH	HHHH
1033,	LHHL	HLLL	LLHH	HHLR	LLLL	LHHH	HHHH	LLLM	HHLR	LHHH	HLLR
1034,	LHHL	HLLL	LLHH	HHLR	LLLL	LHHH	HHHH	LLLM	HHLR	LHHH	HLRM
1035,	HHHH	HLRM	HLHL	LLXX	XHLM	LHHH	HHHH	HLRM	HHHH	HHHH	HHHH
1036,	LHHL	HLLL	LLHH	HLHL	LHHL	HHHH	HLRM	HHHH	HHHH	HHHH	HHHH
1037,	HHHH	HLLL	LLHH	HXX	XHLM	LHHH	HHHH	LLLM	HHLR	LHHH	HLRM
1040,	LHHL	HLLL	LLHH	HXX	XLLM	LHHH	HHHH	LLLM	HHLR	LHHH	HLLR
1041,	HHHH	XXXX	XHHH	HXX	XHLM	LHHH	HHHH	HLRM	LLLM	HHLR	LHHH
1042,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	HLRM	LLLM	HHLR	LHHH	HLLR
1033,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	HLRM	LLLM	HHLR	LHHH	HLRM
1034,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	HLRM	LLLM	HHLR	LHHH	HLLR
1035,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	HLRM	LLLM	HHLR	LHHH	HLRM
1036,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	HLRM	LLLM	HHLR	LHHH	HLLR
1037,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	HLRM	LLLM	HHLR	LHHH	HLRM
1040,	HHHH	HHHH	LLLM	LHHH	HHHL	HHHH	LLLM	HLRM	HHHH	HHHH	HHHH
1041,	HHHH	HHHL	LLHH	HXX	XHLM	LHHH	HHHH	HLRM	HHHH	HHHH	HHHH
1042,	HHHH	HLRM	HHHH	HHHL	LHHL	LHHL	HHHH	HLRM	HHHH	HHHH	HHHH
1033,	LHHL	HLLL	LLHH	HHLR	LLLL	LHHH	HHHH	LLLM	HHLR	LHHH	HLLR
1034,	LHHL	HLLL	LLHH	HHLR	LLLL	LHHH	HHHH	LLLM	HHLR	LHHH	HLRM
1035,	HHHH	HLRM	HLHL	LLXX	XHLM	LHHH	HHHH	HLRM	HHHH	HHHH	HHHH
1036,	LHHL	HLRM	HLHL	LLHM	HLHL	LHHL	HHHH	HLRM	HHHH	HHHH	HHHH
1037,	HHHH	HLLL	LLHH	LLXX	XHLM	LHHH	HHHH	HLRM	HHLR	LHHH	HLRM
1040,	LHHL	XXXX	XHHL	LHLL	LHHL	HHHH	HLRM	HHHH	HHHH	HHHH	HHHH
1041,	HHHH	XXXX	XLHH	HLHL	HLHL	LHHH	HHHH	LHLR	HHHH	HHHH	HHHH
1042,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	LLLL	LHHH	HHLR	LHHH	HHHH
1033,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	HLRM	LLLM	HHLR	LHHH	HLLR
1034,	LHHL	HLLL	LLHH	HHLR	LLLL	LHHH	HHHH	LLLM	HHLR	LHHH	HLRM

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UPC	284	281	282	283	284	285	286	287	288	289
ADDR	AAAA	BBBB	BCCC	CCDD	DEFM	JJKL	MMMM	MNPP	PPPP	PPPP

1035,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	HLRL	LLLM	HLLL	HLRM		
1036,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	HLRL	LLLM	HHLR	LHLL		
1037,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	HLRM	LLLM	HHHH	HHHH		
1040,	HHHH	HHHH	LLLM	LHHH	HHHL	HHHH	HLRM	LLLM	HHHH	HHHH		
1041,	HHHH	HHHL	LLHH	HXX	XHLM	LHHH	HHHH	HLRM	HHHH	HHHH		
1042,	HHHH	HLRM	HHHH	HHHL	LHHL	LHLL	HHHH	HLRM	HHHH	HHHH		
1033,	LHHL	HLLL	LLHH	HHLR	LLLL	LHHH	HHHH	LLLM	HHLR	LHHH		
1034,	LHHL	HLLL	LLHH	HHLR	LLLL	LHHH	HHHH	LLLM	HHLR	LHHH		
1035,	HHHH	HLRM	HLHL	LLXX	XHLM	LHHH	HHHH	HLRM	HHHH	HHHH		
1036,	LHHL	HLRM	HLHL	LLHM	HLHL	LHHL	HHHH	HLRM	HHHH	HHHH		
1037,	HHHH	HLLL	LLHH	LLXX	XHLM	LHHH	HHHH	HLRM	HHLR	LHHH		
1040,	LHHL	XXXX	XHHL	LHLL	LHHL	HHHH	HLRM	HHHH	HHHH	HHHH		
1041,	HHHH	XXXX	XLHH	HLHL	HLHL	LHHH	HHHH	LHLR	HHHH	HHHH		
1042,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	LLLL	LHHH	HHLR	LHHH		
1033,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	HLRM	LLLM	HHLR	LHHH		
1034,	LHHL	HLLL	LLHH	HHLR	LLLL	LHHH	HHHH	LLLM	HHLR	LHHH		
1035,	HHHH	HLRM	HLHL	LLXX	XHLM	LHHH	HHHH	HLRM	HHHH	HHHH		
1036,	LHHL	HLRM	HLHL	LLHM	HLHL	LHHL	HHHH	HLRM	HHHH	HHHH		
1037,	HHHH	HLLL	LLHH	LLXX	XHLM	LHHH	HHHH	HLRM	HHLR	LHHH		
1040,	LHHL	XXXX	XHHL	LHLL	LHHL	HHHH	HLRM	HHHH	HHHH	HHHH		
1041,	HHHH	XXXX	XLHH	HLHL	HLHL	LHHH	HHHH	LHLR	HHHH	HHHH		
1042,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	LLLL	LHHH	HHLR	LHHH		
1033,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	HLRM	LLLM	HHLR	LHHH		
1034,	LHHL	HLLL	LLHH	HHLR	LLLL	LHHH	HHHH	LLLM	HHLR	LHHH		

ROM NUMBER 23-XXXA2-04

UPC	288	289	290	291	292	293	294	295	296	297	298
ADDR	AAAA	BBBB	BCCC	CCDD	DEFM	JJKL	MMMM	MNPP	PPPP	PPPP	RRRR

1035,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	HLRL	LLLM	HLLL	HLRM	HHHH
1036,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	HLRL	LLLM	HHLR	LHLL	LHHH
1037,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	HLRM	LLLM	HHHH	HHHH	HHHH
1040,	HHHH	HHHH	LLLM	LHHH	HHHL	HHHH	HLRM	LLLM	HHHH	HHHH	HHHH
1041,	HHHH	HHHL	LLHH	HXX	XHLM	LHHH	HHHH	HLRM	HHHH	HHHH	HHHH
1042,	HHHH	HLRM	HHHH	HHHL	LHHL	LHLL	HHHH	HLRM	HHHH	HHHH	HHHH
1033,	LHHL	HLLL	LLHH	HHLR	LLLL	LHHH	HHHH	LLLM	HHLR	LHHH	HLLR
1034,	LHHL	HLLL	LLHH	HHLR	LLLL	LHHH	HHHH	LLLM	HHLR	LHHH	HLRM
1035,	HHHH	HLRM	HLHL	LLXX	XHLM	LHHH	HHHH	HLRM	HHHH	HHHH	HHHH
1036,	LHHL	HLRM	HLHL	LLHM	HLHL	LHHL	HHHH	HLRM	HHHH	HHHH	HHHH
1037,	HHHH	HLLL	LLHH	LLXX	XHLM	LHHH	HHHH	HLRM	HHLR	LHHH	HLRM
1040,	LHHL	XXXX	XHHL	LHLL	LHHL	HHHH	HLRM	HHHH	HHHH	HHHH	HHHH
1041,	HHHH	XXXX	XLHH	HLHL	HLHL	LHHH	HHHH	LHLR	HHHH	HHHH	HHHH
1042,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	LLLL	LHHH	HHLR	LHHH	HHHH
1033,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	HLRM	LLLM	HHLR	LHHH	HLLR
1034,	LHHL	HLLL	LLHH	HHLR	LLLL	LHHH	HHHH	LLLM	HHLR	LHHH	HLRM

ROM NUMBER 23-XXXA2-04

UPC	292	293	294	295	296	297	298	299	300	301	302
ADDR	AAAA	BBBB	BCCC	CCDD	DEFM	JJKL	MMMM	MNPP	PPPP	PPPP	RRRR

1035,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	HLRL	LLHH	HLLL	HLRM		
1036,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	HLRL	LLHH	HHLR	LHHH		
1037,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	HLRM	LLLM	HHHH	HHHH		
1040,	HHHH	HHHH	LLLM	LHHH	HHHL	HHHH	HLRM	LLLM	HHHH	HHHH		
1041,	HHHH	HHHL	LLHH	HXX	XHLM	LHHH	HHHH	HLRM	HHHH	HHHH		
1042,	HHHH	HLRM	HHHH	HHHL	LHHL	LHLL	HHHH	HLRM	HHHH	HHHH		
1033,	LHHL	HLLL	LLHH	HHLR	LLLL	LHHH	HHHH	LLLM	HHLR	LHHH		
1034,	LHHL	HLLL	LLHH	HHLR	LLLL	LHHH	HHHH	LLLM	HHLR	LHHH		
1035,	HHHH	HLRM	HLHL	LLXX	XHLM	LHHH	HHHH	HLRM	HHHH	HHHH		
1036,	LHHL	HLRM	HLHL	LLHM	HLHL	LHHL	HHHH	HLRM	HHHH	HHHH		
1037,	HHHH	HLLL	LLHH	LLXX	XHLM	LHHH	HHHH	HLRM	HHLR	LHHH		
1040,	LHHL	XXXX	XHHL	LHLL	LHHL	HHHH	HLRM	HHHH	HHHH	HHHH		
1041,	HHHH	XXXX	XLHH	HLHL	HLHL	LHHH	HHHH	LHLR	HHHH	HHHH		
1042,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	LLLL	LHHH	HHLR	LHHH		
1033,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	HLRM	LLLM	HHLR	LHHH		
1034,	LHHL	HLLL	LLHH	HHLR	LLLL	LHHH	HHHH	LLLM	HHLR	LHHH		

ROM NUMBER 23-XXXA2-04

UPC	296	297	298	299	300	301	302	303	304	305	306
ADDR	AAAA	BBBB	BCCC	CCDD	DEFM	JJKL	MMMM	MNPP	PPPP	PPPP	RRRR

1035,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	HLRL	LLHH	HLLL	HLRM	HHHH
1036,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	HLRL	LLHH	HHLR	LHLL	LHHH
1037,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	HLRM	LLLM	HHHH	HHHH	HHHH
1040,	HHHH	HHHH	LLLM	LHHH	HHHL	HHHH	HLRM	LLLM	HHHH	HHHH	HHHH
1041,	HHHH	HHHL	LLHH	HXX	XHLM	LHHH	HHHH	HLRM	HHHH	HHHH	HHHH
1042,	HHHH	HLRM	HHHH	HHHL	LHHL	LHLL	HHHH	HLRM	HHHH	HHHH	HHHH
1033,	LHHL	HLLL	LLHH	HHLR	LLLL	LHHH	HHHH	LLLM	HHLR	LHHH	HLLR
1034,	LHHL	HLLL	LLHH	HHLR	LLLL	LHHH	HHHH	LLLM	HHLR	LHHH	HLRM
1035,	HHHH	HLRM	HLHL	LLXX	XHLM	LHHH	HHHH	HLRM	HHHH	HHHH	HHHH
1036,	LHHL	HLRM	HLHL	LLHM	HLHL	LHHL	HHHH	HLRM	HHHH	HHHH	HHHH
1037,	HHHH	HLLL	LLHH	LLXX	XHLM	LHHH	HHHH	HLRM	HHLR	LHHH	HLRM
1040,	LHHL	XXXX	XHHL	LHLL	LHHL	HHHH	HLRM	HHHH	HHHH	HHHH	HHHH
1041,	HHHH	XXXX	XLHH	HLHL	HLHL	LHHH	HHHH	LHLR	HHHH	HHHH	HHHH
1042,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	LLLL	LHHH	HHLR	LHHH	HHHH
1033,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	HLRM	LLLM	HHLR	LHHH	HLLR
1034,	LHHL	HLLL	LLHH	HHLR	LLLL	LHHH	HHHH	LLLM	HHLR	LHHH	HLRM

ROM NUMBER 23-XXXA2-04

UPC	300	301	302	303	304	305	306	307	308	309	310
ADDR	AAAA	BBBB	BCCC	CCDD	DEFM	JJKL	MMMM	MNPP	PPPP	PPPP	RRRR

1035,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	HLRL	LLHH	HLLL	HLRM	HHHH
1036,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	HLRL	LLHH	HHLR	LHLL	LHHH
1037,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	HLRM	LLLM	HHHH	HHHH	HHHH
1040,	HHHH	HHHH	LLLM	LHHH	HHHL	HHHH	HLRM	LLLM	HHHH	HHHH	HHHH
1041,	HHHH	HHHL	LLHH	HXX	XHLM	LHHH	HHHH	HLRM	HHHH	HHHH	HHHH
1042,	HHHH	HLRM	HHHH	HHHL	LHHL	LHLL	HHHH	HLRM	HHHH	HHHH	HHHH
1033,	LHHL	HLLL	LLHH	HHLR	LLLL	LHHH	HHHH	LLLM	HHLR	LHHH	HLLR
1034,	LHHL	HLLL	LLHH	HHLR	LLLL	LHHH	HHHH	LLLM	HHLR	LHHH	HLRM
1035,	HHHH	HLRM	HLHL	LLXX	XHLM	LHHH	HHHH	HLRM	HHHH	HHHH	HHHH
1036,	LHHL	HLRM	HLHL	LLHM	HLHL	LHHL	HHHH	HLRM	HHHH	HHHH	HHHH
1037,	HHHH	HLLL	LLHH	LLXX	XHLM	LHHH	HHHH	HLRM	HHLR	LHHH	HLRM
1040,	LHHL	XXXX	XHHL	LHLL	LHHL	HHHH	HLRM	HHHH	HHHH	HHHH	HHHH
1041,	HHHH	XXXX	XLHH	HLHL	HLHL	LHHH	HHHH	LHLR	HHHH	HHHH	HHHH
1042,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	LLLL	LHHH	HHLR	LHHH	HHHH
1033,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	HLRM	LLLM	HHLR	LHHH	HLLR
1034,	LHHL	HLLL	LLHH	HHLR	LLLL	LHHH	HHHH	LLLM	HHLR	LHHH	HLRM

ROM NUMBER 23-XXXA2-04

UPC	304	305	306	307	308	309	310	311	312	313	314
ADDR	AAAA	BBBB	BCCC	CCDD	DEFM	JJKL	MMMM	MNPP	PPPP	PPPP	RRRR

1035,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	HLRL	LLHH	HLLL	HLRM	HHHH
1036,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	HLRL	LLHH	HHLR	LHLL	LHHH
1037,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	HLRM	LLLM	HHHH	HHHH	HHHH
1040,	HHHH	HHHH	LLLM	LHHH	HHHL	HHHH	HLRM	LLLM	HHHH	HHHH	HHHH
1041,	HHHH	HHHL	LLHH	HXX	XHLM	LHHH	HHHH	HLRM	HHHH	HHHH	HHHH
1042,	HHHH	HLRM	HHHH	HHHL	LHHL	LHLL	HHHH	HLRM	HHHH	HHHH	HHHH
1033,	LHHL	HLLL	LLHH	HHLR	LLLL	LHHH	HHHH	LLLM	HHLR	LHHH	HLLR
1034,	LHHL	HLLL	LLHH	HHLR	LLLL	LHHH	HHHH	LLLM	HHLR	LHHH	HLRM
1035,	HHHH	HLRM	HLHL	LLXX	XHLM	LHHH	HHHH	HLRM	HHHH	HHHH	HHHH
1036,	LHHL	HLRM	HLHL	LLHM	HLHL	LHHL	HHHH	HLRM	HHHH	HHHH	HHHH
1037,	HHHH	HLLL	LLHH	LLXX	XHLM	LHHH	HHHH	HLRM	HHLR	LHHH	HLRM
1040,	LHHL	XXXX	XHHL	LHLL	LHHL	HHHH	HLRM	HHHH	HHHH	HHHH	HHHH
1041,	HHHH	XXXX	XLHH	HLHL	HLHL	LHHH	HHHH	LHLR	HHHH	HHHH	HHHH
1042,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	LLLL	LHHH	HHLR	LHHH	HHHH
1033,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	HLRM	LLLM	HHLR	LHHH	HLLR
1034,	LHHL	HLLL	LLHH	HHLR	LLLL	LHHH	HHHH	LLLM	HHLR	LHHH	HLRM

ROM NUMBER 23-XXXA2-04

UPC	308	309	310	311	312	313	314	315	316	317	318
ADDR	AAAA	BBBB	BCCC	CCDD	DEFM	JJKL	MMMM	MNPP	PPPP	PPPP	RRRR

1035,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	HLRL	LLHH	HLLL	HLRM	HHHH
1036,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	HLRL	LLHH	HHLR	LHLL	LHHH
1037,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	HLRM	LLLM	HHHH	HHHH	HHHH
1040,	HHHH	HHHH	LLLM	LHHH	HHHL	HHHH	HLRM	LLLM	HHHH	HHHH	HHHH
1041,	HHHH	HHHL	LLHH	HXX	XHLM	LHHH	HHHH	HLRM	HHHH	HHHH	HHHH
1042,	HHHH	HLRM	HHHH	HHHL	LHHL	LHLL	HHHH	HLRM	HHHH	HHHH	HHHH
1033,	LHHL	HLLL	LLHH	HHLR	LLLL	LHHH	HHHH	LLLM	HHLR	LHHH	HLLR
1034,	LHHL	HLLL	LLHH	HHLR	LLLL	LHHH	HHHH	LLLM	HHLR	LHHH	HLRM
1035,	HHHH	HLRM	HLHL	LLXX	XHLM	LHHH	HHHH	HLRM	HHHH	HHHH	HHHH
1036,	LHHL	HLRM	HLHL	LLHM	HLHL	LHHL	HHHH	HLRM	HHHH	HHHH	HHHH
1037,	HHHH	HLLL	LLHH	LLXX	XHLM	LHHH	HHHH	HLRM	HHLR	LHHH	HLRM
1040,	LHHL	XXXX	XHHL	LHLL	LHHL	HHHH	HLRM	HHHH	HHHH	HHHH	HHHH
1041,	HHHH	XXXX	XLHH	HLHL	HLHL	LHHH	HHHH	LHLR	HHHH	HHHH	HHHH
1042,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	LLLL	LHHH	HHLR	LHHH	HHHH
1033,	HHHH	XXXX	XHHH	HXX	XHHH	HHHH	HLRM	LLLM	HHLR	LHHH	HLLR
1034,	LHHL	HLLL	LLHH	HHLR	LLLL	LHHH	HHHH	LLLM	HHLR	LHHH	HLRM

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UPC ADDR	280 AAAA	281 BBBB	282 BCCC	283 CCDD	284 DEFM	285 JJKL	286 MMMM	287 MNPP	288 PPPP	289 PPPP
1112,	HLLH	LHHL	HHHH	HHXX	XHLH	LHHH	HLHL	HLLH	HLHH	LLLH
1113,	HLLH	LHLH	HHHH	HHXX	XHLH	LHHH	HHHH	HLHH	HHHH	HHHH
1114,	HLLH	LHLH	LHHH	HHXX	XHLH	LHHH	HHHH	HLHH	HHHH	HHHH
1115,	HLLH	LHLL	HHHH	HHXX	XHLH	LHHH	HHHH	HLHH	HHHH	HHHH
1116,	HLLH	LHHL	LHHH	HHXX	XHLH	LHHH	HHLL	LLHH	HHHH	HHHH
1117,	HHHH	LLHH	HLHL	LLXX	XHLH	LHHH	HHHH	HLHH	HHHH	HHHH
1120,	HHHH	LHLH	HHHH	HHLL	LHHL	LHHL	HHHH	HLHH	HHHH	HHHH
1121,	HHHH	LHLL	HLHL	LLXX	XHLH	LHHH	HHHH	HLHH	HHHH	HHHH
1122,	HHHH	LHHL	LHHH	HHLL	LHHL	LHHL	HHHH	HLHH	HHHH	HHHH
1123,	HHHH	LHLH	LLHL	LLXX	XHLH	LHHH	HHHH	HLHH	HHHH	HHHH
1124,	HHHH	LHHL	HHHH	HHLL	LHHL	LHHL	HHHH	HLHH	HHHH	HHHH
1125,	HHHH	LHLH	HLHL	LLXX	XHLH	LHHH	HHHH	HLHH	HHHH	HHHH
1126,	HHHH	LHHH	LHHH	HHLL	LHHL	LHHL	HHHH	HLHH	HHHH	HHHH
1127,	HHHH	LHHL	LLHL	LLXX	XHLH	LHHH	LLLL	HLHH	HHHH	HHHH
1130,	LLHL	LHHH	LHHH	HHXX	XHLH	LHLL	HHHH	HLHH	HHHH	HHHH
1131,	HLLL	LHHH	LHHH	HHLL	LHLL	LHHL	HHHH	HLHH	HHHH	HHHH
1132,	HHHH	LHHL	HLHL	LLXX	XHLH	LHHH	HHLL	LLHH	HHHH	HHHH
1133,	HHHH	LHHL	LHHH	HHHH	HHHL	LHHL	HLHL	HLLH	HLLH	HLLH
1134,	HHHH	LHLH	LHHH	HHHH	HHHL	LHHL	HHHH	HLHH	HHHH	HHHH
1135,	LHHL	LHLH	LLHH	HHXX	XLLH	LHHH	HHHH	HLHH	HHHH	HHHH
1136,	HHHH	LHLH	HHHH	HHHH	HHHL	LHHL	HHHH	HLHH	HHHH	HHHH
1137,	LHHL	LHLH	HLHH	HHXX	XLLH	LHLH	HHHH	HLHH	HHHH	HHHH
1140,	HHHH	LHHL	LHHH	HHHH	HHHL	LHHL	HHHH	HLHH	HHHH	HHHH
1141,	LHHL	LHHL	LLHH	HHXX	XLLH	LHLH	HHHH	HLHH	HHHH	HHHH
1142,	HHHH	LHHL	HHHH	HHHH	HHHL	LHHL	HHHH	HLHH	HHHH	HHHH
1143,	LHHL	LHHL	HLHH	HHXX	XLLH	LHLH	HHHH	HLHH	HHHH	HHHH
1144,	HHHH	LHHH	LHHH	HHHH	HHHL	LHHL	HHHH	HLHH	HHHH	HHHH
1145,	LHHL	LHHH	LLHH	HHXX	XLLH	LHLH	HHLL	LLHH	HHHH	HHHH
1146,	LHHL	LHHL	LLHH	HHXX	XLLH	LHHH	HHHH	LLLH	HLLH	HHLH
1147,	HHHH	HLLL	LHHH	HHXX	XHLH	LHHL	HHHH	HLHH	HHHH	HHHH
1150,	HLHL	HLLL	LHLH	HLXX	XHLH	LHHL	HHHH	HLHH	HHHH	HHHH
1151,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	LLHH	LLLH	HLLH	LHLL
1152,	HLHL	HLLL	LHLH	LHXX	XHLH	LHHL	HHLL	LLHH	HHHH	HHHH
1153,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	LLHH	LLLH	HLLL	HLHL
1154,	HLHL	HLLL	LHLH	LHXX	XHLH	LHHL	HHHH	HLHH	HHHH	HHHH
1155,	HLHL	HLLL	LHHH	HLXX	XHLH	LHHL	HLHH	LLLH	HLLL	HHLH
1156,	LLHH	LHHL	LHHH	HHXX	XHLH	LHHL	HHHH	HLHH	HHHH	HHHH
1157,	LLHH	LHHL	HHHH	HHXX	XHLH	LHLL	HHHH	HLHH	HH··	HHHH
1160,	LLHH	LHHH	LHHH	HHXX	XHLH	LHLL	LLHH	LLLH	HLLH	LLHL
1161,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHLL	LLHH	HHHH	HHHH
1162,	LLHH	LHLH	LHHH	HHXX	XHLH	LHHL	HHHH	HLHH	HHHH	HHHH
1163,	LLHH	LHLH	HHHH	HHXX	XHLH	LHLL	HHHH	HLHH	HHHH	HHHH
1164,	LLHH	LHHL	LHHH	HHXX	XHLH	LHLL	HHHH	LLLH	HLLH	LLLL
1165,	HHHH	LHHL	HHHH	HHHH	HHHL	LHHL	HHHH	HLHH	HHHH	HHHH
1166,	HHHH	LHHH	LLHH	HHXX	XHLH	LHHH	HHHH	HLHH	HHHH	HHHH

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UPC ADDR	280 AAAA	281 BBBB	282 BCCC	283 CCDD	284 DEFM	285 JJKL	286 MMMM	287 MNPP	288 PPPP	289 PPPP
1167,	HHHH	LHHL	LHHH	HHHH	HHHL	LHHL	HHHH	HLHH	HHHH	HHHH
1170,	HHHH	LHHL	HLHH	HHXX	XHLH	LHHH	HLHL	HLLH	HLLL	LLLH
1171,	HHHH	LHLH	HHHH	HHHH	HHHL	LHHL	HHHH	HLHH	HHHH	HHHH
1172,	HHHH	LHHL	LLHH	HHXX	XHLH	LHHH	HHHH	HLHH	HHHH	HHHH
1173,	HHHH	LHLH	LHHH	HHHH	HHHL	LHHL	HHHH	HLHH	HHHH	HHHH
1174,	HHHH	LHLH	HLHH	HHXX	XHLH	LHHH	HHHH	HLHH	HHHH	HHHH
1175,	HLLH	LHLH	LHHH	HHXX	XHLH	LHHH	HHHH	LLLH	HLLH	LHHH
1176,	HLLH	LHHL	LHHH	HHXX	XHLH	LHHH	HHHH	LLLH	HLLH	LHHH
1177,	HHHH	LHHH	LHHH	HHXX	XHHH	LHHL	HLHH	HLLH	LHLH	HHHH
1200,	HHHH	LHHL	HHHH	HHXX	XHHH	LHHL	LHLH	HLLH	LHLH	HHHH
1201,	HHHH	LHHL	LHHH	HHXX	XHHH	LHHL	HLLL	HLLH	LHHH	LLHL
1202,	HHHH	LHLH	HHHH	HHXX	XHHH	LHHL	HLLL	LLLH	LHHL	LLLL
1203,	HHHH	LHLH	LHHH	HHXX	XHHH	LHHL	HLHL	HLLH	LHHL	LHLH
1204,	LLHH	LHLL	HHHH	HHXX	XHLH	LHHL	HLLL	LLLH	LHHH	LHLL
1205,	LLHH	LHLH	LHHH	HHXX	XHLH	LHLL	LLHL	LLHH	HHHH	HHHH
1206,	LLHH	LHLH	HHHH	HHXX	XHLH	LHLL	HHHH	HLHH	HHHH	HHHH
1207,	LLHH	LHHL	LHHH	HHXX	XHLH	LHLL	HHHH	HLHH	HHHH	HHHH
1210,	LLHH	LHHL	HHHH	HHXX	XHLH	LHLL	HHHH	HLHH	HHHH	HHHH
1211,	LLHH	LHHH	LHHH	HHXX	XHLH	LHLL	HHHH	HLHH	HHHH	HHHH
1212,	HLHL	HLLL	LHHL	HHXX	XHLH	LHHL	HHHH	LLLH	LHHH	HLHH
1213,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	LLHL	LLHH	HHHH	HHHH
1214,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	LLLH	LHHL	LLLL
1215,	HLHL	HLLL	LHLH	LHXX	XHLH	LHHL	HHHH	HLHH	HHHH	HHHH
1216,	HHHH	LHHL	HHHH	HHHH	HHHL	LHHL	HHHH	HLHH	HHHH	HHHH
1217,	HHHH	LHHH	LLHH	HHXX	XHLH	LHHH	LLHL	LLHH	HHHH	HHHH
1220,	HHHH	LHHL	LHHH	HHHH	HHHL	LHHL	HHHH	HLHH	HHHH	HHHH
1221,	HHHH	LHHL	HLHH	HHXX	XHLH	LHHH	HLHL	HLLH	LHHL	LHHL
1222,	HHHH	LHLH	HHHH	HHHH	HHHL	LHHL	HHHH	HLHH	HHHH	HHHH
1223,	HHHH	LHHL	LLHH	HHXX	XHLH	LHHH	HHHH	HLHH	HHHH	HHHH
1224,	HHHH	LHLH	LHHH	HHHH	HHHL	LHHL	HHHH	HLHH	HHHH	HHHH
1225,	HHHH	LHLH	HLHH	HHXX	XHLH	LHHH	HHHH	HLHH	HHHH	HHHH
1226,	HHHH	LHLL	HHHH	HHHH	HHHL	LHHL	HHHH	HLHH	HHHH	HHHH
1227,	HHHH	LHLH	LLHH	HHXX	XHLH	LHHH	HHHH	HLHH	HHHH	HHHH
1230,	HLLH	LHLL	HHHH	HHXX	XHLH	LHHH	HHHH	LLLH	LHHH	HHHL
1231,	HLLH	LHHL	LHHH	HHXX	XHLH	LHHH	HHHH	LLLH	LHHH	HHHL
1232,	LLHH	LHHL	LHHH	HHXX	XHLH	LHHL	HLLL	LLLH	LHHL	LLLH
1233,	LLHH	LHHL	HHHH	HHXX	XHLH	LHLL	LLHL	LLHH	HHHH	HHHH
1234,	LLHH	LHHH	LHHH	HHXX	XHLH	LHLL	HHHH	HLHH	HHHH	HHHH
1235,	HLHL	HLLL	LHHL	HHXX	XHLH	LHHL	HHHH	LLLH	LHHL	LHLH
1236,	LLHL	LHHL	LHHH	HHXX	XHLH	LHLL	LLHL	LLHH	HHHH	HHHH
1237,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	LHLL	HLLH	LHLH	LHHH
1240,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HLHH	LLLH	LHLH	HLLL
1241,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	LHLH	LLLH	LHLH	LLHH
1242,	HLHL	LHHL	LHLL	LHXX	XLHH	LHHL	HHHH	HLHH	HHHH	HHHH
1243,	HLHL	LHHL	HHHH	HHXX	XHLH	LHLL	HHHH	HLHH	HHHH	HHHH

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UPC	280	281	282	283	284	285	286	287	288	289
ADDR	AAAA	BBBB	BCCC	CCDD	DEFM	JJKL	MMMM	MNPP	PPPP	PPPP
1244,	HLHL	LMMM	LMMM	MMXX	XMLM	LMLL	LMLM	HLLM	LMLM	LLML
1245,	HLLM	LMML	LMMM	MMXX	XMLM	LMMM	HLMM	HLLM	LMLM	HLLL
1246,	MMMM	XXXX	XMMM	MMXX	XMMM	MMMM	LMLL	HLLL	MMMM	HLML
1247,	MMMM	XXXX	XMMM	MMXX	XMMM	MMMM	MMLL	LLMM	MMMM	MMMM
1250,	HLHL	HLLL	LMMM	HLXX	XMLM	LMML	MMMM	HLMM	MMMM	MMMM
1251,	LLHL	LMMM	LMMM	MMXX	XMLM	LMML	MMMM	HLMM	MMMM	MMMM
1252,	MMMM	XXXX	XMMM	MMXX	XMMM	MMMM	LLML	LLMM	MMMM	MMMM
1253,	MMMM	XXXX	XMMM	MMXX	XMMM	MMMM	MMLL	LLMM	MMMM	MMMM
1254,	HLHL	LMML	LMLL	LMXX	XMMM	LMML	MMMM	LLLM	LMLM	MMLL
1255,	HLLM	LMML	LMMM	MMXX	XMLM	LMMM	HLMM	HLLM	LMLM	HLLL
1256,	MMMM	XXXX	XMMM	MMXX	XMMM	MMMM	LMLM	HLLM	LMLM	HLLL
1257,	MMMM	XXXX	XMMM	MMXX	XMMM	MMMM	MMMM	LLLM	LMMM	MMML
1260,	MMMM	HLLL	LMMM	MMXX	XMLM	LMML	MMMM	HLMM	MMMM	MMMM
1261,	HLHL	HLLL	LMLM	HLXX	XMLM	LMML	MMMM	HLMM	MMMM	MMMM
1262,	MMMM	XXXX	XMMM	MMXX	XMMM	MMMM	LLMM	LLLM	LMLL	MLMM
1263,	HLHL	HLLL	LMLM	LMXX	XMLM	LMML	MMLL	LLMM	MMMM	MMMM
1264,	MMMM	XXXX	XMMM	MMXX	XMMM	MMMM	LLMM	LLLM	LLMM	MMMM
1265,	HLHL	HLLL	LMLM	LMXX	XMLM	LMML	MMMM	HLMM	MMMM	MMMM
1266,	HLHL	HLLL	LMMM	HLXX	XMLM	LMML	MMMM	HLMM	MMMM	MMMM
1267,	LLHL	LMMM	LMMM	MMXX	XMLM	LMML	MMMM	HLMM	MMMM	MMMM
1270,	LLHL	LMML	MMMM	MMXX	XMLM	LMLL	HLMM	LLLM	LMLL	LMLL
1271,	LLHL	LMML	LMMM	MMXX	XMLM	LMLL	LLMM	LLLM	LMLL	HLLM
1272,	MMMM	XXXX	XMMM	MMXX	XMMM	MMMM	MMLL	LLMM	MMMM	MMMM
1273,	LLHL	LMML	LMMM	MMXX	XMLM	LMLL	MMMM	HLMM	MMMM	MMMM
1274,	LLHL	LMLM	MMMM	MMXX	XMLM	LMLL	MMMM	HLMM	MMMM	MMMM
1275,	LLHL	LMLM	LMMM	MMXX	XMLM	LMLL	LLMM	LLLM	LMLL	HLLM
1276,	LLHL	LMLL	MMMM	MMXX	XMLM	LMLL	MMMM	HLMM	MMMM	MMMM
1277,	MMMM	XXXX	XMMM	MMXX	XMMM	MMMM	MMLL	LLMM	MMMM	MMMM
1300,	MMMM	LMML	MMMM	MMMM	MMML	LMML	HLHL	HLLM	LLMM	LMMM
1301,	MMMM	LMLM	LMMM	MMMM	MMML	LMML	MMMM	HLMM	MMMM	MMMM
1302,	MMMM	LMLL	HLMM	MMXX	XMLM	LMMM	MMMM	HLMM	MMMM	MMMM
1303,	MMMM	LMLM	MMMM	MMMM	MMML	LMML	MMMM	HLMM	MMMM	MMMM
1304,	MMMM	LMLM	LLMM	MMXX	XMLM	LMMM	MMMM	HLMM	MMMM	MMMM
1305,	MMMM	LMML	LMMM	MMMM	MMML	LMML	MMMM	HLMM	MMMM	MMMM
1306,	MMMM	LMLM	HLMM	MMXX	XMLM	LMMM	MMMM	HLMM	MMMM	MMMM
1307,	MMMM	LMML	MMMM	MMMM	MMML	LMML	MMMM	HLMM	MMMM	MMMM
1310,	MMMM	LMML	LLMM	MMXX	XMLM	LMMM	MMMM	HLMM	MMMM	MMMM
1311,	MMMM	LMMM	LMMM	MMMM	MMML	LMML	MMMM	HLMM	MMMM	MMMM
1312,	MMMM	LMML	HLMM	MMXX	XMLM	LMMM	MMMM	HLMM	MMMM	MMMM
1313,	HLLL	LMMM	LMMM	MMXX	XMLM	LMML	MMMM	LLLM	LMLL	MMML
1314,	MMMM	LMMM	LMMM	MMMM	MMML	LMML	MMMM	HLMM	MMMM	MMMM
1315,	MMMM	LMMM	LLMM	HLXX	XMLM	LMMM	MMMM	HLMM	MMMM	MMMM
1316,	MMMM	XXXX	XLMM	MMMM	LMML	LMMM	HLHL	HLLM	LLML	LMMM
1317,	MMMM	LMML	LMMM	MMMM	MMML	LMML	MMMM	HLMM	MMMM	MMMM
1320,	MMMM	LMML	LLMM	LLXX	XMLM	LMMM	MMMM	HLMM	MMMM	MMMM

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UPC	280	281	282	283	284	285	286	287	288	289
ADDR	AAAA	BBBB	BCCC	CCDD	DEFM	JJKL	MMMM	MNPP	PPPP	PPPP
1321,	MMMM	XXXX	XLMM	MMML	LMML	LMMM	MMMM	HLMM	MMMM	MMMM
1322,	MMMM	LMLM	MMMM	MMMM	MMML	LMML	MMMM	HLMM	MMMM	MMMM
1323,	MMMM	LMLM	HLHL	MMXX	XMLM	LMMM	MMMM	HLMM	MMMM	MMMM
1324,	MMMM	XXXX	XLMM	MMLM	MMML	LMMM	MMMM	HLMM	MMMM	MMMM
1325,	MMMM	LMLM	LMMM	MMMM	MMML	LMML	MMMM	HLMM	MMMM	MMMM
1326,	MMMM	LMLM	LLHL	HLXX	XMLM	LMMM	MMMM	HLMM	MMMM	MMMM
1327,	MMMM	XXXX	XLMM	MMLM	LMML	LMMM	MMMM	HLMM	MMMM	MMMM
1330,	MMMM	LMML	MMMM	MMMM	MMML	LMML	MMMM	HLMM	MMMM	MMMM
1331,	MMMM	LMML	HLMM	LMXX	XMLM	LMMM	MMMM	HLMM	MMMM	MMMM
1332,	MMMM	XXXX	XLMM	MMML	MMML	LMMM	MMLL	LLMM	MMMM	MMMM
1333,	MMMM	HLMM	LMMM	MMMM	MMML	LMML	MMMM	HLMM	MMMM	MMMM
1334,	MMMM	LMMM	LLMM	MMXX	XMLM	LMMM	MMMM	HLML	HLLM	LLLM
1335,	HLLM	LMLL	MMMM	MMXX	XMLM	LMMM	MMMM	HLMM	MMMM	MMMM
1336,	MMMM	HLML	LMMM	MMMM	MMML	LMML	MMMM	HLMM	MMMM	MMMM
1337,	MMMM	LMML	LLMM	MMXX	XMLM	LMMM	MMMM	HLMM	MMMM	MMMM
1340,	MMMM	HLLM	MMMM	MMMM	MMML	LMML	MMMM	HLMM	MMMM	MMMM
1341,	MMMM	LMLM	HLMM	MMXX	XMLM	LMMM	MMMM	HLMM	MMMM	MMMM
1342,	MMMM	HLLM	LMMM	MMMM	MMML	LMML	MMMM	HLMM	MMMM	MMMM
1343,	MMMM	LMLM	LLMM	MMXX	XMLM	LMMM	MMMM	HLMM	MMMM	MMMM
1344,	MMMM	HLML	MMMM	MMMM	MMML	LMML	MMMM	HLMM	MMMM	MMMM
1345,	MMMM	LMML	HLMM	MMXX	XMLM	LMMM	MMLL	LLMM	MMMM	MMMM
1346,	HLLM	LMML	LMMM	MMXX	XMLM	LMMM	MMMM	LLLM	LLLM	HLMM
1347,	MMMM	LMMM	LMMM	MMMM	MMML	LMML	MMMM	HLMM	MMMM	MMMM
1350,	MMMM	HLMM	LLMM	MMXX	XMLM	LMMM	HLHL	HLLM	LLLM	LLLL
1351,	MMMM	LMML	LMMM	MMMM	MMML	LMML	MMMM	HLMM	MMMM	MMMM
1352,	MMMM	HLML	LLMM	MMXX	XMLM	LMMM	MMMM	HLMM	MMMM	MMMM
1353,	MMMM	LMLM	MMMM	MMMM	MMML	LMML	MMMM	HLMM	MMMM	MMMM
1354,	MMMM	HLLM	HLMM	MMXX	XMLM	LMMM	MMMM	HLMM	MMMM	MMMM
1355,	MMMM	LMLM	LMMM	MMMM	MMML	LMML	MMMM	HLMM	MMMM	MMMM
1356,	MMMM	HLLM	LLMM	MMXX	XMLM	LMMM	MMMM	HLMM	MMMM	MMMM
1357,	MMMM	LMML	MMMM	MMMM	MMML	LMML	LMLM	HLLM	LLLL	MMML
1360,	MMMM	HLML	HLMM	MMXX	XMLM	LMMM	LLLL	LLMM	MMMM	MMMM
1361,	MMMM	HLML	HLMM	MMXX	XMLM	LMMM	HLMM	HLLM	MMMM	LMLL
1362,	HLLM	HLMM	MMMM	MMLL	LMLL	LMMM	LLLL	LLMM	MMMM	MMMM

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UPC	290	291	292	293	294	295	296	297	298	299
ADDR	AAAA	BBBB	BCCC	CCDD	DEFM	JJKL	MMMM	MNPP	PPPP	PPPP
1400,	MMMM	HLMM	LMMM	MMMM	MMML	LMML	MMMM	LMLL	MMMM	LMLL
1401,	MMMM	HLMM	MMMM	MMLL	LMML	LMML	MMMM	LMLL	MMML	MMLM
1402,	MMMM	HLMM	MMMM	MMLL	LMML	LMML	MMMM	LLLL	MMLL	LMLM
1403,	LLMM	HLMM	LMMM	MMXX	XMMM	LMML	MMMM	LMLL	HLLL	MMLM
1404,	MMMM	XXXX	XLMM	LMXX	XMMM	LMMM	MMMM	LLLL	HLLM	MMMM
1405,	HLHL	HLLL	LMMM	HLXX	XMLM	LMML	MMMM	HLMM	MMMM	MMMM
1406,	LMLL	LMMM	LMMM	MMXX	XMLM	LMML	MMMM	HLMM	MMMM	MMMM
1407,	LLHL	LMML	MMMM	MMXX	XMLM	LMLL	LLML	LLMM	MMMM	MMMM
1410,	LLHL	LMML	LMMM	MMXX	XMLM	LMLL	HLHL	HLLM	LMLM	MMMM
1411,	LLHL	LMLM	MMMM	MMXX	XMLM	LMLL	MMMM	HLMM	MMMM	MMMM
1412,	LLHL	LMLM	LMMM	MMXX	XMLM	LMLL	MMLL	LLMM	MMMM	MMMM

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	290	291	292	293	294	295	296	297	298	299
UPC										
ADDR	AAAA	BBBB	BCCC	CCDD	DEFH	JJKL	MMMM	NNPP	PPPP	PPPP

1470,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHLH	LLLL	HHHH	HLHL
1471,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHLH	LLLL	HHLH	HLLL
1472,	HHHH	HHLH	LLHH	HLXX	XHLH	LHHH	LHLH	HLLL	HHLH	LHHH
1473,	HLLL	HHLH	LHHH	HHHH	HHHL	LHHL	LHHL	LLLL	HHLH	LHHH
1474,	HHHH	HLLL	LLHL	LLXX	XHLH	LHHH	HHLH	LLLH	HLHH	LHHL
1475,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HLHL	HLLL	HLLH	LHLH
1476,	HHHH	HLLH	LHHH	HHXX	XHHH	LHHL	LHHH	LLLL	HLHH	HHHH
1477,	LLLL	LHHL	LLHH	LHLL	LHLH	HHHL	HLLL	LLLH	HLLH	LLLH
1500,	HHHH	LHHL	HHHH	HHLL	LHHL	LHHL	HHLH	LLLH	HLHL	LHHL
1501,	HHHH	HLLH	LHHH	HHXX	XHHH	HHHH	HLHH	HHHH	HHHH	HHHH
1502,	LLLL	LHLH	HLHL	LLXX	XHLH	HHHL	LHLH	LLLH	LLLH	HLLL
1503,	HHHH	LHHL	LHHH	HHLL	LHHL	LHHL	HHLH	LLLL	HLHL	HHLL
1504,	HHHH	HLHL	LHHH	HHXX	XHHH	HHHH	HLHH	HHHH	HHHH	HHHH
1505,	LLLL	LHLH	LLHL	HHLL	LHLH	HHHL	HLLL	HLLH	HLLH	LLHH
1506,	HHHH	HLHL	HHHH	HHXX	XHHH	LHHL	LHHL	HHLH	LLLL	HLHL
1507,	HHHH	HLHL	HHHH	HHXX	XHHH	HHHH	HLHH	HHHH	HHHH	HHHH
1510,	LLLL	LHLL	HLHL	LLHL	LHLH	HHHL	HLLL	HLLH	HLLH	LHHL
1511,	HHHH	LHLH	LHHH	HHLL	LHHL	LHHL	HHLH	LLLH	HLHH	LLLL
1512,	HHHH	HLHH	LHHH	HHXX	XHHH	LHHL	HHHH	HLHH	HHHH	HHHH
1513,	LLLL	LLHH	HHHH	HHLL	LHLH	HHHL	HHLL	HLLL	HLLH	LHLH
1514,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	LHHL	HLLL	HLHL	HHLH
1515,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHLH	LLLH	HLLL	LLLL
1516,	HLHL	HLLL	LLHL	LHXX	XHLH	LHHL	HHHH	HLHH	HHHH	HHHH
1517,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HLHH	HLLL	HHHL	HHHH
1520,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	LLHL	LLHH	HHHH	HHHH
1521,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	LLLL	HHLH	HLLL
1522,	LHHL	LHLH	LLHL	HLXX	XLLH	LHHL	HHLH	LLLL	HLHL	HLHL
1523,	LHHL	LHLH	LLHL	HLXX	XLLH	LHHL	HHLH	LLLL	HLHL	HLHL
1524,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	LLLL	HLHH	LLHL
1525,	LHHL	LHLH	HLHL	HHXX	XLLH	LHLL	HLHH	LLLL	HLHL	LHHH
1526,	LHHL	LHHL	HLHH	LHXX	XLLH	LHHL	HHHH	HLHH	HHHH	HHHH
1527,	LHHL	LHHH	LLHH	HLXX	XLLH	LHLL	HHHH	LLLH	HHHH	HHHH
1530,	LHHL	LHHL	LLHH	LLXX	XLLH	LHLL	HHHH	HLHH	HHHH	HHHH
1531,	LHHL	LHHL	HLHH	LHXX	XLLH	LHLL	HHHH	LLLL	HLHL	HLLL
1532,	HHHH	HLHL	HHHH	HHXX	XHHH	LHHL	LLLL	HLHH	HHHH	HHHH
1533,	LLLL	LHHL	LLHH	LHLL	LHLH	HHHL	HHLL	HLLL	HLLH	LLLH
1534,	HHHH	LHHL	HHHH	HHLL	LHHL	LHHL	HHLH	LLLH	HLHL	HLHL
1535,	HHHH	HLHH	LHHH	HHXX	XHHH	LHHL	HHHH	HLHH	HHHH	HHHH
1536,	LLLL	LHLH	HHHH	HHLL	LHLH	HHHL	HHLL	HLLL	HLLH	LLHL
1537,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	LLLL	HLHH	LLHH
1540,	HHHH	HHLH	LLHH	HLXX	XHLH	LHHH	LHLH	HLLL	HHLH	LHHH
1541,	HLLL	HHLH	LHHH	HHHH	HHHL	LHHL	LHHL	LLLL	HHLH	LHHH
1542,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHLH	LLLH	HLHH	LHHL
1543,	HHHH	HLHH	LHHH	HHXX	XHHH	LHHL	LLLL	HLHH	HHHH	HHHH
1544,	LLLL	LHHL	HLHH	LHLL	LHLH	HHHL	HHLL	HLLL	HLLL	HHHH

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	290	291	292	293	294	295	296	297	298	299
UPC										
ADDR	AAAA	BBBB	BCCC	CCDD	DEFH	JJKL	MMMM	NNPP	PPPP	PPPP

1413,	HHHH	LHHH	LLHH	HHXX	XHLH	LHHH	HHLH	LLLH	LLLH	HLHH
1414,	HLHL	LHHL	HLHH	LHXX	XHLH	LHHL	HHHH	HLHH	HHHH	HHHH
1415,	HLHL	LHHH	LLHH	HLXX	XHLH	LHLL	HHHH	HLHH	HHHH	HHHH
1416,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	HLHH	HHHH	HHHH
1417,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	LLHL	LLHH	HHHH	HHHH
1420,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HLLH	LLLL	HHLH	LLLL
1421,	HHHH	LHHH	LHHH	HHHH	HHHL	LHHL	HHHH	LLLH	LLLH	LHHH
1422,	HHHH	HLLL	LLHL	LLXX	XHLH	LHHH	LHLH	HLLL	HHLH	LHLH
1423,	HHHH	LHHH	HLHL	LLXX	XHLH	LHHH	HHLH	LLLH	LLHL	LHLL
1424,	LHHL	HLLL	LLHL	LHLL	LLLL	LHHL	LHHL	LLLL	HHLH	LLHL
1425,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	HLHH	HHHH	HHHH
1426,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HLLH	LLLL	HHLH	LLLL
1427,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	LLHH	LLLH	HHLH	HHLH
1430,	LHHL	HLLL	LLHL	LLXX	XLLH	LHHH	HHHH	HLHH	HHHH	HHHH
1431,	LHHL	HLLL	LHLL	LLXX	XLHH	LHHL	HLHL	HLLL	HHHL	LHLL
1432,	LHHL	HLLL	LHHL	LLXX	XLHH	LHHL	HHHH	HLHH	HHHH	HHHH
1433,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	HLHH	HHHH	HHHH
1434,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	LHLL	LLLL	HHLL	HHHH
1435,	HHHH	HLHH	HHHH	HHLL	LHHL	HHLH	LLLH	LLHH	LLHH	LLHH
1436,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHLH	LLLL	HHLL	LHLL
1437,	HLHL	LHLH	LLHL	HLXX	XHLH	LHHL	HLHL	HLLL	HHLL	HLLL
1440,	HLHL	LHLH	HLHL	HHXX	XHLH	LHHL	HHHH	HLHH	HHHH	HHHH
1441,	HLHL	LHHL	LLHH	LLXX	XHLH	LHLL	HHHH	HLHH	HHHH	HHHH
1442,	HLHL	LHHL	HLHH	LHXX	XHLH	LHLL	HHHH	HLHH	HHHH	HHHH
1443,	HLHL	LHHH	LLHH	HLXX	XHLH	LHLL	HHHH	HLHH	HHHH	HHHH
1444,	HHHH	HLLL	LLHL	LHXX	XHLH	LHHH	HHLH	LLLL	HHLL	LHHH
1445,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HLLH	LLLL	HHLL	LHHH
1446,	HHHH	HLLH	LHHH	HHXX	XHHH	HHHH	HHLH	LLLH	HLLL	LLLL
1447,	HHHH	HLLL	LHHH	HHLL	LHHL	LHHH	HHLL	HLLH	HHLH	LHHL
1450,	HLLH	XXXX	XHHH	HHLL	LHHL	LHHH	HHLH	LLLL	HLHH	LHHL
1451,	HHHH	LHHH	LLHH	HLXX	XHLH	LHHH	LHHH	HLHH	HHHH	HHHH
1452,	HHHH	HLHH	HLHL	LLXX	XHLH	HHHL	HHHH	LLLH	LLLH	HLLL
1453,	HHHH	HLHH	LHHH	HHHH	HHHL	LHHL	HHLH	LLLH	LLHH	LLHH
1454,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	HLHH	HHLH	HLLH
1455,	HLLL	LHLL	LLHL	LLXX	XHLH	LHHH	LHLH	LLLH	LLHH	LLHH
1456,	HLHL	LHHL	HLHH	LHXX	XHLH	LHHH	HHHH	HLHH	HHHH	HHHH
1457,	HLHL	LHHL	HLHH	LHXX	XHLH	LHHL	HHHH	LLLL	HHLH	HHLL
1460,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHLH	LLLL	HHLH	LHHH
1461,	HHHH	HLLL	LLHL	LLXX	XHLH	LHHH	HHHH	LLLL	HHLH	HLLH
1462,	LHHL	HLLL	LHLL	LLXX	XLHH	LHHL	HLHL	HLLL	HHLL	HLHH
1463,	LHHL	HLLL	LHHL	LLXX	XLLH	LHHH	HHHH	HLHH	HHHH	HHHH
1464,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	HLHH	HHHH	HHHH
1465,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	LHLL	LLLL	HHLH	LLHL
1466,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	LLLL	HHHL	LLLH
1467,	HLHL	LHHL	HLHH	LHXX	XHLH	LHHL	HHHH	LLLL	HHLH	HHLL

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UPC ADDR	290 AAAA	291 BBBB	292 BCCC	293 CCDD	294 DEFM	295 JJKL	296 MMMM	297 MNPP	298 PPPP	299 PPPP
1545,	HHHH	LHHL	HHHH	HHXX	XHHH	LHHL	LLLL	HLHH	HHHH	HHHH
1546,	HHHH	HLHL	HHHH	HHXX	XHHH	LHHL	LLHL	LLHH	HHHH	HHHH
1547,	LLLL	LHHL	HLHH	LHLL	LHLH	HHHL	HHLL	HLLL	HLLL	HHHH
1550,	LLHL	LHHH	LHHH	HHXX	XHLH	LHLL	HHHH	HLHH	HHHH	HHHH
1551,	LLHL	LHHL	HHHH	HHXX	XHLH	LHLL	HHHH	LLLL	HLHH	LLHH
1552,	LLLL	LHLL	HLHL	HLLL	LHLH	HHLL	HHHH	HLHH	HHHH	HHHH
1553,	LLLL	LHLH	LLHL	HHLL	LHLH	HHLL	HHHH	HLHH	HHHH	HHHH
1554,	LLLL	LHLH	HLHH	LLLL	LHLH	HHLL	HHHH	HLHH	HHHH	HHHH
1555,	LLLL	LHHL	LLHH	LHLL	LHLH	HHLL	HHHH	HLHH	HHHH	HHHH
1556,	LLLL	LHHL	HLHH	HLLL	LHLH	HHLL	HHHH	HLHH	HHHH	HHHH
1557,	LLLL	LHHH	LLHH	HHLL	LHLH	HHLL	HHLL	LLHH	HHHH	HHHH
1560,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	LLHL	LLHH	HHHH	HHHH
1561,	LLLL	LHHH	LLHH	HLLL	LHLH	HHLL	HHLL	LLHH	HHHH	HHHH
1562,	LLHL	HHLH	LHHH	HHXX	XHLH	LHLH	LHLH	HHLL	LHHL	LHHH
1563,	HLLH	LHHL	LHHH	HHXX	XHLH	LHHH	HLHH	HHLL	HLLL	LHHH
1564,	HLLH	LHLL	HHHH	HHXX	XHLH	LHHH	HLLL	LHLL	HLLL	LHHH
1565,	HHHH	HLLL	LLHL	LHXX	XHLH	LHHH	HHLH	LLLH	LLHH	LLHH
1566,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHLH	LLLH	HLLL	LLLL
1567,	HHHH	HLLL	LHHH	HHLL	HHHL	LHHL	HHLH	LLLH	LLHH	LLHH
1570,	HHHH	HLHH	HHHH	HHHH	HHHL	LHHL	LHHL	LLLH	HHLH	LHHH
1571,	HHHH	HLLL	LLHH	HHXX	XHLH	LHHH	HHLH	LLLH	LLHL	LHLL
1572,	HHHH	XXXX	XLHH	HLLL	LHHL	LHHH	LHHL	HLLL	LHHL	HLHH
1573,	HLHL	HHLH	LLHH	HLXX	XHLH	LHHL	LLLL	HLHH	HHHH	HHHH
1574,	HHHH	XXXX	XHHH	HLXX	XHHH	LHHH	HLHL	HLLL	LHHL	LHLH
1575,	LLLL	LHLL	HHHH	HHLL	LHLH	HHHL	HHLL	HLLL	LHLL	HHHL
1576,	HHHH	LLHH	HLLH	HLXX	XHLH	HHHH	LLLL	HLHH	HHHH	HHHH
1577,	LLLL	LHLL	HHHH	HHLL	LHLH	HHHL	HHLL	HLLL	LHLL	HHHL
1600,	HHHH	LLHH	LLLH	HLXX	XHLH	HHHH	LLLL	HLHH	HHHH	HHHH
1601,	LLLL	LHLH	LLHL	HLLL	LHLH	HHHL	HHLL	HLLL	LHLL	HHLH
1602,	HHHH	LLHL	HLLH	HLXX	XHLH	HHHH	LLLL	HLHH	HHHH	HHHH
1603,	LLLL	LHLH	HLHL	HHLL	LHLH	HHHL	HHLL	HLLL	LHLL	HHLL
1604,	HHHH	LLHL	LLLH	HLXX	XHLH	HHHH	LLLL	HLHH	HHHH	HHHH
1605,	LLLL	LHHL	LLHH	LLLL	LHLH	HHHL	HHLL	HLLL	LHLL	HLHH
1606,	HHHH	LHLH	LLLH	HLXX	XHLH	HHHH	HHHH	HLHH	HHHH	HHHH
1607,	HLLH	LHLL	HHHH	HHXX	XHLH	LHHH	HHHH	HLHH	HHHH	HHHH
1610,	HHHH	LLHL	LHHH	HHHH	HHHL	LHHL	HHHH	HLHH	HHHH	HHHH
1611,	HHHH	LHLH	HLHH	HHXX	XHLH	LHHH	HHHH	HLHH	HHHH	HHHH
1612,	HHHH	LLHL	HHHH	HHHH	HHHL	LHHL	HHHH	HLHH	HHHH	HHHH
1613,	HHHH	LHHL	LLHH	HHXX	XHLH	LHHH	HHHH	HLHH	HHHH	HHHH
1614,	HHHH	LLHH	HHHH	HHHH	HHHL	LHHL	HHHH	HLHH	HHHH	HHHH
1615,	HHHH	LHHH	LLHH	HHXX	XHLH	LHHH	HHHH	HLHH	HHHH	HHHH
1616,	HHHH	LLHH	LHHH	HHHH	HHHL	LHHL	HHHH	HLHH	HHHH	HHHH
1617,	HHHH	HHLH	LHHH	HHXX	XHHH	LHHL	HHHH	HLHH	HHHH	HHHH
1620,	HHHH	LHHL	HLHH	HHXX	XHLH	LHHH	LHLH	LLLL	LHLH	HLHH
1621,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	LHLL	LLLL	LHHL	HLLH

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UPC ADDR	290 AAAA	291 BBBB	292 BCCC	293 CCDD	294 DEFM	295 JJKL	296 MMMM	297 MNPP	298 PPPP	299 PPPP
1622,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHLH	LLLH	HLLL	LLLL
1623,	LHHL	HLLL	LLHL	LHXX	XLLH	LHHL	HHHH	LLLL	HLHH	LLLL
1624,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHLH	LLLH	HLHL	LHLL
1625,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	LLLL	HLLL	LHLL
1626,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHLH	LLLH	HLHL	LHLL
1627,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	LLLL	LHHL	HHLH
1630,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	LLHL	HLHH	HHHH	HHHH
1631,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	LLLH	HHHH	HHHH
1632,	LLLL	LHHL	LLHH	LLLL	LHLH	HHHL	HHLL	HLLL	LHLL	HLHH
1633,	HHHH	LLHH	HLLH	HLXX	XHLH	HHHH	LLLL	HLHH	HHHH	HHHH
1634,	LLLL	LHHL	LLHH	LLLL	LHLH	HHHL	HHLL	HLLL	LHLL	HLHH
1635,	HHHH	LLHH	LLLH	HLXX	XHLH	HHHH	HHHH	HLHH	HHHH	HHHH
1636,	LLLL	LHHL	LLHH	LLLL	LHLH	HHHL	HHLH	LLLL	LHLL	HLHH
1637,	LLLL	LHHL	LLHH	LLLL	LHLH	HHHL	HHLH	LLLL	LHLL	HLHH
1640,	LLHL	XXXX	XLLH	HLXX	XHHH	LHHH	HHHH	HLHH	HHHH	HHHH
1641,	LLHL	LHHL	LHHH	HHXX	XHLH	HHLH	HHHH	HLHH	HHHH	HHHH
1642,	LLHL	XXXX	XLLH	HLXX	XHHH	LHHH	HHHH	HLHH	HHHH	HHHH
1643,	LLHL	LHHL	LHHH	HHXX	XHLH	LHLL	HHHH	LLLL	LHHH	LLHH
1644,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	LHLL	LLLL	LHLH	LHHH
1645,	HHHH	XXXX	XHLL	LHXX	XLHH	LHHH	HLHH	HLLL	LHLH	LLLH
1646,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHLH	LLLL	HHHH	HLHL
1647,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	LLLL	LHHL	HHLL
1650,	HHHH	XXXX	XHLL	LHXX	XLHH	LHHH	HLHH	HLLL	LHLH	LLLH
1651,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	LHLL	HLLL	LHLH	LLHH
1652,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHLH	LLLH	HLHL	LHLL
1653,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	LLLL	LHLH	HLHL
1654,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHLH	LLLH	LHLH	LHHH
1655,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	LLLL	LHHL	HHLL
1656,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	HLHH	HHHH	HHHH
1657,	HHHH	HHLH	LHHH	HHXX	XHHH	LHHL	LLHL	LLHH	HHHH	HHHH
1660,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	LLLL	LHHL	HHHL
1661,	LLLL	LHLH	LLHL	HLLL	LHLH	HHLL	HHHH	HLHH	HHHH	HHHH
1662,	LLLL	LHLH	HLHL	HHLL	LHLH	HHLL	HHHH	HLHH	HHHH	HHHH
1663,	LLLL	LHHL	LLHH	LLLL	LHLH	HHLL	HHHH	HLHH	HHHH	HHHH
1664,	LLLL	LHHL	HLHH	LHLL	LHLH	HHLL	HHHH	HLHH	HHHH	HHHH
1665,	LLLH	LHHH	LLHH	HLLL	LHLH	HHLL	HHLL	LLHH	HHHH	HHHH
1700,	HHHH	HLHH	HHHL	HHXX	XHLH	LHHH	HHHH	HHHH	HHHH	HHHH
1701,	HLLH	XXXX	XHHH	HHXX	XHHH	LHHH	HHHH	HHHH	HHHH	HHHH
1702,	HHHH	HHHH	HHHH	HLHH	LHLL	LHHH	HHHH	HHHH	HHHH	HHHH
1703,	HHHH	HLHH	LHHL	HLXX	XHLH	LHHH	HHHH	HHHH	HHHH	HHHH
1704,	HHHH	HHHH	LHHH	LHHL	HHLL	LHHH	HHHH	HHHH	HHHH	HHHH
1705,	HHHH	HLHL	HHLH	LLXX	XHLH	LHHH	HHHH	HHHH	HHHH	HHHH
1706,	HHHH	HHHL	LHHH	LLHL	LHLL	LHHH	HHHH	HHHH	HHHH	HHHH
1707,	HHHH	HLHL	LHLL	HHXX	XHLH	LHHH	HHHH	HHHH	HHHH	HHHH
1710,	HHHH	HHLH	HHLH	HLLH	HHLL	LHHH	HHHH	HHHH	HHHH	HHHH

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UPC ADDR	290 AAAA	291 BBBB	292 BCCC	293 CCDD	294 DEFH	295 JJKL	296 MMMM	297 MNPP	298 PPPP	299 PPPP
1711,	HHHH	HLLH	HHLH	LHXX	XHLH	LHHH	HHHH	HHHH	HHHH	HHHH
1712,	HHHH	HHLH	LHLL	HLLH	LHLL	LHHH	HHHH	HHHH	HHHH	HHHH
1713,	HHHH	HLLH	LHHL	LHXX	XHLH	LHHH	HHHH	HHHH	HHHH	HHHH
1714,	HHHH	HLLL	LHLL	LHLL	HHLL	LHHH	HHHH	HHHH	HHHH	HHHH
1715,	HHHH	LHHH	HHLL	LLXX	XHLH	LHHH	HHHH	HHHH	HHHH	HHHH
1716,	HHHH	HHHL	HHHL	LLLL	LHLL	LHHH	HHHH	HHHH	HHHH	HHHH
1717,	HLLH	XXXX	XHHH	HHXX	XHHH	LHHH	HHHH	HHHH	HHHH	HHHH
1720,	HLLH	XXXX	XHHH	HHXX	XHHH	LHHH	HHLH	LHLH	LLHL	LHLL
1721,	HHHH	LHLL	HHHH	HHXX	XHHH	LHHL	HHLH	LHLH	LLHH	LLHH
1722,	HHHH	HHHH	HHHH	HHXX	XHHH	LHHL	HHHH	HHHH	HHHH	HHHH
1723,	HHHH	HHHH	LHHH	HHXX	XHHH	LHHL	HHHH	HHHH	HHHH	HHHH
1724,	HHHH	HHHL	HHHH	HHXX	XHHH	LHHL	HHHH	HHHH	HHHH	HHHH
1725,	HHHH	HHHL	LHHH	HHXX	XHHH	LHHL	HHHH	HHHH	HHHH	HHHH
1726,	HHHH	HHLH	HHHH	HHXX	XHHH	LHHL	HHHH	HHHH	HHHH	HHHH
1727,	HHHH	HHLH	LHHH	HHXX	XHHH	LHHL	HHHH	HHHH	HHHH	HHHH
1730,	HHHH	HLLL	LHHH	HHXX	XHHH	LHHL	HHHH	HHHH	HHHH	HHHH
1731,	HHHH	HLHH	HHHH	HHXX	XHHH	LHHL	HHHH	HHHH	HHHH	HHHH
1732,	HHHH	XXXX	XLHL	LHXX	XHHH	LHHH	HHHH	HHHH	HHHH	HHHH
1733,	HHHH	XXXX	XLHL	LLXX	XHHH	LHHH	HHHH	HHHH	HHHH	HHHH
1734,	HHHH	LHHH	HHHH	HHXX	XHHH	LHHL	HHHH	HHHH	HHHH	HHHH
1735,	HHHH	HLLL	LLHH	LLXX	XHHH	LHHL	HHHH	HHHH	HHHH	HHHH
1736,	HHHH	LHLH	LHLH	HLXX	XLHH	LHHL	HHHH	HHHH	HHHH	HHHH
1737,	HLHL	HHHH	LLHH	HLXX	XLHH	LHHL	HHHH	HHHH	HHHH	HHHH
1740,	HHLH	LHHH	HHHH	HHXX	XHHH	LHHL	HHHH	HHHH	HHHH	HHHH
1741,	HHLH	HLLL	LLLH	HLXX	XHHH	LHHL	HHHH	HHHH	HHHH	HHHH
1742,	HLLH	LHHH	HHHH	HHXX	XHLH	LHHH	HHHH	HHHH	HHHH	HHHH
1743,	HHLH	LHHH	HHHH	HHXX	XHLH	LHHL	HHHH	HHHH	HHHH	HHHH
1744,	HHHH	LHLH	HHLL	LHXX	XLLH	LHHH	HHHH	HHHH	HHHH	HHHH
1745,	HHHL	LHLH	HHLH	HLHH	HHHL	LHHL	HHHH	HHHH	HHHH	HHHH
1746,	HHLL	XXXX	XLHH	HHHH	LHHL	LHHH	HHHH	HHHH	HHHH	HHHH
1747,	HLHH	HLHH	LLHH	HLXX	XHLH	LHHH	HHHH	HHHH	HHHH	HHHH
1750,	HHLH	HLHH	LHHH	HHXX	XHLH	LHHL	HHHH	HHHH	HHHH	HHHH
1751,	HHLH	HHLH	LHLH	HHXX	XHLH	LHHL	HHHH	HHHH	HHHH	HHHH
1752,	HHLH	HHHH	HHHH	HHXX	XHLH	LHHL	HHHH	HHHH	HHHH	HHHH
1753,	LHHH	HHHH	HLLL	LLXX	XHHH	LHHL	HHHH	HHHH	HHHH	HHHH
1754,	LHHL	XXXX	XHHH	HHXX	XLHH	LHHH	HHHH	HHHH	HHHH	HHHH
1755,	LHHL	LHLL	HHHL	HHXX	XLHH	LHHL	HHHH	HHHH	HHHH	HHHH
1756,	LHLL	HLHH	LHHH	HHXX	XHHH	LHHL	HHHH	HHHH	HHHH	HHHH
1757,	LLHH	LHLL	HHLL	HLXX	XLLH	LHHH	HHHH	HHHH	HHHH	HHHH
1760,	LLHH	LHLL	HHHH	HHXX	XHLH	LHLL	HHHH	HHHH	HHHH	HHHH
1761,	LLHH	LHLL	HHHH	HHXX	XHLH	LHLL	HHHH	HHHH	HHHH	HHHH
1762,	LLHH	LHLL	HHHH	HHXX	XHLH	LHLL	HHHH	HHHH	HHHH	HHHH
1763,	HLHL	XXXX	XHHL	HHXX	XHHH	LHHH	HHLH	LHHH	HLLL	HLHL
1764,	HLHL	HHLH	HHHL	HHXX	XHLH	LHHH	HHHH	HHHH	HHHH	HHHH
1765,	HLHL	HHLH	HHHL	HHXX	XHLH	LHHL	HHHH	HHHH	HHHH	HHHH

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UPC ADDR	290 AAAA	291 BBBB	292 BCCC	293 CCDD	294 DEFH	295 JJKL	296 MMMM	297 MNPP	298 PPPP	299 PPPP
1766,	HLLH	XXXX	XHHH	HHXX	XHHH	LHHH	HHLH	LHHH	HLLL	HLHL
1767,	HHHH	HHLL	HLHH	HHXX	XHLH	LHHH	HHHH	HHHH	HHHH	HHHH
1770,	HLLH	XXXX	XHHH	HHXX	XHHH	LHHH	HHHH	HHHH	HHHH	HHHH
1771,	HHHH	HHLL	HHHH	HHXX	XHHH	LHHL	HHHH	HHHH	HHHH	HHHH
1772,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	HHHH	HHHH	HHHH
1773,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	HHHH	HHHH	HHHH
1774,	HHHH	XXXX	XHHH	HHXX	XHHH	HHHH	HHHH	LHHH	HHHH	HHHL

REV.	NUMBER	CODE	SIZE
	M8410-0-9	CS	K

FIRST USED ON OPTION MODEL	QTY.	DESCRIPTION	PART NO.	ITEM NO.
M8410		PARTS LIST		

DRN. K. Davis	DATE 3-5-76	digital EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS	
CHK'D [illegible]	DATE 5/19/76		
ENG. W. Kershner	DATE 19MAY76	TITLE CONTROL ROM OPERATIONS' LIST	
PROJ. ENG. [illegible]	DATE 5/19/76		
PROD. R. Kaplan	DATE 5-13-76		
NEXT HIGHER ASSEMBLY B-DD-M8410-0		SIZE K / CODE CS / NUMBER M8410-0-9	REV. *
SCALE — / —			
SHEET 1 OF 26		DIST.	

REVISIONS	REV.	CHANGE NO.	CHK

DEC FORM NO. DRB 109

```
        /FUNCTIONS OF MAIN CONTROL ROM OF FPP FOR EACH ROM ADDRESS
        /D.A.WHITE 3/18/76

        /MICRO PC IS INITIALIZED TO 0.  ADDRESSES 0, 1 AND 2 REPRESENT "HALTED
        /AND FLAG = 0", "HALTED AND FLAG = 1" AND "PAUSED" RESPECTIVELY.

        /ADDRS  NEXT DATA PATH OPERATION                    TIME    CTRL FUNCTION

        *0
0       HALTED, NO OPERATION                                TS3     GO TO, HLTD1 (3)
1       FLAG,   NO OPERATION                                TS3     GO TO, FLAG (1)
2       PAUSED, NO OPERATION                                TS3     GO TO, PAUSED (2)

        *3
        /"DB:=MD" IN THE NEXT LINE IS A KLUDGE.  THE DB IS REALLY
        /LOADED FROM THE DATA LINES OF THE OMNIBUS (THIS STEP ONLY).
3       HLTD1,  DB:=MD; TEMP:=FIELD                         T4      GO TO, HALTED (0)

        ////////////////////////IOT AREA////////////////////////////////
        /FPST AND CONTINUE CONDITION
        *6
6       FCONT,  NO OPERATION                                T4      GO TO, FETCH (20)

        /FPCOM
        *7
7       FPCOM,  FIELD:=(R3R)DB                              T4      GO TO, HALTED (0)

        /FPST AND START CONDITION
        *13
13      FPST,   APTP:=TEMP<1:3>,DB                          T4      GO TO, GETAPT (300)

        /FPHLT IOT GIVEN WHILE FPP IS PAUSED.  BACK UP FPC, EXIT.
        *16
16      FPHLT,  FPC:=FPC[+]M1                               T4      GO TO, EXSTRT (1000

        /JUMP TO MAINTENANCE PROGRAM
        *17
17      MAINT,  NO OPERATION                                T4      GO TO, MAINT1 (1700

        ////////////////////////DATA BREAK AREA//////////////////////////

        /SUBROUTINE--GET SECOND HALF OF 24-BIT INSTRUCTION
        *4
4       INST24, FPC:=FPC[+]K1                               T4      BKCMD:=0
5               DB:=MD                                      BT1     RETURN

        /SUBROUTINE--GET WORD AT NEXT OPADD, BUMP OPADD
        *10
10      NEXTOP, BKMA, OPADD:=OPADD[+]K1                     T3
11      NXTOP1, NO OPERATION                                T4      BKCMD:=0
12              DB:=MD                                      BT1     RETURN

        /BRANCH AND CONDITION TRUE
        *14
14      BRTRUE, BKMA:=FPC                                   T3      SUB, INST24 (4)
15              FPC:=TEMP<1:3>,DB                           T2      EXTEST
```

```
        /PAGE 2
        /FLOATING-POINT INSTRUCTION FETCH

        *20
20      FETCH,  BKMA1:=FPC                                      T3
21      FETCH1, 1:=FACE[EXPSIZE]M30                             T4      BKCMD1:=7
22              FPC1:=FPC[+]K1; DB:=MD                          BT1
23              TEMP1:=FIR<9:11>                                T2      INSTR DISP 1

        /       *       *       *       *       *       *       *       *       /
        /INSTRUCTION DISPATCH 1 DISPATCHES MICRO PC AS FOLLOWS:                  /
        /       INSTRUCTION     ADDRESS         INSTRUCTION     ADDRESS         /
        /       SETX            34              SETB            36              /
        /       LDX             40              ADDX            44              /
        /       JSA             50              JSR             60              /
        /       BRANCH (TRUE)   14              BRANCH (FALSE)  24 AND EXTEST   /
        /       TRAP            74              JNX             26              /
        /       ALN (NOT XR0)   70              ALN (XR0)       1030            /
        /       XTA             72              ATX             1040            /
        /       LTR(0)          1026            LTR(1)          1016            /
        /       JAC             1014            FNORM           1006            /
        /       FNEG            1004            FCLA            1002            /
        /       FPAUSE          2               FEXIT           1000            /
        /       STARTF          1010            STARTD          1012            /
        /       STARTE          1020                                            /
        /       ALL UNDEFINED   EXTEST                                          /
        /ALL DATA REFERENCE INSTRUCTIONS (LEA, LEAI, FLDA, FADD, FSUB, FDIV,     /
        /FMUL, FADDM, FSTA, AND FMULM) DO ONE OF THE FOLLOWING ADDESS CALC:      /
        /       ADDRESS MODE                                    LABEL   ADDRESS /
        /       12 BIT DIRECT (NOT DP)                          DIRFP   100     /
        /       12 BIT DIRECT (DP)                              DIRDP   102     /
        /       24 BIT, NO INCR, NO INDEX                       NINC24  114     /
        /       24 BIT, INCR, NO INDEX                          INC24   112     /
        /       24 BIT, INDEXED                                 X24     110     /
        /       12 BIT INDIRECT, NO INCR, NO INDEX              INDIR   134     /
        /       12 BIT INDIRECT, INCR, NO INDEX                 INCIND  132     /
        /       12 BIT INDIRECT, INDEXED                        XIND    130     /
        ////IN ADDITION, GATING IN MAJOR REGISTERS CAUSES THE FOLLOWING:          /
        ////////INSTRUCTION                                     OPERATION       /
        ////////DIRECT 12-BIT ADDRESSING                       TEMP1:=3*FIR<5:11>      /
        ////////INDIRECT ADDRESSING (ALSO LEAI)                 TEMP1:=3*FIR<9:11>      /
        ////////ALL OTHER INSTRUCTIONS, 24-BIT                                   /
        ////////       ADDRESSING MODE                          TEMP1:=(N3R)FIR<9:11>   /
        /       *       *       *       *       *       *       *       *       /


        /       *       *       *       *       *       *       *       *       /
        /                                                                       /
        /       NOTE CAREFULLY!                                                 /
        /               DO NOT FILL DB AT THE DISPATCHED ADDRESS--              /
        /               THE DATA PATH WILL GET VERY CONFUSED!!!                 /
        /                                                                       /
        /       *       *       *       *       *       *       *       *       /
```



```
        /PAGE 3
        /BRANCH AND CONDITION NOT TRUE
        *24
24      BRNTRU, BKMA, FPC1:=FPC[+]K1                            T3      GO TO, FETCH1 (21)

25      DONE,   NO OPERATION                                    T2      EXTEST

        /JNX---LITTLE HACK--JNX ALWAYS REQUIRES 2 BREAKS, EVEN IF C(XR)#0.
        /REASON IS THAT THE ZFLAG IS LOADED SO LATE IN THE BREAK CYCLE
        /THAT THE FPP HAS ALREADY COMMITTED TO STARTING THE BREAK BEFORE THE
        /FLAG CAN BE TESTED.
        *26
26      JNX,    BKMA1:=X0[+]FIR<6:8>                            T3      SUB, INCXR (105)
27              BKMA1:=FPC                                      T3
30              FPC1:=FPC[+]K1                                  T4      BKCMD1:=0
31              DB1:=MD                                         BT1     IF ZFLG, DONE (25)
32              FPC1:=TEMP<1:3>,DB                              T2      EXTEST

        /SETX
        *34
34      SETX,   BKMA1:=FPC                                      T3      SUB, INST24 (4)
35              X01:=TEMP<1:3>,DB                               T2      EXTEST
        /"EXTEST" DISPATCHES MICRO PC TO EXSTRT IF THE EXF FLAG IS SET,
        /       EITHER OVERFLOW FLAG IS SET, OR THE EXPONENT UNDERFLOW FLAG
        /       IS SET AND THE ZTRAP BIT OF THE COMMAND REGISTER IS SET.
        /       IF NONE OF THESE CONDITIONS OCCURS, "EXTEST" DISPATCHES TO
        /       FETCH.

        /SETB
        *36
36      SETB,   BKMA1:=FPC                                      T3      SUB, INST24 (4)
37              BR1:=TEMP<1:3>,DB                               T2      EXTEST

        /LDX
        *40
40      LDX,    BKMA1:=FPC                                      T3      SUB, INST24 (4)
41              BKMA, TEMP1:=X0[+]FIR<9:11>                     T3
42              OPADD1:=TEMP                                    T4      BKCMD1:=1
43              NO OPERATION                                    BT1     EXTEST

        /ADDX
        *44
44      ADDX,   BKMA1:=FPC                                      T3      SUB, INST24 (4)
45              BKMA, TEMP1:=X0[+]FIR<9:11>                     T3
46              OPADD1:=TEMP                                    T4      BKCMD1:=3
47              NO OPERATION                                    BT1     EXTEST

        /JSA
        *50
50      JSA,    BKMA1:=FPC                                      T3      SUB, INST24 (4)
51              OPADD1:=TEMP<1:3>,DB                            T2
52              BKMA1:=OPADD; DB1:=8                            T3
53              DB1:=1030!FPC<1:3>                              T4      BKCMD1:=1
54              DB1:=FPC                                        BT1
55              BKMA, OPADD1:=OPADD[+]K1                        T3
56              TEMP1:=OPADD[+]K1                               T4      BKCMD1:=1
57              FPC1:=TEMP                                      BT1     EXTEST
```

```
        /PAGE 4
        /JSR
        *60
60      JSR,    BKMA:=FPC                               T3      SUB, INST24 (4)
61              TEMP1:=TEMP<1:3>,DB                     T2
62              BKMA:=BR[+]K1; DB:=0                    T3
63              DB:=1030|FPC<1:3>                       T4      BKCMD:=1
64              DB:=FPC                                 BT1
65              BKMA:=BR[+]K2                           T3
66              OPADD:=TEMP1                            T4      BKCMD:=1
67              FPC:=TEMP1                              BT1     EXTEST
        /ALN
        *70
70      ALN,    BKMA, TEMP:=X0[+]FIR<9:11>              T3      SUB, GETXR (235)
71              TEMP7:=D0                               T2      GO TO, ALN2 (1031)

        /XTA
        *72
72      XTA,    BKMA, TEMP:=X0[+]FIR<9:11>              T3      SUB, GETXR (235)
73              FALM:=DB                                T2      GO TO, XTA1 (1103)

        /TRAP
        *74
74      TRAP,   BKMA:=FPC                               T3
75              NO OPERATION                            T4      BKCMD:=0
76              FPC:=FPC[+]K1; DB:=MD                   BT1     SET TRAP1
77              OPADD:=TEMP<1:3>,DB                     T2      GO TO, EXSTRT (1000)

        //////////ADDRESS CALCULATIONS////////////////////////////////////////
        //AT CONCLUSION OF ALL ADDRESS CALCULATIONS, ADDRESS MUST BE IN TEMP1;
        //DB MUST BE 0.
        /DIRECT ADDRESS CALCULATION
        *100
100     DIRFP,  BKMA, TEMP1:=TEMP[+]BR; DB:=0           T3      INSTR DISP 2

        /OP CALCULATION ADDS 1 BECAUSE BASE PAGE ALWAYS CONTAINS 3-WORD ARG.
        *102
102     DIROP,  BKMA, TEMP1:=TEMP[+]BR+1; DB:=0         T3      INSTR DISP 2

        /       *       *       *       *       *       *       *       /
        /INSTRUCTION DISPATCH 2 DISPATCHES MICRO PC AS FOLLOWS:          /
        /       INSTRUCTION                     LABEL   ADDRESS         /
        /       LEA, LEAI (FP AND EP MODES)     LEAB    256             /
        /       FLDA                            LOAD    200             /
        /       FSTA (NOT DP)                   STOREF  220             /
        /       FSTA (DP)                       STORED  224             /
        /       FSUB                            GETN    260             /
        /       FADD, FADDM, FMUL, FMULM, FDIV  GETARG  240             /
        /       IMUL (SAME OP CODE AS LEA, LEAI                         /
        /                       BUT DP MODE)    GETARG  240             /
        /       NO OTHER INSTRUCTIONS USE THIS DISPATCH                 /
        /       *       *       *       *       *       *       *       /
```



```
        /PAGE 5

103     A24DP,  TEMP2:=[2*]DB                           T4      BKCMD:=0
104             FPC:=FPC[+]K1; DB:=MD                   BT1     GO TO, INDIR1 (156)

105     INCXR,  NO OPERATION                            T4      BKCMD:=2
106             NO OPERATION                            BT1     RETURN

107     FETCH2, BKMA, OPADD:=TEMP7                      T3      GO TO, FETCH1 (21)

        /INDEXED 24-BIT ADDRESS CALCULATION
        *110
110     X24,    BKMA:=X0[+]FIR<6:8>                     T3      GO TO, X24A (116)

        /INCREMENTED, NON-INDEXED 24-BIT ADDRESS CALCULATION
        /       FIR<6:8> MUST BE ZERO OR WE'D NOT BE HERE.  BUMP X0.
        *112
112     INC24,  BKMA:=X0                                T3      SUB, INCXR (105)
113             NO OPERATION                            T2      GO TO, NINC24 (114)

        /ENTER HERE FOR NON-INCREMENTED, NON-INDEXED 24-BIT ADDRESS CALC.
        /GET LAST 12 BITS OF ADDRESS, COMBINE WITH 3 MSB ALREADY IN TEMP.
        *114
114     NINC24, BKMA:=FPC                               T3      SUB, INST24 (4)
115             TEMP1:=TEMP<1:3>,DB                     T2      GO TO, INSDSP (141)

116     X24A,   NO OPERATION                            T4      BKCMD:=2
117             NO OPERATION                            BT1
120             DB:=MD                                  T2      IF NOT EP, A24FP (124)
121             BKMA:=FPC                               T3
122             TEMP2:=[0*]DB                           T4      BKCMD:=0
123             FPC:=FPC[+]K1; DB:=MD                   BT1     GO TO, INDIR1 (156)
124     A24FP,  BKMA:=FPC                               T3      IF DP, A24DP (103)
125             TEMP2:=[3*]DB                           T4      BKCMD:=0
126             FPC:=FPC[+]K1; DB:=MD                   BT1     GO TO, INDIR1 (156)
        /OPADD WILL CONTAIN 15 ADDRESS BITS FROM INSTRUCTION WORD; TEMP2
        //CONTAINS M*C(XR)

        /INDEXED INDIRECT ADDRESS CALCULATION
        //TEMP HOLDS 3*FIR<9:11> AT ENTRY.
        *130
130     XIND,   BKMA:=X0[+]FIR<6:8>                     T3      GO TO, XIND1 (147)

        /INCREMENTED, NON-INDEXED INDIRECT ADDRESS CALCULATION
        //FIR<6:8>=0.  BUMP X0.
        *132
132     INCIND, BKMA:=X0                                T3      SUB, INCXR (105)
133             NO OPERATION                            T2      GO TO, INDIR (134)
```

```
        /PAGE 6
        /ENTER HERE FOR NON-INCREMENTED, NON-INDEXED INDIRECT ADDRESS CALC.
        //TEMP CONTAINS 3*FIN<9:11> AT ENTRY
        *134
134     INDIR,  BKMA, TEMP1:=TEMP[+]BR+1                T3
135             OPADD:=TEMP1                            T4      BKCMD:=4
136             DB:=MD                                  BT1
137             TEMP:=[R3R]DB                           T2      SUB, NEXTOP (10)
140             TEMP1:=TEMP<1:3>,DB                     T2
141     INSDSP, BKMA:=TEMP1; DB:=0                      T3      INSTR DISP 2

142     INDDP,  TEMP2:=[2*]DB                           T4      BKCMD:=0
143             DB:=MD                                  BT1     GO TO, INDP1 (155)

144     INDEP,  BKMA, OPADD:=TEMP1                      T3
145             TEMP2:=[6*]DB                           T4      BKCMD:=0
146             DB:=MD                                  BT1     GO TO, INDP1 (155)

147     XIND1,  TEMP1:=BR[+]TEMP+1                      T4      BKCMD:=2
150             NO OPERATION                            BT1
151             DB:=MD                                  T2      IF EP, INDEP (144)
152             BKMA, OPADD:=TEMP1                      T3      IF DP, INDDP (142)
153             TEMP2:=[3*]DB                           T4      BKCMD:=0
154             DB:=MD                                  BT1
155     INDP1,  TEMP:=[R3R]DB                           T2      SUB, NEXTOP (10)
156     INDIR1, OPADD:=TEMP<1:3>,DB                     T2
157             BKMA, TEMP1:=OPADD[+]TEMP2; DB:=0       T3      INSTR DISP 2

        /FAST EXIT--FILL ONLY FPC AND FIELD LOCATIONS OF APT.
160     FASTX,  BKMA:=APTP; DB:=0                       T3
161             DB:=FPC                                 T4      BKCMD:=5
162             DB:=FPC<1:3>                            BT1
163             BKMA, APTP:=APTP[+]M1                   T3      SUB, EXST1A (166)
164             NO OPERATION                            T2      GO TO, FLAG (1)

165     EXST1,  BKMA, APTP:=APTP[+]K1                   T3
166     EXST1A, NO OPERATION                            T4      BKCMD:=5
167             TEMA:=TEMP<1:3>,0[R3R]TEMA              BT1     RETURN

170     EXST2,  BKMA, APTP:=APTP[+]M1                   T3
171     EXST3,  NO OPERATION                            T4      BKCMD:=1
172             NO OPERATION                            BT1     RETURN
```



```
        /PAGE 7
        /FLDA--ALL MODES
        *200
200     LOAD,   OPADD:=TEMP1                            T4      BKCMD:=0
201             DB:=MD                                  BT1     IF DP, LOAD1 (203)
202             FACE:=DB                                T2      SUB, NEXTOP (10)
203     LOAD1,  FACM:=DB                                T2
204             BKMA, OPADD:=OPADD[+]K1                 T3
205             NO OPERATION                            T4      BKCMD:=0
206             DB:=MD                                  BT1     IF NOT EP, LOAD2 (216)
207             FACN:=DB                                T2
210             BKMA:=OPADD[+]K1                        T3      SUB, NXTOP1 (11)
211             FACP:=DB                                T2
212             BKMA:=OPADD[+]K2                        T3      SUB, NXTOP1 (11)
213             FACR:=DB                                T2
214             BKMA:=OPADD[+]K3                        T3      SUB, NXTOP1 (11)
215             FACS:=DB                                T2      EXTEST
216     LOAD2,  FACN:=DB                                T2      EXTEST

        /FSTA--FP AND EP MODES ENTER HERE
        *220
220     STOREF, DB:=FACE                                T4      BKCMD:=1
221             OPADD:=TEMP1                            BT1
222             BKMA, OPADD:=OPADD[+]K1; DB:=0          T3      GO TO, STORED (224)
223     STRD1,  OPADD:=TEMP1                            T2      GO TO, STORE1 (226)
        /FSTA--DP MODE ENTERS HERE.
        *224
224     STORED, DB:=FACM                                T4      BKCMD:=1
225             NO OPERATION                            BT1     IF DP, STRD1 (223)
226     STORE1, BKMA, TEMP, OPADD:=OPADD[+]K1; DB:=0    T3
227             DB:=FACN                                T4      BKCMD:=1
230             TEMA:=TEMP                              BT1     IF NOT EP, DONE (25)
231             DB:=FACP                                T2      SUB, DEPOS2 (370)
232             DB:=FACR                                T2      SUB, DEPOS2 (370)
233             DB:=FACS                                T2      SUB, DEPOS2 (370)
234             NO OPERATION                            T2      EXTEST

        /SUBROUTINE--USED MOSTLY BY INDEX REGISTER OPERATION
235     GETXR,  OPADD:=TEMP                             T4      BKCMD:=0
236             DB:=MD                                  BT1     RETURN

        /GET ARGUMENT, PLACE FRACTION IN TEMP1-TEMP5, AND EXPONENT
        /(IF USED) IN TEMP6.  TEMP1, BKMA ALREADY CONTAIN ADDRESS OF
        /ARGUMENT AT ENTRY.  USED BY FADD, FADDM, FMUL, FMULM, IMUL AND FDIV.
        *240
240     GETARG, OPADD:=TEMP1                            T4      BKCMD:=0
241             DB:=MD; TEMP3:=[0]                      BT1     IF DP, GET1 (243)
242             TEMP6:=DB                               T2      SUB, NEXTOP (10)
243     GET1,   TEMP1:=DB                               T2      SUB, NEXTOP (10)
244             TEMP2:=DB                               T2      IF NOT EP, ARITH (1837)
245             BKMA:=OPADD[+]K1                        T3      SUB, NXTOP1 (11)
246             TEMP3:=DB                               T2
247             BKMA:=OPADD[+]K2                        T3      SUB, NXTOP1 (11)
250             TEMP4:=DB                               T2
251             BKMA:=OPADD[+]K3                        T3      SUB, NXTOP1 (11)
252             TEMP5:=DB                               T2      GO TO, ARITH (1837)
```

```
        /PAGE 8
253     ATXSTN, BKMA:=OPADD; DB:=0                              T3
254             DB:=SCRATCHN                                    T4      BKCMD:=1
255             NO OPERATION                                    BT1     EXTEST

        *256
        /LOAD EFFECTIVE ADDRESS--DO BREAK READ, IGNORE DATA--NECESSARY
        /BECAUSE FPP IS ALREADY COMMITTED TO BREAK AT INSTR. DISP. 2 TIME.
256     LEAB,   OPADD:=TEMP1                                    T4      BKCMD:=0
257             DB, FACN:=(12BIT)TEMP1                          BT1     GO TO, LOADEA (1060)

        /GET 2'S COMPLEMENT OF ARGUMENT.  SIMILAR TO GET ARG. USED BY FSUB.
        *260
260     GETN,   OPADD:=TEMP1                                    T4      BKCMD:=0
261             DB:=MD                                          BT1     IF DP, GETN1 (263)
262             TEMP6:=DB                                       T2      SUB, NEXTOP (10)
263     GETN1,  TEMP:=DB                                        T2
264             BKMA, OPADD:=OPADD[+]K1                         T3
265             NO OPERATION                                    T4      BKCMD:=0
266             DB:=MD                                          BT1     IF EP, GETN2 (270)
267             DB, TEMP2:=[MINUS]DB                            T2      GO TO, GETN5 (1027)
270     GETN2,  TEMP1:=DB                                       T2
271             BKMA:=OPADD[+]K3                                T3      SUB, NXTOP1 (11)
272             DB, TEMP5:=[MINUS]DB                            T2
273             BKMA:=OPADD[+]K2                                T3      SUB, NXTOP1 (11)
274             DB, TEMP4:=[EXT][MINUS]DB                       T2
275             BKMA:=OPADD[+]K1                                T3      SUB, NXTOP1 (11)
276             DB, TEMP3:=[EXT][MINUS]DB                       T2      GO TO, GETN4 (1025)


        /GET ACTIVE PARAMETER TABLE
        *300
300     GETAPT, BKMA:=APTP                                      T3
301             NO OPERATION                                    T4      BKCMD:=4
302             DB:=MD                                          BT1     IF FS, APT2 (317)
303             TEMA:=DB                                        T2      SUB, APT1 (321)
304             TEMP7, FPC:=TEMP<1:3>,DB                        T2      SUB, APT1 (321)
305             X0:=TEMP<1:3>,DB                                T2      SUB, APT1 (321)
306             BR:=TEMP<1:3>,DB                                T2
307             BKMA, APTP:=APTP[+]K2                           T3      SUB, APT1B (322)
310             FACE:=DB                                        T2      SUB, APT1 (321)
311             FACM:=DB                                        T2      SUB, APT1 (321)
312             FACN:=DB                                        T2      IF NOT EP, FETCH2 (107)
        /GO TO FETCH UNLESS IN EXTENDED PRECISION.  OTHERWISE PICK UP 3
        / REMAINING WORDS.
313             OPADD, BKMA:=OPADD[+]K1                         T3      SUB, NXTOP1 (11)
314             FACP:=DB                                        T2      SUB, NEXTOP (10)
315             FACR:=DB                                        T2      SUB, NEXTOP (10)
316             FACS:=DB                                        T2      GO TO, FETCH2 (107)

        /FAST START--FS=1.  GET FPC ONLY, THEN GO TO FETCH
317     APT2,   TEMA:=DB                                        T2      SUB, APT1 (321)
320             TEMP7, FPC:=TEMP<1:3>,DB                        T2      GO TO, FETCH2 (107)

321     APT1,   BKMA, TEMP1, APTP:=APTP[+]K1                    T3
322     APT1B,  TEMP, TEMA:=(R3R)TEMA                           T4      BKCMD:=4
323             DB:=MD; OPADD:=TEMP1                            BT1     RETURN
```



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        /PAGE 9
        /LONG EXIT
324     LONGX,  BKMA:=APTP; DB:=0                               T3
325             DB:=FACN                                        T4      BKCMD:=1
326             DB:=FACS                                        BT1     IF NOT EP, EXIT1 (335)
327             BKMA, APTP:=APTP[+]K3                           T3      SUB, EXST3 (171)
330             DB:=FACR                                        T2      SUB, EXST2 (170)
331             DB:=FACP                                        T2
332             BKMA, APTP:=APTP[+]M1                           T3
333             APTP:=APTP[+]M1                                 T4      BKCMD:=1
334             NO OPERATION                                    BT1
335     EXIT1,  DB:=FACM                                        T2
336             BKMA, APTP:=APTP[+]M1                           T3
337             NO OPERATION                                    T4      BKCMD:=5
340             DB:=FAL                                         BT1
341             BKMA, APTP:=APTP[+]M1                           T3
342             APTP:=APTP[+]M5                                 T4      BKCMD:=5
343             TEMA:=[0]                                       BT1
344     EXIT2,  TEMP, DB:=FPC                                   T2      SUB, EXST1 (165)
345             TEMP, DB:=X0                                    T2      SUB, EXST1 (165)
346             TEMP, DB:=BR                                    T2      SUB, EXST1 (165)
347             TEMP, DB:=OPADD                                 T2      SUB, EXST1 (165)
350             DB:=TEMA                                        T2
351             BKMA, APTP:=APTP[+]M5+1                         T3      SUB, EXST1A (166)
352     EXIT4,  NO OPERATION                                    T2      GO TO, FLAG (1)

        /PUT RESULT IN MEMORY.  USED BY FADDM AND FMULM.
353     DEPOS,  BKMA:=OPADD[+]M1; DB:=0                         T3      IF TEMPZERO, DEPOS5 (373)
354             DB:=SCRATCHM                                    T4      BKCMD:=1
355             NO OPERATION                                    BT1     IF DP, DEPOS1 (360)
356             DB:=SCRATCHE                                    T2
357     DEPOS4, BKMA:=OPADD[+]M2                                T3      SUB, DEPOS3 (371)
360     DEPOS1, DB:=SCRATCHN                                    T2
361             TEMP, BKMA:=OPADD                               T3
362             NO OPERATION                                    T4      BKCMD:=1
363             TEMA:=TEMP                                      BT1     IF NOT EP, DONE (25)
364             DB:=SCRATCHP                                    T2      SUB, DEPOS2 (370)
365             DB:=SCRATCHR                                    T2      SUB, DEPOS2 (370)
366             DB:=SCRATCHS                                    T2      SUB, DEPOS2 (370)
367             NO OPERATION                                    T2      EXTEST

370     DEPOS2, TEMA, BKMA:=TEMA[+]K1                           T3
371     DEPOS3, NO OPERATION                                    T4      BKCMD:=1
372             NO OPERATION                                    BT1     RETURN

373     DEPOS5, DB:=[0]                                         T4      BKCMD:=1
374             NO OPERATION                                    BT1     IF DP, DEPOS1 (360)
375             NO OPERATION                                    T2      GO TO, DEPOS4 (357)
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        /PAGE 10
        *1000
        /GO TO PROPER EXIT ROUTINE
1000    EXSTRT, NO OPERATION                                FREE*   IF FS, FASTX (160)
1001            NO OPERATION                                FREE*   GO TO, LONGX (324)

        *1002
        /CLEAR FAC
1002    FCLA,   NO OPERATION                                FREE*   GO TO, CLRFAC (1050)

1003    JAC2,   DB, FPC:=TEMP<11:5>,0[+]FPC                 FREE*   EXTEST

        /FNEG
        *1004
1004    FNEG,   TEMP:=FACM                                  FREE*   SUB, FTOS1 (1334)
1005            NO OPERATION                                FREE*   GO TO, NEGATE (1072)

        /NORMALIZE
        *1006
1006    FNORM,  TEMP:=FACE                                  FREE*   IF DP, END (1013)
1007            DB, SC:=TEMP                                FREE*   GO TO, FNORM1 (1070)

        /ENTER FP MODE
        *1010
1010    STARTF, NO OPERATION                                FREE*   GO TO, ST24F (1074)

1011    JAC1,   DB, TEMP:=[R3R]FACM                         FREE*   GO TO, JAC2 (1003)

        /STARTD--ENTER 24-BIT, FIXED POINT MODE
        *1012
1012    STARTD, NO OPERATION                                FREE*   ENTER DP MODE
1013    END,    NO OPERATION                                FREE*   EXTEST

        /JAC
        *1014
1014    JAC,    TEMP:=FACN                                  FREE*
1015            DB, FPC:=[126IT]TEMP                        FREE*   GO TO, JAC1 (1011)

        *1016
1016    LTR1,   FACM:=K2000                                 FREE*   IF DP, CLRF1 (1055)
1017            NO OPERATION                                FREE*   GO TO, LTR2 (1056)

        /STARTE--ENTER 60-BIT MODE; CLEAR FAC LSB IF NOT ALREADY IN EP
        *1020
1020    STARTE, NO OPERATION                                FREE*   IF EP, END (1013)
1021            DB, FACP:=[0]                               FREE*   ENTER EP MODE
1022            DB, FACR:=[0]                               FREE*
1023            DB, FACS:=[0]                               FREE*   EXTEST

        /BRANCH FALSE AND EXIT FLAG SET
        *1024
1024    EXBRNT, FPC:=FPC[+]K1                               FREE*   GO TO, EXSTRT (1000)
1025    GETN4,  DB, TEMP2:=[EXT][MINUS]TEMP1                FREE    GO TO, GETN5 (1027)
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        /PAGE 11
        /LTR(0)
        *1026
1026    LTR0,   NO OPERATION                                FREE*   GO TO, CLRFAC (1050)

1027    GETN5,  DB, TEMP1:=[EXT][MINUS]TEMP                 FREE    INSTR DISP 3
        *1030
        /ALN (XR0)
1030    ALN0,   TEMP7:=[MINUS]M27                           FREE*
1031    ALN2,   DB, SC:=TEMP7                               FREE*   IF DP, ALN3 (1064)
1032            DB, TEMP:=FACE[MINUS]TEMP7                  FREE*
1033            DB, FACE:=TEMP7                             FREE*
1034            DB, SC, TEMP7:=[MINUS]TEMP                  FREE*   GO TO, ALN3 (1064)
1035    ALN4,   NO OPERATION                                FREE*   SUB, SHL (1147)
1036            NO OPERATION                                FREE*   GO TO, NEG1 (1073)

        /ARITHMETIC DISPATCH
1037    ARITH,  NO OPERATION                                FREE    INSTR DISP 3

        /       *       *       *       *       *       *       *       *       /
        /INSTRUCTION DISPATCH 3 DISPATCHES ARITHMETIC                               /
        /                               INSTRUCTIONS AS FOLLOWS:                    /
        /       INSTRUCTION                                 LABEL   ADDRESS         /
        /       FADD, FADDM (DP MODE)                       DPADD   1400            /
        /       FADD, FADDM (NOT DP)                        FADD    1401            /
        /       FMUL, FMULM                                 FMUL    1402            /
        /       FDIV                                        FDIV    1403            /
        /       IMUL                                        IMUL    1404            /
        /       *       *       *       *       *       *       *       *       /

        *1040
        /ATX
1040    ATX,    TEMP:=X0[+]FIR<9:11>                        FREE*
1041            DB, UPADD:=TEMP                             FREE*
1042            DB, TEMP7:=FACE[+]M27                       FREE*
1043            DB, SC:=TEMP7                               FREE*   SUB, FTOS (1333)
1044            NO OPERATION                                FREE*   IF DP, ATXSTR (253)
1045            NO OPERATION                                FREE*   IF EXPFL, ATX2 (1062)
1046            DB, SC:=[MINUS]TEMP7                        FREE*   SUB, SHL (1147)
1047    ATX3,   NO OPERATION                                FREE*   GO TO, ATXSTR (253)

        *1050
1050    CLRFAC, DB, FACM:=[0]                               FREE*   IF DP, CLRF1 (1055)
1051    CLRF2,  DB, FACE:=[0]                               FREE*   IF NOT EP, CLRF1 (1055)
1052            DB, FACP:=[0]                               FREE*
1053    CLRF3,  DB, FACR:=[0]                               FREE*
1054            DB, FACS:=[0]                               FREE*
1055    CLRF1,  DB, FACN:=[0]                               FREE*   EXTEST
1056    LTR2,   DB, FACE:=[126IT]K1                         FREE*   IF NOT EP, CLRF1 (1055)
1057            DB, FACP:=[0]                               FREE*   GO TO, CLRF3 (1053)
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        /PAGE 12
        /LOAD EFFECTIVE ADDRESS
        *1060
1060    LOADEA, DB, FACM:=TEMP1                         FREE*   ENTER DP MODE
1061            DB, FACM:=FACM<1:3>                     FREE*   EXTEST

1062    ATX2,   NO OPERATION                            FREE*   SUB, SHR (1260)
1063            NO OPERATION                            FREE*   GO TO, ATX3 (1047)

        /MORE OF ALIGN
1064    ALN3,   DB, TEMP:=FACM                          FREE*   SUB, FTOS1 (1334)
1065            NO OPERATION                            FREE*   IF EXPFL, ALN4 (1035)
1066            DB, SC:=(MINUS)TEMP/                    FREE*   SUB, SHR (1260)
1067            NO OPERATION                            FREE*   GO TO, NEG1 (1073)

1070    FNORM1, DB, TEMP:=FACM                          FREE*   SUB, FTOS1 (1334)
1071            NO OPERATION                            FREE*   GO TO, FADDB (1446)

1072    NEGATE, NO OPERATION                            FREE*   SUB, COMPS (1133)
1073    NEG1,   DB, TEMP:=SCRATCHM                      FREE*   GO TO, STOF1 (1350)

        /REMAINDER OF STARTF
1074    ST24F,  NO OPERATION                            FREE*   IF NOT EP, ST24F2 (1101)
1075            DB, TEMP:=FACM                          FREE*   SUB, FTOS1 (1334)
1076            DB, TEMP:=FACE                          FREE*   ENTER FP MODE
1077    ST24F1, DB, SC:=TEMP                            FREE*   SUB, RND (1240)
1100            NO OPERATION                            FREE*   GO TO, FADD9 (1447)
1101    ST24F2, NO OPERATION                            FREE*   ENTER FP MODE
1102            NO OPERATION                            FREE*   EXTEST

        /REMAINDER OF XTA--FACN HOLDS C(XR) AT ENTRY
1103    XTA1,   DB, TEMP:=(SIGN)FACN                    FREE*
1104            DB, FACM:=TEMP                          FREE*   IF DP, END (1013)
1105            DB, SC:=(MINUS)M27                      FREE*   IF NOT EP, FNORM1 (1070)
1106            DB, FACP:=(0)                           FREE*
1107            DB, FACN:=(0)                           FREE*
1110            DB, FACS:=(0)                           FREE*   GO TO, FNORM1 (1070)

        //////////////SUBROUTINES//////////////////////////////////////////////
        /SUBROUTINE--CLEAR SCRATCH FRACTION.  ALL MODES
1111    CLRS,   DB, SCRATCHM:=(0)                       FREE*
1112    CLRS2,  DB, SCRATCHN:=(0)                       FREE*   IF NOT EP, CLRS1 (1116)
1113            DB, SCRATCHR:=(0)                       FREE*
1114            DB, SCRATCHS:=(0)                       FREE*
1115            DB, SCRATCHT:=(0)                       FREE*
1116    CLRS1,  DB, SCRATCHP:=(0)                       FREE*   RETURN
```



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        /PAGE 13
        /SUBROUTINE--MOVE TWO WORDS RIGHT.  USED BY MULTIPLY.  ALL MODES.
        //FILL VACATED BITS WITH CONTENTS OF SLINK.
1117    R2MF,   DB, MQM:=TEMP7                          FREE*
1120            DB, TEMP7:=SCRATCHR                     FREE*
1121    R2ME,   DB, SCRATCHT:=TEMP7                     FREE*
1122            DB, TEMP7:=SCRATCHP                     FREE*
1123    R2MB,   DB, SCRATCHS:=TEMP7                     FREE*
1124            DB, TEMP7:=SCRATCHN                     FREE*
1125    R2MA,   DB, SCRATCHR:=TEMP7                     FREE*
1126            DB, TEMP7:=SCRATCHM                     FREE*
1127    R2M,    DB, SCRATCHP:=TEMP7                     FREE    PRESET BIT COUNT
1130            DB, SCRATCHM:=SCRATCHM(SHR)(EXT)        FREE*
1131            DB, TEMP7, SCRATCHM:=(SIGN)SCRATCHM     FREE*
1132            DB, SCRATCHN:=TEMP7                     FREE*   RETURN

        /SUBROUTINE--COMPLEMENT SCRATCH FRACTION.  ALL MODES.
1133    COMPS,  DB, TEMP:=SCRATCHP                      FREE*   IF NOT EP, COMPS1 (1146)
1134            DB, TEMP:=SCRATCHS                      FREE*
1135            DB, SCRATCHS:=(MINUS)TEMP               FREE*
1136            DB, TEMP:=SCRATCHR                      FREE*
1137            DB, SCRATCHR:=(EXT)(MINUS)TEMP          FREE*
1140            DB, TEMP:=SCRATCHP                      FREE*
1141            DB, SCRATCHP:=(EXT)(MINUS)TEMP          FREE*
1142    COMPS2, DB, TEMP:=SCRATCHN                      FREE*
1143            DB, SCRATCHN:=(EXT)(MINUS)TEMP          FREE*
1144            DB, TEMP:=SCRATCHM                      FREE*
1145            DB, SCRATCHM:=(EXT)(MINUS)TEMP          FREE*   RETURN
1146    COMPS1, DB, SCRATCHP:=(MINUS)TEMP               FREE*   GO TO, COMPS2 (1142)

        /SUBROUTINE--SHIFT SCRATCH LEFT PER SC,  USE WORD MOVE IF POSSIBLE.
        /SC CONTAINS 2'S COMP NUMBER OF SHIFTS ON ENTRY, IS ZERO AT EXIT.
1147    SHL,    DB, SC:=SC                              FREE*
1150    SHL6,   DB, SC:=SC(12BIT)K14                    FREE*
1151            NO OPERATION                            FREE*   IF EXPFL, SHL6A (1153)
1152            DB, SC:=SC(12BIT)M14                    FREE*   RETURN
1153    SHL6A,  NO OPERATION                            FREE*   IF EXPFL, SHL4 (1165)
1154            DB, SC:=SC(12BIT)M14                    FREE*
1155    SHL1,   DB, SC:=SC(12BIT)K1                     FREE*   IF EP, SHL3 (1162)
1156            DB, SCRATCHP:=(SHL)SCRATCHP             FREE*
1157    SHL2,   DB, SCRATCHN:=(SHL)(EXT)SCRATCHN        FREE*
1160            DB, SCRATCHM:=(SHL)(EXT)SCRATCHM        FREE*   IF EXPFL, SHL1 (1155)
1161            NO OPERATION                            FREE*   RETURN
1162    SHL3,   DB, SCRATCHS:=(SHL)SCRATCHS             FREE*
1163            DB, SCRATCHR:=(SHL)(EXT)SCRATCHR        FREE*
1164            DB, SCRATCHP:=(SHL)(EXT)SCRATCHP        FREE*   GO TO, SHL2 (1157)
1165    SHL4,   DB, TEMP:=SCRATCHN                      FREE*
1166            DB, SCRATCHM:=TEMP                      FREE*
1167            DB, TEMP:=SCRATCHP                      FREE*
1170            DB, SCRATCHN:=TEMP                      FREE*   IF NOT EP, SHL5 (1176)
1171            DB, TEMP:=SCRATCHR                      FREE*
1172            DB, SCRATCHP:=TEMP                      FREE*
1173            DB, TEMP:=SCRATCHS                      FREE*
1174            DB, SCRATCHR:=TEMP                      FREE*
1175            DB, SCRATCHS:=(0)                       FREE*   GO TO, SHL6 (1150)
1176    SHL5,   DB, SCRATCHP:=(0)                       FREE*   GO TO, SHL6 (1150)
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        /PAGE 14
        /SUBROUTINE--NORMALIZE SCRATCH.  DECREMENT SC ONCE FOR EACH SHIFT.
        /USE WORD MOVE, WHEN POSSIBLE, TO SAVE TIME.
        /ROUND OFF IF NOT IN EP MODE.  DB IS LOADED AT FIRST FIVE STEPS FOR
        /BETTER VISIBILITY OF UN-NORMALIZED ANSWER.

1177    NM1,    DB:=SCRATCHM                                    FREE*   IF DP, RND (1240)
1200            DB:=SCRATCHN                                    FREE*   IF TEMPZERO, RND (1240)
1201    NM11,   DB:=SCRATCHP                                    FREE*   IF MOVE OK, NMI4 (1215)
1202            DB:=SCRATCHR                                    FREE*   IF NORMED, NMI6 (1237)
1203            DB:=SCRATCHS                                    FREE*   IF NOT EP, NMI3 (1232)
1204    NM11A,  DB, SCRATCHT:=[SHL]SCRATCHT                     FREE*   IF NORMED, NMI1B (1213)
1205            DB, SCRATCHS:=[SHL][EXT]SCRATCHS                FREE*   TEST OVFLO
1206            DB, SCRATCHR:=[SHL][EXT]SCRATCHR                FREE*
1207            DB, SCRATCHP:=[SHL][EXT]SCRATCHP                FREE*
1210            DB, SCRATCHN:=[SHL][EXT]SCRATCHN                FREE*
1211            DB, SCRATCHM:=[SHL][EXT]SCRATCHM                FREE*
1212            DB, SC:=SC[12BIT]M1                             FREE*   GO TO, NMI1A (1204)
1213    NMI1B,  NO OPERATION                                    FREE*   TEST OVFLO
1214            NO OPERATION                                    FREE*   GO TO, NMI6 (1237)
1215    NMI4,   DB, SC:=SC[12BIT]M14                            FREE*
1216            DB, TEMP:=SCRATCHN                              FREE*
1217            DB, SCRATCHM:=TEMP                              FREE*   TEST OVFLO
1220            DB, TEMP:=SCRATCHP                              FREE*
1221            DB, SCRATCHN:=TEMP                              FREE*   IF NOT EP, NMI5 (1231)
1222            DB, TEMP:=SCRATCHR                              FREE*
1223            DB, SCRATCHP:=TEMP                              FREE*
1224            DB, TEMP:=SCRATCHS                              FREE*
1225            DB, SCRATCHR:=TEMP                              FREE*
1226            DB, TEMP:=SCRATCHT                              FREE*
1227            DB, SCRATCHS:=TEMP                              FREE*
1230            DB, SCRATCHT:=[0]                               FREE*   GO TO, NMI1 (1201)
1231    NMI5,   DB, SCRATCHP:=[0]                               FREE*   GO TO, NMI1 (1201)
1232    NMI3,   DB, SCRATCHP:=[SHL][EXT]SCRATCHP                FREE*   IF NORMED, NMI3A (1236)
1233            DB, SCRATCHN:=[SHL][EXT]SCRATCHN                FREE*   TEST OVFLO
1234            DB, SCRATCHM:=[SHL][EXT]SCRATCHM                FREE*
1235            DB, SC:=SC[12BIT]M1                             FREE*   GO TO, NMI3 (1232)
1236    NMI3A,  DB, SCRATCHP:=[SHR][EXT]SCRATCHP                FREE*   TEST OVFLO
1237    NMI6,   NO OPERATION                                    FREE*   IF FORBIDDEN, NMI8 (1250)
1240    RND,    NO OPERATION                                    FREE*   IF EP, NMI7 (1247)
1241            NO OPERATION                                    FREE*   IF TEMPSGN, RND1 (1254)
1242            DB:=SCRATCHP[12BIT]K3777+1                      FREE*
1243    RND2,   DB, SCRATCHN:=SCRATCHN[12BIT][EXT]              FREE*
1244            DB, SCRATCHM:=SCRATCHM[12BIT][EXT]              FREE*   IF TEMPZERO, RND4 (1255)
1245            DB, SCRATCHP:=[0]                               FREE*   IF DP, NMI7 (1247)
1246            NO OPERATION                                    FREE*   IF FORBIDDEN, OVREC (1405)
1247    NMI7,   NO OPERATION                                    FREE*   RETURN
1250    NMI8,   DB, SC:=SC[12BIT]K1                             FREE*
1251            DB, SCRATCHM:=[SHR]SCRATCHM                     FREE*
1252            NO OPERATION                                    FREE*   TEST OVFLO
1253            NO OPERATION                                    FREE*   RETURN
1254    RND1,   DB:=SCRATCHP[12BIT]K3777                        FREE*   GO TO, RND2 (1243)
1255    RND4,   DB, SCRATCHP:=[0]                               FREE*   IF DP, NMI7 (1247)
1256            NO OPERATION                                    FREE*   IF TEMPZERO, NMI7 (1247)
1257            NO OPERATION                                    FREE*   GO TO, NMI1 (1201)
```



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        /PAGE 15
        /SUBROUTINE--SHIFT SCRATCH RIGHT PER SC.  USE WORD MOVE IF POSSIBLE.
        /SC CONTAINS 2'S COMPLEMENT OF NUMBER OF SHIFTS ON ENTRY, 0 AT EXIT
1260    SHR,    DB, SC:=SC                                      FREE*
1261    SHR1B,  DB, SC:=SC[12BIT]K14                            FREE*
1262            NO OPERATION                                    FREE*   IF EXPFL, SHR1A (1264)
1263            DB, SC:=SC[12BIT]M14                            FREE*   RETURN
1264    SHR1A,  NO OPERATION                                    FREE*   IF EXPFL, RWM (1300)
1265            DB, SC:=SC[12BIT]M14                            FREE*
1266    SHR1,   DB, SC:=SC[12BIT]K1                             FREE*
1267            DB, SCRATCHM:=[SHR]SCRATCHM                     FREE*
1270            DB, SCRATCHN:=[SHR][EXT]SCRATCHN                FREE*   IF EP, SHR2 (1273)
1271            DB, SCRATCHP:=[SHR][EXT]SCRATCHP                FREE*   IF EXPFL, SHR1 (1266)
1272            NO OPERATION                                    FREE*   RETURN
1273    SHR2,   DB, SCRATCHP:=[SHR][EXT]SCRATCHP                FREE*
1274            DB, SCRATCHR:=[SHR][EXT]SCRATCHR                FREE*
1275            DB, SCRATCHS:=[SHR][EXT]SCRATCHS                FREE    IF EXPFL, SHR1 (1266)
1276            DB, SCRATCHT:=[SHR][EXT]SCRATCHT                FREE*
1277            NO OPERATION                                    FREE*   RETURN
1300    RWM,    DB, TEMP:=SCRATCHN                              FREE*   IF NOT EP, RWM1 (1310)
1301            DB, TEMP:=SCRATCHS                              FREE*
1302            DB, SCRATCHT:=TEMP                              FREE*
1303            DB, TEMP:=SCRATCHR                              FREE*
1304            DB, SCRATCHS:=TEMP                              FREE*
1305            DB, TEMP:=SCRATCHP                              FREE*
1306            DB, SCRATCHR:=TEMP                              FREE*
1307            DB, TEMP:=SCRATCHN                              FREE*
1310    RWM1,   DB, SCRATCHP:=TEMP                              FREE*
1311            DB, TEMP:=SCRATCHM                              FREE*
1312            DB, SCRATCHN:=TEMP                              FREE*
1313            DB, SCRATCHM:=[SIGN]SCRATCHM                    FREE*   GO TO, SHR1B (1261)

        /SUBROUTINE--EXCHANGE SCRATCH AND TEMP FRACTIONS.
1314    EST,    DB, TEMP:=SCRATCHM                              FREE*
1315            DB, SCRATCHM:=TEMP1                             FREE*
1316            DB, TEMP1:=TEMP                                 FREE*   IF NOT EP, EST1 (1330)
1317            DB, TEMP:=SCRATCHP                              FREE*
1320            DB, SCRATCHP:=TEMP3                             FREE*
1321            DB, TEMP3:=TEMP                                 FREE*
1322            DB, TEMP:=SCRATCHR                              FREE*
1323            DB, SCRATCHR:=TEMP4                             FREE*
1324            DB, TEMP4:=TEMP                                 FREE*
1325            DB, TEMP:=SCRATCHS                              FREE*
1326            DB, SCRATCHS:=TEMP5                             FREE*
1327            DB, TEMP5:=TEMP                                 FREE*
1330    EST1,   DB, TEMP:=SCRATCHN                              FREE*
1331            DB, SCRATCHN:=TEMP2                             FREE*
1332            DB, TEMP2:=TEMP                                 FREE*   RETURN
```

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        /PAGE 16
        /SUBROUTINE--MOVE FAC FRACTION TO SCRATCH.
1333    FTOS,   DB, TEMP:=FACM                                  FREE*
1334    FTOS1,  DB, SCRATCHM:=TEMP                              FREE*   IF NOT EP, FTOS3 (1346)
1335            DB, SCRATCHT:=[0]                               FREE*
1336            DB, TEMP:=FACP                                  FREE*
1337            DB, SCRATCHP:=TEMP                              FREE*
1340            DB, TEMP:=FACR                                  FREE*
1341            DB, SCRATCHR:=TEMP                              FREE*
1342            DB, TEMP:=FACS                                  FREE*
1343            DB, SCRATCHS:=TEMP                              FREE*
1344    FTOS2,  DB, TEMP:=FACN                                  FREE*
1345            DB, SCRATCHN:=TEMP                              FREE*   RETURN
1346    FTOS3,  DB, SCRATCHP:=[0]                               FREE*   GO TO, FTOS2 (1344)

        //////////////////////MOVE SCRATCH TO FAC AND EXIT///////////////
1347    STUF,   DB, TEMP:=SCRATCHM                              FREE*
1350    STUF1,  DB, FACM:=TEMP                                  FREE*   IF NOT EP, STUF2 (1357)
1351            DB, TEMP:=SCRATCHP                              FREE*
1352            DB, FACP:=TEMP                                  FREE*
1353            DB, TEMP:=SCRATCHN                              FREE*
1354            DB, FACR:=TEMP                                  FREE*
1355            DB, TEMP:=SCRATCHS                              FREE*
1356            DB, FACS:=TEMP                                  FREE*
1357    STUF2,  DB, TEMP:=SCRATCHN                              FREE*   IF TEMPZERO, STUF3 (1361)
1360            DB, FACN:=TEMP                                  FREE*   EXTEST
1361    STUF3,  DB, FACN:=TEMP                                  FREE*   IF DP, END (1015)
1362            DB, TEMP7, FACE:=[0]                            FREE*   EXTEST
```



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        /PAGE 17
        //////////////////FLOATING POINT ARITHMETIC//////////////////////////
        *1400
        /POINTERS TO THE ARITHMETIC ROUTINES
1400    DPADD,  DB, TEMP:=FACM                                  FREE    GO TO, DPLUS (1413)
1401    FADD,   DB, TEMP7:=FACE                                 FREE    GO TO, FPLUS (1422)
1402    FMUL,   DB, TEMP7:=FACE                                 FREE*   GO TO, FTIMES (1472)
1403    FDIV,   DB:=[SHL]FACM                                   FREE    GO TO, FDUO (1562)
1404    IMUL,   DB:=TEMP2                                       FREE*   GO TO, IMUL1 (1540)
        /RECOVER FROM OVERFLOW.  USED BY FP AND EP NMI, FADD, FDIV
1405    OVREC,  DB, SC:=SC[12BIT]K1                             FREE*
1406            DB, SCRATCHM:=[OVFREC]SCRATCHM                  FREE*
1407            DB, SCRATCHN:=[SHR][EXT]SCRATCHN                FREE*   TEST OVFLO
1410            DB, SCRATCHP:=[SHR][EXT]SCRATCHP                FREE*   IF NOT EP, RND (1240)
1411            DB, SCRATCHR:=[SHR][EXT]SCRATCHR                FREE*
1412            DB, SCRATCHS:=[SHR][EXT]SCRATCHS                FREE*   RETURN

        /////DPADD--ADD FIXED POINT FAC AND TEMP/////
1413    DPLUS,  DB, SCRATCHM:=TEMP                              FREE*   SUB, FTOS2 (1344)
1414            DB, SCRATCHN:=SCRATCHN[12BIT]TEMP2              FREE*
1415            DB, SCRATCHM:=SCRATCHM[12BIT][EXT]TEMP1         FREE*
1416    DPLUS1, NO OPERATION                                    FREE*
1417    DPADD0, NO OPERATION                                    FREE*   TEST OVFLO
1420    DPADD1, NO OPERATION                                    FREE*   IF MEM, DEPOS (353)
1421    DPADD2, DB, TEMP:=SCRATCHM                              FREE*   GO TO, STOF1 (1350)

        ////////FLOATING POINT ADD////////////
        /FIRST TEST FOR ZERO ARGUMENT.
1422    FPLUS,  DB, SC:=TEMP7                                   FREE*   IF TEMPZERO, FADD11 (1453)
1423            DB, SCRATCHE:=TEMP7                             FREE*   SUB, FTOS (1333)
1424            DB, TEMP7, SC:=SC[MINUS]TEMP6                   FREE*   IF FACZERO, FADD8 (1455)
        /NOW FIND SMALLER EXPONENT.  TEST FOR OVERSHIFT.
1425            NO OPERATION                                    FREE*
1426            NO OPERATION                                    FREE*   IF OVFLO, FADD1 (1457)
1427            NO OPERATION                                    FREE*   IF EXPFL, FPLUS1 (1462)
1430            DB, SC:=[MINUS]TEMP7                            FREE*
1431            DB:=SC[MINUS]M30                                FREE*   IF NOT EP, FPLUS2 (1433)
1432            DB:=SC[MINUS]M73                                FREE*
1433    FPLUS2, NO OPERATION                                    FREE*
1434            NO OPERATION                                    FREE*   IF SGN, FADD1A (1460)
1435            DB, TEMP6:=FACE                                 FREE*   SUB, EST (1314)
        /ALIGN NUMBERS.  SMALLER NUMBER IS IN SCRATCH; SC CONTAINS EXP DIFF.
        /DIFFERENCE IN EXPONENTS IS SMALL ENOUGH THAT A NON-ZERO
        /NUMBER WILL BE IN SCRATCH AFTER THE SHIFT.
1436    FADD4,  NO OPERATION                                    FREE*   SUB, SHR (1268)
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        /PAGE 18
        /ADD FRACTIONS
1437    FA,     DB, SCRATCHS:=SCRATCHS[12BIT]TEMP5      FREE*   IF NOT EP, FB (1467)
1440            DB, SCRATCHR:=SCRATCHR[12BIT][EXT]TEMP4 FREE*
1441            DB, SCRATCHP:=SCRATCHP[12BIT][EXT]TEMP3 FREE*
1442            DB, SCRATCHN:=SCRATCHN[12BIT][EXT]TEMP2 FREE*
1443    FADD7,  DB, SCRATCHM:=SCRATCHM[12BIT][EXT]TEMP1 FREE*
1444            DB, SC:=TEMP6                           FREE*
1445            NO OPERATION                            FREE*   IF OVFLO, FADD2 (1470)
        /NORMALIZE RESULT.
1446    FADD8,  NO OPERATION                            FREE*   SUB, NMI (1177)
1447    FADD9,  DB, TEMP7:=SC                           FREE*   IF NZSET, FADD10 (1451)
        /CLEAR SCRATCH IF NON-TRAPPED EXPONENT UNDERFLOW
1450    FADD9A, DB, TEMP7:=[0]                          FREE*   SUB, CLRS (1111)
        /STORE IN EITHER MEMORY OR FAC, DEPENDING ON OP CODE.
1451    FADD10, DB, SCRATCHE:=TEMP7                     FREE*   IF MEM, DEPOS (353)
1452            DB, FACE:=TEMP7                         FREE*   GO TO, STOF (1347)
        /ZEROS IN TEMP.  FAC HOLDS ANSWER.
1453    FADD11, DB, TEMP:=FACM                          FREE*   SUB, FTOS1 (1334)
1454            NO OPERATION                            FREE*   GO TO, FADD8 (1446)
        /FAC IS ZERO OR OVERSHIFT OCCURRED.  TEMP HOLDS ANSWER.
1455    FADD0,  DB, SC:=TEMP6                           FREE*   SUB, EST (1314)
1456            NO OPERATION                            FREE*   GO TO, FADD8 (1446)
        /DIFF IN EXPONENTS SO BIG THAT THE SHIFT SUBTRACTION
        /OVERFLOWED.  SC FLAG TELLS WHICH ARGUMENT LARGER.
1457    FADD1,  NO OPERATION                            FREE*   IF EXPFL, FADD0 (1455)
1460    FADD1A, DB, TEMP7:=FACE                         FREE*
1461            DB, SC:=TEMP7                           FREE*   GO TO, FADD8 (1446)
        /TEST FOR OVERSHIFT, BUT BYPASS EXCHANGE.
1462    FPLUS1, DB:=SC[MINUS]M30                        FREE*   IF NOT EP, FPLUS3 (1464)
1463            DB:=SC[MINUS]M73                        FREE*
1464    FPLUS3, NO OPERATION                            FREE*
1465            NO OPERATION                            FREE*   IF SGN, FADD0 (1455)
1466            NO OPERATION                            FREE*   GO TO, FADD4 (1436)
        /START FP ADD.
1467    FB,     DB, SCRATCHN:=SCRATCHN[12BIT]TEMP2      FREE*   GO TO, FADD7 (1443)
        /RECOVER FROM OVERFLOW.
1470    FADD2,  NO OPERATION                            FREE*   SUB, OVREC (1405)
1471            NO OPERATION                            FREE*   GO TO, FADD9 (1447)

        /////////FLOATING AND FIXED POINT FRACTIONAL MULTIPLY//////////
        /MULTIPLY IS DIRECT MULT OF SIGNED 2'S COMPLEMENT NUMBERS, WITH
        /A CORRECTION FOR NEGATIVE MULTIPLIER.  ENTER WITH TEMP FLAGS
        /SET, CHECK FOR ZERO FACTOR.  EXTEND SIGN OF TEMP1 INTO TEMP.
1472    FTIMES, DB, TEMA:=TEMP1                         FREE*   IF TEMPZERO, FADD9A (1450)
1473            DB, TEMP:=[SIGN]TEMA                    FREE*   IF FACZERO, FADD9A (1450)
1474            DB, SC:=TEMP7                           FREE*   SUB, CLRS (1111)
        /MULTIPLY FRACTIONS
1475            NO OPERATION                            FREE*   IF NOT EP, FMUL4 (1532)
1476            DB:=FACS                                FREE*   PRESET BIT COUNT
1477            SCRATCHP:=SCRATCHP[MDS]TEMP2            FREE*   CSUB, MUL3A (1556)
1500            DB, TEMP7:=SCRATCHN                     FREE*   SUB, R2MA (1125)
1501            DB:=FACR                                FREE*
1502            SCRATCHR:=SCRATCHR[MDS]TEMP3            FREE*   CSUB, MUL4A (1555)
1503            DB, TEMP7:=SCRATCHP                     FREE*   SUB, R2MB (1123)
1504            DB:=FACP                                FREE*
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        /PAGE 19
1505            SCRATCHS:=SCRATCHS[MDS]TEMP4            FREE*   CSUB, MUL5A (1554)
1506            DB, TEMP7:=SCRATCHR                     FREE*   SUB, R2ME (1121)
1507            DB:=FACN                                FREE*
1510            SCRATCHT:=SCRATCHT[MDS]TEMP5            FREE*   CSUB, MUL6A (1553)
1511            DB, TEMP7:=SCRATCHS                     FREE*   SUB, R2MF (1117)
1512            DB:=FACM                                FREE*
1513            MQM:=MQM[MDS]                           FREE*   CSUB, MUL7A (1552)
        /IF MULTIPLIER IS NEGATIVE, A CORRECTION IS REQUIRED.
1514    FMUL2,  NO OPERATION                            FREE*   IF FACSGN, FMUL6 (1522)
        /NORMALIZE (IF NOT DP), ROUND OFF RESULT IF NOT EP MODE.
1515    R,      NO OPERATION                            FREE*   SUB, NMI (1177)
        /ADD EXPONENTS, TEST FOR EXPONENT OVERFLOW.
1516            DB, SC:=SC[12BIT]TEMP6                  FREE*
1517    FMUL3,  NO OPERATION                            FREE*   IF DP, DPADD1 (1420)
1520            NO OPERATION                            FREE*   TEST OVFLO
1521            NO OPERATION                            FREE*   GO TO, FADD9 (1447)

        /CORRECTION FOR NEGATIVE MULTIPLIER--SUBTRACT 2*MULTIPLICAND
1522    FMUL6,  DB, SCRATCHS:=SCRATCHS[MINUS]TEMP5      FREE*   SUB, N (1525)
1523            DB, SCRATCHS:=SCRATCHS[MINUS]TEMP5      FREE*   SUB, N (1525)
1524            NO OPERATION                            FREE*   GO TO, R (1515)
1525    N,      DB, SCRATCHR:=SCRATCHR[MINUS][EXT]TEMP4 FREE*   IF EP, M (1530)
1526            DB, SCRATCHN:=SCRATCHN[MINUS]TEMP2      FREE*
1527    P,      DB, SCRATCHM:=SCRATCHM[MINUS][EXT]TEMP1 FREE*   RETURN
1530    M,      DB, SCRATCHP:=SCRATCHP[MINUS][EXT]TEMP3 FREE*
1531            DB, SCRATCHN:=SCRATCHN[MINUS][EXT]TEMP2 FREE*   GO TO, P (1527)

        /MULTIPLY FRACTIONS--DP OR FP
1532    FMUL4,  DB:=FACN                                FREE*   PRESET BIT COUNT
1533            SCRATCHP:=SCRATCHP[MDS]TEMP2            FREE*   CSUB, MUL3A (1556)
1534            DB, TEMP7:=SCRATCHN                     FREE*   SUB, R2MA (1125)
1535            DB:=FACM                                FREE*
1536            SCRATCHR:=SCRATCHR[MDS]                 FREE*   CSUB, MUL4A (1555)
1537            NO OPERATION                            FREE*   GO TO, FMUL2 (1514)

        ////////////////SIGNED INTEGER MULTIPLY--DP MODE ONLY//////////
1540    IMUL1,  DB, TEMA:=TEMP1                         FREE*   IF TEMPZERO, FADD9A (1450)
1541            DB, TEMP:=[SIGN]TEMA                    FREE*   IF FACZERO, FADD9A (1450)
1542            NO OPERATION                            FREE*   SUB, CLRS (1111)
1543            DB:=FACM                                FREE*   PRESET BIT COUNT
1544            SCRATCHN:=SCRATCHN[MDS]TEMP2            FREE*   CSUB, IMUL2 (1560)
1545            DB:=SCRATCHN                            FREE*   PRESET BIT COUNT
1546            DB:=FACN                                FREE*   TEST OVFLO
1547            SCRATCHN:=SCRATCHN[MDS]TEMP2            FREE*   CSUB, IMUL2 (1560)
1550            DB, SCRATCHM:=SCRATCHM[SHR][EXT]        FREE*
1551            DB, SCRATCHN:=SCRATCHN[SHR][EXT]        FREE*   GO TO, FMUL2 (1514)
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        /PAGE 20
        /MULTIPLY SUBROUTINES
1552    MUL7A,  SCRATCHT:=SCRATCHT[MDS][EXT]TEMP5       FREE*
1553    MUL6A,  SCRATCHS:=SCRATCHS[MDS][EXT]TEMP4       FREE*
1554    MUL5A,  SCRATCHR:=SCRATCHR[MDS][EXT]TEMP3       FREE*
1555    MUL4A,  SCRATCHP:=SCRATCHP[MDS][EXT]TEMP2       FREE*
1556    MUL3A,  SCRATCHN:=SCRATCHN[MDS][EXT]TEMP1       FREE*
1557            SCRATCHM:=SCRATCHM[MDS][EXT]TEMP        FREE*   RETURN

1560    IMUL2,  NO OPERATION                            FREE*   TEST OVFLO
1561            SCRATCHM:=SCRATCHM[MDS][EXT]TEMP1       FREE*   RETURN

        //////////FLOATING AND FIXED POINT DIVIDE//////////
        /SHIFT LINK HOLDS FAC SIGN AT ENTRY.  CHECK FIRST FOR ZERO DIVISOR
        /(SET DIVZERO FLAG AND EXIT); IF IN FP OR EP MODE, MAKE SURE
        /DIVISOR NORMED--IF NOT, DO IT; THEN CHECK FOR ZERO DIVIDEND (ANS
        /ALREADY IN FAC).  XOR FRACTION SIGNS AND MAKE SIGN OF TEMA
        /EQUAL TO SIGN OF RESULT.  SETTING DB=1 AT "FQUO1"
        /FORCES CORRECT FIRST DIVIDE OPERATION, SINCE HARDWARE
        /EXAMINES DB11 TO DETERMINE WHAT TO DO.  THE DIVIDE IS A NON-
        /RESTORING DIVIDE OF A SIGNED DIVISOR AND A POSITIVE DIVIDEND.

1562    FQUO,   DB, TEMA:=[SHR][EXT]                    FREE    IF TEMPZERO, FDIV6 (1630)
1563            DB, SCRATCHP:=[0]                       FREE    IF DP, FQUO2 (1570)
1564            DB, SCRATCHT:=[0]                       FREE    IF NORMED, FQUO2 (1570)
1565            DB, SC:=TEMP6                           FREE*   SUB, EST (1314)
1566            NO OPERATION                            FREE*   SUB, NMI (1177)
1567            DB, TEMP6:=SC                           FREE*   SUB, EST (1314)
1570    FQUO2,  DB, TEMP:=FACE                          FREE*   IF FACZERO, CLRFAC (1650)
1571            DB, SC:=TEMP                            FREE*   SUB, FTOS (1333)
1572            DB, TEMP7:=TEMP1                        FREE*   IF FACSGN, FDIV1 (1624)
1573    FQUO1,  DB, TEMA:=TEMA[12BIT]TEMP1              FREE*   PRESET BIT COUNT
1574            DB:=K1                                  FREE*   IF NOT EP, FDIV10 (1632)
1575            SCRATCHT:=SCRATCHT[MDS]                 FREE*   CSUB, DIV6A (1661)
1576            MQM:=DB                                 FREE*   PRESET BIT COUNT
1577            SCRATCHT:=SCRATCHT[MDS]                 FREE*   CSUB, DIV6A (1661)
1600            MQN:=DB                                 FREE*   PRESET BIT COUNT
1601            SCRATCHS:=SCRATCHS[MDS]TEMP5            FREE*   CSUB, DIV5A (1662)
1602            MQP:=DB                                 FREE*   PRESET BIT COUNT
1603            SCRATCHR:=SCRATCHR[MDS]TEMP4            FREE*   CSUB, DIV4A (1663)
1604            MQR:=DB                                 FREE*   PRESET BIT COUNT
1605            SCRATCHP:=SCRATCHP[MDS]TEMP3            FREE*   CSUB, DIV3A (1664)
        /MOVE QUOTIENT INTO SCRATCH
1606            SCRATCHS:=DB                            FREE*
1607            DB, SCRATCHT:=[0]                       FREE*
1610            DB, TEMP:=MQR                           FREE*
1611            DB, SCRATCHR:=TEMP                      FREE*
1612            DB, TEMP:=MQP                           FREE*
1613            DB, SCRATCHP:=TEMP                      FREE*
1614    FDIV2,  DB, TEMP:=MQM                           FREE*
1615            DB, SCRATCHM:=TEMP                      FREE*
1616            DB, TEMP:=MQN                           FREE*
1617            DB:=TEMA                                FREE*
1620            DB, SCRATCHN:=TEMP                      FREE*   IF TEMPSGN, FDIV4 (1644)
        /NEGATIVE QUOTIENT AT THIS POINT INDICATES DIVIDE OVERFLOW.
1621    FDIV3,  NO OPERATION                            FREE*   IF SGN, FDIV8 (1626)
1622    FDIV9,  NO OPERATION                            FREE*   SUB, NMI (1177)
1623    FDIV5,  DB, SC:=SC[MINUS]TEMP6                  FREE*   GO TO, FMULS (1517)
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        /PAGE 21

        /COMPLEMENT SCRATCH IF FAC IS NEGATIVE TO MAKE DIVIDEND ALWAYS POS.
1624    FDIV1,  NO OPERATION                            FREE*   SUB, COMPS (1133)
1625            NO OPERATION                            FREE*   GO TO, FQUO1 (1573)

        /COMPLEMENT RESULT IF TEMA NEGATIVE.
1626    FDIV8,  NO OPERATION                            FREE*   SUB, COMPS (1133)
1627            NO OPERATION                            FREE*   GO TO, FDIV9 (1622)

        /DIVISOR IS ZERO.  SET "DIVIDE BY ZERO" FLAG, EXIT.
1630    FDIV6,  NO OPERATION                            FREE*   SET DIV0
1631            NO OPERATION                            FREE*   GO TO, EXSTMT (1000)

        /DO 24-BIT DIVIDE
1632    FDIV10, SCRATCHP:=SCRATCHP[MDS]TEMP3            FREE*   CSUB, DIV3A (1664)
1633            MQM:=DB                                 FREE*   PRESET BIT COUNT
1634            SCRATCHP:=SCRATCHP[MDS]TEMP3            FREE*   CSUB, DIV3A (1664)
1635            MQN:=DB                                 FREE
1636            SCRATCHP:=SCRATCHP[MDS]TEMP3            FREE*   SUB, DIV3A (1664)
1637            SCRATCHP:=SCRATCHP[MDS]TEMP3            FREE*   SUB, DIV3A (1664)
1640            DB:=[SHR]DB                             FREE*
1641            SCRATCHP:=[SHR][EXT]                    FREE*
1642            DB:=[SHR]DB                             FREE*
1643            DB, SCRATCHP:=[SHR][EXT]SCRATCHP        FREE*   GO TO, FDIV2 (1614)

        /OVERFLOW OCCURED.
        /DP MODE: OVERFLOW IS BY AN UNKNOWN AMOUNT.  SET DP OVFLO BIT.
        /FP, EP MODES: OVERFLOW BY ONLY ONE BIT, SINCE DIVISOR IS FORCED
        /TO BE NORMALIZED BEFORE THE DIVIDE.  RECOVER.  RESULTING
        /ANSWER IS CORRECT.
1644    FDIV4,  NO OPERATION                            FREE*   IF SGN, FDIV11 (1650)
1645    FDIV12, DB:=K3777+1                             FREE*   IF DP, FDIV13 (1656)
1646            NO OPERATION                            FREE*   SUB, OVREC (1485)
1647            NO OPERATION                            FREE*   GO TO, FDIV5 (1623)
1650    FDIV11, DB:=K3777+1                             FREE*   IF DP, FDIV13 (1656)
1651            NO OPERATION                            FREE*   IF FORBIDDEN, FDIVSC (1654)
1652            NO OPERATION                            FREE*   SUB, COMPS (1133)
1653            NO OPERATION                            FREE*   GO TO, FDIV12 (1645)
        /OVERFLOW SPECIAL CASE--ANSWER IS EXACTLY 8000 0000.
1654    FDIVSC, NO OPERATION                            FREE*   SUB, NMI8 (1250)
1655            NO OPERATION                            FREE*   GO TO, FDIV5 (1623)
        /AN ADDITION WAS FORCED AT FDIV11 OR FDIV12 THAT WILL ALWAYS
        /OVERFLOW, IN ORDER TO SET DP OVERFLOW BIT
1656    FDIV13, NO OPERATION                            FREE*
1657            DB:=TEMA                                FREE*   TEST OVFLO
1660            NO OPERATION                            FREE*   GO TO, FDIV3 (1621)

        /DIVIDE SUBROUTINES
1661    DIV6A,  SCRATCHS:=SCRATCHS[MDS][EXT]TEMP5       FREE*
1662    DIV5A,  SCRATCHR:=SCRATCHR[MDS][EXT]TEMP4       FREE*
1663    DIV4A,  SCRATCHP:=SCRATCHP[MDS][EXT]TEMP3       FREE*
1664    DIV3A,  SCRATCHN:=SCRATCHN[MDS][EXT]TEMP2       FREE*
1665            SCRATCHM:=SCRATCHM[MDLST][EXT]TEMP1     FREE*   RETURN
```

```
        /PAGE 22
        /MAINTENANCE FIRMWARE
        /IOT 6550 GETS YOU HERE VIA LOCATION 17

        *1700
        /VERIFY THAT CONSTANTS ARE CORRECT
        /
        /=77777
1700    MAINT1, DB, FACE:=M1                                    FREE
        /=00000
1701            DB:=[0]                                         FREE
        /=00001
1702            DB, FPC, TEMP1:=K1                              FREE
        /=77776
1703            DB, FACM:=M2                                    FREE
        /=00002
1704            DB, X0, TEMP2:=K2                               FREE
        /=77773
1705            DB, FACN:=M5                                    FREE
        /=00003
1706            DB, OPADD, TEMP3:=K3                            FREE
        /=77772
1707            DB, FACP:=M6                                    FREE
        /=00014
1710            DB, APTP, TEMP4:=K14                            FREE
        /=77764
1711            DB, FACR:=M14                                   FREE
        /=02000
1712            DB, TEMA, TEMP5:=K2000                          FREE
        /=77751
1713            DB, FACS:=M27                                   FREE
        /=03777
1714            DB, TEMP6, SC:=K3777                            FREE
        /=77750
1715            DB, SCRATCHE:=M30                               FREE
        /=77765
1716            DB, TEMP7, BR:=M73                              FREE

        /REVISION NUMBER FOR THIS MICRO CODE.
        /THE REVISION NUMBER IS A TWO DIGIT NUMBER AND USES THE FOLLOWING
        /CONVERSION TABLE
        /       DIGIT   NUMBER IN DB            DIGIT   NUMBER IN DB
        //      0       0                       5       M2
        //      1       K1                      6       M5
        //      2       K2                      7       M6
        //      3       K3                      8       M27
        //      4       M1                      9       M73
        ////REV NUMBER IN LOCATIONS VMSB AND VLSB

1717    VMSB,   DB:=[0]                                         FREE
1720    VLSB,   DB:=[0]                                         FREE    SUB, FTOS (1333)
        /SUBROUTINE FTOS WILL MOVE FAC TO SCRATCH

        /=0
1721            DB:=SCRATCHT                                    FREE    SUB, EST (1314)
        /SUBROUTINE EST WILL EXCHANGE SCRATCHM-S WITH TEMP1-5
```



```
        /PAGE 23

        /CHECK REGISTERS FOR CORRECT VALUES.

        /=00001
1722            DB:=FPC                                         FREE
        /=00002
1723            DB:=X0                                          FREE
        /=77750
1724            DB:=BR                                          FREE
        /=00003
1725            DB:=OPADD                                       FREE
        /=00014
1726            DB:=APTP                                        FREE
        /=02000
1727            DB:=TEMA                                        FREE
        /=03777
1730            DB:=SC                                          FREE
        /=77777
1731            DB:=FACE                                        FREE
        /=03777
1732            DB:=TEMP6                                       FREE
        /=77765
1733            DB:=TEMP7                                       FREE
        /=77750
1734            DB:=SCRATCHE                                    FREE

        /CHECK THE ADD FUNCTION
        /03777+77772=03771
1735            DB:=SC[+]TEMP3                                  FREE
        /02000+00014+1=02015
1736            DB:=SCRATCHS[+]K14+1                            FREE
        /77776+[12BITS]2+1=00001
1737            DB:=X0[12BIT]TEMP1+1                            FREE

        /CHECK [R3R]
        /77750=07775
1740            DB:=[R3R]SCRATCHE                               FREE
        /07775+03777=13774    [R3R]=41377
1741            DB:=DB[R3R]SC                                   FREE
        /0 TO SCRATCHE
1742            DB, SCRATCHE:=[0]                               FREE
        /CHECK THAT SCRATCHE IS 0
1743            DB, SCRATCHE:=[R3R]SCRATCHE                     FREE
```

```
        /PAGE 24

        /ADDRESS MULTIPLICATION
        /TIMES 2  (A+B)X2
1744            DB, SCRATCHR:=K3777+1                       FREE
        /(4000+14)*2=10030
1745            DB, TEMP:=SCRATCHR(2*)K14                   FREE

        /TIMES 3
        /10030*3=30110
1746            DB, TEMP1:=(3*)TEMP                         FREE

        /TIMES 6
        /20660*6 = 20660
1747            DB, FACM:=(6*)TEMP1                         FREE

        /R3R TO CHECK MSB OF ADDRESS CALCULATION
        /20660 =  (R3R)  =  02066
1750            DB, FACM:=(R3R)FACM                         FREE

        /CHECK ABILITY TO MASK BITS, ROTATE AND ADD
        /10000 + 2000 =12000  (R3R) =01200
1751            DB, TEMA:=TEMP<11:3>,0(R3R)TEMA             FREE
        /ADD THE RESULT, OR IN THE "OR" STATEMENT BITS, PUT IN BITS 9-11
1752            DB, FPC:=(R3R)FPC                           FREE
1753            DB:=1030!FPC<11:3>                          FREE

        /CHECK SUBTRACT  (MINUS)
        /A + NOT B + CARRY = RESULT
        /0 MINUS 0 = 0
1754            DB:=(MINUS)                                 FREE
        /0-M1=1
1755            DB:=SCRATCHT(MINUS)M1                       FREE

        /OVERFLOW RECOVERY
        /SET SIGN BIT = COMPLEMENT.  REPLACE SIGN BIT AND ALL OTHER BITS
        /SHIFTED RIGHT
        /2000 (OVERFLOW RECOVER) = 5033
1756            DB:=(OVFREC)FACM                            FREE


        //CHECK SHIFT LEFT (12 BITS)
        /2000+1 SHL = 4002
1757            DB, SCRATCHT:=(SHL)K2000+1                  FREE
        / =0000 + BIT IN LINK
1760            DB, SCRATCHT:=(EXT)(SHL)SCRATCHT            FREE
        / =0011
1761            DB, SCRATCHT:=(EXT)(SHL)SCRATCHT            FREE
        / =0022
1762            DB, SCRATCHT:=(EXT)(SHL)SCRATCHT            FREE
```



```
        /PAGE 25

        /DATA BREAK TEST
        /DEPOSIT ALL 1'S IN LOCATION 15
        /NOTE: SUBROUTINE "EXST1" REQUIRES APTP BE 1 LESS THAN
        //LOCATION WHERE BREAK IS TO OCCUR.

1763            DB:=(12BIT)M1                               FREE    SUB, EXST1 (165)

        /DEPOSIT ALL 0 IN LOCATION 7777
        /SET APTP TO 7776
1764            DB, APTP:=(12BIT)M1                         FREE
1765            DB, APTP:=APTP(12BIT)M1                     FREE
1766            DB:=(0)                                     FREE    SUB, EXST1 (165)

        /TEST FIELD LOCATION,  TEMP=10030 AT START.
1767            DB, FIELD:=TEMP                             FREE
1770            DB:=(0)                                     FREE
1771            DB:=FIELD                                   FREE

        /LEAVE ROUTINE WITH INTERRUPT
1772            NO OPERATION                                FREE
1773            NO OPERATION                                FREE
1774            NO OPERATION                                FREE    GO TO, FLAG (1)
```

REV.	NUMBER	CODE	SIZE
	M8410-0-10	CS	K

REVISIONS	CHANGE NO.	REV.
CHK		

FIRST USED ON OPTION MODEL
M8410

QTY.	DESCRIPTION	PART NO.	ITEM NO.
	PARTS LIST		

DRN. K. Davis	DATE 3-5-76	digital EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS
CHKD.	DATE 3/7/76	
ENG.	DATE 19 MAY 76	
PROJ. ENG.	DATE 5/19/76	
PROD.	DATE 5-19-76	
NEXT HIGHER ASSEMBLY B-DD-M8417-0		
SCALE — / —		
SHEET 1 OF 2		

TITLE

FPLA
PATTERN SPEC
2300IC5

SIZE	CODE	NUMBER	REV.
K	CS	M8410-0-10	*

DIST.

DEC FORM NO. DRB 109

FPP8A PROGRAMMABLE LOGIC ARRAY DEC P/N 23001C5
D. A. WHITE 1/15/76, REV 1/19/76 (ADD P/N)

TRUTH TABLE (H=HIGH, L=LOW, "-"=DONT CARE IF INPUT, OR NOT CONNECTED IF OUTPUT):

PROD	INPUT PIN														OUTPUT PIN								INSTRUCTION
TERM	11	10	9	8	7	6	5	4	3	2	1	23	22	21	20	19	18	17	16	15	14	13	
00	H	L	H	H	H	-	-	-	-	-	-	-	-	H	-	-	-	-	L	-	L	L	JNX
01	H	H	L	H	H	L	H	H	H	-	-	-	-	H	-	-	-	-	L	L	L	-	SETX
02	H	H	L	H	H	L	H	H	L	-	-	-	-	H	-	-	-	-	L	L	L	L	SETB
03	H	H	H	H	H	L	H	H	H	-	-	-	-	H	-	-	-	L	-	-	-	-	LDX
04	H	H	H	H	H	L	H	H	L	-	-	-	-	H	-	-	-	L	-	-	L	-	ADDX
05	H	H	L	H	H	L	H	L	H	-	-	-	-	H	-	-	-	L	-	L	-	-	JSA
06	H	H	L	H	H	L	H	L	L	-	-	-	-	H	-	-	-	L	L	-	-	-	JSR
07	H	H	H	H	H	H	H	L	H	-	-	-	-	H	-	L	-	L	-	-	-	-	ATX
08	H	H	H	H	H	H	H	L	L	-	-	-	-	H	-	-	-	L	L	L	-	L	XTA
09	H	L	L	H	H	-	-	-	-	-	-	-	-	H	-	-	-	L	L	L	L	-	TRAP
10	L	H	H	H	H	-	-	-	-	-	-	-	-	H	-	-	-	L	L	L	L	-	TRAP
11	-	-	-	H	L	-	-	-	-	-	-	-	L	H	-	-	-	L	-	-	-	-	DIRPP--DIRECT BASE PAGE ADDRESSING (NOT DP)
12	-	-	-	H	L	-	-	-	-	-	-	-	H	H	-	-	L	-	-	-	-	L	DIRDP--DIRECT BASE PAGE ADDRESSING (DP)
13	-	-	-	L	H	-	-	-	-	-	-	-	-	H	-	-	L	-	-	L	-	-	24-BIT ADDRESSING
14	L	L	H	H	H	-	-	-	-	-	-	-	-	H	-	-	L	-	-	L	-	-	24-BIT ADDRESSING (LEA OR IMUL)
15	-	-	-	L	-	L	H	H	H	-	-	-	-	H	-	-	L	-	-	L	-	L	INCREMENT XR0 (24-BIT OR INDIRECT ADDRESSING)
16	L	L	-	H	H	L	H	H	H	-	-	-	-	H	-	-	L	-	-	L	-	L	INCREMENT XR0 (24-BIT OR INDIRECT, LEA OR IMUL)
17	-	-	-	L	-	H	H	H	H	-	-	-	-	H	-	-	L	-	-	L	L	-	DO NOT INCREMENT (24-BIT OR INDIRECT ADDRESSING)
18	L	L	-	H	H	H	H	H	H	-	-	-	-	H	-	-	L	-	-	L	L	-	DO NOT INCR (24-BIT OR INDIRECT ADDR--LEA, LEAI, IMUL)
19	-	-	-	L	L	-	-	-	-	-	-	-	-	H	-	-	L	-	L	L	-	-	INDIRECT ADDRESSING
20	L	L	L	H	H	-	-	-	-	-	-	-	-	H	-	-	L	-	L	L	-	-	INDIRECT ADDRESSING (LEAI OR IMULI)
21	L	H	L	H	H	H	-	-	-	-	-	-	-	H	-	L	-	-	-	-	-	L	LTR ("OR"ED WITH BRANCH)
22	-	H	L	H	H	H	H	-	-	L	-	-	-	H	-	-	-	-	-	L	L	-	BRANCH TRUE--FAC=0
23	-	H	L	H	H	H	H	H	L	-	L	-	-	H	-	-	-	-	-	L	L	-	BRANCH TRUE--FAC>=0
24	-	H	L	H	H	H	H	L	H	-	H	-	-	H	-	-	-	-	-	L	L	-	BRANCH TRUE--FAC<=0
25	-	H	L	H	H	H	H	L	L	-	-	-	-	H	-	-	-	-	-	L	L	-	BRANCH TRUE--ALWAYS
26	-	H	L	H	H	H	L	H	H	H	-	-	-	H	-	-	-	-	-	L	L	-	BRANCH TRUE--FAC<>0
27	-	H	L	H	H	H	L	H	L	-	H	-	-	H	-	-	-	-	-	L	L	-	BRANCH TRUE--FAC<0
28	-	H	L	H	H	H	L	L	H	H	L	-	-	H	-	-	-	-	-	L	L	-	BRANCH TRUE--FAC>0
29	-	H	L	H	H	H	L	L	L	-	-	L	-	H	-	-	-	-	-	L	L	-	BRANCH TRUE--SIGN H NEGATED (JAL TEST)
30	-	H	L	H	H	H	H	H	H	H	-	-	-	H	L	-	-	-	L	-	L	-	BRANCH FALSE--FAC<>0
31	-	H	L	H	H	H	H	H	L	-	H	-	-	H	L	-	-	-	L	-	L	-	BRANCH FALSE--FAC<0
32	-	H	L	H	H	H	H	L	H	H	L	-	-	H	L	-	-	-	L	-	L	-	BRANCH FALSE--FAC>0
33	-	H	L	H	H	H	L	-	H	L	-	-	-	H	L	-	-	-	L	-	L	-	BRANCH FALSE--FAC=0
34	-	H	L	H	H	H	L	H	L	-	L	-	-	H	L	-	-	-	L	-	L	-	BRANCH FALSE--FAC<0
35	-	H	L	H	H	H	L	L	H	-	H	-	-	H	L	-	-	-	L	-	L	-	BRANCH FALSE--FAC>=0
36	-	H	L	H	H	H	L	L	L	-	-	H	-	H	L	-	-	-	L	-	L	-	BRANCH FALSE--SIGN NEGATIVE (JAL TEST)
37	H	H	L	H	H	L	L	-	-	-	-	-	-	H	L	-	-	-	-	-	-	-	UNUSED INSTRUCTION
38	H	H	H	H	H	H	L	L	-	-	-	-	-	H	L	-	-	-	-	-	-	-	UNUSED INSTRUCTION
39	H	H	H	H	H	H	L	H	L	-	-	-	-	H	L	-	-	-	-	-	-	-	UNUSED INSTRUCTION
40	H	H	H	H	H	H	L	L	-	-	-	-	-	H	L	-	-	-	-	-	-	-	UNUSED INSTRUCTION
41	L	H	L	H	H	L	-	-	-	-	-	-	-	H	L	-	-	-	-	-	-	-	UNUSED INSTRUCTION
42	H	H	H	H	H	H	L	H	H	-	-	-	-	H	L	-	-	-	-	-	-	-	NOP
43	H	H	H	H	H	H	L	H	L	-	-	-	-	H	-	L	-	-	L	-	-	-	STARTE
44	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
47	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

DEC PART NUMBER: 23-301A2-00
LEFT COLUMN OF BIN DATA IS MSB

ORIGINATOR: D.A.WHITE
DATE ORIGINATED: 30-MAR-76

BINARY DATA "1" = HIGH
BINARY DATA "0" = LOW

DEC LOC	OCT LOC	BIN DATA	DEC LOC	OCT LOC	BIN DATA	DEC LOC	OCT LOC	BIN DATA	DEC LOC	OCT LOC	BIN DATA
0	000	0000	32	040	0000	64	100	0000	96	140	0000
1	001	0000	33	041	0000	65	101	0000	97	141	0000
2	002	0000	34	042	0000	66	102	0000	98	142	0000
3	003	0000	35	043	0000	67	103	0000	99	143	0000
4	004	0000	36	044	0000	68	104	0000	100	144	0000
5	005	0000	37	045	0000	69	105	0000	101	145	0000
6	006	0000	38	046	0000	70	106	0000	102	146	0000
7	007	0000	39	047	0000	71	107	0000	103	147	0000
8	010	0000	40	050	0000	72	110	0000	104	150	0000
9	011	0000	41	051	0000	73	111	0000	105	151	0000
10	012	0000	42	052	0000	74	112	0000	106	152	0000
11	013	0000	43	053	0000	75	113	0000	107	153	0000
12	014	0000	44	054	0000	76	114	0000	108	154	0000
13	015	0000	45	055	0000	77	115	0000	109	155	0000
14	016	0000	46	056	0000	78	116	0000	110	156	0000
15	017	0000	47	057	0000	79	117	0000	111	157	0000
16	020	0000	48	060	0000	80	120	0000	112	160	0000
17	021	0000	49	061	0000	81	121	0000	113	161	0000
18	022	0000	50	062	0000	82	122	0000	114	162	0000
19	023	0000	51	063	0000	83	123	0000	115	163	0000
20	024	0000	52	064	0000	84	124	0000	116	164	0000
21	025	0000	53	065	0000	85	125	0000	117	165	0000
22	026	0000	54	066	0000	86	126	0000	118	166	0000
23	027	0000	55	067	0000	87	127	0000	119	167	0000
24	030	0000	56	070	0000	88	130	0000	120	170	0000
25	031	0000	57	071	0000	89	131	0000	121	171	0000
26	032	0000	58	072	0000	90	132	0000	122	172	0000
27	033	0000	59	073	0000	91	133	0000	123	173	0000
28	034	0000	60	074	0000	92	134	0000	124	174	0000
29	035	0000	61	075	0000	93	135	0000	125	175	0000
30	036	0000	62	076	0000	94	136	0000	126	176	0000
31	037	0000	63	077	0000	95	137	0000	127	177	0000

REV		FIRST USED ON OPTION MODEL		DIGITAL EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS			
		FPP8-A					
		DRN. Jack A. Mason	DATE 17 MAY 76	TITLE			
PEVISIONS	CHANGE NO	CHK'D [signature]	DATE 5/19/76	256 X 4 ROM/PROM PATTERN SPEC 23-301A2-00			
		ENG. [signature]	DATE 17 MAY 76				
		PROJ. ENG. [signature]	DATE 5/19/76				
		PROD. [signature]	DATE 5-19-76	SIZE: K	CODE: CS	NUMBER: M8410-0-42	REV
CHK		NEXT HIGHER ASSEMBLY B-DD-M8410-0		DIST.			

DEC PART NUMBER: 23-301A2-00
LEFT COLUMN OF BIN DATA IS MSB

ORIGINATOR: D.A.WHITE
DATE ORIGINATED: 30-MAR-76

BINARY DATA "1" = HIGH
BINARY DATA "0" = LOW

DEC LOC	OCT LOC	BIN DATA	DEC LOC	OCT LOC	BIN DATA	DEC LOC	OCT LOC	BIN DATA	DEC LOC	OCT LOC	BIN DATA
128	200	0111	160	240	0111	192	300	0111	224	340	0111
129	201	0111	161	241	0111	193	301	0111	225	341	0111
130	202	0111	162	242	0111	194	302	0111	226	342	0111
131	203	0111	163	243	0111	195	303	0111	227	343	0111
132	204	0111	164	244	0111	196	304	0111	228	344	0111
133	205	0111	165	245	0111	197	305	0111	229	345	0111
134	206	0111	166	246	0111	198	306	0111	230	346	0111
135	207	0111	167	247	0111	199	307	0111	231	347	0111
136	210	0111	168	250	0111	200	310	1011	232	350	0111
137	211	0111	169	251	0111	201	311	0111	233	351	0111
138	212	0111	170	252	0111	202	312	0111	234	352	0111
139	213	0111	171	253	0111	203	313	0111	235	353	0111
140	214	0111	172	254	0111	204	314	1011	236	354	0111
141	215	0111	173	255	0111	205	315	0111	237	355	0111
142	216	0111	174	256	0111	206	316	0111	238	356	0111
143	217	0111	175	257	0111	207	317	0111	239	357	0111
144	220	1110	176	260	0111	208	320	1011	240	360	0111
145	221	0111	177	261	0111	209	321	0111	241	361	0111
146	222	0101	178	262	0111	210	322	0111	242	362	0111
147	223	0111	179	263	0111	211	323	0111	243	363	0111
148	224	1101	180	264	0111	212	324	1011	244	364	0111
149	225	0110	181	265	0111	213	325	0111	245	365	0111
150	226	0111	182	266	0111	214	326	0111	246	366	0111
151	227	0111	183	267	0111	215	327	0111	247	367	0111
152	230	0111	184	270	0111	216	330	0111	248	370	0111
153	231	0111	185	271	0111	217	331	0111	249	371	0111
154	232	0111	186	272	0111	218	332	0111	250	372	0111
155	233	0111	187	273	0111	219	333	0111	251	373	0111
156	234	1101	188	274	0111	220	334	1011	252	374	0111
157	235	0110	189	275	0111	221	335	0111	253	375	0111
158	236	0111	190	276	0111	222	336	0111	254	376	0111
159	237	0111	191	277	0111	223	337	0111	255	377	0111

DIGITAL EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS	TITLE: 256 X 4 ROM/PROM PATTERN SPEC 23-301A2-00	SIZE: K	CODE: CS	NUMBER: M8410-0-42	REV

DEC PART NUMBER: 23-124A1-00
LEFT COLUMN OF BIN DATA IS MSB

ORIGINATOR: D. A. WHITE
DATE ORIGINATED: 05-JAN-76

BINARY DATA "1" = HIGH
BINARY DATA "0" = LOW

DEC LOC	OCT LOC	BIN DATA
0	00	11000110
1	01	11000110
2	02	11000110
3	03	11000110
4	04	11000110
5	05	11000110
6	06	11000110
7	07	10100110
8	10	10110010
9	11	10110100
10	12	10110110
11	13	10111000
12	14	10111010
13	15	10111100
14	16	11111100
15	17	00111110
16	20	00000000
17	21	00000000
18	22	00000000
19	23	00000000
20	24	00000000
21	25	00000000
22	26	00000000
23	27	00000000
24	30	00000000
25	31	00000000
26	32	00000000
27	33	00000000
28	34	00000000
29	35	00000000
30	36	00000000
31	37	00000000

REVISIONS	REV	CHK

FIRST USED ON OPTION MODEL
FPP8-A

DRN. Jack L. Mason DATE 17 MAY 76
CHK'D DATE 5/19/76
ENG. DATE 5/19/76
PROJ. ENG. DATE 5/19/76
PROD. DATE 5-25-76
NEXT HIGHER ASSEMBLY
B-DD-M841Ø-Ø

DIGITAL EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

TITLE
32 X 8
ROM/PROM PATTERN SPEC
23-124A1-00

SIZE	CODE	NUMBER	REV
K	CS	M841Ø-Ø-43	

DIST.

DEC PART NUMBER: 23-125A1-00
LEFT COLUMN OF BIN DATA IS MSB

ORIGINATOR: D. A. WHITE
DATE ORIGINATED: 19-JAN-76

BINARY DATA "1" = HIGH
BINARY DATA "0" = LOW

DEC LOC	OCT LOC	BIN DATA	DEC LOC	OCT LOC	BIN DATA	DEC LOC	OCT LOC	BIN DATA	DEC LOC	OCT LOC	BIN DATA
0	00	10010001									
1	01	10010001									
2	02	00000000									
3	03	00000000									
4	04	00000000									
5	05	00000000									
6	06	00000000									
7	07	00000000									
8	10	10011111									
9	11	10101111									
10	12	10011111									
11	13	10011111									
12	14	10011111									
13	15	10001111									
14	16	10011111									
15	17	10111111									
16	20	10011111									
17	21	10011111									
18	22	00000000									
19	23	00000000									
20	24	00000000									
21	25	00000000									
22	26	00000000									
23	27	00000000									
24	30	10011111									
25	31	10101011									
26	32	10011111									
27	33	10011111									
28	34	10011111									
29	35	10001111									
30	36	10011111									
31	37	10111111									

REV	CHK

FIRST USED ON OPTION MODEL
FPP8-A

DRN. Jack A. Mason DATE 17 MAY 76
CHK'D DATE 5/19/76
ENG. DATE 18 MAY 76
PROJ.ENG. DATE 5/19/76
PROD. R. K. DATE 5-25-76
NEXT HIGHER ASSEMBLY
B-DD-M841Ø-Ø

DIGITAL EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

TITLE
32 X 8
ROM/PROM PATTERN SPEC
23-125A1-00

SIZE	CODE	NUMBER	REV
K	CS	M841Ø-Ø-44	

DIST.

DEC PART NUMBER: 23-126A1-00
LEFT COLUMN OF BIN DATA IS MSB

ORIGINATOR: D. A. WHITE
DATE ORIGINATED: 05-JAN-76

BINARY DATA "1" = HIGH
BINARY DATA "0" = LOW

DEC LOC	OCT LOC	BIN DATA	DEC LOC	OCT LOC	BIN DATA	DEC LOC	OCT LOC	BIN DATA	DEC LOC	OCT LOC	BIN DATA
0	00	00000000									
1	01	00000000									
2	02	00000000									
3	03	00000000									
4	04	00000000									
5	05	00000000									
6	06	00000000									
7	07	00000000									
8	10	00000101									
9	11	00000000									
10	12	00000110									
11	13	00000101									
12	14	00000100									
13	15	00000110									
14	16	00000110									
15	17	00000000									
16	20	00000011									
17	21	00000011									
18	22	00000000									
19	23	00000000									
20	24	00000000									
21	25	00000000									
22	26	00000000									
23	27	00000000									
24	30	00000101									
25	31	00000000									
26	32	00000111									
27	33	00000101									
28	34	00000100									
29	35	00000111									
30	36	00000111									
31	37	00000000									

REV	CHANGE NO	CHK

FIRST USED ON OPTION MODEL
FPP8-A

DRN. Jack A. Mason — DATE 7MAY76
CHK'D Bert Olivier — DATE 5-19-76
ENG. [illegible] — DATE
PROJ.ENG. Dennis — DATE 5/19/76
PROD. R. K. [illegible] — DATE 5-17-76
NEXT HIGHER ASSEMBLY
B-DD-M841Ø-Ø

DIGITAL EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

TITLE
32 X 8
ROM/PROM PATTERN SPEC
23-126A1-00

SIZE	CODE	NUMBER	REV
K	CS	M841Ø-Ø-45	

DIST.

DEC PART NUMBER: 23-127A1-00
LEFT COLUMN OF BIN DATA IS MSB

ORIGINATOR: D. A. WHITE
DATE ORIGINATED: 05-JAN-76

BINARY DATA "1" = HIGH
BINARY DATA "0" = LOW

DEC LOC	OCT LOC	BIN DATA	DEC LOC	OCT LOC	BIN DATA	DEC LOC	OCT LOC	BIN DATA	DEC LOC	OCT LOC	BIN DATA
0	00	10001111									
1	01	10111111									
2	02	10111111									
3	03	10101101									
4	04	10111111									
5	05	10011110									
6	06	10111111									
7	07	10111111									
8	10	10111111									
9	11	10111110									
10	12	10111111									
11	13	10111111									
12	14	10111111									
13	15	10111111									
14	16	10111111									
15	17	00110010									
16	20	10111111									
17	21	10111111									
18	22	10111111									
19	23	10111111									
20	24	10001111									
21	25	10101110									
22	26	10111111									
23	27	10111111									
24	30	00000000									
25	31	00000000									
26	32	00000000									
27	33	00000000									
28	34	00000000									
29	35	00000000									
30	36	00000000									
31	37	00000000									

REVISIONS	REV	CHK

FIRST USED ON OPTION MODEL: FPP8-A

DRN. Jack A. Mason — DATE 17 MAY 76
CHK'D. — DATE
ENG. — DATE
PROJ. ENG. — DATE 5/19/76
PROD. — DATE

NEXT HIGHER ASSEMBLY: B-DD-M8410-0

DIGITAL EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

TITLE: 32 X 8
ROM/PROM PATTERN SPEC
23-127A1-00

SIZE	CODE	NUMBER	REV
K	CS	M8410-0-46	

DIST.

DEC PART NUMBER: 23-128A1-00
LEFT COLUMN OF BIN DATA IS MSB

ORIGINATOR: D. A. WHITE
DATE ORIGINATED: 05-JAN-76

BINARY DATA "1" = HIGH
BINARY DATA "0" = LOW

SHEET 1 OF 1

DEC LOC	OCT LOC	BIN DATA	DEC LOC	OCT LOC	BIN DATA	DEC LOC	OCT LOC	BIN DATA	DEC LOC	OCT LOC	BIN DATA
0	00	11111111									
1	01	11011111									
2	02	11111111									
3	03	01111011									
4	04	01110111									
5	05	10111111									
6	06	11111111									
7	07	11111111									
10	10	11111111									
9	11	11111111									
10	12	11111110									
11	13	11111111									
12	14	11101111									
13	15	11111111									
14	16	01111101									
15	17	11111111									
16	20	11111111									
17	21	11111111									
18	22	11111111									
19	23	01111011									
20	24	01110111									
21	25	10111111									
22	26	11111111									
23	27	11111111									
24	30	11111111									
25	31	11111111									
26	32	11111110									
27	33	11111111									
28	34	11101111									
29	35	11111111									
30	36	01111101									
31	37	11111111									

REVISIONS	REV	CHK

FIRST USED ON OPTION MODEL: PP8-A

DRN. Jack A Mason — DATE 17 MAY 76
CHK'D. — DATE 5/19/76
ENG. — DATE
PROJ. ENG. — DATE 5/7/76
PROD. R. K. Olsen — DATE 5-25-76
NEXT HIGHER ASSEMBLY: B-DD-M841Ø-Ø

DIGITAL EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

TITLE
32 X 8
ROM/PROM PATTERN SPEC
23-128A1-00

SIZE	CODE	NUMBER	REV
K	CS	M841Ø-Ø-47	

DIST.

DEC PART NUMBER: 23-129A1-00
LEFT COLUMN OF BIN DATA IS MSB

ORIGINATOR: D. A. WHITE
DATE ORIGINATED: 05-JAN-76

BINARY DATA "1" = HIGH
BINARY DATA "0" = LOW

DEC LOC	OCT LOC	BIN DATA
0	00	01111101
1	01	01111111
2	02	11111111
3	03	11111111
4	04	11111111
5	05	11111111
6	06	11111111
7	07	11111111
8	10	11111111
9	11	11111111
10	12	11111111
11	13	11111111
12	14	11111111
13	15	11111111
14	16	11111111
15	17	11111111
16	20	10000000
17	21	11111000
18	22	11111011
19	23	10000000
20	24	10000000
21	25	10000000
22	26	11111111
23	27	11111111
24	30	10000000
25	31	10000000
26	32	10000000
27	33	10000000
28	34	11111111
29	35	11111111
30	36	11111111
31	37	11111111

REV	CHANGE NO	FIRST USED ON OPTION MODEL		DIGITAL EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS
PREVISIONS		FPP8-A		
		DRN. Jack ? M...	DATE 17 Mar 76	TITLE 32 X 8 ROM/PROM PATTERN SPEC 23-129A1-00
		CHK'D.	DATE 5/19/76	
		ENG.	DATE	
		PROJ. ENG.	DATE 5/19/76	
		PROD.	DATE 5/19/76	SIZE K / CODE CS / NUMBER M8411-Ø-8 / REV
CHK		NEXT HIGHER ASSEMBLY B-DD-M8411-Ø		DIST.

DEC PART NUMBER: 23-130A1-00
LEFT COLUMN OF BIN DATA IS MSB

ORIGINATOR: D. A. WHITE
DATE ORIGINATED: 05-JAN-76

BINARY DATA "1" = HIGH
BINARY DATA "0" = LOW

DEC LOC	OCT LOC	BIN DATA
0	00	11100111
1	01	11111111
2	02	11111111
3	03	11111111
4	04	11111111
5	05	11111111
6	06	11111111
7	07	11111111
8	10	11111111
9	11	11111111
10	12	11111111
11	13	11111111
12	14	11111111
13	15	11111111
14	16	11111111
15	17	11111111
16	20	00010111
17	21	00000000
18	22	11111111
19	23	00000101
20	24	00000100
21	25	00001011
22	26	11110011
23	27	11111111
24	30	00111010
25	31	00010110
26	32	00000001
27	33	00000000
28	34	11111100
29	35	11111101
30	36	11111110
31	37	11111111

REVISION	CHK

FIRST USED ON OPTION MODEL: FPP8-A

DRN. Jack I. Mason DATE 17 MAY 76
CHK'D DATE 5/19/76
ENG. DATE
PROJ. ENG. DATE 5/7/76
PROD. DATE 5-20-76
NEXT HIGHER ASSEMBLY: 5-DD-M8411-0

DIGITAL EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

TITLE
32 X 8
ROM/PROM PATTERN SPEC
23-130A1-00

SIZE	CODE	NUMBER	REV
K	CS	M8411-0-9	

DIST.

DEC PART NUMBER: 23-131A1-00
LEFT COLUMN OF BIN DATA IS MSB

ORIGINATOR: D. A. WHITE
DATE ORIGINATED: 05-JAN-76

BINARY DATA "1" = HIGH
BINARY DATA "0" = LOW

DEC LOC	OCT LOC	BIN DATA	DEC LOC	OCT LOC	BIN DATA	DEC LOC	OCT LOC	BIN DATA	DEC LOC	OCT LOC	BIN DATA
0	00	00001111									
1	01	00000101									
2	02	00000000									
3	03	00001111									
4	04	00000101									
5	05	00101011									
6	06	00101011									
7	07	00101011									
8	10	00101011									
9	11	00101011									
10	12	00101011									
11	13	00111010									
12	14	00101001									
13	15	00101010									
14	16	00101001									
15	17	00101001									
16	20	00000000									
17	21	00000000									
18	22	00000000									
19	23	00000000									
20	24	00000000									
21	25	00000000									
22	26	00000000									
23	27	00000000									
24	30	00000000									
25	31	00000000									
26	32	00000000									
27	33	00000000									
28	34	00000000									
29	35	00000000									
30	36	00000000									
31	37	00000000									

REVISION CHANGE NO / CHK		FIRST USED ON OPTION MODEL: FPP8-A	DIGITAL EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS
		DRN. Jack A Mann DATE 17 MAY 76	TITLE: 32 X 8 ROM/PROM PATTERN SPEC
		CHK'D DATE 5/19/76	23-131A1-00
		ENG. DATE 5/19/76	SIZE K CODE CS NUMBER M8411-Ø-1Ø REV
		PROJ. ENG. DATE 5/19/76	DIST.
		PROD. R K Olsen DATE 5-25-76	
		NEXT HIGHER ASSEMBLY: B-DD-M8411-Ø	

DEC PART NUMBER: 23-132A1-00
LEFT COLUMN OF BIN DATA IS MSB

ORIGINATOR: D. A. WHITE
DATE ORIGINATED: 05-JAN-76

BINARY DATA "1" = HIGH
BINARY DATA "0" = LOW

DEC LOC	OCT LOC	BIN DATA
0	00--	01101001
1	01--	01101001
2	02--	01101001
3	03--	01001001
4	04--	01001001
5	05--	01101001
6	06--	01111100
7	07--	01110011
8	10--	01111010
9	11--	00100110
10	12--	01110011
11	13--	01111111
12	14--	01101001
13	15--	01101001
14	16--	01101111
15	17--	01101111
16	20--	01101001
17	21--	01101001
18	22--	01101001
19	23--	01001001
20	24--	01001001
21	25--	01101001
22	26--	01111100
23	27--	01111100
24	30--	01111010
25	31--	00100110
26	32--	01101001
27	33--	01111111
28	34--	01101001
29	35--	01101001
30	36--	01101111
31	37--	01101111

REV	REVISIONS / CHANGE NO.	FIRST USED ON OPTION MODEL		DIGITAL EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS
		FPP8-A		
		DRN. Jack I Mason	DATE 17 may 76	TITLE
		CHK'D [signature]	DATE 1/19/76	32 X 8
		ENG. [signature]	DATE 19 MAY 76	ROM/PROM PATTERN SPEC
		PROJ.ENG. [signature]	DATE 5/7/76	23-132A1-00
		PROD. R K [signature]	DATE 5-25-76	SIZE: K · CODE: CS · NUMBER: M8411-0-11 · REV:
CHK		NEXT HIGHER ASSEMBLY: E-DD-M8411-0		DIST.

DEC PART NUMBER: 23-133A1-00
LEFT COLUMN OF BIN DATA IS MSB

ORIGINATOR: D. A. WHITE
DATE ORIGINATED: 05-JAN-76

BINARY DATA "1" = HIGH
BINARY DATA "0" = LOW

SHEET 1 OF 1

DEC LOC	OCT LOC	BIN DATA
0	00	00000100
1	01	01111000
2	02	00000100
3	03	01111000
4	04	00000100
5	05	01111000
6	06	00000100
7	07	01111000
8	10	00000100
9	11	01111000
10	12	00000100
11	13	01111000
12	14	00000100
13	15	01111000
14	16	00000100
15	17	01111000
16	20	00000100
17	21	01111000
18	22	00000100
19	23	01111000
20	24	01111100
21	25	01111000
22	26	00000100
23	27	01111000
24	30	00000100
25	31	01111000
26	32	00000100
27	33	01111000
28	34	01111000
29	35	01111000
30	36	00000100
31	37	01111000

REV

REVISION | CHANGE NO

CHK

FIRST USED ON OPTION MODEL: FPP8-A

DRN. Jack A. Mason — DATE 17 MAY 76
CHK'D. [illegible] — DATE 5/19/76
ENG. W. A. [illegible] — DATE 19 MAY 76
PROJ. ENG. [illegible] — DATE 5/17/76
PROD. R. K. [illegible] — DATE 5-25-76

NEXT HIGHER ASSEMBLY: B-DD-M8411-Ø

DIGITAL EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

TITLE: 32 X 8 ROM/PROM PATTERN SPEC 23-133A1-00

SIZE	CODE	NUMBER	REV
K	CS	M8411-Ø-12	

DIST.

DEC PART NUMBER: 23-134A1-00
LEFT COLUMN OF BIN DATA IS MSB

ORIGINATOR: D. A. WHITE
DATE ORIGINATED: 05-JAN-76

BINARY DATA "1" = HIGH
BINARY DATA "0" = LOW

DEC LOC	OCT LOC	BIN DATA
0	00	00000000
1	01	00000000
2	02	00000000
3	03	00000000
4	04	00000000
5	05	00000000
6	06	00000000
7	07	00000000
8	10	00000000
9	11	00000110
10	12	00000000
11	13	00001001
12	14	00000000
13	15	00001001
14	16	00000000
15	17	00000110
16	20	00011111
17	21	10000110
18	22	00011111
19	23	10011001
20	24	00011001
21	25	10011001
22	26	00011001
23	27	10000110
24	30	10001111
25	31	10000110
26	32	10001111
27	33	10001001
28	34	10001001
29	35	10001001
30	36	10001001
31	37	10000110

REVISION	CHK

FIRST USED ON OPTION MODEL
FPP8-A

DRN. Jack L Mason DATE 17 MAY 76
CHK'D [signature] DATE 5/19/76
ENG. [signature] DATE [illegible]
PROJ.ENG. [signature] DATE 5/19/76
PROD. [signature] DATE 5/25/76
NEXT HIGHER ASSEMBLY
B-DD-M8411-Ø

DIGITAL EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

TITLE
32 X 8
ROM/PROM PATTERN SPEC
23-134A1-00

SIZE	CODE	NUMBER	REV
K	CS	M8411-Ø-13	

DIST.

DEC PART NUMBER: 23-135A1-00
LEFT COLUMN OF BIN DATA IS MSB

ORIGINATOR: D. A. WHITE
DATE ORIGINATED: 7-APR-76

BINARY DATA "1" = HIGH
BINARY DATA "0" = LOW

DEC LOC	OCT LOC	BIN DATA
0	00	--00000111
1	01	--00000111
2	02	--00000000
3	03	--00000000
4	04	--00000101
5	05	--00000011
6	06	--00000110
7	07	--00010110
8	10	--00011111
9	11	--00011111
10	12	--00011111
11	13	--00011111
12	14	--00011111
13	15	--00011111
14	16	--00011111
15	17	--00011111
16	20	--00000111
17	21	--00000111
18	22	--00000111
19	23	--00000111
20	24	--00000111
21	25	--00000111
22	26	--00000111
23	27	--00010111
24	30	--00000111
25	31	--00000111
26	32	--00000111
27	33	--00000111
28	34	--00000111
29	35	--00000111
30	36	--00000111
31	37	--00000111

REV
REVISIONS
CHANGE NO.
CHK

FIRST USED ON OPTION MODEL
FPP8-A

DRN. Jack A. Mason DATE 17 MAY 76
CHK'D DATE 5/19/76
ENG. DATE
PROJ.ENG. D.A. White DATE 5/19/76
PROD. DATE 5-12-76
NEXT HIGHER ASSEMBLY
B-DD-M8411-0

DIGITAL EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

TITLE
32 X 8
ROM/PROM PATTERN SPEC
23-135A1-00

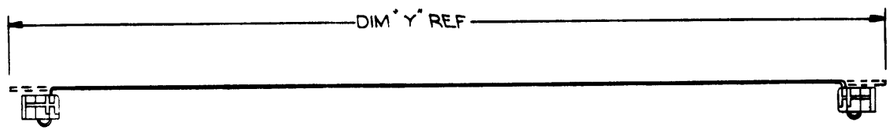
SIZE	CODE	NUMBER	REV
K	CS	M8411-0-14	

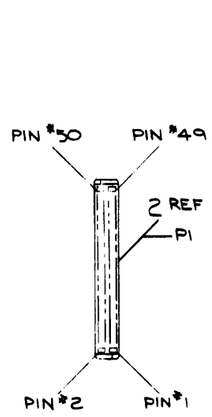
DIST.

LEGEND		
NUMBER	DIM 'X' VARIATION	DIM 'Y' PRECUT (REF)
BCØ2D-Ø1	12 IN ± .5 IN	13.5 IN ± .5 IN

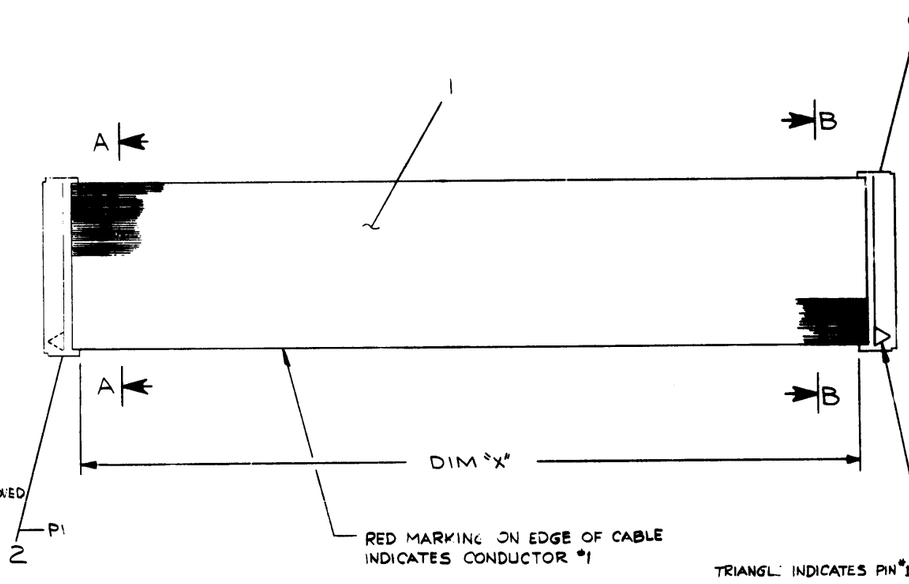
NOTES:

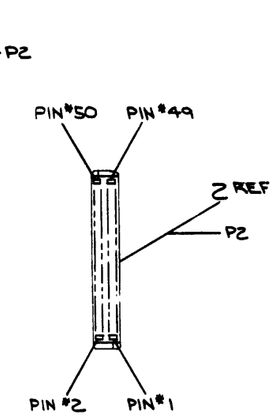
1. CONNECTORS P1 AND P2 ARE TO BE WIRED POINT-TO-POINT (P1-1 TO P2-1, P1-2 TO P2-2, ETC).





VIEW A-A
(REAR VIEW)
WITH ITEM #1 (CABLE) REMOVED





VIEW B-B
(REAR VIEW)
WITH ITEM #1 (CABLE) REMOVED

2	CONN, 50 PIN SOCKET	12116Ø4-ØØ	2
A/R	CABLE, 50 COND FLAT	9107747-04	1
	DESCRIPTION	DWG./PART NO.	ITEM NO.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES

ANGLES ±° ′	AREA OF ACCEPT (CHECK ONE)	NOMINAL DIMENSION RANGE INCHES				
		OVER 0 TO 6	OVER 6 TO 12	OVER 12 TO 24	OVER 24 TO 48	OVER 48 TO 80
SURFACE QUALITY IN MICROINCHES ✓	MEDIUM ☐	±.Ø5Ø	±.Ø75	±.1Ø	±.15Ø	±.2Ø
	PRECISION ☐	±.Ø12	±.Ø15	±.Ø2Ø	±.Ø3Ø	±.Ø4

QUANTITY & VARIATION

THIRD ANGLE PROJECTION

REMOVE BURRS AND BREAK SHARP CORNERS

DO NOT SCALE DWG

MATERIAL SEE PARTS LIST

FINISH

DRN. CHK'D ENG. PROJ. ENG. PROD.

NEXT HIGHER ASSY. D-UA-FPP8-A-0

SCALE NONE

SHEET OF

FIRST USED ON FPP8-A

TITLE 50 CONDUCTOR SIGNAL CABLE (BCØ2D)

SIZE	CODE	NUMBER	REV.
D	1A	BCØ2D-Ø-Ø	

DIST.

REV.	REVISIONS	CHANGE NO.	CHK.

DEC FORM NO. DRD 100-C