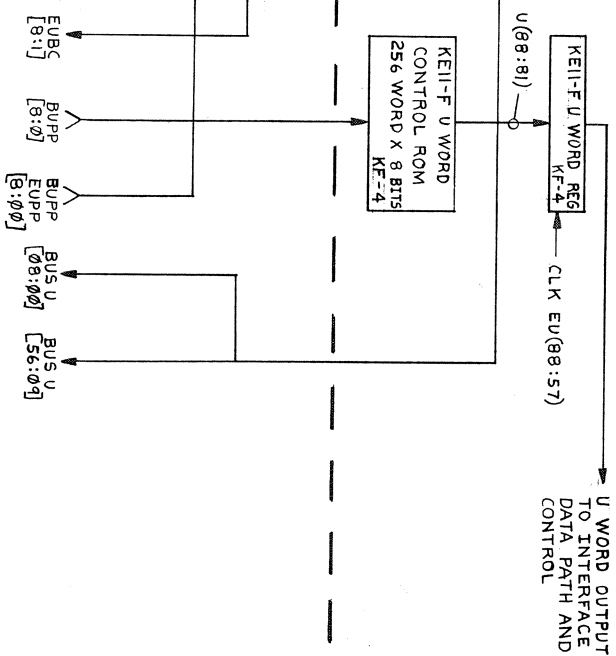


**KE11-F floating
instruction set
(FIS) option
engineering drawings**

digital equipment corporation • maynard, massachusetts

2	SIZE CODE	NUMBER	REV
D	ED	KE11-F-BD	A



SIZE D	CODE BD	NUMBER KE11-F-BD	REV A
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EXPANSION U WORD

CON		FCI	FUB	MHR		FRD	ERD	SRD		SDR		CWM			NZM		CCC		GPC		CEE	CNT		EUB				CBA			
CON1	CON Ø	FCI BUS	EUBF4	SMSR	SHSR1	SHSRØ	STFADM	STADM	SADM1	SADMØ	SDR1	SDR Ø	SCWM2	SCWM1	SCWMØ	SNEM1	SNEMØ	CLK NZ	CLK V	CLK C	GPC2	GPC1	GPC Ø	CLK UPB8	LCNT	ECNT	EUBF3	EUBF2	EUBF1	EUBFØ	CLK BR
U88 (1)H	U87 (1)H	U86 (1)H	U85 (1)H	U84 (1)H	U83 (1)H	U82 (1)H	U81 (1)H	U8Ø (1)H	U79 (1)H	U78 (1)H	U77 (1)H	U76 (1)H	U75 (1)H	U74 (1)H	U73 (1)H	U72 (1)H	U71 (1)H	U7Ø (1)H	U69 (1)H	U68 (1)H	U67 (1)H	U66 (1)H	U65 (1)H	U64 (1)H	U63 (1)H	U62 (1)H	U61 (1)H	U6Ø (1)H	U59 (1)H	U58 (1)H	U57 (1)H

ELIBC (A.1) BUILT CHART

[illegible]

FUBC BUT CHART

FUBC BUT CHART						
FUBC (4:1)						
STB	SE	SI	SO	FN	BUT	
EUBF4	EUB2	EUB1	EUB0		(FUBC)	
H	—	—	—	L	—	—
L	L	L	L	D	—	ARA
L	L	L	H	01	—	MSR01
L	L	H	L	02	—	ZB + EPS (Z)
L	L	H	H	03	—	COUNT > 50
L	H	L	L	04	—	NORMALIZED
L	H	L	H	05	—	MSR00
L	H	H	L	06	—	—
L	H	H	H	07	—	—

CONSTANTS

CONSTANTS			
GPC=6	CON 1	CON 2	CONSTAN (OCTAL)
H	L	L	400
H	L	H	244
H	H	L	6
H	H	H	30
L	L	L	200

GPC CHART			
	FUNCTION		
GPC2	GPC1	GPC0	
0	0	0	NOOP
0	1	0	BUT (NORMALIZE) TESTS DR09
0	1	0	ALLOWS ALU CONTROL AS A FUNCTION OF CERTAIN CONDITIONS RAATHER THAN DIRECTLY BY THE CONTROL ROM
0	1	1	ENABLES DR15 TO PROVIDE THE CARRY-IN TO THE ALU
1	0	0	ENABLES EPC(0) TO PROVIDE THE CARRY-IN TO THE ALU
1	0	1	ENABLES HS15 TO PROVIDE USB SHIFT INPUT TO THE DR
1	1	0	GENERATES CONSTANT 000(8)
1	1	1	USED TO EXECUTE A MICROPROGRAM BRANCH TEST FOR BUS REQUESTS

KEI-E KEI-F		ALU FUNCTIONS		ALU f (FUNCTION)	
ALUM	ALUS 3	ALUS2	ALUS1	ALUS0	
L	L	L	L	L	f = A
L	L	L	H	H	f = MINUS 1 (2'S COMPLEMENT)
L	L	H	H	H	f = A MINUS B MINUS 1
L	L	L	L	H	f = A PLUS B
L	H	H	L	L	f = A PLUS B
H	L	L	L	L	f = A
H	L	L	L	H	f = LOGICAL ϕ
H	L	L	H	H	f = B
H	H	H	H	L	f = AB

REVISIONS		
CHK	CHANGE NO.	REV.

DEC 10 1972-887

1

111

HEET

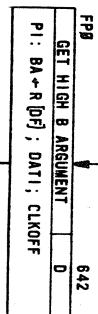
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FIRST USED ON OPTION MODEL		QTY.		DESCRIPTION		PART NO.		ITEM NO.	
PDP 11									
UNLESS OTHERWISE SPECIFIED DIMENSION IN INCHES.				DIN DIN 5575		DATE 8-8-72		EQUIPMENT CORPORATION	
TOLERANCES				C&D Handwritten		DATE 7-1-72		DRAWING NUMBER 0012778	
DECIMALS		ANGLES		ENG. HANDWRITTEN		DATE 9-1-72			
.XXX - .005		±0° 30'		PROC. ENG.		DATE 9-1-72			
.XX - .02				HANDWRITTEN		DATE 9-1-72			
X = .1				PROB. HANDWRITTEN		DATE 9-1-72			
REMOVE BURRS AND BREAK SHARP CORNERS. SURFACE QUALITY				PROB. HANDWRITTEN		DATE 9-1-72			
MATERIAL				NEXT HIGHER ASSY.					
FINISH				B-D-D, KE11-F		SIZE CODE		NUMBER	
SHEET 2 OF 2				SCALE NONE		D BD		KE11-F-BD	
						REV		A	

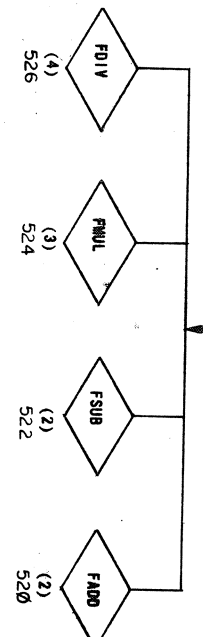
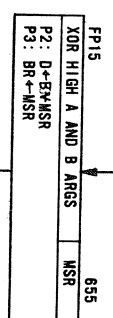
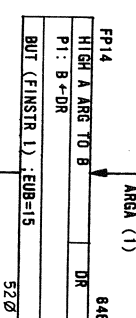
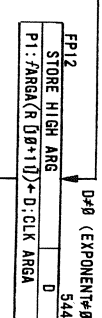
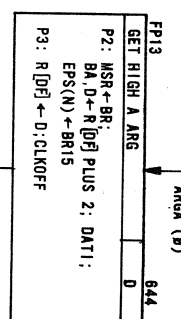
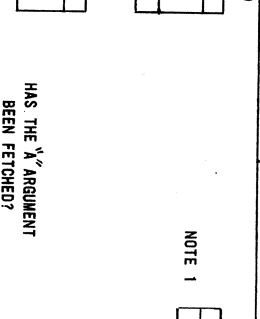
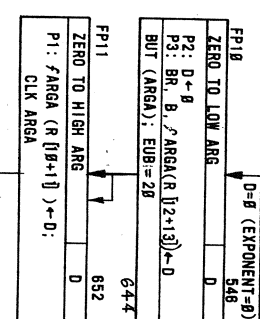
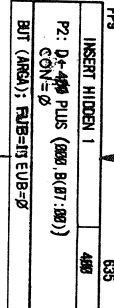
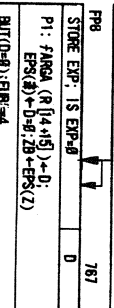
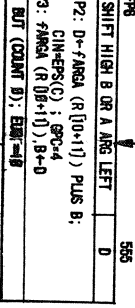
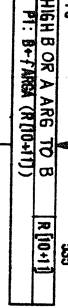
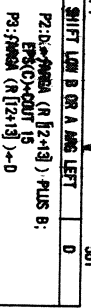
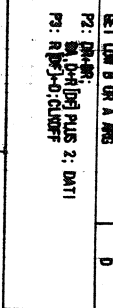
SIZE D	CODE BD	NUMBER KE11-F-BD	REV A
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(II) KEIL-FLOW



ORDER OF ARGUMENTS ON STACK:
(R) ← LOW A ARG
(R) ← HIGH A ARG
(R) ← LOW B ARG
(R) ← HIGH B ARG



NOTES:

1. FARGA ALLOWS THE SELECTION OF THE EVEN OR ODD REGISTER TO STORE THE ARGUMENTS IN. IF THE ARG A FLOP IS CLEAR THE ODD REGISTER IS SELECTED. IF ARG A IS SET THE EVEN REGISTER IS SELECTED. THE ROM ALWAYS SELECTS THE ODD REGISTER. ARG B GOES TO THE ODD REGISTERS. ARG A GOES TO THE EVEN REGISTERS.
2. ALL NUMBERS ARE ASSUMED TO BE NORMALIZED THEREFORE, THE MOST SIGNIFICANT BIT IS NOT STORED AND MUST BE INSERTED.
3. BUT(COUNT=B) IS USED TO CLOCK THE MP & BUS REQUEST FLAGS AND TO CLEAR THE BRST FLAG IN THE M011-A. THIS ALLOWS MPRS TO OCCUR WITHOUT THE M011-A DOING A BUS DATA CYCLE.
4. D IN THE DISPLAY IS THE LAST DATA LOADED INTO THE D REGISTER AND MAY NOT BE PERTINENT.
5. GPC=4 ALLOWS EPS(C) TO PROVIDE THE CARRY IN TO THE CPU ALU.

LEFT SHIFT PROVIDES AN EXTRA BIT ON THE LOW END FOR ROUNDING PURPOSES.

NOTE 3,5

NOTE 2

NOTE 1

XOR DETERMINES SIGN OF ANSWER FOR FDI AND FMUL INSTRUCTIONS

REVISIONS		
CHK	CHANGE NO	REV
22	KEIL-F-00001	A
BUZYNSKI		
11/10/72		

BRUNING 40-522 15640

040 100-B

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7

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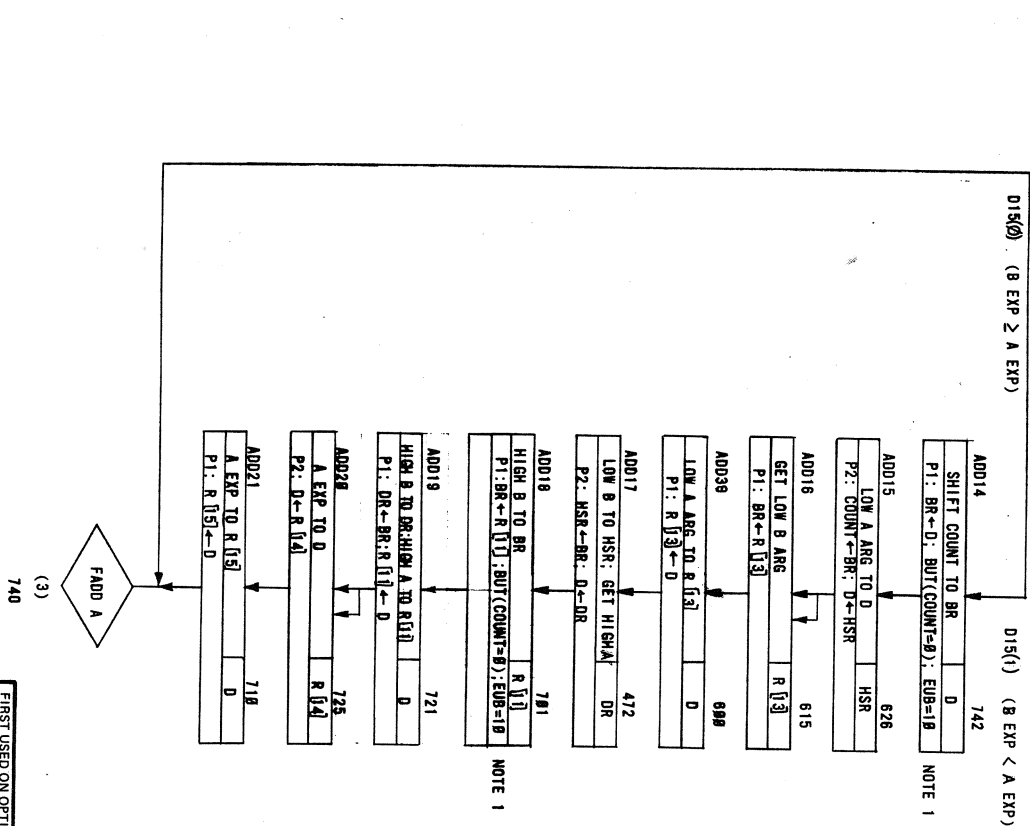
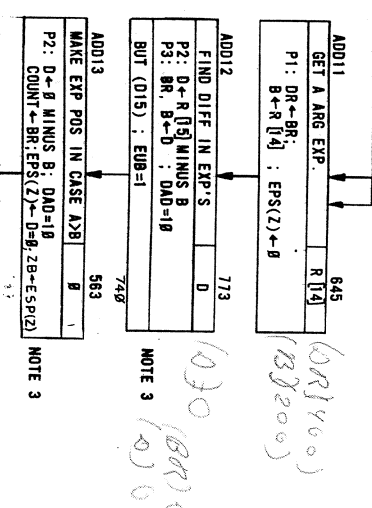
96

97

98

99

100



A & B ARG'S MUST
CHANGE PLACES

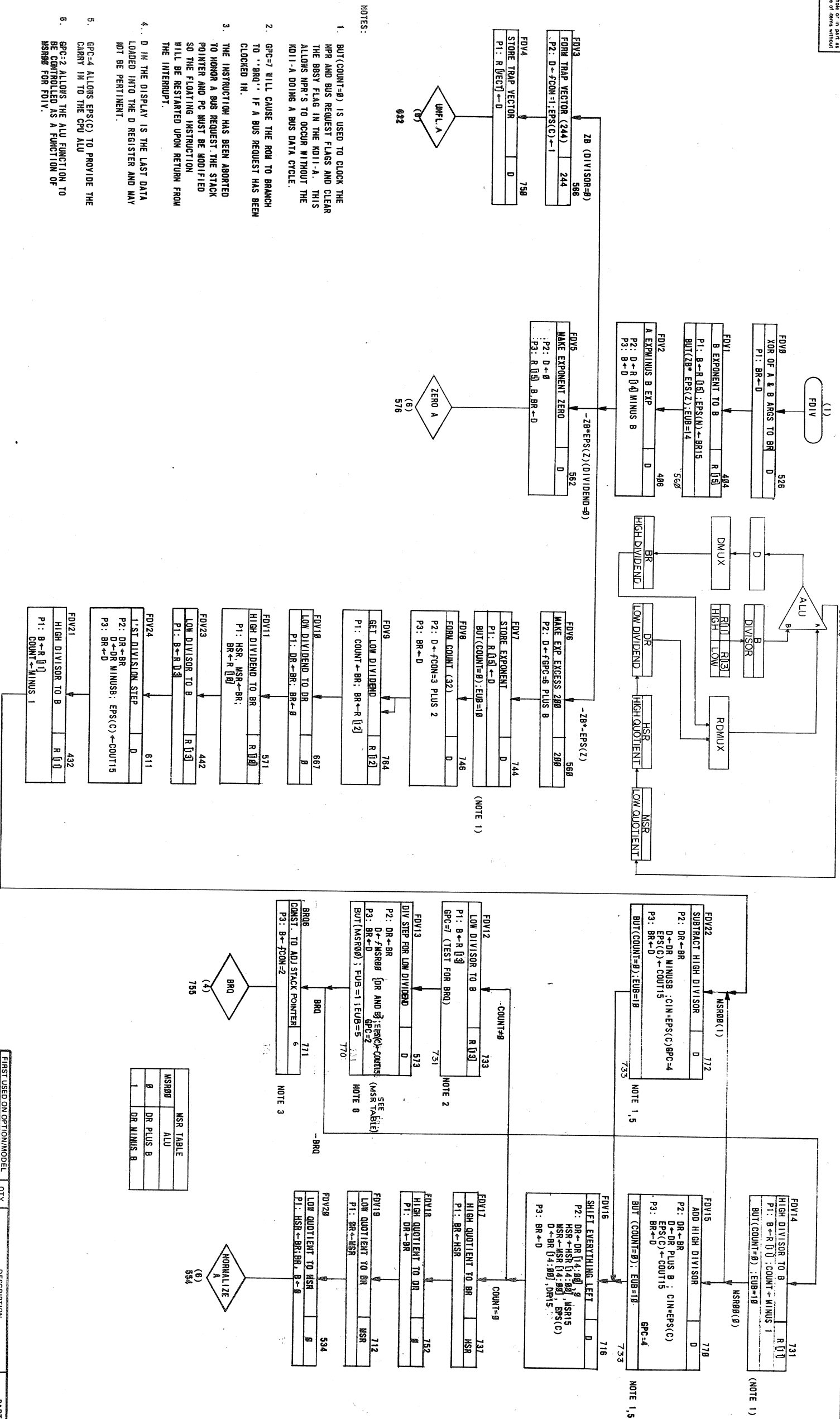
BRUNING 40-522 15840		A	
REVISIONS			
CHK	CHANGE NO	REV	
UNLESS OTHERWISE SPECIFIED DIMENSION IN INCHES		PARTS LIST	
TOLERANCES		DRAWN BY <u>J. P. Ball</u> DATE <u>9-17-72</u>	
DECIMALS	ANGLES	CHECKED BY <u>J. P. Ball</u> DATE <u>9-17-72</u>	
XXX + .005	± 0° 30'	DATE <u>9-21-72</u>	
XX + .02	XX + .30'	DATE <u>9-21-72</u>	
X + .1	X + .1	DATE <u>9-21-72</u>	
REMOVE BURRS AND BREAK SHARP CORNERS SURFACE QUALITY		DATE <u>9-21-72</u>	
MATERIAL		DATE <u>9-21-72</u>	
NEXT HIGHER ASSY.		DATE <u>9-21-72</u>	
FINISH		DATE <u>9-21-72</u>	
SCALE		DATE <u>9-21-72</u>	
SHEET 2 OF 6		DATE <u>9-21-72</u>	
SIZE CODE		DATE <u>9-21-72</u>	
NUMBER		DATE <u>9-21-72</u>	
REV.		DATE <u>9-21-72</u>	
D F D		DATE <u>9-21-72</u>	
K E I I - F - F D		DATE <u>9-21-72</u>	
A		DATE <u>9-21-72</u>	



- MASSACHUSETTS**

FIRST USED ON OPTION/MODEL		QTY.	DESCRIPTION	PART NO.	ITEM NO.
PDP-11			PARTS LIST		
UNLESS OTHERWISE SPECIFIED DIMENSION IN INCHES TOLERANCES		DWG. <i>D. Powell</i>	DATE <i>4-18-72</i>	 DIGITAL EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS	
DECIMALS	ANGLES	CHDR. <i>0.00125 in.</i>	DATE <i>4-18-72</i>		
.XXX + .005		<i>0.0001 in.</i>	DATE <i>4-18-72</i>		
.XX ± .02	± 0° 30'	<i>0.0001 in.</i>	DATE <i>4-18-72</i>		
.X ± .1		<i>0.0001 in.</i>	DATE <i>4-18-72</i>		
REMOVE BURNS AND BREAK SHARP CORNERS SURFACE QUALITY ✓		PROBING	DATE <i>4-18-72</i>	TITLE FLOW DIAGRAM (FWUL)	
		PROD. <i>W. Burges</i>	DATE <i>4-18-72</i>		
MATERIAL					
NEXT HIGHER ASSY.					
SIZE CODE					
FINISH	SCALE <i>1" = 1"</i>	SIZE CODE	NUMBER	REV.	
<i>1</i>	<i>1</i>	<i>D/FD</i>	<i>KE11-F-FD</i>	<i>A</i>	
SHEET <i>4</i>	OF <i>6</i>	DIST.			
(4)					

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- NOTES:
1. BUT(COUNT=0) IS USED TO CLOCK THE HSR AND BUS REQUEST FLAGS AND CLEAR THE BUSY FLAG IN THE K011-A. THIS ALLOWS HSR'S TO OCCUR WITHOUT THE K011-A DOING A BUS DATA CYCLE.
 2. GPC=7 WILL CAUSE THE ROM TO BRANCH TO "BRQ" IF A BUS REQUEST HAS BEEN CLODED IN.
 3. THE INSTRUCTION HAS BEEN ABORTED TO HONOR A BUS REQUEST. THE STACK POINTER AND PC MUST BE MODIFIED SO THE FLOATING INSTRUCTION WILL BE RESTARTED UPON RETURN FROM THE INTERRUPT.
 4. D IN THE DISPLAY IS THE LAST DATA LOADED INTO THE D REGISTER AND MAY NOT BE PERTINENT.
 5. GPC=4 ALLOWS EPS(C) TO PROVIDE THE CARRY IN TO THE CPU ALU
 6. GPC=2 ALLOWS THE ALU FUNCTION TO BE CONTROLLED AS A FUNCTION OF MSRB0 FOR FDIV.

REVISIONS	
REV	CHANGE NO.
CHK	

FIRST USED ON OPTION/MODEL		QTY.	DESCRIPTION	PART NO.	ITEM NO.
PDP-11					
UNLESS OTHERWISE SPECIFIED					
DIMENSIONS IN INCHES					
TOLERANCES					
DECIMALS	ANGLES				
XXX ± .005	± 0° 30'				
X ± .02					
X ± .1					
REMOVE BURRS AND BREAK SHARP CORNERS SURFACE QUALITY					
MATERIAL					
FINISH					
SCALE					
SHEET 5 OF 6					
DIST.					
SIZE CODE					
D F D KEII-F-FD					
NUMBER					
REV. A					

FLOW DIAGRAM

SIZE CODE D F D KEII-F-FD

REV A

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(4,5) ZERO A

(3) NORMALIZE

(4,5) NORMALIZE A

(5) EXIT

(6) STORE

IS ANS FOR FAD OR FSR B
P1: B, BR←B
BUT (D=0): EUB=4
727
724

ADJ. EXP. IN USE NORMALIZED
P2: D←R (15) PLUS 1
P3: R (15)←D: FUB=1: EUB=4
BUT (NORMALIZED): GPC=1
584
705 (NOTE 1)

NAME EXPONENT ZERO
P2: D←B
P3: R (15): B, BR←D
728
D=0 (ZERO ANSWER)

SET UP TO CHECK & OVERFLOW
P1: BR←R (15): DAD=6
724
NOTE 4

GET READY TO STORE ZERO
P1: DR: HSR←BR
P2: DR: HSR←BR
P3: R (15): DAD=6
578
B
NOTE 4

STORE
(6)
820

NORMALIZE, ADJUST EXPONENT
P2: D←R (15) MINUS 1
P3: DR: HSR←BR: HSR (15): GPC=5
P1: R (15)←D: BUT (COUNT=0)
707
536
NOTE 2

ROUND LOW ANSWER
P2: D←HSR PLUS 1: EPS(C)←COUNT 15
P3: BR←D
558
NOTE 2

ROUND HIGH ANSWER
P2: D←DR PLUS B (B=0): C1N=EPS(C)
P3: BR←D: BUT (COUNT=0): EUB=1B
873
D
NOTE 2

SHIFT ANSWER RIGHT
P1: HSR←DR: HSR (15): D
P2: DR←BR: DR (15): D
BUT (COUNT=0): EUB=1B
785
B
NOTE 2

ROUND LOW ANSWER TO HSR
P1: HSR←BR
574
B

ROUND HIGH ANSWER TO DR
P1: DR←BR
614
B

SHIFT ANSWER RIGHT
P1: HSR←DR: HSR (15): D
P2: DR←BR: DR (15): D
BUT (NORMALIZED): GPC=1
616
D
NOTE 1

EXPONENT TO B
P2: D←R (15)
P3: B, BR←R (15)
634
R (15)

NORMALIZE, ADJUST EXPONENT
P2: HSR←DR: HSR (15): D
P3: R (15): B, BR←D
548
D
NORMALIZED (0 or 9) (9)
NORMALIZED (0 or 9) (9)

EXIT
(6)
542

EX10 ASSEMBLE HIGH ANSWER, HIGH ANS.
P1: BR←EPS(N): BR (15): D
P2: D←R (15): D
732

EX11 FORM TRAP VECTOR (244)
P2: D←FCON 2
BUT (OVL+UNFL+STORE): EUB=11
636
244

EX12 STORE TRAP VECTOR
P1: R (15): D: FCI BUS=1
654
D

EX13 DATA FOR EPS (N)
P2: D←FCON 1 (15)
P3: BR←D
622
D

EX14 CONST TO ADJ STACK POINTER
P1: B←FCON 2
P2: EPS(N)←B: EPS(2)←B:
EPS(V)←1
561
D

EX15 MOVE EPS TO STATUS
P1: PS(N:C)←EPS(N:C): UPB←B
656
D

EX16 ADJUST STACK POINTER
P2: D←R (15) MINUS B
P3: R (15): D
754
D

EX17 STORE LOW ANSWER
P2: D←HSR:
DATO: CLKOFF
736
B

EX18 ASSEMBLE ANSWER TO B
P1: B←BR
736
B

EX19 MODIFY STACK POINTER
P2: D←R (15) MINUS 2: DAD=6
P3: R (15): D: FCI BUS=1
756
D
NOTE 4

EX20 STORE ASSEMBLED ANSWER
P2: D←B: DATO: CLKOFF
774
B

EX21 SET LOCAL CODES
P1: EPS(N)←BR15
P2: EPS(2)←D=0
P3: EPS(V,C)←B
778
B

EX22 MOVE EPS
(2) MOVE-E FLOW
577

EX23 TRAP D
(8) AD11-A FLOW
7

EX24 EXIT
(5)

EX25 EXIT
(5)

EX26 EXIT
(5)

EX27 EXIT
(5)

EX28 EXIT
(5)

EX29 EXIT
(5)

EX30 EXIT
(5)

FIRST USED ON OPTION/MODEL		QTY	DESCRIPTION	PART NO.	ITER
PDP-11					
UNLESS OTHERWISE SPECIFIED					
DIMENSIONS IN INCHES					
TOLERANCES					
DECIMALS					
ANGLES					
X.XX ± .005					
X.X ± .01					
X ± .1					
REMOVE BURRS AND BREAK SHARP CORNERS SURFACE QUALITY					
MATERIAL					
FINISH					
SCALE					
SHEET 6 OF 6					
DIST.					
SIZE CODE					
NUMBER					
REV.					
A					

FLOW DIAGRAM
(NORMALIZE ROUND & STORE)

REV	CHANGE NO.	REVISIONS
8		
7		
6		
5		
4		
3		
2		
1		

BRUNING 40-522 15840

CHK

REV

8

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