
IDENTIFICATION

PRODUCT CODE: AC-E679M-MC
PRODUCT NAME: XRPAM0 RP11 MODULE
PRODUCT DATE: SEPTEMBER 1978
MAINTAINER: DEC/X11 SUPPORT GROUP

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1. ABSTRACT:

RPA IS A IOMDX THAT EXERCISES THE RP11 HIGH AND LOW DENSITY DISK DRIVES.

2. REQUIREMENTS:

HARDWARE: A PDP11 INTERFACED WITH A RP11.
STORAGE: RPA REQUIRES:

1. DECIMAL WORDS: 1237
2. OCTAL WORDS: 02355
3. OCTAL BYTES: 4652

3. PASS DEFINITION:

AN END OF PASS OCCURS WHEN 788,000 WORDS HAVE BEEN TRANSFERRED. FIRST A WRITE OF 1024 WORDS IS EXECUTED FOLLOWED BY A WRITE CHECK OF 1024 WORDS, THEN READING 256 WORDS FOLLOWED BY AN IN-CORE COMPARE. THIS IS DONE ON ALL DRIVES THEN ALL TRACKS.

4. EXECUTION TIME:

AN END OF PASS TAKES APPROXIMATELY ONE MINUTE.

5. CONFIGURATION REQUIREMENTS:

DEFAULT PARAMETERS ARE AS FOLLOWS;
DVA=176710
VCT=254
RRI=5

6. DEVICE/OPTION SETUP:

MAKE SURE THE DRIVE IS POWERED UP WITH WRITE ENABLED AND THAT THE DRIVE IS READY. ALSO BE SURE THAT THE PACK HAS BEEN FORMATTED PROPERLY.

7. MODULE OPERATION:

EXECUTES A WRITE, WRITE CHECK, AND A READ ON ALL TRACKS, ALL SECTORS, AND ALL CYLINDERS. A RETRY IS DONE 3 TIMES BEFORE A MODULE IS DROPPED OR CONTINUES TO A NEW PLOCK DEPENDING ON THE SPI OPTION BITS. LOCATION "RTLMT" CAN BE CHANGED TO ALTER THE NUMBER OF ATTEMPTED RETRYs.

3. OPERATING OPTIONS:

SPI BIT0=0->IF LOW DENSITY
SPI BIT0=1->IF HIGH DENSITY
SPI BIT1=0->DROPS MODULE AFTER 3 UNRECOVERABLE ERRORS
SPI BIT1=1->GOES ON TO NEXT TRACK AFTER AN UNRECOVERABLE ERROR IN LOCATION DLTCNT
SPI BIT2=0->WILL TYPEOUT DATA LATE ERRORS AND KEEPS COUNT OF THEM IN DLTCNT
SPI BIT2=1->WILL NOT TYPEOUT DATA LATE ERRORS AND KEEPS COUNT OF THEM IN DLTCNT
THERE IS A TABLE AT LOCATION "BADLOC" IN WHICH UP TO 20 CYLINDER-TRACK COMBINATIONS MAY BE ENTERED. THIS IS INTENDED FOR USE WITH PACKS WITH KNOWN BAD SPOTS. REFER TO THE LISTS IN THIS TABLE FOR DIRECTIONS ON HOW TO ENTER DISC ADDRESSES INTO THE TABLE.
NOTE: ANY ADDRESS ENTERED IN THIS TABLE WILL APPLY TO ALL DISKS UNDER TEST.

9. NON-STANDARD PRINTOUTS:

ALL PRINTOUTS ARE STANDARD ACCORDING TO DEC/X11 DOCUMENTS.
PREFIX PRINTOUTS OTHER THAN DATA ERRORS AND NOT READY ERRORS DUMP THE REGISTERS IN THE FOLLOWING ORDER:

- DEVICE STATUS
- ERROR
- CONTROL STATUS
- WORD COUNT
- BUS ADDRESS
- CYLINDER ADDRESS
- DISK ADDRESS
- SELECTED UNIT CYLINDER ADDRESS

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;XRP11 EXERCISER
000000- IOMODX <RPAM >176710,254,5,0,0,750,6,INRD,256,1024
000000- MODULE 150000,RPAM,176710,254,5,0,6,750,6,INRD,256,1024.
;TITLE RPAM DEC/X11 SYSTEM EXERCISER MODULE
;DDXCOM VERSION 6 23-NOV-78
*****LIST*****
000000- *****LIST*****
000005- 050122 046501 040 BEGIN: ASCII /RPAM / ;MODULE NAME
000006- 176710 ADDR: 176710+0 ;USED TO KEEP TRACK OF WBUFF USAGE
000007- 000254 VECTCR: 254+0 ;1ST DEVICE ADDR
000008- 000127 240 BR1: -BYTE PRTV5+0 ;1ST DEVICE VECTOR.
000009- 000113 000 BR2: -BYTE PRTV0+0 ;1ST RR LEVEL.
000010- 000001 DVCT1: 0 ;2ND RR LEVEL.
000011- 000000 SR1: OPEN ;SWITCH REGISTER 1.
000012- 000000 SR2: OPEN ;SWITCH REGISTER 2.
000013- 000000 SR3: OPEN ;SWITCH REGISTER 3.
000014- 000000 SR4: OPEN ;SWITCH REGISTER 4.
*****LIST*****
000015- 150000 STAT: 150000 ;STATUS WORD.
000016- 000252 INT: 0 ;MODULE START ADDR.
000017- 000252 SPINT: MODSP ;MODULE STACK POINTER.
000018- 000000 PASCNT: 0 ;PASS COUNTER.
000019- 000000 ICNT: 750. ;# OF ITERATIONS PER PASS=750.
000020- 000000 ICGU: 0 ;LOC TO COUNT ITERATIONS.
000021- 000000 SPCNT: 0 ;LOC TO SAVE TOTAL SOFT ERRORS
000022- 000000 HRDcnt: 0 ;LOC TO SAVE TOTAL HARD ERRORS
000023- 000000 SRPFAS: 0 ;LOC TO SAVE SOFT ERRORS PER PASS
000024- 000000 HRDPAS: 0 ;LOC TO SAVE HARD ERRORS PER PASS
000025- 000000 SYSCNT: 0 ;# OF SV ERRORS ACCUMULATED
000026- 000000 RANNUM: 0 ;HOLDS RANDOM # WHEN RAND MACRO IS CALLED
000027- 000000 COMFIC: 0 ;RESERVED FOR MONITOR USE
000028- 000000 RES1: 0 ;RESERVED FOR MONITOR USE
000029- 000000 RES2: 0 ;RESERVED FOR MONITOR USE
000030- 000000 SVRO: OPEN ;LOC TO SAVE R0.
000031- 000000 SVR1: OPEN ;LOC TO SAVE R1.
000032- 000000 SVR2: OPEN ;LOC TO SAVE R2.
000033- 000000 SVR3: OPEN ;LOC TO SAVE R3.
000034- 000000 SVR4: OPEN ;LOC TO SAVE R4.
000035- 000000 SVR5: OPEN ;LOC TO SAVE R5.
000036- 000000 SVR6: OPEN ;LOC TO SAVE R6.
000037- 000000 CSRA: OPEN ;ADDR OF CURRENT CSR.
000038- 000000 SBADR: ;ADDR OF GOOD DATA, OR
000039- 000000 ACSR: OPEN ;ADDR OF BAD DATA, OR
000040- 000000 WMSADP: ;CONTENTS OF CSR.
000041- 000000 ASTAT: OPEN ;ADDR OF BAD DATA, OR
000042- 000000 ERRTYP: ;STATUS REG CONTENTS.
000043- 000000 ASR: OPEN ;TYPE OF ERROR.
000044- 000000 AWAS: OPEN ;EXPECTED DATA.
000045- 001432 RSTRT: RSTRT ;ACTUAL DATA.
000046- 000000 WDIO: OPEN ;WORD ADDRESS AFTER END OF PASS
000047- 000000 WDFR: OPEN ;WORDS TO MEMORY PER ITERATION
;WORDS FROM MEMORY PER ITERATION

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000120- 000000 INTR: OPEN ;# OF INTERRUPTS PER ITERATION
000121- 000006 IDNUM: 6 ;MODULE IDENTIFICATION NUMBER=6
000122- 000320 RBUFVA: INRD ;READ BUFFER VIRTUAL ADDRESS
000123- 000320 RBUFPA: OPEN ;READ BUFFER PHYSICAL ADDRESS
000124- 000320 RBUFSA: OPEN ;READ BUFFER EA BITS
000125- 000400 RBUSZ: 256 ;SIZE OF THE READ BUFFER
000126- 000000 WRUFPA: OPEN ;WRITE BUFFER PHYSICAL ADDRESS
000127- 000000 WRUFVA: OPEN ;WRITE BUFFER EA BITS
000128- 000000 WRUSZ: 1024 ;WRITE BUFFER SIZE REQUESTED
000129- 000000 WRDCT: OPEN ;WRITE BUFFER SIZE AVAILABLE
000130- 000000 CDRECT: OPEN ;CDATA/DATCK ERROR COUNT
000131- 000000 CDWDC: OPEN ;CDATA/DATCK WORD COUNT
000132- 000000 FREE: OPEN ;RESERVED FOR FUTURE USE
;MODULE STACK STARTS HERE.
;REPT SPSIZ
;NLIST
;WORD 0
;LIST
;ENDR
000252- MODSP: *****LIST*****
199 000252- 012767 000400 177634 START: MOV #256,WDIO ;256 WORDS TO MEM FROM RP
200 000260- 016767 002000 177630 MOV #1024,WDFR ;1024 WORDS FROM MEM TO RP
201 000266- 012767 000003 177624 MOV #3,INTR ;3 INTERRUPTS PER ITERATION
202 000274- 012767 175113 004316 MOV DVCT1,DVCT ;GET NUMBER OF DEVICES
203 000280- 012767 004316 004316 MOV DVCT,RDIO ;SAVE NUMBER
204 000310- 012767 000001 003252 START1: MOV #1,DRDP ;SET MODULE DROP POINTER
205 000316- 005067 003216 CLR DLACTN ;CLEAR DATA LATE ERROR COUNTER
206 000322- 005067 003256 CLR TRV5 ;
207 000328- 005067 004310 CLR SVT4 ;
208 000334- 005067 004262 CLR SVT4 ;
209 000336- 001002 BNE STR ;ANY SELECTED?
210 000340- 104410 000000 ENDS,BEGIN ;YES
211 000344- 004567 001226 STR: JSP R5,SRG ;SET UP REGISTER ADDRESS
212 000350- 005067 003234 CLR MDCNT ;CLEAR OUT COUNTERS
213 000356- 005067 003234 CLR TRK1 ;
214 000360- 005067 003234 CLR BLK1 ;
215 000364- 122737 000003 000041 CWPB R#3,R#41 ;TEST FOR LOAD MEDIUM
216 000372- 001020 BNE RPDNO ;BRANCH IF NOT
217 000374- 113700 000040 MOV R#40,R0 ;LOAD DEVICE NUMBER
218 000378- 113700 000001 MOV #1,R1 ;DEVICE MASK
219 000404- 105700 000001 TSTR R0,R1 ;HAVE LOAD DEVICE?
220 000406- 001403 BEQ 2S ;YES, DROP IT
221 000410- 005301 ASL R0 ;NO, SHIFT TO NEXT DEVICE
222 000414- 105300 DECB R0 ;
223 000416- 040167 004176 2S: BIC R1,DVCT ;CHECK AGAIN
224 000422- 040167 004200 BIC R1,RPDV ;CLEAR LOAD DEVICE
225 000430- 104416 000000 ENDS,BEGIN ;GO CALCULATE IT ALL
226 000434- 104414 000000 RPDNO: ;
227 000438- 104415 000000 GETPAS,BEGIN ;GET WRITE BUFFER INFORMATION
228 000440- 104415 000000 MOV RBUFVA,RBUFVA ;GET PHYSICAL ADDRESS FROM 16-BIT RBUFVA
229 000442- 016767 177460 003142 MOV RBUSZ,RDCT ;
230 000444- 005467 003136 NDC RDCT ;

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235 000460 016767 177456 004134 MOV WRUFSZ,WRDCT
236 000466 005467 004130 JSR WRDCT
237 000472 004567 001360 JSR RS,CLEAR ;CLEAR TRY COUNTERS
238 000476 004567 001172 JSR RS,CLEAR ;GO DETERMINE A DRIVE
240 000516 016777 003102 003036 2S: MOV MDCNT,RCR ;SET DEVICE NO.
241 000514 100402 003032 JSR RCR ;DEVICE READY?
242 000516 004567 001606 JSR RMHD ;IF READY HOME HEAD
243 000516 004567 001606 JSR RS,WAIT
244
245 ;HOME HEADS ROUTINE
246 -----
247
248 000522 032767 000010 004112 HMHD: BIT #10,SWIT ;HAVE HEADS BEEN HOMED?
249 000530 001035 000000 BNE EXER ;YES
250 000532 016700 177252 MOV VECTOR,RO ;SET VECTOR
251 000535 112720 001115 MOV HHSRV,(RO)+ ;SET BR LEVEL
252 000546 052777 000115 002772 MOV BR1,(RO) ;HOME HEADS
253 000554 104400 000000 BIS #115,RCR ;EXIT TO MONITOR. MODULE WAIT FOR INTERRUPT.
254 EXITS,BEGIN
255
256
257
258 000560 005767 004034 RTRN: TST DVCT ;ANY MORE DRIVES?
259 000564 105267 003017 BEQ IS INCR MDCNT+1
260 000572 000720 000010 BR RPDNO
261 000574 052767 000010 004040 1S: BIS #10,SWIT ;SET HEADS HOMED FLAG
262 000576 016767 004020 004010 MOV RPDV,DVCT ;RESTORE DEVICE COUNTER
263 000610 012767 006001 002746 CLR MDCNT
264 000614 012767 006001 MOV #1,DRDP
265 000622 000704 000000 BR RPDNO ;GO DO STUFF
266
267 ;START DATA TRANSFER
268 -----
269
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271
272 000624 005777 002712 EXER: TST QDVS ;TEST FOR UNIT READY
273 000630 100402 001566 BNE IS JSR RS,WAIT ;GO
274
275
276
277 000636 004567 001076 1S: JSR RS,BLKNO ;GO DETERMINE BLOCK NO.
278 000646 004567 001122 JSR RS,TRKN0 ;GO DETERMINE TRACK NO.
279 000652 005067 003772 JSR RS,CALC ;CALCULATE BLOCK CONVERSION
280 000656 004567 000024 CLR DATCK ;CLEAR KNOWN BAD SPOT FLAG
281
282
283 000662 004567 000024 GOA: JSR RS,WRT ;DO A WRITE
284 000664 000533 000000 BR RETRY1 ;TRY AGAIN
285
286 000664 004567 000056 GOB: JSR RS,WCK ;DO A WRITE CHECK
287 000670 000556 000000 BR RETRY2 ;TRY AGAIN
288
289 000672 004567 000110 GOC: JSR RS,RDCMD ;DO A READ
290 000676 000167 000400 JMP RETRY3 ;TRY AGAIN

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291 000702 000167 000500 JMP ALDN ;ALL DONE
292
293
294 000706 116777 003720 002532 WRT: MOVB WRITE,RCR ;SET WRITE COMMAND
295 000714 042777 000060 002624 BIC #60,RCR ;CLEAR EA BITS
296 000722 056777 177210 002616 BIS WRUFEA,RCR
297 000730 016777 003666 002606 MOV WRDCT,WDC ;SET WORD COUNT
298 000736 016777 177172 002606 MOV WRUFA,ABAD ;SET BUFFER ADDRESS
299 000744 000437 000000 BR GO1
300
301 000746 116777 003664 002572 WCK: MOVB WRTCK,RCR ;SET WRITE CHECK
302 000754 042777 000060 002564 BIC #60,RCR ;CLEAR EA BITS
303 000762 056777 177150 002556 BIS WRUFEA,RCR
304 000770 016777 177132 002546 MOV WRDCT,WDC ;SET WORD COUNT
305 000776 016777 177132 002546 MOV WRUFA,ABAD
306 001004 000417 000000 BR GO1
307
308 001006 116777 003622 002532 RDCMD: MOVB READ,RCR ;SET READ COMMAND
309 001014 042777 000060 002524 BIC #60,RCR ;CLEAR EA BITS
310 001022 056777 177102 002516 BIS WRUFEA,RCR
311 001030 016777 002554 002504 MOV WRUFA,ABAD
312 001036 016777 002554 002504 MOV RDCT,WDC
313
314 001044 016700 176740 002470 GO1: MOV VECTOR,RO ;SET VECTOR
315 001050 012720 001132 002460 MOVB #RPSUB,(RO)+ ;SET BR LEVEL
316 001054 116710 002460 MOV BR1,(RO) ;SET TRACK ADDRESS
317 001060 016777 002526 002470 MOV TRK1,ADSAD ;SET CYLINDER ADDRESS
318 001066 016777 002536 002460 MOV CVLCKT,RCVAD ;CLEAR HARD ERROR FLAG
319 001074 103067 002440 002440 CLR RDRERR ;SET GO + INTERRUPT ENABLE
320 001100 052777 000101 002440 BIS #101,RCR ;EXIT TO MONITOR. MODULE WAIT FOR INTERRUPT.
321 001106 104400 000000 EXITS,BEGIN
322
323
324 ;HOMED HEAD INTERRUPT SERVICE ROUTINE
325 -----
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329 001112 HHSRV:
330 001112 000004 000000 001120 ;
331 001120 042777 000115 002420 1S: PIRQS,BEGIN,1S ;QUEUE UP TO CONTINUE AT 1S AND RTI
332 001126 000167 177426 JMP #115,RCR ;CLEAR HOME HEADS BITS
333 ;RETURN
334
335 ;DATA TRANSFER SERVICE ROUTINE
336 -----
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340 001132 RPSUB:
341 001132 000004 000000 001140 ;
342 001140 004567 000740 1S: JSR RS,ERCK ;GO CHECK FOR ERRORS

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347 001144* 000295
348 001146* 0052795
349 001150* 000265
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    RTS      R5          ;ERRORS
    TST      (R5)+
    RTS      R5          ;NO ERRORS

;RETRY ROUTINES
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397 001152* 105767 003466 RETRY1: TSTR  HDERF          ;WAS IT A HARD ERROR?
398 001156* 001013          BNE  IS          ;SKIP MSG IF YES
399 001160* 004787          JSR  PC,NOW      ;PUT INTO MSG CURRENT POSITION
400 001164* 104403          MSCNS,BEGIN,MG1 ;ASCII MESSAGE CALL WITH COMMON HEADER
401 001172* 012767          MOV  #1,ERRTYP  ;DATA ERROR
402
403 001200* 104406 000000* 000000
404
405 001206* 026767 002374 002360 1S:  SOFERS,BEGIN,NULL ;WRITE CHECK ERROR
406
407 001214* 001460          CMP  R1,TR1     ;LIMIT MET?
408 001216* 005267          BEQ  COM       ;YES
409 001222* 000167          INC  TR1       ;RETRY 3 TIMES
410          JMP  GOA
411
412 001226* 105767 003412 RETRY2: TSTR  HDERF          ;WAS IT A HARD ERR?
413 001232* 001013          BNE  IS          ;SKIP MSG IF YES
414 001236* 004787          JSR  PC,NOW      ;PUT INTO MSG CURRENT POSITION
415 001240* 104403          MSCNS,BEGIN,MG2 ;ASCII MESSAGE CALL WITH COMMON HEADER
416 001246* 012767          MOV  #1,ERRTYP  ;DATA ERROR
417
418 001254* 104406 000000* 000000
419
420 001262* 026767 002320 002306 1S:  SOFERS,BEGIN,NULL ;WRITE CHECK ERROR
421
422 001270* 001434          CMP  R1,TR2     ;LIMIT MET?
423 001272* 005267          BEQ  COM       ;YES
424 001276* 000167          INC  TR2       ;RETRY 3 TIMES
425          JMP  GOB
426
427 001302* 105767 003336 RETRY3: TSTR  HDERF          ;WAS IT A HARD ERR?
428 001306* 001013          BNE  IS          ;SKIP MSG IF YES
429 001310* 004787          JSR  PC,NOW      ;PUT INTO MSG CURRENT POSITION
430 001312* 004403          MSCNS,BEGIN,MG3 ;ASCII MESSAGE CALL WITH COMMON HEADER
431 001322* 012767          MOV  #1,ERRTYP  ;DATA ERROR
432
433 001330* 104406 000000* 000000
434
435 001336* 026767 002244 002234 1S:  SOFERS,BEGIN,NULL ;READ ERROR
436
437 001344* 001404          CMP  R1,TR3     ;LIMIT MET?
438 001346* 005267          BEQ  COM       ;YES
439 001352* 000167          INC  TR3       ;RETRY 3 TIMES
440          JMP  GOC
441
442 001356* 104405 000000* 000000
443
444 001364* 104403          HDRERS,BEGIN,NULL ;TOO MANY RETRIES
445 001372* 032767          MSCNS,BEGIN,MG8 ;ASCII MESSAGE CALL WITH COMMON HEADER
446 001400* 001014          BIT  #2,SRI    ;IS DROP SWITCH ON?
  
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403 001402* 004567 001224      JSR  R5,OFFEND  ;GO DROP
404
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410 001406* 005767 003236      ALDN:  TST  DATCK          ;IS THIS A KNOWN BAD TRACK?
411 001412* 001004          CDATAS,BEGIN,RBUFPA ;SKIP THE CHECK DATA IF YES
412 001414* 104412          -+2          ;REQUEST FOR MONITOR TO CHECK DATA
413
414 001422* 001424          1S:  ENDTIS,BEGIN        ;SIGNAL END OF ITERATION.
415 001424* 104413          BR  RESTRT      ;MONITOR SHALL TEST END OF PASS
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425 001432* 005767 003162      RESTRT: TST  DVCT          ;TEST FOR MORE DRIVES
426 001436* 001406          BEQ  TRCT       ;INCREMENT DRIVE COUNT
427 001440* 105267          INCB WDCNT+1    ;MOVE DROP POINTER
428 001444* 006367          ISL  DROP      ;GO DO ANOTHER DRIVE
429 001450* 000167          JMP  RPDNO
430
431 001454* 016767 003136      TRCT:  MOV  RPDV,DVCT   ;RESTORE COUNT
432 001462* 005067          CLR  NDCNT      ;CLEAR MODULE COUNT
433 001466* 012767          MOV  #1,DROP    ;RESTORE DROP POINTER
434 001474* 12767          CMPB #2,TRK1+1  ;ALL TRACK TESTED?
435 001504* 052767          BIS  #4,SWIT   ;YES
436 001512* 000167          JMP  RPDNO      ;NO
437
438 001516* 005067 002070      BLCT:  CLR  TRK1      ;CLEAR TRACK COUNTER
439 001522* 032767          BIT  #1,SRI    ;TEST FOR HIGH OR LOW DENSITY
440 001530* 001405          BEQ  #1
441
442
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444
445 001532* 022767 007726 002054 1S:  CMP  #4054,RLK1   ;BLOCK LIMIT MET?
446 001540* 003472          BR  RESTRT    ;RESTART
447 001542* 000404          ;NO
448
449
450
451
452
453 001544* 022767 003750 002042 1S:  CMP  #2024,BLK1   ;LOW DENSITY LIMIT MET?
454 001552* 001405          BEQ  RESTRT   ;YES
455
456 001554* 052767 000020 003060 2S:  BIS  #20,SWIT     ;NO
457 001562* 000167          JMP  RPDNO
458 001572* 000167          RESTRT: CLR  SWIT
  
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;REGISTER SET-UP SUBROUTINE
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SRG:  MOV   ADDR,R0      ;MOVE ADDRESS TO R0 AND
      CLR   (R0)+        ;START TO SET UP REGS.
      MOV   R0,ERC       ;DEVICE STATUS REG.
      MOV   R0,ERC       ;SET ERROR REG
      CLR   (R0)+
      MOV   R0,CSR       ;CONTROL STATUS REG
      CLR   (R0)+        ;INCREMENT ADDRESS
      MOV   R0,WDC       ;WORD COUNT REG.
      CLR   (R0)+
      MOV   R0,BAD       ;BUS ADDRESS REG.
      CLR   (R0)+
      MOV   R0,CYAD      ;CYLINDER ADDRESS REG.
      CLR   (R0)+
      MOV   R0,DSAD      ;DISK ADDRESS REG.
      CLR   (R0)+
      CMP   (R0)+,(R0)+
      TST   (R0)+
      MOV   R0,SUCA      ;SAVE CSR ADDRESS
      MOV   CSR,CSRA
      RTS   R5

;DEVICE SELECT SUBROUTINE
-----
RPSEL: ASR   DVCT        ;LOOK FOR ACTIVE DEVICE
        IS   R5
        INCR MDCNT+1
        ASL  DROP
        RR   RPSEL
1$:     RTS   R5

;RESET THE RP
-----
REST:  MOVB  #1,CSR     ;SET IDLE COMMAND
        MOV  WDCNT,CSR  ;RESET DRIVE # AFTER IDLE
        JSR  R5,WAIT1   ;GO WAIT FOR UNIT READY
        RTS   R5

;SET BLOCK NUMBER
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BLKNO: BIT   #20,SWIT   ;NEW BLOCK FLAG SET?
        BNE  R5
        RTS  R5
1$:     BIT   #20,SWIT   ;CLEAR FLAG
        AND  BLK1
        INC  R5
        RTS  R5

;SET TRACK NUMBER
-----
TRKNO:  BIT   #40,SWIT   ;DO NEW TRACK FLAG SET?
        BNE  R5
        RTS  R5
1$:     BIT   #40,SWIT   ;CLEAR FLAG
        INCR TRK1+1
        RTS  R5

;CALCULATE CYLINDER AND SECTOR
-----
CALC:  CLR   CYLCNT      ;CLEAR CYLINDER COUNT
        MOV  #10,R1      ;SET DIVIDE
        MOV  BLK1,R2     ;SET BLOCK NO.
1$:     CMP  R0,R2       ;START CALCULATION.
        BCP  DIV        ;GO DIVIDE
        ADD  R1,R2       ;SUBTRACT FOR DIVIDE
        INC  CYLCNT      ;KEEP COUNT.
        BR  R5
DIV:    MOVB  R5,TRK1    ;SET SECTOR ADDRESS
        RTS   R5

;CLEAR ROUTINE
-----
CLEAR:  CLR   TRV1
        CLR  TRV2
        CLR  TRV3
        CLR  TRV4
        RTS  R5

;ERROR CHECK ROUTINE
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571 002104 005777 001436 ERCK: TST ACSR ;TEST FOR ERROR BIT
572 002110 104404 ;ERR IF ERROR
573 002112 005725 1S: TST (R5)+ ;NO ERROR
574 002114 000225 ;
575 002116 037777 000020 001420 2S: RTS R5 ;TIMING ERROR?
576 002124 001411 ;NO
577 002126 005267 001406 ;COUNT ERROR
578 002132 177767 000002 175746 ;DATA LATE
579 ;*****
580 002140 104406 000000 000000 ;DATA LATE
581 ;*****
582 002146 000426 ;CONT
583 002150 014146 001400 3S: MOV R5, R6 ;SAVE R1
584 002156 105001 ;SET TRACK INFO
585 002160 006301 ;LEAVE ONLY TRACK BITS
586 002162 007767 001366 ;MOVE TRACK BITS OVER 1 PLACE
587 002164 007767 001366 ;FOR IN THE C/H BITS
588 002166 014146 001366 ;FOR IN THIS CURRENT ADDR OF DISK
589 002172 012701 003054 ;GET START OF TABLE OF KNOWN BAD SPOTS
590 002176 021127 177777 4S: CMP (R1), #177777 ;END OF TABLE?
591 002180 001407 ;BRANCH IF YES, MUST BE REAL ERROR
592 002184 026721 002436 ;IS THIS ADDR A KNOWN BAD SPOT?
593 002210 001372 ;IF NO, TRY NEXT TABLE ENTRY
594 002212 002601 ;RESTORE R1
595 002214 002601 002430 ;RETURN AND DO NOT REPORT THE ERROR
596 002220 007734 ;
597 002222 012601 ;RESTORE R1
598 002224 016767 001316 175646 6S: MOV CSR, CSR ;SET UP FOR ERROR CALLS
599 002230 017767 001276 175636 ;DITTO
600 002240 017767 004000 001272 ;DITTO
601 002244 032777 004000 ;HARD ERROR?
602 002246 001416 ;
603 002254 001416 ;
604 002256 104403 000000 003164 ;PUT INTO MSG CURRENT POSITION
605 002270 005067 175612 ;ASCII MESSAGE CALL WITH COMMON HEADER
606 ;*****
607 002274 104405 000000 003542 ;UNKNOWN ERROR
608 ;*****
609 002302 105267 002336 ;
610 002306 004567 177404 ;
611 002312 032777 000002 001224 7S: BIT R5, R5 ;SET HARD ERR FLAG TO GATE LATER MSG
612 002314 032777 ;RESET AND TRY AGAIN
613 002322 004567 ;CHECK FOR OVERFLOW SET
614 002326 000205 ;
615 ;
616 ;
617 ;
618 ;
619 ;
620 ;
621 002330 005067 002270 WAIT: CLR TMCNT
622 002334 104407 000000 1S: BREAKS, BEGIN ;TEMPORARY RETURN TO MONITOR....
623 002336 104407 000000 ;THEN CONTINUE AT NEXT INSTRUCTION.
624 002344 105777 001176 ;CONTROLLER READY?
625 002350 100424 ;YES

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627 002352 005267 002246 INC TMCNT ;NO
628 002356 014786 ;TIME OUT
629 002360 017767 001162 175514 ;
630 002366 017767 001150 175510 ;
631 002374 104403 000000 003154 ;
632 002402 012767 000003 175476 ;
633 ;*****
634 002410 104405 000000 000000 ;CONTROLLER NOT READY
635 ;*****
636 002416 004567 000210 ;CONTROLLER NOT READY
637 ;*****
638 002422 000205 2S: RTS R5 ;CONTROLLER NOT READY
639 ;*****
640 ;
641 ;
642 ;
643 ;
644 ;
645 ;
646 002424 005067 002174 WAIT1: CLR TMCNT
647 002430 104407 000000 1S: BREAKS, BEGIN ;TEMPORARY RETURN TO MONITOR....
648 002434 104407 000000 ;THEN CONTINUE AT NEXT INSTRUCTION.
649 002440 005777 001076 ;UNIT READY?
650 002444 100424 ;YES
651 002448 005267 002152 ;NO
652 002454 017767 001066 175420 ;TIME OUT
653 002462 017767 001054 175414 ;
654 002470 104403 000000 003154 ;
655 002476 012767 000006 175402 ;
656 ;*****
657 002504 104405 000000 000000 ;DEVICE NOT READY
658 ;*****
659 002512 004567 000114 ;UNIT NOT READY
660 ;*****
661 002516 000205 2S: RTS R5 ;UNIT NOT READY
662 ;*****
663 ;
664 ;
665 ;
666 ;
667 ;
668 ;
669 ;
670 ;
671 002520 017703 001036 OVFL0: MOV ASUCA, R3
672 002524 032767 000001 175264 BIT R1, SP1 ;HIGH OR LOW DENSITY?
673 002530 014404 ;ERR IF LOW
674 002534 012704 000625 ;
675 002540 166304 ;
676 002542 000463 ;
677 002546 012704 000312 1S: MOV R3, R4
678 002550 166304 ;
679 002552 100417 ;
680 002556 016467 ;
681 002562 001002 ;ARE WE PAST 405?
682 002562 005067 001000 ;SET COUNTER

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683 002566 062767 005000 000772 1S: ADD #2560.,TET ;FIND SPACE LEFT
684 002800 005367 000764 BNE 1S
685 002800 005367 000764 BNE 1S
686 002802 026767 175334 000756 CMP WBUF SZ,TET ;COMPARE SPACE LEFT
687 002610 101407 BLOS RET ;RESTORE STACK
688 002614 065926 TST (R6)+,(R6)+
689 002614 065926 TST (R6)+,(R6)+
690 002516 042767 000010 002016 BIC #10,SWIT
691 002624 000167 175514 RET: JMP STR
692 002630 000205 RTS
693
694
695
696 ;DROP ROUTINE
697
698
699
700 002632 046767 000732 001766 OFFEND: BIC RPDV,RPDV ;CLEAR OFFENDING DRIVE
701 002640 005767 001762 TST RPDV ;ANY MORE DRIVES?
702 002644 001002 BNE 3S
703 002646 104410 000000 ENDS,BEGIN
704
705 002652 104403 000000 003160 3S: MSGNS,BEGIN,MC6 ;ASCII MESSAGE CALL WITH COMMON HEADER
706 002660 016767 001742 001732 MOV RPDV,DVCT ;RESTORE COUNT
707 002666 005726 TST (R6)+ ;RESTORE STACK
708 002670 000167 175450 JMP STR
709
710 ;NOW ROUTINE INSTALLS CURRENT ADDRESS INTO MSG
711
712
713
714 002674 010146 NOW: MOV R1,-(R6) ;SAVE CURRENT R1
715 002676 017701 MOV @CSR,R1 ;GET DEVICE #
716 002702 000301 SWAB R1 ;GET GOOD BITS ON RIGHT SIDE
717 002704 042701 BIC #177770,R1 ;LEAVE ONLY CORRECT BITS
718 002710 010167 MOV R1,NUMBA1 ;STORE IT
719
720 ;*****
721 ;CONVERT NUMBA1 TO ASCII AND
722 ;STORE AT DNUM
723 OTOAS,BEGIN,NUMBA1,DNUM
724 ;*****
725 002724 116767 000115 000537 MOVB DNUM+5,NW+4 ;PUT IN MSG
726 002732 017767 000616 000110 MOV @VAD,NUMBA2 ;PUT CYL IN NUMBA2 FOR MACRO
727 ;*****
728 ;CONVERT NUMBA2 TO ASCII AND
729 ;STORE AT DNUM
730 OTOAS,BEGIN,NUMBA2,DNUM
731 ;*****
732 002750 116767 000067 000516 MOVB DNUM+3,NW+7. ;PUT CYC# DIGITS
733 002756 116767 000062 000511 MOVB DNUM+4,NW+8. ;INTO MSG
734 002764 116767 000055 000504 MOVB DNUM+5,NW+9. ;MSG
735 002772 017781 000560 000504 MOV @SAD,R1 ;PUT TRACK# ON STACK
736 002776 000301 SWAB R1 ;GET GOOD BITS ON RIGHT SIDE
737 003000 042701 BIC #177740,R1 ;LEAVE ONLY TRAVK BITS
738 003004 010167 000942 MOV R1,NUMBA3 ;SAVE

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739 ;*****
740 ;CONVERT NUMBA3 TO ASCII AND
741 ;STORE AT DNUM
742 003010 104420 000000 003052 OTOAS,REGIN,NUMBA3,DNUM
743 003016 003040 ;*****
744 ;*****
745 003020 116767 000020 000453 MOVB DNUM+4,NW+12. ;PUT TRACK# DIGITS
746 003026 116767 000013 000446 MOVB DNUM+5,NW+13. ;INTO MSG
747 003034 012601 MOV (R6)+,R1 ;RESTORE R1
748 003036 000207 RTS PC ;GO BACK
749
750
751
752
753
754
755 003040 000003 DNUM: .RLKW 3. ;RESERVE SIX BYTES FOR BTOD MACRO
756 003046 000000 NUMBA1: .WORD 0
757 003050 000000 NUMBA2: .WORD 0
758 003052 000000 NUMBA3: .WORD 0
759
760
761
762
763
764 003054 177777 BADLOC: 177777 ;TABLE FOR ENTRY OF KNOWN BAD
765 003056 177777 177777 ;TRACK-CYLINDER LOCATIONS
766 003060 177777 177777 ;FOR ANY TRACK-CYLINDER COMBINATIONS
767 003062 177777 177777 ;LISTED IN THIS TABLE, NO ERRORS WILL
768 003064 177777 177777 ;BE REGISTERED OR PRINTED.
769 003066 177777 177777 ;THE FIRST OCCURANCE OF A MINUS ONE,
770 003070 177777 177777 ;177777 MARKS THE END OF THE TABLE
771 003074 177777 177777 ;AND ANY ENTRIES PAST IT WILL BE IGNORED.
772
773
774
775
776
777
778
779
780
781
782
783
784 003124 177777 ;DATA MUST BE IN THE FOLLOWING
785 ;PATTERN:
786 ;0 0 1 1 0 0 0 0 0 0 0 0
787 ;WHERE 0 IS UNUSED, 1 IS TRACK
788 ;C IS CYCLINDER. IF IS THEREFORE
789 ;JUST , IN OCTAL, 0 IS CCC. THE LAST
790 ;ENTRY IN THE TABLE MUST BE 177777
791 ;OR THE PROGRAM WILL BLOW UP
792 ;THIS MEANS THERE IS ROOM FOR 20 ENTRIES
793
794
795
796
797
798
799
800 003126 003176 MG1: HE1
801 003132 177777 NW
802
803
804
805
806
807
808
809 003134 003222 MG2: HE2
810 003136 003468 NW

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795 003140 177777          177777
796
797 003142 003254          MG3: HE3
798 003144 003465          NW
799 003146 177777          177777
800
801 003150 003277          MG4: DNR
802 003152 177777          177777
803
804 003154 003324          MG5: UNR
805 003156 177777          177777
806
807
808 003160 003347          MG6: DRD
809 003162 177777          177777
810
811
812 003164 003404          MG7: HRD
813 003166 003465          NW
814 003170 177777          177777
815
816
817 003172 003435          MG8: SOE
818 003174 177777          177777
819
820
821 003176 020045 047523 052106 HE1: .ASCIZ "% SOFT WRITE ERROR "
822 003204 053440 044522 042524
823 003226 006040 051122 051117
824
825
826 003228 020045 047523 052106 HE2: .ASCIZ "% SOFT WRITE CHECK ERROR "
827 003236 041440 042510 045503
828 003244 042440 051122 051117
829 003252 006040
830
831
832 003254 020045 047523 052106 HE3: .ASCIZ "% SOFT READ ERROR "
833 003262 051040 049505 020104
834 003270 051105 047522 020122
835 003276 000
836
837 003277 045 042040 053105 DNR: .ASCIZ "% DEVICE NOT READY %"
838 003304 041511 020105 047516
839 003326 020151 006045 042101
840
841
842 003324 020045 047125 052111 UNR: .ASCIZ "% UNIT NOT READY %"
843 003340 040505 054504 022440
844 003346 000
845
846
847
848 003347 045 042040 047522 DRD: .ASCIZ "% DROPPED OFFENDING DRIVE %"
849 003354 050120 042105 047440
850 003362 043106 047105 044504
  
```

```

851 003370 043516 042040 044522
852 003376 042526 020040 000045
853
854 003404 020045 040510 042122 HRD: .ASCIZ "% HARD ERROR BIT 14 SET "
855 003412 042440 051122 051117
856 003420 041040 052111 030440
857 003434 020045 042523 020124
858 003434 000
859
860
861 003435 045 052440 051116 SOE: .ASCIZ "% UNRECOVERABLE ERROR %"
862 003442 041505 053117 051105
863 003450 041101 042514 042440
864 003456 051122 051117 022440
865
866 003465 040 042504 020126 NW: .ASCIZ "% DEV C T IN OCTAL "
867 003472 041440 020040 020040
868 003500 020124 020040 044440
869 003506 020116 041517 040524
870 003514 060114
871 003516 020045 052101 020101 MES10: .ASCIZ "%DATA LATE ERROR*"
872 003524 040514 042524 042440
873 003532 051122 051117 000045
874
875
876
877
878
879 003540 000000 DLTCNT: 0
880 003542 000000 SAVRG: 0
881 003544 000000 DVS: 0
882 003546 000000 ERS: 0
883 003548 000000 CSR: 0
884 003550 000000 WDC: 0
885 003552 000000 BAD: 0
886 003554 000000 CYAD: 0
887 003556 000000 DSAD: 0
888 003560 177777 177777
889
890
891 003562 000000 SUCA: 0
892 003564 000000 QMT: 0
893 003566 000000 TET: 0
894 003570 000000 DROP: 0
895 003572 000000 TRV: 0
896 003574 000000 TRV1: 0
897 003576 000000 TRV2: 0
898 003580 000000 TRV3: 0
899 003602 000000 TRV4: 0
900 003604 000000 TRV5: 0
901 003606 000002 RTLMT: 2
902 003608 000000 WDCNT: 0
903 003612 000000 TRKI: 0
904 003614 000000 BLKI: 0
905 003616 000000 RDCI: 0
906 003620 000400 INRD: .BLKW 256.
  
```

;DEVICE STATUS REG
;ERROR REG
;CONTROL STATUS REG
;WORD COUNT REG
;BUS ADDRESS REG.
;CYLINDER ADDRESS REG.
;DISK ADDRESS REG.

;SELECTED UNIT CYLINDER ADDRESS

;RETRY LIMIT *****CAN BE CHANGED
;TRACK NO.
;READ WORD COUNT
;READ BUFFER

SOE	003435R	817	861#																	
SOP	000042R	152#																		
SOPERS=	104406	199#	362	376	390	580														
SOPPAS	000046R	154#																		
SPDINT	000037R	148#																		
SPSIZ =	000046	1	192																	
SRG	001576R	212#	465#																	
SRI	000016R	143#	401	439	672															
SR4	000025R	144#																		
SR4	000024R	144#																		
START	000217R	174#	199#																	
START1	000310R	204#																		
START	000026R	146#																		
STR	000344R	209#	212#	458	691	708														
SUCA	003562R	483#	671	891#																
SVRO	000062R	161#																		
SVR1	000064R	162#																		
SVR2	000066R	163#																		
SVR3	000070R	164#																		
SVR4	000072R	165#																		
SVR5	000074R	166#																		
SVR6	000076R	167#																		
SWIT	004642R	207#	248	262*	435*	455*	457*	515	518*	527	530*	690*	916#							
SYSCNT	000052R	158#																		
TEA	002612R	676#																		
TEA	003566R	682#	680	688#																
TECMT	004624R	621#	627*	686#	893#															
TRC*	001454R	425	430#	646*	909#															
TRKNO	001770R	279	527#																	
TRK1	003612R	214*	318	433	438*	531*	547*	903#												
TRDPD=	000027R	199#																		
TRY	000052R	158#																		
TRY1	003574R	364	895#																	
TRY2	003576R	378	366*	559*	896#															
TRY3	003600R	392	380*	560*	897#															
TRY4	003602R	394	394*	561*	898#															
TRY5	003604R	396	392*	899#																
UNR	003324R	804	900#																	
VECTOR	000010R	137#	804	842#																
WAIT	002139R	242	250	315																
WASADR	000104R	171#	621#	646#																
WBUPEA	000136R	186#	296	303																
WBUPEA	000136R	186#	298	305																
WBUPEA	000140R	187#																		
WBUFSZ	000142R	188#	235	686																
WCK	000746R	286	301#																	
WDC	003550R	297*	304*																	
WDFR	000149R	178#	313*	473*	884#															
WDT0	000114R	177#	200*																	
WDOCT	004622R	235*	199*																	
WRITE	004632R	294	236*	297	304	908#														
WRT	001706R	283	912#																	
WRTCK	004636R	301	292#																	
XPLAG	000005R	135#	914#																	

. = 004652R 412 755# 906#

. ABS. 000000 000
 004652 001

ERRORS DETECTED: 0
 DEFAULT GLOBALS GENERATED: 0
 XRPAMO,XRPAMO/SOL/CRF:SYM=DDXCOM,XRPAMO
 RUN-TIME: 1 2.4 SECONDS
 RUN-TIME RATIO: 2574=5.1
 CORE USED: 7K (13 PAGES)