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PRODUCT CODE: AC-9190B-MC
PRODUCT NAME: CZRJCBO RPD4/5/6 HEAD ALIGNMENT PROGRAM
PRODUCT DATE: DECEMBER 1977
MAINTAINER: DIAGNOSTIC ENGINEERING

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C2RJCB0. RPO4 5 6 HEAD ALNMT MACY11 30(1046) 04-NOV-77 17:31
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1. ABSTRACT

THE RPD4/5/6 HEAD ALIGNMENT VERIFICATION PROGRAM CHECKS RPD4, RPD5, OR RPD6 DISK DRIVE HEAD ALIGNMENT OR ALLOWS THE OPERATOR TO ALIGN HEADS WITH THE APPROPRIATE DRIVE'S TEST BOX. THE PROGRAM ALSO CONTAINS A UTILITY ROUTINE WHICH PERFORMS 5,000 RANDOM SEEKS WITHOUT DATA TRANSFERS. THE RANDOM SEEK UTILITY ALLOWS THE OPERATOR TO EXERCISE THE DRIVE WITH THE ALIGNMENT PACK IN PLACE AND THEN RE-VERIFY HEAD ALIGNMENT.

2. REQUIREMENTS

2.1 EQUIPMENT

PDP-11 PROCESSOR
8K MEMORY
TELETYPE
PROGRAM LOAD DEVICE
KW11-L OR KW11-P CLOCK
RH11 OR RH70 WITH RPD4'S, RPD5'S, OR RPD6'S
ALIGNMENT PACK ('CE' PACK)
'DDU' OR 'DEDU' FOR RPD4'S
'PERCH' FOR RPD5/6'S

2.2 PRELIMINARY PROGRAMS

THE RPD4/5/6 DISK SUBSYSTEM MUST BE OPERATION AND ALL OTHER PROGRAMS IN THE SET FOR THE SUBSYSTEM MUST RUN SUCCESSFULLY.

3. LOADING PROCEDURE

THE PROGRAM MAY BE LOADED FROM PAPER TAPE USING THE ABSOLUTE LOADER OR IT MAY BE LOADED FROM THE APPROPRIATE 'XXDP' MEDIA USING THE ASSOCIATED LOADER. THE PROGRAM MAY NOT BE INCLUDED IN A 'XXDP' CHAIN.

4. STARTING PROCEDURES

4.1 STARTING ADDRESSES

THE PROGRAM IS STARTED FROM LOCATION 200(8) IF THE ADDRESS OF THE RH11 OR RH70 WILL NOT BE CHANGED.

THE PROGRAM IS STARTED FROM LOCATION 204(8) IF THE ADDRESS OF THE RH11 OR RH70 IS TO BE CHANGED FROM THE PRELOADED VALUE. (SEE SECTION 4.4)

4.2 PROGRAM & OPERATION ACTION

1. LOAD THE PROGRAM INTO MEMORY (SEE SECTION 3)
2. LOAD ADDRESS 200 OR 204.
3. SET THE SWITCHES AND PRESS 'START'
4. PLACE AN ALIGNMENT DISK PACK ON THE DRIVE TO BE CHECKED AND SET THE DRIVE IN WRITE PROTECT MODE.
5. CYCLE UP THE DRIVE TO BE CHECKED. ALLOW SUFFICIENT TIME FOR THE ALIGNMENT PACK TO REACH OPERATING TEMPERATURE AND TO STABILIZE. REFER TO APPLICABLE MAINTENANCE PROCEDURES FOR THE REQUIRED AMOUNT OF TIME.
6. SELECT THE DRIVE TO BE CHECKED IN RESPONSE TO THE TYPEOUT ON THE TELETYPE.
7. THE PROGRAM WILL ASK FOR THE MODE OF OPERATION: ENTER AN 'A' IF THE PROGRAM IS TO BE USED FOR HEAD ALIGNMENT; ENTER A 'V' IF HEAD ALIGNMENT IS TO BE CHECKED; OR ENTER AN 'E' IF THE RANDOM SEEK UTILITY IS TO BE RUN.
8. IF AN 'A' IS ENTERED IN RESPONSE TO THE PROGRAM MODE MESSAGE, THE PROGRAM WILL POSITION THE DRIVE TO THE ALIGNMENT CYLINDER: RPO4/5 - CYLINDER 245; RPO6 - CYLINDER 496. THE PROGRAM WILL THEN ASK FOR A HEAD ADDRESS. THE HEAD ENTERED WILL BE SELECTED AND THE PROGRAM WILL REQUEST ANOTHER HEAD. UNTIL A NEW HEAD ADDRESS IS ENTERED, THE LAST ENTERED HEAD ADDRESS WILL REMAIN SELECTED. THE ALIGNMENT SEQUENCE MAY BE TERMINATED BY TYPING A 'CONTROL C'; THE PROGRAM WILL RETURN TO THE DRIVE SELECTION ROUTINE.
9. IF THE PROGRAM IS BEING RUN IN 'VERIFICATION' MODE AND SW<02> IS SET, THE PROGRAM WILL ASK FOR HEAD AND CYLINDER ADDRESSES. (HEAD AND CYLINDER ADDRESSES ARE ENTERED IN DECIMAL.) WITH SW<02>, ONLY THE ALIGNMENT OF THE SPECIFIED HEAD WILL BE CHECKED.
10. WHEN THE OPERATOR HAS COMPLETED THE PRESENT DRIVE, CYCLE THE DRIVE DOWN, AND TRANSFER THE TEST BOX AND ALIGNMENT PACK TO THE NEXT DRIVE TO BE CHECKED. WHEN THE ALIGNMENT PACK HAS STABILIZED, THE NEW DRIVE CAN BE SELECTED. IT IS NOT NECESSARY TO RESTART THE PROGRAM.

4.3 DRIVE SELECTION

ENTER A DRIVE NUMBER IN RESPONSE TO THE 'ENTER DRIVE NUMBER:' TYPEOUT FROM THE PROGRAM. ONLY VALID DRIVE NUMBERS (0 - 7) WILL BE ACCEPTED BY THE PROGRAM. NOTE THAT THE DRIVE SETUP (TEST BOX CONNECTION AND ALIGNMENT PACK STABILIZATION) MUST HAVE BEEN COMPLETED BEFORE A DRIVE IS SELECTED.

4.4 RH11 - RH70 UNIBUS ADDRESSES

BE FOLLOWED.

6. ERRORS

6.1 TEST ERRORS

RP04/5:

THE PROGRAM CHECKS THAT EACH HEAD IS WITHIN + OR - 150 MICRO-INCHES FROM THE TRACK CENTERLINE FOR CYLINDER 245 AND IS WITHIN + OR - 350 MICRO-INCHES FOR CYLINDERS 4 AND 400. IF A HEAD IS FOUND THAT IS NOT WITHIN THESE TOLERANCES, AN ERROR MESSAGE IS TYPED. THE ERROR MESSAGE IDENTIFIES THE CYLINDER, HEAD, AND THE ACTUAL POSITION OF THE HEAD RELATIVE TO THE CENTERLINE. (IF SW<00>=1, THE ACTUAL ALIGNMENT OF EACH HEAD WILL BE TYPED OUT; HEADS OUT OF TOLERANCE WILL NOT BE IDENTIFIED.)

RP06:

THE PROGRAM CHECKS THAT EACH HEAD IS WITHIN + OR - 75 MICRO-INCHES FROM THE TRACK CENTERLINE FOR CYLINDER 496 AND IS WITHIN + OR - 175 MICRO-INCHES FOR CYLINDERS 8 AND 800. IF A HEAD IS FOUND THAT IS NOT WITHIN THESE TOLERANCES, AN ERROR MESSAGE IS TYPED. THE ERROR MESSAGE IDENTIFIES THE CYLINDER, HEAD, AND THE ACTUAL POSITION OF THE HEAD RELATIVE TO THE CENTERLINE. (IF SW<00>=1, THE ACTUAL ALIGNMENT OF EACH HEAD WILL BE TYPED OUT; HEADS OUT OF TOLERANCE WILL NOT BE IDENTIFIED.)

6.2 ENTRY ERRORS

THE PROGRAM WILL NOT ACCEPT DRIVE NUMBERS GREATER THAN 7. IF AN INVALID DRIVE NUMBER IS ENTERED IN RESPONSE TO THE DRIVE NUMBER REQUEST, THE PROGRAM WILL TYPE A '?'; THE OPERATOR MAY ENTER A VALID NUMBER.

THE PROGRAM WILL NOT ACCEPT HEAD ADDRESSES GREATER THAN 18 (DECIMAL) OR CYLINDER ADDRESSES OTHER THAN 245(10) FOR RP04/5'S OR 496(10) FOR RP06'S. IF AN INVALID CYLINDER OR HEAD ADDRESS IS ENTERED, THE PROGRAM WILL REJECT THE ENTRY AND RETURN TO THE DRIVE SELECTION ROUTINE.

THE PROGRAM WILL NOT ALLOW A DRIVE TO BE ASSIGNED IF IT IS NOT 'WRITE PROTECTED'. IF THIS IS ATTEMPTED, THE OPERATOR WILL BE NOTIFIED.

DRIVES ASSIGNED ARE CHECKED TO ENSURE THAT THE DRIVE ASSIGNED IS PRESENT, ONLINE, AND IS AN RP04, RP05, OR RP06. THE PROGRAM WILL REJECT ASSIGNMENTS FOR DRIVES WHICH ARE NOT PRESENT OR ARE NOT ONLINE.

6.3 SUBSYSTEM/DEVICE ERROR MESSAGES

1. 'RH11 INTERRUPT OCCURRED (RPAS=0) - AN INTERRUPT

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OCCURRED, BUT NOTHING ON THE MASSBUS IS INDICATING AN ATTENTION.

2. 'UNEXPECTED ATTENTION OCCURRED' - THE INDICATED DRIVE INTERRUPTED, BUT NO INTERRUPT WAS EXPECTED FROM THE INDICATED DRIVE.
3. 'MASSBUS PARITY ERROR (MCPE=1)' - A CONTROL BUS PARITY ERROR WAS DETECTED BY THE RH11 WHEN THE INDICATED REGISTER WAS READ.
4. 'MASSBUS PARITY ERROR (PAR=1)' - A CONTROL BUS PARITY ERROR OCCURRED WHEN THE INDICATED REGISTER WAS WRITTEN.
5. 'ADDRESS PLUG CHANGE BIT SET' - THE PROGRAM FOUND THE 'OPE' BIT SET FOR THE INDICATED DRIVE.
6. 'RH11 DIDN'T RESPOND TO ADDRESSING' - THE PROGRAM ACCESSED THE RH11 AT THE INDICATED ADDRESS AND RECEIVED NO RESPONSE.
7. 'DRIVE OR DATA ERROR' - THE INDICATED DRIVE COMPLETED AN OPERATION WITH THE INDICATED ERROR CONDITIONS SET.
8. 'DRIVE UNSAFE ERROR' - THE INDICATED DRIVE SIGNALLED AN UNSAFE CONDITION.
9. 'HEAD OUT OF ALIGNMENT' - THE INDICATED HEAD OF NOT WITHIN TOLERANCE.
10. 'HEAD TOO FAR OUT OF ALIGNMENT' - THE INDICATED HEAD IS TOO FAR OUT OF ALIGNMENT FOR THE PROGRAM TO FIND THE TRACK CENTERLINE FOR THAT HEAD.
11. 'SOFTWARE TIMEOUT' - THE INDICATED DID NOT COMPLETE THE OPERATION WITH 1 SECOND.
12. 'UNCORRECTABLE MASSBUS PARITY ERROR' - THE PROGRAM ATTEMPTED TO PERFORM AN OPERATION AND DETECTED 3 SUCESSIVE MASSBUS PARITY ERRORS OR THE PROGRAM ATTEMPTED TO CLEAR A 'PAR' ERROR IN THE DRIVE AND A PARITY ERROR OCCURRED.
13. 'DRIVE IS UNAVAILABLE' - THE INDICATED DRIVE HAS GONE OFFLINE OR HAS BECOME NON-EXISITENT.

7. RESTRICTIONS

BECAUSE AN ALIGNMENT DISK PACK IS USED ON DRIVES TESTED BY THIS PROGRAM, NO DATA TRANSFER OPERATIONS ARE PERFORMED.

8. PROGRAM DESCRIPTION

- 8.1 VERIFICATION MODE
- 8.1.1 RP04/5 OPERATIONS

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HEADS 0, 1, 10, 17, 18 AT CYLINDERS 8 AND 800.

THE OPERATOR MAY TERMINATE THE OPERATION AT ANY TIME BY TYPING A
'CONTROL C'.

8.2

ALIGNMENT MODE

THE PROGRAM MAY ALSO BE USED TO PROVIDE HEAD SELECTION FOR DDU
CONTROLLED HEAD ALIGNMENT. WHEN THIS MODE IS SELECTED, THE
PROGRAM WILL PERFORM NO ALIGNMENT CHECKING - ONLY THE REQUESTED
HEAD IS SELECTED IN THE DCL. THE ACTUAL ALIGNMENT MUST BE PERFORMED
USING THE ALIGNMENT METER ON THE DDU, DEDU, OR PERCH. WHEN USED IN
THE ALIGNMENT MODE, THE PROGRAM PROVIDES HEAD SELECTION WHICH IS NOT
PRESENT IN THE DDU.

THE OPERATOR MAY TERMINATE THE OPERATION AT ANY TIME BY TYPING A
'CONTROL C'.

8.3

RANDOM SEEK UTILITY

THE PROGRAM CONTAINS A UTILITY ROUTINE WHICH PERFORMS 5,000 (10)
RANDOM SEEK OPERATIONS ON THE DRIVE BEING CHECKED. THIS UTILITY
ALLOWS THE OPERATOR TO EXERCISE THE HEAD ASSEMBLY ON THE DRIVE AFTER
HEAD ALIGNMENT HAS BEEN PERFORMED.

THE UTILITY ROUTINE IS NORMALLY USED AFTER HEADS HAVE BEEN ALIGNED;
THE RANDOM SEEK UTILITY IS CALLED AND HEAD ALIGNMENT IS RE-VERIFIED
AT THE COMPLETION OF THE RANDOM SEEKS. USE OF THIS ROUTINE DOES
NOT REQUIRE CYCLING DOWN THE DRIVE AND REPLACING THE ALIGNMENT
PACK WITH A SCRATCH PACK FOR THE HEAD SHAKE DOWN.

THE OPERATOR MAY TERMINATE THE OPERATION AT ANY TIME BY TYPING A
'CONTROL C'.

9.

PROGRAM LISTING

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      .IIF NB (CZRJCBO, RPO4/5/6 HEAD ALNMT ),.TITLE CZRJCBO, RPO4/5/6 HEAD ALNMT
      .IF NB (1976,1977)
      .;*COPYRIGHT (C) 1976,1977
      .;*DIGITAL EQUIPMENT CORP.
      .;*MAYNARD, MASS. 01754
      .;*
      .ENDC
      .IIF NB (C. HESS),;*PROGRAM BY C. HESS
      .;*
      .;*THIS PROGRAM WAS ASSEMBLED USING THE PDP-11 MAINDEC SYSMAC
      .;*PACKAGE (MAINDEC-11-DZQAC-C3), JAN 19, 1977.
      .;*
      .IIF NDF $HD,$HD=0
      .IIF NDF $TN,$HD=$HD!1
      .IIF NDF $SWR,$HD=$HD!2
      .IIF NE $HD&1,$TN=1
      .IIF NE $HD&2,$SWR=160000
      .SBTTL OPERATIONAL SWITCH SETTINGS
      .;*
      .;*      SWITCH      USE
      .;*      -----
      .IIF NE 100000&$SWR,;*      15      HALT ON ERROR
      .IIF NE 040000&$SWR,;*      14      LOOP ON TEST
      .IIF NE 020000&$SWR,;*      13      INHIBIT ERROR TYPEOUTS
      .IF NE 010000&$SWR
      .;*      12      INHIBIT TRACE TRAP
      .IFF
      .IF NB (>)
      .;*      12
      .ENDC
      .ENDC
      .IIF NE 004000&$SWR,;*      11      INHIBIT ITERATIONS
      .IF NE 002000&$SWR
      .;*      10      BELL ON ERROR
      .IFF
      .IF NB (>)
      .;*      10
      .ENDC
      .ENDC
      .IF NE 001000&$SWR
      .;*      9      LOOP ON ERROR
      .IFF
      .IF NB (LOOP ON ERROR)
      .;*      9      LOOP ON ERROR
      .ENDC
      .ENDC
      .IF NE 000400&$SWR
      .NLIST
      .IIF NDF $SWRMK,$SWRMK=0
      .LIST
      .IIF EQ (<$SWRMK&377>),;*      8      LOOP ON TEST IN SWR<7:0>
      .IIF EQ (<$SWRMK&377>-200),;*      8      LOOP ON TEST IN SWR<6:0>
      .IIF EQ (<$SWRMK&377>-300),;*      8      LOOP ON TEST IN SWR<5:0>
      .IIF EQ (<$SWRMK&377>-340),;*      8      LOOP ON TEST IN SWR<4:0>

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E02

F02

C2RJCB0 RPO4 5 6 HEAD ALNMT
C2RJCB.P11 04-NOV-77 12:49

MACY11 30(1046) 04-NOV-77 17:31 PAGE 21
PROGRAM STARTING ADDRESS = 200

SEQ 0021

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1037
1038
1039

SRPVEC: .WORD 254

;PH11/RPO4/5/6 VECTOR ADDRESS

.MACRO .ENDM MORETAGS
\$REG'A: .WORD 0

::CONTAINS ((\$REGAD)+'B')

.NLIST
SCM1=SCM1+1
SCM2=SCM2+2

.LIST
.ENDM \$\$CMREG
.MACRO \$\$CMTMP A

::USER DEFINED

\$TMP'A: .WORD 0
.NLIST
SCM4=SCM4+1
.LIST
.ENDM \$\$CMTMP

K02

M02

CZRJCBO, RPO4/5/6 HEAD ALNMT
CZRJCBO.P11 04-NOV-77 12:49

MACY11 30(1046) 04-NOV-77 17:31 PAGE 25
RH11/RPO4/5/6 ADDRESS & VECTOR LOCATIONS

SEQ 0025

1208
1209 001
1210
1211 001264 176700
1212 001266 000254
1213
1214 000

.LIST
.ENDC

\$RPADR: .WORD 176700
\$RPVEC: .WORD 254

;RH11/RPO4/5/6 UNIBUS ADDRESS
;RH11/RPO4/5/6 VECTOR ADDRESS

.ENDC

