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IDENTIFICATION

PRODUCT CODE: AC-E794E-MC
PRODUCT NAME: CXFAEO AFC11 MODULE
PRODUCT DATE: SEPTEMBER 1978
MAINTAINER: DEC/X11 SUPPORT GROUP

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1. ABSTRACT:

APA IS AN IOMD THAT EXERCISES AN AFC11 LOW LEVEL MULTIPLEXER. IT PERFORMS A WAS/LS TEST ON CHANNELS ZERO THRU SEVEN. BY LOADING THE CONVERSION RESULTS OF EACH CHANNEL INTO TWO TABLES AND COMPARING THE RESULTS STORED IN THE TABLES. 20 IN THE WAS/LS READINGS ARE NOT WITHIN PLUS OR MINUS .20 IN THE LSH AN ERROR IS REPORTED. THE CONVERSIONS ARE DONE AT A GAIN OF 1000 SO EACH CHANNEL MUST HAVE A CONSTANT DC INPUT LESS THAN 5MV.

2. REQUIREMENTS:

HARDWARE: ONE AFC11 CONVERTER

STORAGE:: AFA REQUIRES:
1. DECIMAL WORDS: 272
2. OCTAL WORDS: 0420
3. OCTAL BYTES: 1040

3. PASS DEFINITION

ONE PASS OF THE AFA MODULE CONSISTS OF READING THE RESULTS OF 3,072 CONVERSIONS WHICH RESULTS IN 3072 WORDS TRANSFERRED ON THE UNIBUS.

4. EXECUTION TIME

AFA RUNNING ALONE ON A PDP11/05 PROCESSOR TAKES APPROXIMATELY ONE MINUTE TO COMPLETE ONE PASS.

5. CONFIGURATION REQUIREMENTS:

DEFAULT PARAMETERS:

DEVADR: 172570, VECTOR: 134, BR1: 5, DEVCNT: 1

REQUIRED PARAMETERS:

NONE

6. DEVICE/OPTION SET-UP:

ALL CHANNELS MUST HAVE A DC INPUT LESS THAN 5 MILLIVOLTS.

7. MODULE OPERATION:

TEST SEQUENCE:

- A. SET UP VECTOR AND ADDRESS POINTERS
- B. MAKE ONE CONVERSION ON EACH CHANNEL (0-7)
AND STORE READINGS IN TABLE 1
- C. REPEAT B BUT STORE READINGS IN TABLE 2
- D. COMPARE DATA IN TABLE 1 WITH TABLE 2 AND REPORT
ERRORS - READINGS MUST BE WITHIN 4 OR - 20 IN LSB.
- E. REPEAT B-D 192 TIMES
- F. REPORT END OF PASS - RESTART AT B

8. OPERATION OPTIONS:

9. NON STANDARD PRINTOUT:

NONE: ALL PRINTOUTS HAVE THE STANDARD FORMATS DESCRIBED
IN THE DEC/X11 DOCUMENT.

AFAPAE DEC/X11 EXERCISER MODULE

```
000000 IOMOD <AFAPAE> 172570,134,5,192,51
000000 MODULE 140000,AFAPAE,172570,134,5,192,51
; TITLE AFAPAE DEC/X11 SYSTEM EXERCISER MODULE
; DDACOM VFRS10N 6 23-MAY-78
;*****LIST BIN*****
000000 BGIN: *****
000000 MODNAM: .ASCII /AFAPAE / ;MODULE NAME
000005 XFLAG: .RYTE OPEN ;USED TO KEEP TRACK OF WBUFF USAGE
000006 ADDR: 172570+0 ;1ST DEVICE ADDR.
000010 VECTOR: 134+0 ;1ST DEVICE VECTOR.
000012 BR1: .RYTE PRTY5+0 ;1ST RR LEVEL.
000014 BR2: .RYTE PRTY+0 ;2ND RR LEVEL.
000016 SVR1: OPEN ;DEVICE INDICATOR 1.
000020 SVR2: OPEN ;SWITCH REGISTER 1
000022 SVR3: OPEN ;SWITCH REGISTER 2
000024 SVR4: OPEN ;SWITCH REGISTER 3
;*****
000026 STAT: 140000 ;STATUS WORD.
000030 INTR: START ;MODULE START ADDR.
000032 SPOINT: MODSP ;MODULE STACK POINTER.
000034 PASCNT: 0 ;PASS COUNTER.
000036 ICOUNT: 92. ;# OF ITERATIONS PER PASS=192.
000040 SOFCNT: 0 ;LOC TO COUNT ITERATIONS
000042 HRDCNT: 0 ;LOC TO SAVE TOTAL SOFT ERRORS
000044 HRDPAS: 0 ;LOC TO SAVE TOTAL HARD ERRORS
000046 SOFPAS: 0 ;LOC TO SAVE SOFT ERRORS PER PASS
000050 HRDPAS: 0 ;LOC TO SAVE HARD ERRORS PER PASS
000052 SVSCNT: 0 ;# OF SVS ERRORS ACCUMULATED
000054 RANUM: 0 ;HOLDS RANDOM # WHEN RAND MACRO IS CALLED
000056 CONFIG: 0 ;RESERVED FOR MONITOR USE
000060 RES1: 0 ;RESERVED FOR MONITOR USE
000062 RES2: 0 ;RESERVED FOR MONITOR USE
000064 SVR1: OPEN ;LOC TO SAVE R0.
000066 SVR2: OPEN ;LOC TO SAVE R1.
000070 SVR3: OPEN ;LOC TO SAVE R2.
000072 SVR4: OPEN ;LOC TO SAVE R3.
000074 SVR5: OPEN ;LOC TO SAVE R4.
000076 SVR6: OPEN ;LOC TO SAVE R5.
000100 CSRA: OPEN ;ADDR OF CURRENT CSR.
000102 SRAADR: OPEN ;ADDR OF GOOD DATA, OR
000104 ACSR: OPEN ;CONTENTS OF CSR.
000106 WASADR: OPEN ;ADDR OF BAD DATA, OR
000108 ERRTYP: OPEN ;STATUS REG CONTENTS.
000106 ASB: OPEN ;EXPECTED DATA.
000110 AVAS: OPEN ;ACTUAL DATA.
000112 RSTRT: RSTRT ;RESTART ADDRESS AFTER END OF PASS
000114 WDTO: OPEN ;WORDS TO MEMORY PER ITERATION
000120 WDFR: OPEN ;WORDS FROM MEMORY PER ITERATION
INTR: OPEN ;# OF INTERRUPTS PER ITERATION
```

```
000122 000051 IDNUM: 51 ;MODULE IDENTIFICATION NUMBER=51
000040 ;MODULE STACK STARTS HERE.
;*****
000224 MODSP: *****
;*****
186 AFCSR: OPEN ;CONTAINS ADDRESS OF THE CSR
187 AFDBR: OPEN ;CONTAINS ADDRESS OF THE DBR
188 APCAR: OPEN ;CONTAINS ADDRESS OF CHAN. ADDR. REG.
189
190 ;MODULE INITIALIZATION
191
193 START: MOV #16, WDTO ;16 WDS TO MEM PER ITERATION
194 MOV #16, INTR ;16 INTERRUPTS PER ITERATION
195
196 RSTRT: MOV ADDR, R5 ;GET THE FIRST ADDRESS
197 MOV R5, AFCSR ;BUILD ALL THE DEVICE ADDRESSES
198 TST (5)+
199 MOV R5, AFDBR
200 TST (5)+
201 MOV R5, APCAR
202 MOV VECTOR, R0 ;GET THE VECTOR ADDRESS
203 MOV #AFC11, (0)+ ;POINT INTERRUPTS TO AFC11
204 MOV# BR1, (0)+ ;SET UP THE PRIORITY LEVEL
205 MOV #AFTAB1, R3
206 CLR AFPLG ;CLEAR TABLE PASS FLAG
207 MOV #10, R1 ;SET UP TO CLEAR DATA TABLES
208 MOV R3, R2
209 CLR (R2)+
210 INC R1
211 BLT 15 ;STAY IN LOOP TIL TABLE CLEAR
212 MOV R3, R2 ;RESET THE TABLE POINTER
213 MOV# #10, AFCTR1 ;SAMPLE COUNTS FOR STORAGE OF
214 MOV# AFCTR1, AFCTR2 ;INDIVIDUAL SAMPLES AND AVERAGES FOR
215 ;EACH CHANNEL TESTED
216 CLR AFSEL ;TO ENABLE GENERATING TABLE OF AVGS.
217 MOV #100, @AFCSR ;SELECT CHN. 0 AT GAIN=X1000
218 MOV AFSEL, @AFCSR ;SET INTERRUPT ENABLE
219 MOV #10, @AFCSR ;START CONVERSION
220 EXITS, BGIN ;EXIT TO MONITOR. MODULE WAIT FOR INTERRUPT.
221
222 ;INTERRUPT SERVICE ROUTINES
223
224 AFC11:
225 -----
226 PTRQS, BGIN, 15 ; QUEUE UP TO CONTINUE AT 15 AND RTI
227 -----
228 1$: MOV AFCSR, R0 ; GET CSR ADDRESS
229 STR (0) ; WAS DONE SET ??
230 BRW 2S ; BRANCH IF YES
231 MOV @AFCSR, ACSR ; SAVE THE CONTENTS OF THE CSR IN ACSR
232 MOV AFCSR, CSRA ; SAVE THE ADDRESS OF THE CSR IN CSRA
233 MOV #11, ERRTYP ; ILLEGAL INTERRUPT OR DONE NOT SET
```

```

234
235 000434 104405 000000 000000
236
237 000442 067712 177560
238 000446 105267 000316
239 000452 002424
240 000454 062722
241 000456 006212
242 000460 006222
243 000462 005267 000306
244 000466 105267 000277
245 000472 002411
246 000474 005767 000276
247 000500 001016
248 000502 005167 000270
249 000506 012703 001020
250 000512 000167 177600
251 000516 112767 177770
252 000524 016777 000244
253 000532 104400 000000 000244 177476
254
255 000536 012767 001000 000220
256 000544 112767 177770 000216
257 000552 012767 001020 000206
258 000560 017767 000200 000204
259 000566 167767 000174 000176
260 000574 100402
261 000578 005487 000020
262 000582 002022
263 000610 002022
264 000612 017767 000146 177270
265 000620 017767 000142 177260
266 000626 016767 177372 177244
267 000634 017767 177364 177240
268 000642 012767 000026 177236
269
270 000650 104405 000000 000000
271
272 000656 062767 000002 000100
273 000664 062767 000002 000074
274 000672 105267 000072
275 000676 002730
276 000700 012767 001000 000056
277 000706 012767 001020 000052
278 000714 112767 177770 000046
279 000722 017777 000040 000034
280 000730 062767 000002 000026
281 000736 062767 000002 000022
282 000744 105267 000020
283 000750 002764
284 000752 005077 177246
285 000756 104413 000000
286
287 000762 000651
288
289 000764 000000

```

```

*****
HRDERS,REGIN,NULL ;DONE NOT SET
*****
2S: ADD @AFDDBR,@R2 ;GENERATE TOTAL
INCR @AFCTR ;ALL CHANNELS DONE ??
BLT @AFCTR ;BRANCH IF NOT
ASR @R2 ;DIVIDE THE TOTAL BY 8
ASR @R2
ASR (R2)+
INC @FSEL ;ADVANCE TO THE NEXT CHANNEL
INCR @AFCTR2 ;ALL CHANNELS DONE ??
BLT @AFEXA ;BRANCH IF NOT
TST @APPFLG ;YES, FIRST TABLE ?
BNE @PCOM ;NO COMPARE RESULTS
COM @APPFLG ;CHANGE THE FLAG FO 2ND TABLE
AFSP2: MOV @AFTAB2,R3
JMP SETUP
AFEXA: MOV @-10,AFCTR1 ;SET UP FOR 8 SAMPLES PER LINE
AFEXIT: MOV @FSEL,@AFCAR ;START THE MULTIPLEXOR
EXIT,BEGIN ;EXIT TO MONITOR. MODULE WAIT FOR INTERRUPT.

AFCOM: MOV @AFTAB1,AFPTR ;SET UP TO COMPARE THE TABLES
MOV @-10,AFCTR1 ;8 CHANNELS
MOV @AFTAB2,AFPTRA ;TO BE COMPARED
1S: MOV @AFPTR,AFTEMP ;GET THE DATA
SUB @AFPTRA,AFTEMP ;COMPARE ??
BML 2S ;GET THE ABSOLUTE DIFFERENCE
NEG AFTEMP
2S: ADD #20,AFTEMP ;COMPARE AGAINST ALLOWED LIMIT
BGE 3S ;BRANCH IF OK
MOV @AFPTR,@AWAS ;AWAS AND ASB CONTAIN THE TWO READINGS
MOV @AFPTRA,@ASB ;DIFFERENCE IS THE ERROR
MOV @PCSR,@CSRA ;SAVE THE CSR ADDRESS
MOV @PCSR,@CSR ;SAVE THE CONTENTS OF THE CSR
MOV @26,ERRTYP ;A-D CONVERSION OUT OF TOLERANCE
*****
HRDERS,REGIN,NULL ;DIFFERENCE OUT OF LIMITS
*****
3S: ADD #2,AFPTR ;UPDATE THE POINTERS
ADD #2,AFPTRA
INCR @AFCTR1 ;BUMP THE COUNTER
BLT 1S ;GET THE NEXT TWO READINGS
AFMOV: MOV @AFTAB1,AFPTR ;REPLACE OLD TABLE OF DATA
MOV @AFTAB2,AFPTRA ;WITH NEW DATA
MOV @-10,AFCTR1
1S: MOV @AFPTRA,@AFPTR
ADD #2,AFPTR
ADD #2,AFPTRA
INCR @AFCTR1
BLT 1S
CLR @AFCSR ;TURN OFF INTERRUPTS
ENDITS,BEGIN ;SIGNAL END OF ITERATION.
;MONITOR SHALL TEST END OF PASS
;GET SOME MORE DATA
2S: BR AFSP2
AFPTR: OPEN

```

```

290 000766 000000
291 000770 000
292 000771 000
293
294 000772 000000
295 000774 000000
296 000776 000000
297 001000 000000
298 001020 001020
299 000000 000000
300 001040 000000
301 000001 000001

```

```

AFPTRA: OPEN
AFCTR1: .BYTE 0
AFCTR2: .BYTE 0
-EVEN
AFTEMP: OPEN
AFSEL: OPEN
APPFLG: OPEN
AFTAB1: OPEN
=-+16
AFTAB2: OPEN
=-+16
-END

```


ST1	000306R	205#	
SVR0	000062R	159#	
SVR1	000064R	160#	
SVR2	000066R	161#	
SVR3	000070R	162#	
SVR4	000072R	163#	
SVR5	000074R	164#	
SVR6	000076R	164#	
SVSCNT	000052R	154#	
TRPDFD=	000022	186#	
VECTOR	000010R	135#	202
WASADR	000104R	162#	
WDFR	000116R	172#	
WDTO	000114R	175#	193*
XFLAG	000005R	133#	
.	= 001040R	298#	300#

. ABS. 000000 000
001040 001

ERRORS DETECTED: 0
DEFAULT GLOBALS GENERATED: 0

XAFPAE, XAFPAE/SOL/CRP:SYM=DDXCOM, XAFPAE
RUN-TIME: 11.2 SECONDS
RUN-TIME RATIO: 13/2=4.7
CORE USED: 7K (13 PAGES)