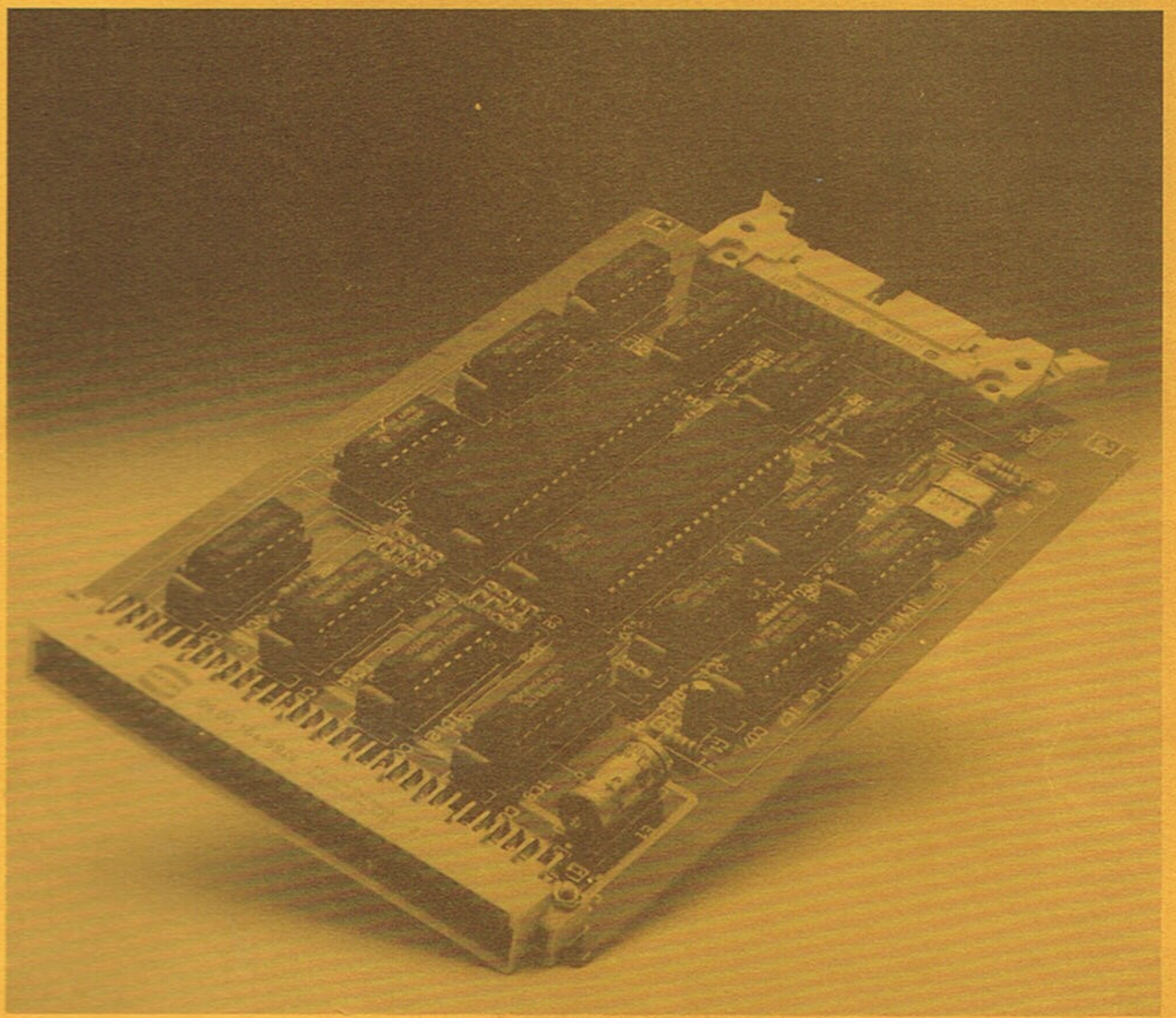
DE 6502 KENNER 45



Tiende Jaargang, Nr. 4
Augustus 1986

DE 6502 KENNER

De 6502 KENNER is een uitgave van de KIM gebruikers Club Nederland.

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Gehele of gedeeltelijke overname van de inhoud van DE 6502 KENNER zonder toestemming van het bestuur is verboden. Toepassing van gepubliceerde programma's, hardware etc. is alleen toegestaan voor persoonlijk gebruik.

DE 6502 KENNER verschijnt 6 x per jaar en heeft een oplage van 500 exemplaren.

De voorpagina is de DOS65-controllerkaart. ontwikkeld door Ad Brouwer.
CAD/CAM: E. Visschedijk.
I.s.m. : A. Hankel
Fotogr.: Fr. Visschedijk.

INHOUDSOPGAVE DE 6502 KENNER NR. 45 AUGUSTUS 1986

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From our member Jaap de Hoop we received information about two new microprocessors: the GTE 65SC802 and the GTE 65SC816, 16-bit mups featuring total software compatibility with 8-bit NMOS and CMOS 6500 series mups. The 65SC802 is pin-to-pin compatible with 8-bit 6502 devices currently available, while also providing full 16-bit internal operation. The 65SC816 provides 24 address lines for 16 Mbyte addressing, while providing both 8-bit and 16-bit operation.
Both microprocessors are obtainable by Microtronics, Wilgenkade 10, 3992 LL Houten, The Netherlands. Phone: 03403 - 91369.
Prices for both microprocessors about Hfl. 75,00.

For Apple][and][E : Graphics Board usable as 768 Kbyte RAM Disk. Computer Informations Systeme, Am Eiseren Schlag 27, 6000 Frankfurt/Main 50, Germany, offers this porduct mentioned above. Supporting software utilities like zoom, copy, pattern, text, dump and filling arrays, the colour graphics board featurs a resolution of 512x512 pixels interlaced or 512x256 non-interlaced. Other features include 48 separate graphics pages for animation, 1 million pixels/s writing speed, 8 basic colours and 28 mixed colours and 8 shades on monochrome monitors. The board can be connected to standard monitors and it features separate BAS and TTL output. Data can be input through light-pen, joy-stick, mouse and digitizer board.

U I T N O D I G I N G   C L U B B I J E E N K O M S T

Datum : Zaterdag 20 september 1986
Lokatie : Speeltuingebouw Beeklust/Ossenkoppelerhoek
Jan Steenstraat 69, ALMELO, TEL.05490 - 19443
Entree : Hfl. 10,== p.p.

Reisroute per auto :

Vanuit het westen en het zuiden via de A1/A35.

1. Aan het einde van de snelweg rechtsaf. Bij de eerstvolgende stoplichten rechtdoor. Na ca. 100 m. kruispunt zonder stoplichten. Ga hier linksaf.
2. Deze straat, de Jan Vermeerstraat, maakt een flauwe bocht naar rechts. Aan het einde van deze bocht ziet U links de lichtmasten van een voetbalveld. Ga linksaf. Het speltuingebouw vindt U na ca. 150 m. aan de linkerkant.

Vanuit het noorden via de N36.

1. Rij door tot ANWB-borden richting Wierden/Zwolle. Ga hier rechtsaf. Blijf deze weg volgen. U komt dan over een spoorwegovergang.
2. Ga na ca. 150 m. linksaf, weer richting Wierden/Zwolle. Na ca. 200 m. ziet U rechts een Texaco-benzinestation. Ga hier rechtsaf. Verder als beschreven bij punt 2 vanuit de richting hierboven.

PROGRAMMA

09.30 - Zaal open.
10.00 - Opening
10.15 - Forum.
Wout van Dinther en Will Cuijpers zijn onverdroten als het gaat om het beantwoorden van hardware en software problemen aangaande de Octopus.
Stuur uw vragen - als het even kan - alvast naar de redaktie, dat spaart wat tijd. Bovendien kan er later wellicht een publikatie over volgen.
Heeft U bepaalde problemen al opgelost, zet ze dan ook even op papier en stuur het naar de redaktie.
Het Forum kan worden gevolgd door het tonen van wat nieuwtjes.
11.45 - MARKT. Vraag en Aanbod door de aanwezige leden.
12.00 - Lunch.
12.45 - INFORMEEL GEDEELTE.
Leden brengen bij voorkeur hun eigen APPLE, Acorn, BBC, Commodore, Junior, Octopus, Sym-1, etc. etc. mee. VERGEET NIET: EEN 220-V VERLENGSNOER MEENEMEN
Er is volop gelegenheid kennis te maken met andere leden van de club en hun systemen.

Heeft U software of hardware ontwikkeld? Breng het mee en geef het af aan de redaktie.
Wilt U meedoen aan vertaalwerk?
Maakt U graag leuke illustraties?
Kent U mensen met een 6502, 6809 of 68000?
Geef het op aan de redaktie.

17.00 - Sluiting van de bijeenkomst.

With this little Forth-compiler program you can list a max. of 32 K in a so called Hex/Ascii-dump.
Author: Fridus Jonkman, The Netherlands.
System: Elektor's JUNIOR computer with PM and TM.

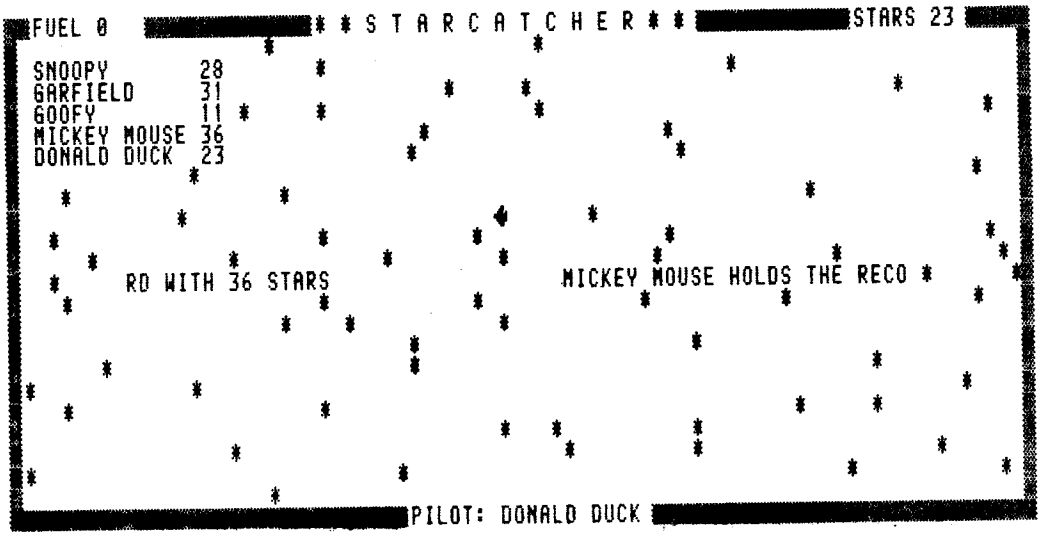
```
SCR # 1
( HEX/ASCII-DUMP )

HEX
: .ROW CR 2 SPACES ." ADRES " 10 0 DI I . SPACE LOOP CR ;
: ?NON-PRINTING DUP 20 < SWAP 7E > OR ;
: &TYPE 0 DO DUP I + C@ DUP ?NON-PRINTING IF DROP 2E THEN EMIT
  LOOP DROP ;
: HDUMP 0 DO DUP I + C@ DUP 10 < IF SPACE 30 EMIT 1 ELSE 3
  THEN .R LOOP DROP ;
: A-LINE CR DUP 0 6 D.R SPACE 10 OVER OVER HDUMP
  2 SPACES &TYPE ;
: DUMP .ROW OVER - 0 DO DUP I + A-LINE 10 +LOOP DROP CR ;
;S
```

NEWS FROM THE PAPERWARE SERVICE

NEW NEW NEW NEW NEW NEW NEW NEW

THE VDU CARD
Article to assure that Elektor's VDU card works well.
Software (6502-machinecode) with introduction.
Many members of the club use this software instead of the software from Elektor's paperware.
Authors: J.J.A. and J.A.J. Janssen, The Netherlands.
Transl.: Willem van Asperen.
System : Elektor's JUNIOR computer with VDU card.
Publ. : DE 6502 KENNER 31, Apr. 1984, p. 17-26.
Send cheque of Hfl. 19.00 to W.L. van Pelt (eurocheque 9,50)
Price only for European (C.E.P.T.) countries.

THE GRAPHIC DISPLAY
Article with schematic diagram to do graphical work (plotting of graphs etc.) with introduction.
Authors: J.J.A. and J.A.J. Janssen, The Netherlands.
Transl.: Willem van Asperen.
System : Elektor's JUNIOR computer with VDU card.
Publ. : DE 6502 KENNER 36, Febr. 1985, p. 5-11.
Send cheque of Hfl. 14,50 to W.L. van Pelt (eurocheque 5,00)
Price only for European (C.E.P.T.) countries.




```
10 LO=59392 : CR=59371 : IK=57601
11 FOR W=1 TO 6 : CU=7+LO : P=0 : F=500 : R=238
12 POKE CR,64 : DISK!"GO F32F"
20 GOSUB 74
21 PRINT&(22,8)W". WHAT IS YOUR NAME ";: INPUT N$(W)
22 POKE CR,32 : DISK!"GO F32F"
30 FOR J=0 TO 23 STEP 23 : FOR I=0 TO 79
31 POKE I+J*80+LO,139 : NEXT : NEXT
32 FOR I=0 TO 79 STEP 79 : FOR J=1 TO 22
33 POKE I+J*80+LO,139 : NEXT : NEXT
34 GOSUB 74 : PRINT&(3,0)"FUEL "F
35 PRINT&(61,0)"STARS "P : Y=12
36 PRINT&(31,23)"PILOT: "+N$(W);
37 FOR I=0 TO 99 : GOSUB 72 : PRINT&(X,Y)"*" : NEXT
40 IF X=0 OR X=79 OR Y=0 OR Y=23 THEN GOSUB 73
41 POKE CU,32 : CU=X+Y*80+LO
42 IF PEEK (CU)=42 THEN P=P+1 : PRINT&(68,0) P
43 POKE CU,R : PRINT&(8,0) F : F=F-1 : IF F<0 THEN 50
44 Q=PEEK(IK)-128
45 IF Q= 8 THEN X=X-1 : R=239 : GOTO 40
46 IF Q= 9 THEN X=X+1 : R=237 : GOTO 40
47 IF Q=11 THEN Y=Y-1 : R=236 : GOTO 40
48 IF Q=10 THEN GOSUB 72 : GOTO 40
49 Y=Y+1 : R=238 : GOTO 40
50 P(W)=P : FOR I=1 TO W : PRINT&(3,I)N$(I),P(I)
51 IF P(I)>=P THEN P=P(I) : B=I
52 NEXT
53 A$=N$(B)+" HOLDS THE RECORD WITH "+STR$(P)+" STARS "
54 FOR I=1 TO 60 : GOSUB 70 : NEXT
55 FOR I=1 TO 60 : GOSUB 71 : GOSUB 70 : NEXT
56 FOR I=1 TO LEN(A$) : GOSUB 71 : NEXT : NEXT
60 DISK!"GO F3E1" : DISK!"GO F32F " : END
70 PRINT&(70-I,12) MID$(A$,1,I) : RETURN
71 PRINT&(10,12) MID$(A$,I+1,LEN(A$)) : RETURN
72 X=INT(77*RND(1)+1) : Y=INT(22*RND(1)+1) : RETURN
73 P=0 : PRINT&(68,0)P : GOSUB 72 : RETURN
74 PRINT&(23,0)"* * S T A R C A T C H E R * * ": RETURN
```

```
100 REM##################################################
101 REM##################################################
102 REM##          List of Variables                   ##
106 REM##   CR......Cursors registeradress             ##
107 REM##   IK......Keyboard data portadress           ##
108 REM##   CU......Position on screen                 ##
109 REM##   X,Y.....Koordinates for CU                 ##
110 REM##   I,J.....Variables for loops                ##
111 REM##   P.......Counts catched stars               ##
112 REM##   F.......Fuel gauge                         ##
113 REM##   R.......Airoplane ascii nr.                ##
114 REM##   W.......Game rounds                        ##
115 REM##   Q.......Keyboard data                      ##
116 REM##   N$......Name of player                     ##
117 REM##   A$......Record display string              ##
118 REM##                                              ##
121 REM##          Descriptions                        ##
123 REM##   line 10......Initialise                    ##
124 REM##   line 11......Start of six games-loop       ##
125 REM##   line 12......Cursor blink, clear screen    ##
126 REM##   line 20-22...Heading, name, cursor off     ##
127 REM##   line 30-37...Make the screen-picture       ##
128 REM##   line 40......Start of main loop. When      ##
129 REM##   the airoplane drops out of the galaxy,     ##
130 REM##   all collected stars are lost.              ##
131 REM##   line 41......Del. last plane, calc. new    ##
132 REM##   line 42......Is it a star inc. star coun.  ##
133 REM##   line 43......Place new plane, dec. fuel    ##
134 REM##   line 44......Get keyboard data (INKEY)     ##
135 REM##   line 45-47...Test for new directions       ##
136 REM##   line 48......or jump into "hyperspace"     ##
137 REM##   line 49......If no inkey: go down!         ##
138 REM##   line 50-52...Test for winner               ##
139 REM##   line 53-72..."Rolls" winner-display        ##
140 REM##   Leif Rasmussen Parkvej 1 DK-4534 Hørve     ##
141 REM##################################################
142 REM##################################################
```

```
>>>
  10REM ************************
  20REM ***  DISASSEMBLER    ***
  30REM ***  Copied out of   ***
  40REM *** a HCC  bulletin ***
  50REM ************************
  60REM ***  Rewritten  by   ***
  70REM ***  S.J. Voortman   ***
  80REM ***  Beatrixweg 28   ***
  90REM *** 3253 BB OUDDORP  ***
 100REM ***   01878  3113    ***
 110REM ************************
 120
 130MODE6:*FX5,0
 140REM Printer off
 150PROCarray:*FX202
 160REM Capital (upper case) letters
 170
 180VDU14,3:ON ERROR PROCfout:END
 190REM Set paged mode
 200PROCinputs
 210PRINT"Printer on ?";:d=GET:IF d<>89 GOTO 280:REM 89 is 'Y'
 220VDU15:*FX5,1
 230REM Printer on
 240VDU2,1,27,1,78,1,3
 250REM Skip over perforation
 260VDU2,1,27,1,87,1,1
 270REM Print Enlarged
 280PRINT'"DISASSEMBLER"
 290PRINT"&"+ST$;" - &";EN$''
 300VDU2,1,27,1,87,1,0
 310REM Reset to normaal print style
 320
 330REPEAT
 340OC%=?(S):PRINT;RIGHT$("000"+STR$~(S),4);TAB(5);
 350MN$=M$(OC%)
 360T=A(OC%)
 370PROCaddress
 380PROCwrite
 390UNTIL S>EN OR INKEY$(5)="@"
 400VDU1,10,2,1,27,1,14:PRINT"End"'
 410REM One line Enlarged
 420VDU15,3:END
 430REM Reset paged mode
 440
 450DEFPROCaddress
 460P$="":O$="":AC$="":OP=0
 470IF M$(OC%)="" MN$="???":OP=?(S):PROConebyte:S=S+1:ENDPROC
 480IFT=0 P$="#&":PROCtwobyte:S=S+2
 490IFT=1 P$="&":PROCtwobyte:S=S+2
 500IFT=2 P$="&":PROCthreebyte:S=S+3
 510IFT=3 P$=" ":PROConebyte:S=S+1
 520IFT=4 P$=" ":PROConebyte:S=S+1
 530IFT=5 P$="(&":O$=",X)":PROCtwobyte:S=S+2
 540IFT=6 P$="(&":O$="),Y":PROCtwobyte:S=S+2
 550IFT=7 P$="&":O$=",X":PROCtwobyte:S=S+2
 560IFT=11P$="&":O$=",Y":PROCtwobyte:S=S+2
 570IFT=8 P$="&":O$=",X":PROCthreebyte:S=S+3
 580IFT=12P$="&":O$=",Y":PROCthreebyte:S=S+3
 590IFT=9 P$="(&":O$=")":PROCthreebyte:S=S+3
 600IFT=10P$="#&":PROCtwobyte:S=S+2
 610ENDPROC
```

```
620
630DEFPROCwrite:IF T=10 PROCrel
640PRINTTAB(15);MN$;TAB(19);P$;:IF T<>3:IF T<>10:IF MN$<>"???" THENPRINT;"@";2

650PRINTTAB(28);AC$
660ENDPROC
670
680DEFPROCarray
690DIM T$(255),M$(255),A(255)
700REPEAT:READ U,V$,W:M$(U)=V$:A(U)=W:UNTIL V$=""
710U=0:REPEAT:T$(U)=STR$~(U):U=U+1:UNTIL U=&FF:ENDPROC
720DATA &0,BRK,3,&1,ORA,5,&5,ORA,1,&6,ASL,1,&8,PHP,3
730DATA 9,ORA,0,10,ASL,4,13,ORA,2,14,ASL,2,16,BPL,10
740DATA 17,ORA,6,21,ORA,7,22,ASL,7,24,CLC,3,25,ORA,12
750DATA 29,ORA,8,30,ASL,6,32,JSR,2,33,AND,5,36,BIT,1
760DATA 37,AND,1,38,ROL,1,40,PLP,3,41,AND,0,42,ROL,4
770DATA 44,BIT,2,45,AND,2,46,ROL,2,48,BMI,10,49,AND,6
780DATA 53,AND,7,54,ROL,7,56,SEC,3,57,AND,12,61,AND,8
790DATA 62,ROL,8,64,RTI,3,65,EOR,5,69,EOR,1,70,LSR,1
800DATA 72,PHA,3,73,EOR,0,74,LSR,4,76,JMP,2,77,EOR,2
810DATA 78,LSR,2,80,BVC,10,81,EOR,6,85,EOR,7,86,LSR,7
820DATA 88,CLI,3,89,EOR,12,93,EOR,8,94,LSR,8,96,RTS,3
830DATA 97,ADC,5,101,ADC,1,102,ROR,1,104,PLA,3,105,ADC,0
840DATA &6A,ROR,4,&6C,JMP,9,&6D,ADC,2,&6E,ROR,2,&70,BVS,10
850DATA &71,ADC,6,&75,ADC,7,&76,ROR,7,&78,SEI,3,&79,ADC,12
860DATA &7D,ADC,8,&7E,ROR,6,&81,STA,5,&84,STY,1,&85,STA,1
870DATA &86,STX,1,&88,DEY,3,&8A,TXA,3,&8C,STY,2,&8D,STA,2
880DATA &8E,STX,2,&90,BCC,10,&91,STA,6,&94,STY,7,&95,STA,7
890DATA &96,STX,11,&98,TYA,3,&99,STA,12,&9A,TXS,3,&9D,STA,8
900DATA &A0,LDY,0,&A1,LDA,5,&A2,LDX,0,&A4,LDY,1,&A5,LDA,1
910DATA &A6,LDX,1,&A8,TAY,3,&A9,LDA,0,&AA,TAX,3,&AC,LDY,2
920DATA &AD,LDA,2,&AE,LDX,2,&B0,BCS,10,&B1,LDA,6,&B4,LDY,7
930DATA &B5,LDA,7,&B6,LDX,11,&B8,CLV,3,&B9,LDA,12,&BA,TSX,3
940DATA &BC,LDY,6,&BD,LDA,6,&BE,LDX,12,&C0,CPY,0,&C1,CMP,5
950DATA &C4,CPY,1,&C5,CMP,1,&C6,DEC,1,&C8,INY,3,&C9,CMP,0
960DATA &CA,DEX,3,&CC,CPY,2,&CD,CMP,2,&CE,DEC,2,&D0,BNE,10
970DATA &D1,CMP,6,&D5,CMP,7,&D6,DEC,7,&D8,CLD,3,&D9,CMP,12
980DATA &DD,CMP,8,&DE,DEC,8,&E0,CPX,0,&E1,SBC,5,&E4,CPX,1
990DATA &E5,SBC,1,&E6,INC,1,&E8,INX,3,&E9,SBC,0,&EA,NOP,3
1000DATA &EC,CPX,2,&ED,SBC,2,&EE,INC,2,&F0,BEQ,10,&F1,SBC,6
1010DATA &F5,SBC,7,&F6,INC,7,&F8,SED,3,&F9,SBC,12,&FD,SBC,8
1020DATA &FE,INC,8,&FF,,0
1030
1040DEFPROCinputs
1050INPUT"Start address &"ST$
1060S=EVAL("&"+ST$):IF S>&FFFF PROCinputs
1070INPUT"End   address &"EN$
1080EN=EVAL("&"+EN$):IF EN>&FFFF OR EN<S PROCinputs
1090ENDPROC
1100
1110DEFPROCthreebyte
1120PRINT;RIGHT$("0"+STR$~?(S),2);TAB(8);RIGHT$("0"+STR$~(S?1),2);TAB(11);RI
("0"+STR$~(S?2),2);
1130PROCpeek1:PROCpeek2:PROCpeek3
1140OP=((S?2)*256)+(S?1)
1150ENDPROC
1160
1170DEFPROCtwobyte
1180PRINT;RIGHT$("0"+STR$~?(S),2);TAB(8);RIGHT$("0"+STR$~(S?1),2);
1190PROCpeek1:PROCpeek2
1200OP=(S?1)
1210ENDPROC
```

```
1220
1230DEFPROCone$byte:IF MN$="???" PRINTRIGHT$("00"+T$(OC%),2):GOTO 1250
1240PRINT;RIGHT$("00"+T$(OC%),2)+" ";
1250OPTOC,ee+1
1260ENDPROC
1270
1280DEFPROCrel
1290IF (?(S-1))>127 P$="$"+STR$~((S-1)-(&FF-OP))
1300IF (?(S-1))<128 P$="$"+STR$~(S+OP)
1310ENDPROC
1320
1330DEFPROCout
1340PRINT;VDU,?T;IF EOF=TT THEN END
1350REPORT:PRINT" at line ";ERL
1360ENDPROC
1370
1380DEFPROCsee:L%=?S:IF ?(S)>31 AND ?(S)<127 THEN AC$=AC$+CHR$(?(S)) ELSE AC$=AC$+"
"
1390ENDPROC
1400DEFPROCsee1:L%=(ST1):IF (ST1)>31 AND (ST1)<127 THEN AC$=AC$+CHR$(ST1) ELSE AC$=AC$+
"
1410ENDPROC
1420DEFPROCsee2:L%=(ST2):IF (ST2)>31 AND (ST2)<127 THEN AC$=AC$+CHR$(ST2) ELSE AC$=AC$+
"
1430ENDPROC
```

Redaktioneel

Op het moment dat ik dit schrijf, half juli '86, zijn er 62 nieuwe leden toegetreden tot onze club, waaronder 39 uit Holland, 14 uit Belgie, 3 uit Engeland, 2 uit Zweden, 2 uit Denemarken, 1 uit Duitsland en 1 uit Spanje.
In het gehele jaar 1985 schreven we in totaal 61 nieuwe leden in. De werving van nieuwe leden - we zijn niet zo rijk dat we daar geld in kunnen steken - verloopt dit jaar blijkbaar beter dan in 1985. Dat is hoopgevend.
Een opvallend verschil met voorgaande jaren is dat in 1985 Elektuur in haar computer-specials onze naam noemde, en in 1986 deed Elektor Electronics in Engeland dat nog eens heel dik over met een halve pagina gratis "advertisement". Het gevolg van dit laatste was brieven om meer informatie uit diverse europese landen, maar ook uit Israel, Iran, Irak, India, Zuid-Afrika etc. Het gevolg van beide was een gunstig effekt op het nu bestaande resultaat.
Veel leden van onze club betrekken hun spullen van Elektuur, en wij van onze kant moedigen dat ook aan, omdat we er ook veel van kunnen leren. Elektuur en onze club hebben een al jaren bestaande onafhankelijke band met elkaar, het is gunstig voor ons beiden.

Eenzelfde onafhankelijke band hebben we al jaren met de Hobby Computer Club, de HCC, tot uiting komend op de jaarlijkse hobbycomputerbeurs in Utrecht, waar ook onze club altijd een gratis plaats kreeg, terwijl o.a. onze club ook in haar Nieuwsbrief werd vermeld in de gele pagina's en wij ook konden aankondigen wanneer onze bijeenkomsten werden gehouden.
Enige tijd geleden al werd dit laatste aan ons ontnomen. Dat was een beslissing waarbij de HCC het niet nodig achtte ons daaromtrent te consulteren.
Met hun brief van 11 juli 1986 schrijft de HCC ons nu een uitnodiging voor de HCC dagen op 21 en 22 november 1986. "Voor het eerst sinds jaren vragen wij van u echter een bijdrage in de kosten. U zult niet worden belast voor het 'commerciele' tarief (red: f 900,=), doch voor een bedrag van f 250,= per kraam (excl. btw).", schrijft men verder. Ten opzichte van vorig jaar mogen bezoekers, dus ook onze leden een toegangsprijs betalen die 50% hoger ligt dan vorig jaar: f 7,50.
Afgezien van de vraag of dit soort prijsmaatregelen in Nederland niet onder de prijswetgeving valt, het heeft bij mij de vraag opgeroepen of leden van onze club zich af zullen vragen hoe ernstig de gevolgen zijn.
Leden van onze club zien ons natuurlijk graag verschijnen op deze manifestatie. Maar dit soort vercommercialisering in de HCC zou wel eens kunnen betekenen dat wij dat geld liever aan andere dingen besteden. Het bestuur zal hieromtrent, geschrokken als ze is, een ernstige gedachtenwisseling houden.
De HCC-dagen waren voor ons een gelegenheid, die de begroting toch al ernstig aanspraken, maar het uitdragen van onze naam, de presentatie van hetgeen onze club presteert, dat zijn belangrijke overwegingen die de doorslag gaven. Er zijn altijd nog andere wegen als we dat onverhoopt niet meer middels de computerdagen in Utrecht kunnen doen. Maar het doet wel pijn als het niet meer kan. W.L. van Pelt.

Please, send your articles, programs, etc. to the editors office, printed on white paper A-4 format, 8 LPI (lines/inch), 68 lines/page max., a new ribbon on your printer. If you are not yet the owner of a printer, we will help you with typing the text.

New: Complete source-listing of the Micro-Ware Assembler/Disassembler/Editor for Elektor's Octopus/EC65-computer. Documentated by Marc Lachaert, Belgium.
Send cheque of Hfl. 74,50 to W.L.v.Pelt (eurocheque 65,00)

THE MC68000 MICROPROCESSOR; A NEW PROCESSOR IN OUR CLUB.

By: Gert van Opbroek
Bateweg 68
2481 AN Woubrugge.
Tel 01729-8636

1. Introduction.

As already written by Willem van Pelt in the 6502-kenner number 41, the executive committee of our club wants to support some new processors. He has written that all processors beginning with a 6 are welcome in this club. Because I am a member of committee and I posses, since january 1986, a 68000 system I was asked to write something about this processor and its differences with our well-known 6502.

First of all, I want to tell why we want to support all processors beginning with 6. Willem van Pelt has written the 6X(C)XXX-processors. That means the processors:

1) the 6800-family: that means 6800, 6809 .....

2) the 6500-family: 6502, 6510, 65C02 .....

3) the 65SC802, 65SC816

4) the 68000-family: 68000, 68008, 68010 .....

Questions you can ask are: why these processors, what do they have in common and what makes them different from other processor families?

The above mentioned processors all have memory mapped I/O. This means that peripherals, such as I/O chips, FDC's and so on, are part of the memory. Other processors, such as the 8080 and 8086 families do have a separate I/O space and IN and OUT instructions. With memory mapped I/O, you can access the peripherals just like you access memory.

Another thing that these families have in common is the fact that the control bus and timing of all the families is the same. The 68000 family forms, partly, an exception. It has a mode compatible with the 6800 but it also has an asynchronous mode. In a later section, I shall describe this difference. Because the timing and control bus of the families are the same, peripherals from one family can easely be interfaced with processors from the other. So a 6522 VIA can easely cooperate with a 68000 processor.

When we look at the register structure, the instruction set and addressing modes of the 6X(C)XXX families, you will see that although there are smaller or greater differences, there are many similarities. The 65SC802 and 65SC816 even can emulate a 6502.

In the next I shall describe the 68000 processor. A review of the 65C02 can be found in [1], of the 65SC816 in [2] and [3]. In november 1985 Nico de Vries has given a small lecture on this processor on the club meeting in Rijswijk.

Within this article I shall compare the 68000 processor with the good old 6502. People who are working with PDP-11 and VAX computers will find that certain features of the 68000 are comparable with features of those computers but because most members of our club do not have knowledge of these minicomputers, I shall not compare the 68000 with these machines.

2. HARDWARE.

Today the 68000 family has the following members:

a) The 68008. This processor has all the features of a 68000 but has an 8 bit databus. The address bus of this processor is 24 bits wide.

b) The 68000. This is the base processor of the 68000 family. It has a full 16 bits databus and a 24 bits address bus.

c) The 68010. This processor has some differences in the exception scheme and is, because of a more efficient microcode and a higher clock frequency, faster.

d) The 68020. I do not have information about this processor.

In fig. 1 the pin-out of a 68000 processor is drawn.

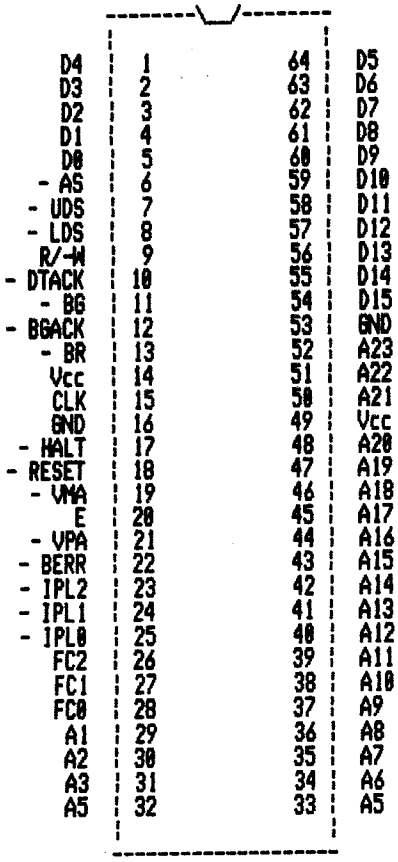


FIG. 1. (note - xxx means NOT(xxx))

In fig. 1, we can see that the 68000 has a full 24-bit address bus. The signal A0 is not available so the 68000 always addresses cells of 16 bit. It also has a 16 bit data bus. The signal -AS (address strobe) indicates a valid memory address on the address bus. The signals -UDS (upper data strobe) and -LDS (lower data strobe) indicates that the processor reads or writes the upper resp. lower databyte. When both signals go down, the processor transfers a full 16-bit dataword.

The CLK input is used by the clock. 68000 processors are available for processor clocks up to 12 MHz. The most commonly used version is the 8 MHz version.

The -BR (bus request), -BG (bus grant) and -BGACK (bus grant acknoledge) are used for DMA devices to become master of the address and data bus.

The signals FC0, FC1 and FC2 indicate the processor status and type of the execution cycle of the processor.

When the -HALT signal is used as input, the processor will stop after completion of the current bus cycle, when the processor stoppes by itself the -HALT signal is outputted by the processor to indicate that the processor has stopped execution.

The 68000 has an asynchronous bus. That means that after an address is put on the address bus the processor waits until external hardware (memory, devices) has indicated that there are valid data on the data bus (read cycle) or the hardware has taken the data from the data bus. This hardware indicates this situation by giving the -DTACK (data transfer acknoledge) signal. When this signal does not come, the processor waits until "Sint Juttemis". This situation can happen when we address, somewhere in the 16 Mb address space, non-existing memory. For this situation, the processor has a bus error (-BERR) input. When this signal goes down, current bus cycle is terminated. When the -HALT signal also goes down, the bus cycle is rerun when the -HALT signal goes heigh again. When the -HALT signal does not go down, the processor performs a BUSERROR exception. The -DTACK, -BERR and -HALT signals must be made by external hardware.

The 68000 has 7 interrupt levels. These levels are coded by the -IPL0, -IPL1 and -IPL2 signals. Interrupt level 7 (ILP0, ILP1 and ILP2 go down together) is called NMI (Non Maskable Interrupt).

In a next section, I will write more about exceptions, of which interrupts forms one fall.

As I have already written, peripherals of the 6500 and 6800 family can be interfaced with a 68000. As is well known, these families do not support an asynchronous bus structure. For this reason, the 68000 suports, besides the asynchronous structure, also a synchronous bus structure. This interface is formed by the signals: E (Enable), -VPA, (Valid Peripheral Address) and -VMA (Valid Memory Address). The E-signal is used as clock signal for those peripherals (PHI-2). This signal is six CLK periods low and four CLK periods high. This means that in a 8 MHz system this signal has a frequency of 800 kHz. (1/10 of CLK).
The -VPA signal indicates that the synchronous mode is chosen (VPA = 0: synchronous, VPA = 1: asynchronous).
The -VMA signal indicates that there is a valid address and (for a write operation) valid data on the bus. This signal is synchrounized with the E signal. The -DTACK is not used in a synchronous operation.

The timing is as follows:
When synchronous operation is prefered, the system responds after a -AS signal with a -VPA signal. The processor synchronizes then its signals with the E signal and gives a synchronized -VMA signal. This signal has to be used to generate a chip select for the addressed peripheral.

3. PROGRAMMING MODEL.

In this section, I shall describe the register structure of the 68000 processor.

In fig. 2 the structure of the registers is drawn.

As already written, the processor has a 24-bit address bus. To address this amount of memory, the processor has a 32-bit program counter. From this register, the 8 most significant bits are ignored. All addresses can also be 24 bit. An address is stored in a so called long word (4 bytes) and, just like with the program counter, the 8 most significant bits of an address are ignored.

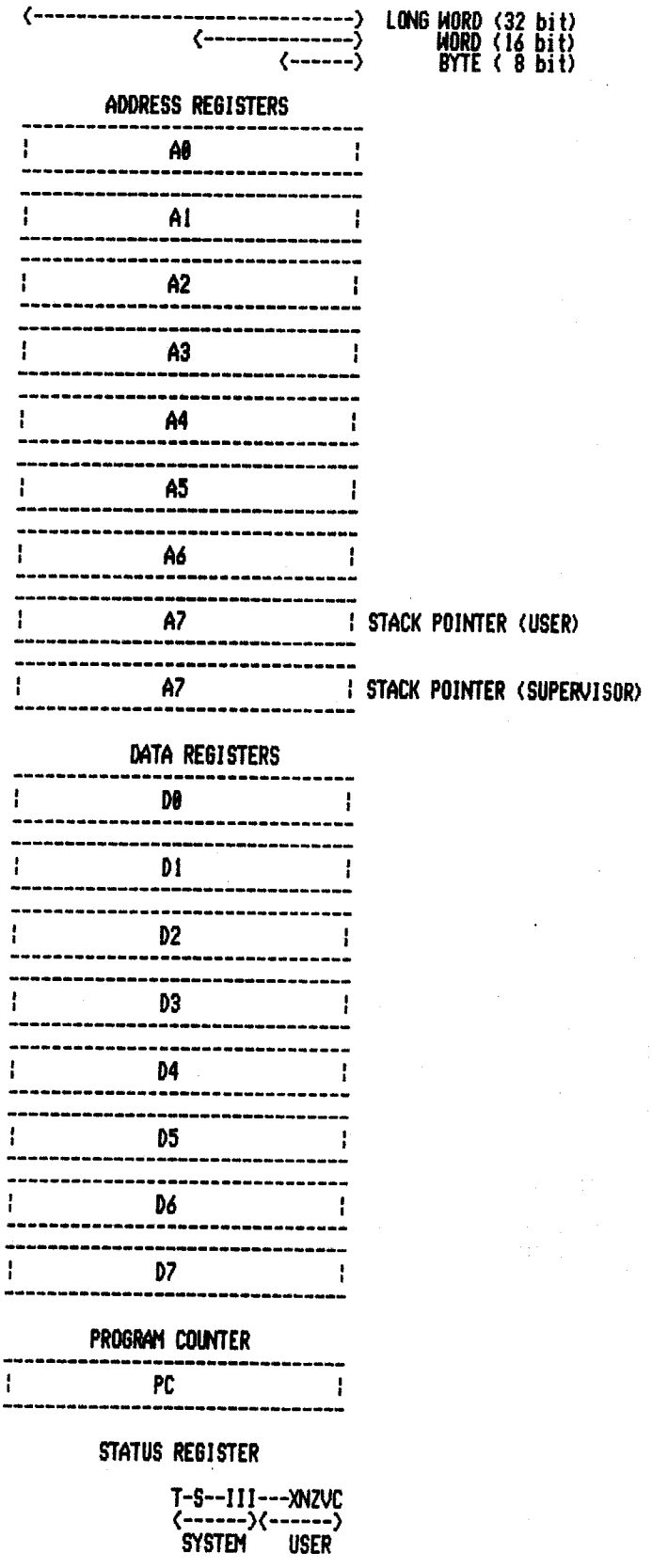


FIG. 2 INTERNAL RGISTERS

As can be seen in fig. 2, the 68000 has 16 registers. The eight address registers are meant for address compuations but can also be used for other purposes. Address registers can only be used for word and longword operations, data registers can be used for byte, word and longword operations. When we move (store) a word in a address register, the operant is sign extended, this means that the most significant bit of the (word) operand is also stored in the 16 most significant bits of the address register. When we move a byte or word to a data register, the other bits of the register are unaffected. This feature can have very funny results:

```
MOVE.L #$00,A0
MOVE.W #$FF,A0
CMPA.L #$FF,A0
BEQ.B  LABEL
```

In the above example, the branch will not be executed, the contents of register A0 = $FFFF.
When we use D0 in stead of A0, the branch will be executed because the contents of the register will be $00FF.

Register A7 is the stackpointer. As you can see in fig. 2, the 68000 has 2 stackpointers. The processor has two operation modes: User mode and Supervisor mode. In Supervisor mode, the processor can execute more instuctions. Each mode has its own stackpointer. When the processor is in supervisor mode, there is an instruction to move the user stackpointer to or from an address register. When the processor is in user mode, you can not access the supervisor stack pointer. When an instruction can only be executed in supervisor mode, the instruction is called priviledged. There are seven priviledged instructions on the 68000.

The status register has a system byte and a user byte. The user byte contains the condition codes as can also be found in the 6502. There is one new condition code: X. This code is a copy of the carry bit, affected only by those instructions which can be used in multi precision operations (i.e. ADD, SUB, ASL, ...).

The 68000 does not have a decimal (D-) flag. For BCD-operations, the 68000 has some (extra) BCD-instructions.

The system byte contains an interrupt mask (III) for the seven interrupt levels. All interrupts greater than mask value are processed. The S-flag is set when the processor is in supervisor state and when the T-bit (trace) is set, a trace exception will take place after each instruction.

4. ADDRESSING MODES.

An instruction for the 68000 consists of an opcode and zero, one ore two operands. The description of these operants is the so-called effective address. The addressing mode is the mode of description of this operand.

The 68000 has 13 addressing modes.

- Data Register Direct: The operand is a data register.

- Address Register Direct: The operand is an address register.

- Address Register Indirect: The address register contains the address of the operand.

- Address Register Indirect with Post-Increment: This is the same as the Address Register Indirect mode but the address in the address register is incremented after the effective address is calculated. For byte instructions the address is incremented by 1, for word instructions by two and for longword instructions by four.

- Address Register Indirect with Pre-Decrement: This addressing mode is the opposite of the Address Register Indirect mode with Post Increment. These modes are used for stack addressing:

```
MOVE D0,-(A7)    ; Push D0
MOVE D0,(A7)+    ; Pull D0
```

There are of course much more applications for these addressing modes. For instance block move:

```
SOURCE:  EQU $10000       ; SOURCE ADDRESS
DESTIN:  EQU $30000       ; DESTINATION ADDRESS
ENDSRC:  EQU $2FFFF       ; END SOURCE
;
START:
         MOVEA.L #@SOURCE,A0
         MOVEA.L #@DESTIN,A1
LOOP:
         MOVE.W  (A0)+,(A1)+
         CMPA.L  #@ENDSRC,A0
         BLS.B   LOOP
         RTS
```

- Address Register Indirect with Displacement: In this mode, a 16-bit signed constant is added to the indirect address to give the address of the operand.

- Address Register Indirect Addressing with Index: The contents of a address or data register is added to another address register. This gives the address of a memory cell with a pointer. An 8 bit signed displacement is added to this pointer to give the address of the operand.

- Absolute Addressing: This addressing mode has two forms: Absolute Short Addressing and Absolute Long addressing. With Absolute Long addressing, we can address the complete memory. With Absolute Short addressing, we can address from $000000 to $007FFF and $FF8000 to $FFFFFF. With short addressing, the address is a 16 bit number, with long addressing, the address is a full 24 bit number.

- Program Counter with Displacement: a signed 16 bit quantity is added to the program counter to give the address of the operand. When this mode is used to address variables in memory, the resulting code is position independent; this means that the program can run anywhere in memory without the need to reassemble it.

- Program Counter with Index: This addressing mode is the Address Register Indirect mode with Index with the program counter in stead of an address register. The contents of an address or data register is added to the program counter to give the address of a pointer. A signed 8 bit quantity is added to this pointer to give the address of the operand.

- Immediate addressing: The operand is given in the instruction as a constant.

- Status Register Addressing: This mode is used to access the status register of the 68000. We can only access the status register with AND, OR and EOR instructions to set or clear flags in the status register. This mode can only be used in destination operands.

When we compare these addressing modes with the modes of the

6502, we see a lot of differences. The 68000 does not have a zero page although the addresses $000000 to $007FFF and $FF8000 to $FFFFFF can be addressed with the Absolute Short mode, something like a zero page mode. Absolute addressing on the 6502 is Absolute Long addressing on the 68000 and immediate addressing is the same on both processors with this difference that the 68000 has 8, 16 and 32 bit constants. The 68000 does not have a indexed addressing like the Zero,X and Zero,Y and Absolute,X and Absolute,Y on the 6502. The 68000 supports Indirect addressing, Indexed,Indirect (like X-indexed,Indirect) and Program Counter with Displacement (Relative addressing on the 6502). This last mode is not only used in branches but also in several other instructions. Indirect,Y-Indexed on the 6502 does not have a counterpart on the 68000. This means that when we want to simulate this mode on a 68000 we have to do address calculations in an address register.

5. INSTRUCTION SET.

In general, a computer has four types of instructions:

1) Data movement instructions.

2) Instructions that combine two operands to produce a result.

3) Instructions with one operand to produce a result.

4) Instructions that control the program flow.

I shall give a brief comparison of the 68000 and the 6502 for the instructions in these four groups:

5.1 Data movement.

The 6502 has the following instructions in this class:

LDA, LDX, LDY, PHA, PHP, PLA, PLP, STA, STX, STY, TAX, TAY, TSX, TXA, TXS, TYA.

The 68000 has the following instructions in this class:

EXG: Exchange the contents of two registers.
LEA: Load an address register with an effective address
MOVE: Move data from the source to the destination; source and destination can be address and data registers, status register, stack, memory and peripherals.
MOVEQ: Move a small (8 bit) signed constant to the destination.
MOVEM: Move one or more registers to or from an effective address. (MOVEM D0-D7/A0-A5,-(A7), MOVEM (A7)+,D0-D7/A0-A5)
PEA: Push an effective address on top of the stack.
SWAP: Swap the low and high order word in a register.

5.2 Two operand instructions:

In this class fall the arithmatical and logical instructions:

6502: ADC, AND, CMP, CPX, CPY, EOR, ORA, SBC.

68000: ADD, AND, CMP, DIV (Divide signed and unsigned), EOR, MUL (Multiply signed and unsigned), OR, SUB.

5.3 One operand instructions.

6502: ASL, BIT, CLC, CLD, CLI, CLV, DEC, DEX, DEY, INC, INX, INY, LSR, ROL, ROR, SEC, SED, SEI.

68000: ASL, ASR, BCHG (Bit change), BCLR (Bit clear), BSET (Bit set), BTST (Bit test), CHK (Check a data register against bounds), CLR, EXT (Sign extend), LSL, LSR, NEG (Negate 2's complement), NOT (1's complement), ROL, ROR, Scc (Set a byte to FF in an effective address when condition code set), TAS (Test and set), TST.

5.4 Program control.

6502: Bcc (Branch on condition), BRK, JMP, JSR, RTI, RTS.

68000: Bcc, DBcc (Decrement a data register and branch until -1 in this register or cc is false; loop with maximum count), BSR (Branch to subroutine byte and word displacement), JMP, JSR, RTE, RTR, (Load condition codes and program counter from the stack), RTS, TRAP, TRAPV.

5.4 Miscellaneous instructions.

In this class fall instructions that not can be classified in one of the other classes:

6502: NOP.

68000: NOP,
LINK, UNLINK: The link instruction allocates a stack frame for local variables in high level languages, the unlink instruction releases the stack frame.
RESET: Reset all external devices.
STOP: Change exception mask and wait for an exception.

5.5 Remarks

As we all know, the 6502 has a decimal mode. When this mode is set, the arithmatic instructions work in BCD format. The 68000 has separate instructions for BCD calculations: ABCD, NBCD, SBCD.

For multiple precision operations, the 6502 uses the carry bit. With ADC and SBC this carry is used as carry bit. The 68000 does not add or subtract the carry bit in an ADD or SUB operation. It has separate instructions ADDX, NEGX and SUBX instructions. These instructions use the X bit that contains a copy of the C bit in ADD, SUB and NEGX instructions.

For immediate operations with small constants, some instructions have a quick mode, just like MOVEQ. In this case, the instruction is shorter than with a normal immediate operand.

When a data register has to be rolled or shifted, the instruction can contain a constant for the number of bits the register has to be rolled or shifted, or the instruction contains another data register in which this constant is stored. In this last mode, a roll or shift instruction is a two operand instruction.

6. EXCEPTIONS.

One of the most complicated things in the 68000 processor is exception processing. The 6502 has only two interrupts, one break instruction and a reset. The 68000 has much more exceptions.

- A hardware reset. The SSP (supervisor stack pointer) is loaded from address $000000 (vector 0), the PC from address $000004 (vector 1).

- A BUSERR exception, used when non-existent memory is addressed.

- Address error: word and longword operations on an odd address result in this exception.

- Illegal instruction.

- Divide by zero.

- CHK instruction. This instruction checks the contents of an address register against bounds. Errors result in this exception.

- TRAPV exception. In the TRAPV instruction exception occurs when the overflow bit is set.

- TRAP instruction. In this instruction a constant 0 to 15 is given. This is the index in the vector table for TRAP instructions. (Address $000000 to $0000BF).

- Privilege violation. The 68000 can work in supervisor mode and in user mode. In user mode not all instructions are allowed. When we try to execute such a priviledged instruction in user mode, an exception occurs.

- TRACE, when the T-bit is set.

- Line 1010 and line 1111 emulator exceptions on illegal instructions with opcode Axxx and Fxxx respectively. These exceptions can be used to emulate non-existing instructions in software.

- Interrupts. The 68000 has 7 vectored interrupts. With the I-bits in the status register, the priority of the processor is chosen. Each interrupt with higher priority is affected and an exception occurs. During this exception, the mask in the status register is set to the priority of the interrupt. Priority 7 can not be masked out, this is the NonMaskable Interrupt. The 68000 has 7 autovector interrupt vectors, one for each priority. When during the interrupt acknoledge the -VPA signal goes down, the processor takes the address in the corresponding vector to find the interrupt service routine. This method is used for interrupts from devices of the 65xx and 68xx series. The 68000 has also 192 user interrupt vectors (64 to 255). During the interrupt acknoledge, the device puts the vector number on the data bus and the processor finds the address of the service routine in the corresponding entry in the vector table. During this interrupt acknoledge the address on the address bus is $FFFFFn where n is the priority X 2. Althoug this address is not meant to address ram, it can be used to read the vector from ram on these locations.

- Unitialized interrupt vector. This interrupt occurs when a 6xxxx peripheral gives an interrupt and the interrupt vector register in the device is not loaded.

- Spurious interrupt when during a interrupt acknoledge no device responds by putting the interrupt vector on the databus and giving a -DTACK (user interrupt) or giving the -VPA signal (autovector interrupt) a spurious exception occurs.

As you see, the exception capabilities go much further on the 68000 than on the 6502. You have however to pay for these features with a very complicated interrupt acknoledge sequence. I hope, that my description of the exception processing does not contain significant errors, I am not sure I understand the interrupt acknoledge completely.

7. SYSTEMS WITH 68000.

There are already a few complete systems with a 68000 on the market. In this section, I shall descripe some of these systems.

7.1 Sinclair QL. The Sinclair QL was one of the first computers with a 68000 on the hobby market. It contains a 68008 processor. As far as I knows, the computer is not very popular, I think the mean reason for this is the fact that there is not many software for this machine.

7.2 The Apple Macintosh. This computer is not meant for the amateur. It contains a 68000 processor and has a operating system with so called icons. That means that almost anything is menu driven. When you want to do something you point to the associated icon with the mouse, press the button and the program starts.

7.3 The Artari 520 ST. I think that this computer is the IBM PC for the 68000 fans. It has a 68000 processor. It supports very nice graphics and there is already some software for it and the number of programs is growing each month. Beside these facts, the computer is rather cheap.

7.4 The Commodore Amiga. Also a 68000 processor, a very new machine. It has more features than the Artari but it also costs a lot of money.

7.5 The MC68000, my computer. This computer is published by the german magazine MC. It is a single board computer just like the Junior with a 68000 two 6522 VIA's, a 6845 video controller and 128 or 512 kB ram. On board there are 8 expansion slots. Already available are a floppy controller, 2 MB ram board, 8 line RS232 interface and operating systems CPM-68K (single user) and OS9-68K (multy user). The only problem with software for this computer is the price.

7.6 The c't 68000. Just like the MC68000 is this a project of a german magazine: C'T. I do not know any details of this computer.

7.7 The EC68000. A new project of Elektuur with a 68000 and a 6809 intergrated in one computer. It is published in Elektuur Computer Special 3.

7.8 All kinds of VME-bus machines with operating systems UNIX, OS9-68K, VERSADOS PDOS etc. These machines are meant for professional applications and are rather expensive. These computers are becoming industrial standard for controlling processes.

7.9 68000 based computers with UNIX-V operating system like HP Integral and AT&T UNIX PC. These computers are the 68000 versions of the IBM PC.

7.10 In the near future, all kinds of upgrade boards with 68000 can be bought for the Apple II and IBM PC.

8. Literature.

1) Herman Burgers: 6502 kenner 31, april 1984.
2) Byte August 1984
3) Byte September 1984

There are many books for the 68000. Each month there are issued new ones. I can not give a review of books, the best thing to do is, go to your local book shop and look for a good book. Elektuur has also issued two books on the 68000, and MC has issued a special on the MC68000.

```
NUMBER    THE JUNIOR PROMOTING CY (W&J)  21:55:19 - TUE 17/JUN/86  PAGE 01

00010:                  ************************************************************
00020:                  *                                                          *
00030:                  *                       N U M B E R S                      *
00040:                  *                                                          *
00050:                  ************************************************************
00060:
00070:
00080:                  Routines to handle the input of numbers from the key-
00090:                   board and to convert them between Decimal and Hexade-
00100:                   cimal notations.
00110:
00120:
00130: D800             NUMBER ORG   $D800
00140:
00150:
00160:          D8 00   DECFLG *     $00D8  decimal flag: 00=dec, FF=hexadecimal
00170:
00180:          ED 00   ONE    *     $00ED  buffer for decimal 5-digit number
00190:          EE 00   TWO    *     ONE    +01
00200:          EF 00   TRE    *     ONE    +02
00210:
00220:          F8 00   INL    *     ONE    +0B (00F8) buffer for hexadecimal 4-digit num
00230:          F9 00   INH    *     INL    +01
00240:
00250:          FC 00   TEMP   *     $00FC  temporary for digit
00260:          FE 00   NIBBLE *     $00FE  number of digits
00270:
00280:          54 EF   DUPLEX *     $EF54
00290:
00300:                  *** CLOCK ADDRESSES ***
00310:
00320:          C8 EF   CLKADR *     $EFC8
00330:          C9 EF   CLKDAT *     $EFC9
00340:
00350:                  *** EXTERNAL SUBROUTINES ***
00360:
00370:          A1 29   PRINTV *     $29A1  print a string on the VDU
00380:          7A F1   BELL   *     $F17A  ring the bell
00390:          5D F3   NPRCHA *     $F35D  print a character
00400:          FE F4   CRLF   *     $F4FE  print a CR and a LF
00410:          06 F5   PRBS   *     $F506  print a backspace
00420:          09 F5   PRSP   *     $F509  print a space
00430:          75 F5   PRBYT  *     $F575  print a byte
00440:          7E F5   PRNIBL *     $F57E  print a nibble
00450:          1A F6   ASHETT *     $F61A  ASCII-hexadecimal conversion
00460:          1B FE   RECCHA *     $FE1B  receive 1 character from keyboard
00470:
00480:
00490:
00500:
00510:                  *** RECEIVE AN HEX NUMBER (UP TO 4 DIGIT) TO INH,INL ***
00520:                  ************************************************************
00530:
00540:                      Duplex flag must be cleared (00)
00550:                      Input ends with a space, or
00560:                      A space will be printed after the 4th digit
00570:
00580: D800 A0 03       RECHEX LDYIM $03    up to 4 digits
00590: D802 2C                 =     $2C    (BIT) jump next two bytes
00600:
00610: D803 A0 01       RECBYT LDYIM $01    2 digits
00620: D805 A9 FF              LDAIM $FF    hexadecimal!
00630: D807 D0 04              BNE   RECDIG always
00640:
00650:
00660:
00670:
00680:                  *** RECEIVE A DECIMAL NUMBER (TO 5 DIGIT) TO TRE,TWO,ONE
00690:                  ************************************************************
00700:
00710:                      Duplex flag must be cleared
00720:                      Input ends with a space, or
00730:                      A space will be printed after the 5th digit
00740:
00750: D809 A0 04       RECDEC LDYIM $04    up to 5 digits
00760: D80B A9 00              LDAIM $00    decimal!
00770:
00780:
```

```
00790:                  *** Receive a digit ***
00800:
00810:                  Error-free numeric input routine:
00820:                   - check for a digit, decimal or hexadecimal
00830:                   - do not accept any other character, except
00840:                   - a SPACE to finish input
00850:                   - or a BACKSPACE to correct a previous digit.
00860:                   - check for a "correction" on a digit that doesn't exis
00870:                   - "beep" the BELL on error.
00880:
00890: D80D 85 D8      RECDIG STAZ  DECFLG set decimal flag
00900: D80F 84 FE             STYZ  NIBBLE max number of digits
00910: D811 8A                TXA         save X register
00920: D812 48                PHA
00930:
00940: D813 20 1B FE   RECDI  JSR   RECCHA receive one digit
00950: D816 C9 20             CMPIM ' '   SP to finish
00960: D818 F0 4D             BEQ   SPCEND if it was a SPace.
00970: D81A C9 08             CMPIM $08   BS to correct
00980: D81C D0 0A             BNE   RECD  if not a BSpace.
00990: D81E C4 FE             CPYZ  NIBBLE are we at the beginning?
01000: D820 B0 13             BCS   RECBEL if so, no backspace! (attempt to correct behind
01010: D822 C8                INY                                the 1st digit)
01020: D823 20 06 F5          JSR   PRBS  correct the previous digit; V=0
01030: D826 50 EB             BVC   RECDI always. Receive a new digit
01040:
01050: D828 20 1A F6   RECD   JSR   ASHETT ASCII to hexadecimal conversion
01060: D82B B0 08             BCS   RECBEL if <0 or >F
01070: D82D 24 D8             BITZ  DECFLG
01080: D82F 70 09             BVS   RECVAL if hexadecimal
01090: D831 C9 0A             CMPIM $0A
01100: D833 90 05             BCC   RECVAL if decimal 0 to 9
01110:
01120: D835 20 20 D9   RECBEL JSR   BELLY : error, ring the bell & save Y; C=1
01130: D838 B0 D9             BCS   RECDI always
01140:
01150: D83A 48         RECVAL PHA         save nibble
01160: D83B 20 7E F5          JSR   PRNIBL print it (DUPLEX is off)
01170: D83E 68                PLA         restore it
01180: D83F 85 FC             STAZ  TEMP
01190: D841 98                TYA         get digit count
01200: D842 4A                LSRA        divide by 2: carry=1 if odd; =0 if even
01210: D843 08                PHP         save carry status
01220: D844 24 D8             BITZ  DECFLG which input buffer?
01230: D846 50 03             BVC   RECTAX if decimal.
01240: D848 18                CLC
01250: D849 69 0B             ADCIM $0B   (INL=ONE+0B) compute hexadecimal-buffer pointer
01260:
01270: D84B AA         RECTAX TAX         get byte-position (pointer)
01280: D84C B5 ED             LDAZX ONE   get byte from buffer
01290: D84E 28                PLP         restore carry status (even/odd)
01300: D84F 90 0B             BCC   RCEVEN if even.
01310:
01320: D851 29 0F      RECODD ANDIM $0F   mask old digit. Y=3 or 1 (odd)
01330: D853 06 FC             ASLZ  TEMP  position correctly the new digit in TEMP
01340: D855 06 FC             ASLZ  TEMP
01350: D857 06 FC             ASLZ  TEMP
01360: D859 06 FC             ASLZ  TEMP
01370: D85B 2C                =     $2C   (BIT) jump next 2 bytes of program code
01380:
01390: D85C 29 F0      RCEVEN ANDIM $F0   mask old digit. Y=2 or 0 (even)
01400: D85E 05 FC             ORAZ  TEMP  include the new one
01410: D860 95 ED             STAZX ONE   save it (byte)
01420: D862 88                DEY         all digits?
01430: D863 10 AE             BPL   RECDI no; receive more.
01440: D865 30 18             BMI   RECEND always. YES; stop.
01450:
01460: D867 C8         SPCEND INY
01470: D868 98                TYA         number of digits (nibbles) missing.
01480: D869 0A                ASLA        multiply by 4: compute number of bits.
01490: D86A 0A                ASLA
01500: D86B A8                TAY         bit count on Y register
01510:
01520: D86C 24 D8      RECROR BITZ  DECFLG decimal or hexadecimal? (which buffer?)
01530:
01540: D86E 70 08      RECBVS BVS   RECINH if hexadecimal.
01550: D870 46 EF             LSRZ  TRE   rotate nibble (digits) through buffer
01560: D872 66 EE             RORZ  TWO   fill missing digits with zeros
01570: D874 66 ED             RORZ  ONE
01580: D876 50 04             BVC   RECDEY always
01590:
```

```
NUMBER    THE JUNIOR PROMOTING CY (W&J)  21:57:59 - TUE 17/JUN/86  PAGE 03

01600: D878 46 F9      RECINH LSRZ  INH     idem for decimal
01610: D87A 66 F8             RORZ  INL
01620:
01630: D87C 88         RECDEY DEY           all bits moved?
01640: D87D D0 EF             BNE   RECBVS
01650:
01660: D87F 68         RECEND PLA           restore X register
01670: D880 AA                TAX
01680: D881 4C 09 F5          JMP   PRSP    print a SPace and RTS; V=0
01690:
01700:
01710:
01720:                 *** DECIMAL - HEXADECIMAL CONVERSION ***
01730:                 ****************************************
01740:
01750:                 Subtract POWERS from the decimal number
01760:                  until a result negative.
01770:
01780: D884 8A         DECHEX TXA
01790: D885 48                PHA
01800: D886 98                TYA
01810: D887 48                PHA
01820: D888 F8                SED
01830: D889 A0 00             LDYIM #00     Y = powers count
01840: D88B 20 AF D8          JSR   SUB
01850: D88E 0A                ASLA
01860: D88F 0A                ASLA
01870: D890 0A                ASLA
01880: D891 0A                ASLA
01890: D892 20 AD D8          JSR   STOSUB (STAZ INH ...)
01900: D895 05 F9             ORAZ  INH
01910: D897 20 AD D8          JSR   STOSUB (STAZ INH ...)
01920: D89A 0A                ASLA
01930: D89B 0A                ASLA
01940: D89C 0A                ASLA
01950: D89D 0A                ASLA
01960: D89E 85 F8             STAZ  INL
01970: D8A0 20 AF D8          JSR   SUB
01980: D8A3 05 F8             ORAZ  INL
01990: D8A5 85 F8             STAZ  INL
02000:
02010: D8A7 68         DECEND PLA           restore registers
02020: D8A8 A8                TAY
02030: D8A9 68                PLA
02040: D8AA AA                TAX
02050: D8AB D8                CLD
02060: D8AC 60                RTS
02070:
02080: D8AD 85 F9      STOSUB STAZ  INH     save nibble
02090: D8AF A2 00      SUB    LDXIM #00     X = subtraction times count
02100: D8B1 38         SUBS   SEC
02110: D8B2 A5 ED             LDAZ  ONE     subtract power from number
02120: D8B4 F9 18 D9          SBCAY POWERS
02130: D8B7 85 ED             STAZ  ONE
02140: D8B9 A5 EE             LDAZ  TWO
02150: D8BB F9 19 D9          SBCAY POWERS +01
02160: D8BE 90 05             BCC   SUBD
02170: D8C0 85 EE      SUBST  STAZ  TWO
02180: D8C2 E8                INX
02190: D8C3 D0 EC             BNE   SUBS
02200: D8C5 C6 EF      SUBD   DECZ  TRE     zero?
02210: D8C7 10 F7             BPL   SUBST   if number still positive.
02220: D8C9 E6 EF             INCZ  TRE     add power again, if negative.
02230: D8CB A5 ED             LDAZ  ONE
02240: D8CD 79 18 D9          ADCAY POWERS
02250: D8D0 85 ED             STAZ  ONE
02260: D8D2 8A                TXA           get count
02270:
02280: D8D3 C8         SUBRTN INY
02290: D8D4 C8                INY           increment POWERS pointer
02300: D8D5 60                RTS
02310:
02320:
02330:                 *** HEXADECIMAL - DECIMAL CONVERSION ***
02340:                 ****************************************
02350:
02360:                 Add powers (hexa)times up to a total decimal number
02370:
```

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NUMBER    THE JUNIOR PROMOTING CY (W&J)  21:59:11 - TUE 17/JUN/86  PAGE 04

02380: D8D6 98          HEXDEC TYA
02390: D8D7 48                 PHA
02400: D8D8 8A                 TXA
02410: D8D9 48                 PHA
02420: D8DA F8                 SED
02430: D8DB 20 29 D9           JSR    CLEAR  ONE TWO TRE (decimal buffer)
02440: D8DE A0 00              LDYIM  $00    Y = powers pointer
02450: D8E0 A5 F9              LDAZ   INH    get high byte
02460: D8E2 F0 03              BEQ    HEXLDY if zero.
02470: D8E4 20 F2 D8           JSR    DECADD add power to number
02480:
02490: D8E7 A0 04       HEXLDY LDYIM  $04
02500: D8E9 A5 F8              LDAZ   INL    get low byte
02510: D8EB F0 BA              BEQ    DECEND if zero.
02520: D8ED 20 F2 D8           JSR    DECADD
02530: D8F0 D0 B5              BNE    DECEND always & RTS
02540:
02550: D8F2 48          DECADD PHA
02560: D8F3 4A                 LSRA          get high byte
02570: D8F4 4A                 LSRA
02580: D8F5 4A                 LSRA
02590: D8F6 4A                 LSRA
02600: D8F7 20 FD D8           JSR    DECAD
02610: D8FA 68                 PLA
02620: D8FB 29 0F              ANDIM  $0F    get low nibble
02630:
02640: D8FD AA          DECAD  TAX           nibble to X
02650: D8FE F0 D3              BEQ    SUBRTN if zero.
02660:
02670: D900 18          DECC   CLC           processor's decimal flag is set!
02680: D901 A5 ED              LDAZ   ONE
02690: D903 79 18 D9           ADCAY  POWERS
02700: D906 85 ED              STAZ   ONE
02710: D908 A5 EE              LDAZ   TWO
02720: D90A 79 19 D9           ADCAY  POWERS +01
02730: D90D 85 EE              STAZ   TWO
02740: D90F 90 02              BCC    DECX
02750: D911 E6 EF              INCZ   TRE    it does not matter the Decimal flag, because
02760:                                       maximum is 07...
02770: D913 CA          DECX   DEX
02780: D914 D0 EA              BNE    DECC
02790: D916 F0 BB              BEQ    SUBRTN always & RTS
02800:
02810:                 ************************************************************
02820:
02830:
02840:
02850: D918 96          POWERS =      $96    4096, 256, 16, 1
02860: D919 40                 =      $40
02870: D91A 56                 =      $56
02880: D91B 02                 =      $02
02890: D91C 16                 =      $16
02900: D91D 00                 =      $00
02910: D91E 01                 =      $01
02920: D91F 00                 =      $00
02930:
02940:
02950:
02960: D920 98          BELLY  TYA           save Y
02970: D921 48                 PHA
02980: D922 20 7A F1           JSR    BELL   ring the bell
02990: D925 68                 PLA
03000: D926 A8                 TAY           restore Y
03010: D927 38                 SEC           set carry for later branches (-always)
03020: D928 60                 RTS
03030:
03040:
03050:
03060: D929 A9 00       CLEAR  LDAIM  $00    clear decimal buffer
03070: D92B 85 ED              STAZ   ONE
03080: D92D 85 EE              STAZ   TWO
03090: D92F 85 EF              STAZ   TRE
03100: D931 60                 RTS
03110:
03120:
03130:
03140:                 ***********  test to verify NUMBER routines ***********
03150:
03160: D932 20 09 D8    decHEX JSR    RECDEC receive decimal
03170: D935 20 84 D8           JSR    DECHEX convert to hexadecimal
```

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NUMBER    THE JUNIOR PROMOTING CY (W&J)  22:00:17 - TUE 17/JUN/86  PAGE 05

03180:  D938 A5 F9            LDAZ   INH
03190:  D93A 20 75 F5         JSR    PRBYT  print the 4-nibble number
03200:  D93D A5 F8            LDAZ   INL
03210:  D93F 20 75 F5         JSR    PRBYT
03220:  D942 20 FE F4         JSR    CRLF   carriage return
03230:  D945 50 EB            BVC    decHEX loop: new conversion ...
03240:
03250:  D947 20 00 D8  hexDEC JSR    RECHEX receive hexadecimal
03260:  D94A 20 D6 D8         JSR    HEXDEC convert to decimal
03270:  D94D A5 EF            LDAZ   TRE
03280:  D94F 20 7E F5         JSR    PRNIBL print the 5-digit number
03290:  D952 A5 EE            LDAZ   TWO
03300:  D954 20 75 F5         JSR    PRBYT
03310:  D957 A5 ED            LDAZ   ONE
03320:  D959 20 75 F5         JSR    PRBYT
03330:  D95C 20 FE F4         JSR    CRLF   carriage return
03340:  D95F 50 E6            BVC    hexDEC loop: receive new number...
03350:
03360:
03490:
03500:                  ************************************************************
03510:                  *                                                          *
03520:                  *           R E A L   T I M E   C L O C K                  *
03530:                  *                                                          *
03540:                  ************************************************************
03550:
03560:
03570:                  Routines to set and to display time.
03580:                  Based on the 146818 Real Time Clock IC.
03590:                  elektor electronics - April 1985.
03600:
03610:                  Format chosen for output:
03620:                  09:20:59 - SAT 22/FEV/86
03630:                  (hour:minutes:seconds - day of the week
03640:                    day of month/month/year)
03650:
03660:
03670:  D961 20 A1 29  RTCLCK JSR    PRINTV
03680:  D964 0D                =      $0D
03690:  D965 0A                =      $0A
03700:  D966 4F                =      'O
03710:  D967 50                =      'P
03720:  D968 54                =      'T
03730:  D969 49                =      'I
03740:  D96A 4F                =      'O
03750:  D96B 4E                =      'N
03760:  D96C 53                =      'S
03770:  D96D 3A                =      ':
03780:  D96E 0D                =      $0D
03790:  D96F 0A                =      $0A
03800:  D970 53                =      'S
03810:  D971 29                =      ')
03820:  D972 45                =      'E
03830:  D973 54                =      'T
03840:  D974 20                =      ' 
03850:  D975 43                =      'C
03860:  D976 4C                =      'L
03870:  D977 4F                =      'O
03880:  D978 43                =      'C
03890:  D979 4B                =      'K
03900:  D97A 0D                =      $0D
03910:  D97B 0A                =      $0A
03920:  D97C 44                =      'D
03930:  D97D 29                =      ')
03940:  D97E 49                =      'I
03950:  D97F 53                =      'S
03960:  D980 50                =      'P
03970:  D981 4C                =      'L
03980:  D982 41                =      'A
03990:  D983 59                =      'Y
04000:  D984 20                =      ' 
04010:  D985 54                =      'T
04020:  D986 49                =      'I
04030:  D987 4D                =      'M
04040:  D988 45                =      'E
04050:  D989 0D                =      $0D
04060:  D98A 0A                =      $0A
04070:  D98B BE                =      '→
04080:  D98C 03                =      $03
04090:
```

←Hex. / ←Decimal	b8	b7	b6	b5	0	1	2	3	4	5	6	7
					0	1	2	3	4	5	6	7
b4 b3 b2 b1												
0 0 0 0	0				NUL 0 0	DLE 10 16	SP 20 32	0 30 48	@ 40 64	P 50 80	` 60 96	p 70 112
0 0 0 1	1				SOH 1 1	DC1 11 17	! 21 33	1 31 49	A 41 65	Q 51 81	a 61 97	q 71 113
0 0 1 0	2				STX 2 2	DC2 12 18	" 22 34	2 32 50	B 42 66	R 52 82	b 62 98	r 72 114
0 0 1 1	3				ETX 3 3	DC3 13 19	# 23 35	3 33 51	C 43 67	S 53 83	c 63 99	s 73 115
0 1 0 0	4				EOT 4 4	DC4 14 20	$ 24 36	4 34 52	D 44 68	T 54 84	d 64 100	t 74 116
0 1 0 1	5				ENQ 5 5	NAK 15 21	% 25 37	5 35 53	E 45 69	U 55 85	e 65 101	u 75 117
0 1 1 0	6				ACK 6 6	SYN 16 22	& 26 38	6 36 54	F 46 70	V 56 86	f 66 102	v 76 118
0 1 1 1	7				BEL 7 7	ETB 17 23	' 27 39	7 37 55	G 47 71	W 57 87	g 67 103	w 77 119
1 0 0 0	8				BS 8 8	CAN 18 24	(28 40	8 38 56	H 48 72	X 58 88	h 68 104	x 78 120
1 0 0 1	9				HT 9 9	EM 19 25	) 29 41	9 39 57	I 49 73	Y 59 89	i 69 105	y 79 121
1 0 1 0	A				LF A 10	SUB 1A 26	* 2A 42	: 3A 58	J 4A 74	Z 5A 90	j 6A 106	z 7A 122
1 0 1 1	B				VT B 11	ESC 1B 27	+ 2B 43	; 3B 59	K 4B 75	[5B 91	k 6B 107	{ 7B 123
1 1 0 0	C				FF C 12	FS 1C 28	, 2C 44	< 3C 60	L 4C 76	\ 5C 92	l 6C 108	| 7C 124
1 1 0 1	D				CR D 13	GS 1D 29	- 2D 45	= 3D 61	M 4D 77	] 5D 93	m 6D 109	} 7D 125
1 1 1 0	E				SO E 14	RS 1E 30	. 2E 46	> 3E 62	N 4E 78	^ 5E 94	n 6E 110	~ 7E 126
1 1 1 1	F				SI F 15	US 1F 31	/ 2F 47	? 3F 63	O 4F 79	_ 5F 95	o 6F 111	DEL 7F 127

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NUMBER    THE JUNIOR PROMOTING CY (W&J)  22:01:26 - TUE 17/JUN/86  PAGE 06

04100: D98D 20 1B FE          JSR   RECCHA
04110: D990 C9 44             CMPIM 'D
04120: D992 D0 06             BNE   CLOCK
04130: D994 20 FE F4          JSR   CRLF
04140: D997 4C 0C DA          JMP   PRTDAT display data
04150:
04160:
04170: D99A A2 00       CLOCK LDXIM $00     *** INPUT TIME AND DATE ***
04180: D99C 8E 54 EF          STX   DUPLEX  ============================
04190: D99F A0 00             LDYIM $00
04200:
04210: D9A1 B9 E0 DA    ASKFOR LDAAY TEXT
04220: D9A4 30 06             BMI   WAIT
04230: D9A6 20 5D F3          JSR   NPRCHA print text (prompt) for input
04240: D9A9 C8                INY
04250: D9AA D0 F5             BNE   ASKFOR always
04260:
04270: D9AC 29 7F       WAIT  ANDIM $7F
04280: D9AE 20 5D F3          JSR   NPRCHA print last character
04290: D9B1 C8                INY
04300: D9B2 98                TYA
04310: D9B3 48                PHA           save pointer
04320:
04330: D9B4 A0 01       RECEIV LDYIM $01
04340: D9B6 20 0B D8          JSR   RECDEC +02 input a number (decimal)
04350: D9B9 A5 ED             LDAZ  ONE     get it
04360: D9BB DD 88 DA          CMPAX MAX     is it correct?
04370: D9BE F0 07             BEQ   SAVE
04380: D9C0 90 05             BCC   SAVE
04390: D9C2 20 7A F1          JSR   BELL    error
04400: D9C5 B0 ED             BCS   RECEIV always; receive again
04410:
04420: D9C7 9D 96 DA    SAVE  STAAX DATA    save inputed data for clock
04430: D9CA 20 FE F4          JSR   CRLF
04440: D9CD 68                PLA
04450: D9CE A8                TAY           restore index
04460: D9CF E8                INX
04470: D9D0 C0 45             CPYIM $45
04480: D9D2 90 CD             BCC   ASKFOR
04490:
04500:
04510: D9D4 A9 06       SETCLK LDAIM $06    0000.0110 clock mode and SQW settings
04520: D9D6 A2 0A             LDXIM $0A     Reg A
04530: D9D8 8E C8 EF          STX   CLKADR prevent time/calendar updates
04540: D9DB 8D C9 EF          STA   CLKDAT
04550:
04560: D9DE A9 83             LDAIM $83     1000.0011 going to initialize time! SQW is off.
04570: D9E0 E8                INX           0B Reg : all interrupts are disabled
04580: D9E1 8E C8 EF          STX   CLKADR   BCD digits; 24 hour/day;
04590: D9E4 8D C9 EF          STA   CLKDAT   daylight savings enabled
04600:
04610: D9E7 A0 00             LDYIM $00
04620: D9E9 B9 96 DA    TAKDAT LDAAY DATA   get data for clock
04630: D9EC BE 8F DA          LDXAY ADDRES  get destination register
04640: D9EF 8E C8 EF          STX   CLKADR  address register
04650: D9F2 8D C9 EF          STA   CLKDAT  write it: set time and date
04660: D9F5 C8                INY
04670: D9F6 C0 07             CPYIM $07     all 7 chosen registers?
04680: D9F8 90 EF             BCC   TAKDAT  if no
04690:
04700: D9FA A2 0B             LDXIM $0B     Reg B
04710: D9FC A9 03             LDAIM $03
04720: D9FE 8E C8 EF          STX   CLKADR
04730: DA01 8D C9 EF          STA   CLKDAT time is already initialized.
04740:
04750: DA04 A2 0D             LDXIM $0D     Reg D
04760: DA06 8E C8 EF          STX   CLKADR
04770: DA09 AD C9 EF          LDA   CLKDAT read reg D to validate RAM and time
04780:
04790:
04800:
04810: DA0C A0 FF       PRTDAT LDYIM $FF    *** PRINT TIME AND DATE ***
04820:                                      ============================
04830: DA0E 20 54 DA          JSR   IV      get hour       18:33:30 - SAT 22/FEB/86
04840: DA11 20 49 DA          JSR   I       print hour; get minutes
04850: DA14 20 49 DA          JSR   I       print minutes; get seconds
04860: DA17 20 75 F5          JSR   PRBYT   print seconds
04870: DA1A 20 09 F5          JSR   PRSP
04880: DA1D A9 2D             LDAIM '-
04890: DA1F 20 5D F3          JSR   NPRCHA
04900: DA22 A9 20             LDAIM '
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NUMBER    THE JUNIOR PROMOTING CY (W&J)  22:02:44 - TUE 17/JUN/86  PAGE 07

04910: DA24 20 51 DA          JSR   III     get number of day of week
04920: DA27 20 71 DA          JSR   VI      print name of day
04930: DA2A A9 20             LDAIM ' '
04940: DA2C 20 51 DA          JSR   III     get number of day of month
04950: DA2F 20 75 F5          JSR   PRBYT   print day of month
04960: DA32 20 4F DA          JSR   IIA     get number of month
04970: DA35 20 69 DA          JSR   V       print name of month
04980: DA38 20 4F DA          JSR   IIA     get year
04990: DA3B 20 75 F5          JSR   PRBYT   print year
05000: DA3E 20 FE F4          JSR   CRLF
05010: DA41 A9 0B             LDAIM $0B
05020: DA43 20 5D F3          JSR   NPRCHA
05030:
05040: DA46 4C 0C DA          JMP   PRTDAT
05050:
05060:
05070:                        *** Auxiliar subroutines ***
05080:
05090: DA49 20 75 F5  I       JSR   PRBYT
05100: DA4C A9 3A     II      LDAIM ':
05110: DA4E 2C                =     $2C     BIT
05120: DA4F A9 2F     IIA     LDAIM '/
05130: DA51 20 5D F3  III     JSR   NPRCHA
05140: DA54 C8        IV      INY
05150: DA55 A2 0A             LDXIM $0A
05160: DA57 8E C8 EF  UIP?    STX   CLKADR
05170: DA5A AD C9 EF          LDA   CLKDAT  Update in progress?
05180: DA5D 30 F8             BMI   UIP?    yes; wait
05190:
05200: DA5F BE 9D DA          LDXAY REG
05210: DA62 8E C8 EF          STX   CLKADR
05220: DA65 AD C9 EF          LDA   CLKDAT  read clock registers
05230: DA68 60                RTS
05240:
05250:                        ************************
05260:
05270: DA69 C9 10     V       CMPIM $10     (OCT/NOV/DEC Binary Coded Decimal)
05280: DA6B 90 02             BCC   VA
05290: DA6D E9 07             SBCIM $07     convert to hexadecimal + carry
05300:
05310: DA6F 69 07     VA      ADCIM $07     add displacement in table + carry
05320:
05330: DA71 85 FC     VI      STAZ  TEMP    multiply by three (3 letters by name)
05340: DA73 0A                ASLA          (x2)
05350: DA74 18                CLC
05360: DA75 65 FC             ADCZ  TEMP    (+1)
05370: DA77 AA                TAX           (transform pointer)
05380: DA78 BD A4 DA  DAYMON  LDAAX DAYS
05390: DA7B 30 06             BMI   DAY
05400: DA7D 20 5D F3          JSR   NPRCHA
05410: DA80 E8                INX
05420: DA81 50 F5             BVC   DAYMON  always
05430: DA83 29 7F     DAY     ANDIM $7F
05440: DA85 4C 5D F3          JMP   NPRCHA & RTS
05450:
05460:
05470:                        *** Real time clock - auxiliar tables ***
05480:
05490: DA88 99                MAX     =     $99     year - maximum value for input
05500: DA89 12                        =     $12     month
05510: DA8A 31                        =     $31     day of month
05520: DA8B 07                        =     $07     day of week
05530: DA8C 23                        =     $23     hour
05540: DA8D 59                        =     $59     minutes
05550: DA8E 59                        =     $59     seconds
05560:
05570: DA8F 09                ADDRES  =     $09     address of the clock-registers for SETCLOCK
05580: DA90 08                        =     $08
05590: DA91 07                        =     $07
05600: DA92 06                        =     $06
05610: DA93 04                        =     $04
05620: DA94 02                        =     $02
05630: DA95 00                        =     $00
05640:                                  '
05650: DA96 00                DATA    =     $00     temporaries for inputed clock data
05660: DA97 00                        =     $00
05670: DA98 00                        =     $00
05680: DA99 00                        =     $00
05690: DA9A 00                        =     $00
05700: DA9B 00                        =     $00
05710: DA9C 00                        =     $00
05720:
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NUMBER    THE JUNIOR PROMOTING CY (W&J)  22:03:58 - TUE 17/JUN/86  PAGE 08

05730: DA9D 04          REG     =     $04    registers' order for formatted read-clock
05740: DA9E 02                  =     $02
05750: DA9F 00                  =     $00
05760: DAA0 06                  =     $06
05770: DAA1 07                  =     $07
05780: DAA2 08                  =     $08
05790: DAA3 09                  =     $09
05800:
05810:
05820: DAA4 2D          DAYS    =     '-     0 names of days and months
05830: DAA5 2D                  =     '-
05840: DAA6 2D                  =     '-       Please translate to your own language
05850:
05860: DAA7 44                  =     'D     1 Sunday
05870: DAA8 4F                  =     'O
05880: DAA9 CD                  =     'M
05890:
05900: DAAA 53                  =     'S     2 Monday
05910: DAAB 45                  =     'E
05920: DAAC C7                  =     'G
05930:
05940: DAAD 54                  =     'T     3 Tuesday
05950: DAAE 45                  =     'E
05960: DAAF D2                  =     'R
05970:
05980: DAB0 51                  =     'Q     4 Wednesday
05990: DAB1 55                  =     'U
06000: DAB2 C1                  =     'A
06010:
06020: DAB3 51                  =     'Q     5 Thursday
06030: DAB4 55                  =     'U
06040: DAB5 C9                  =     'I
06050:
06060: DAB6 53                  =     'S     6 Friday
06070: DAB7 45                  =     'E
06080: DAB8 D8                  =     'X
06090:
06100: DAB9 53                  =     'S     7 Saturday
06110: DABA 41                  =     'A
06120: DABB C2                  =     'B
06130:
06140:
06150: DABC 4A                  =     'J     1 January
06160: DABD 41                  =     'A
06170: DABE CE                  =     'N
06180:
06190: DABF 46                  =     'F     2 February
06200: DAC0 45                  =     'E
06210: DAC1 D6                  =     'V
06220:
06230: DAC2 4D                  =     'M     3 March
06240: DAC3 41                  =     'A
06250: DAC4 D2                  =     'R
06260:
06270: DAC5 41                  =     'A     4 April
06280: DAC6 42                  =     'B
06290: DAC7 D2                  =     'R
06300:
06310: DAC8 4D                  =     'M     5 May
06320: DAC9 41                  =     'A
06330: DACA C9                  =     'I
06340:
06350: DACB 4A                  =     'J     6 June
06360: DACC 55                  =     'U
06370: DACD CE                  =     'N
06380:
06390: DACE 4A                  =     'J     7 July
06400: DACF 55                  =     'U
06410: DAD0 CC                  =     'L
06420:
06430: DAD1 41                  =     'A     8 August
06440: DAD2 47                  =     'G
06450: DAD3 CF                  =     'O
06460:
06470: DAD4 53                  =     'S     9 September
06480: DAD5 45                  =     'E
06490: DAD6 D4                  =     'T
06500:
06510: DAD7 4F                  =     'O     10 October
06520: DAD8 55                  =     'U
06530: DAD9 D4                  =     'T
06540:
```

```
NUMBER    THE JUNIOR PROMOTING CY (W&J)  22:05:04 - TUE 17/JUN/86  PAGE 09

06550: DADA 4E                =      'N      11 November
06560: DADB 4F                =      'O
06570: DADC D6                =      'V
06580:
06590: DADD 44                =      'D      12 December
06600: DADE 45                =      'E
06610: DADF DA                =      'Z
06620:
06630:
06640: DAE0 0D          TEXT  =      $0D     text-prompts for data input
06650: DAE1 0A                =      $0A
06660: DAE2 41                =      'A      Year:
06670: DAE3 4E                =      'N
06680: DAE4 4F                =      'O
06690: DAE5 3A                =      ':
06700: DAE6 A0                =      '
06710: DAE7 4D                =      'M      Month N.
06720: DAE8 45                =      'E
06730: DAE9 53                =      'S
06740: DAEA 20                =      '
06750: DAEB 4E                =      'N
06760: DAEC 2E                =      '.
06770: DAED A0                =      '
06780:
06790: DAEE 44                =      'D      Day of Month N.
06800: DAEF 49                =      'I
06810: DAF0 41                =      'A
06820: DAF1 20                =      '
06830: DAF2 44                =      'D
06840: DAF3 4F                =      'O
06850: DAF4 20                =      '
06860: DAF5 4D                =      'M
06870: DAF6 45                =      'E
06880: DAF7 53                =      'S
06890: DAF8 20                =      '
06900: DAF9 4E                =      'N
06910: DAFA 2E                =      '.
06920: DAFB A0                =      '
06930:
06940: DAFC 44                =      'D      Day of Week N.
06950: DAFD 49                =      'I
06960: DAFE 41                =      'A
06970: DAFF 20                =      '
06980: DB00 44                =      'D
06990: DB01 41                =      'A
07000: DB02 20                =      '
07010: DB03 53                =      'S
07020: DB04 45                =      'E
07030: DB05 4D                =      'M
07040: DB06 41                =      'A
07050: DB07 4E                =      'N
07060: DB08 41                =      'A
07070: DB09 20                =      '
07080: DB0A 4E                =      'N
07090: DB0B 2E                =      '.
07100: DB0C A0                =      '
07110:
07120: DB0D 48                =      'H      Hours:
07130: DB0E 4F                =      'O
07140: DB0F 52                =      'R
07150: DB10 41                =      'A
07160: DB11 53                =      'S
07170: DB12 3A                =      ':
07180: DB13 A0                =      '
07190:
07200: DB14 4D                =      'M      Minutes:
07210: DB15 49                =      'I
07220: DB16 4E                =      'N
07230: DB17 55                =      'U
07240: DB18 54                =      'T
07250: DB19 4F                =      'O
07260: DB1A 53                =      'S
07270: DB1B 3A                =      ':
07280: DB1C A0                =      '
07290:
```

```
07300: DB1D 53                  =       'S      Seconds:
07310: DB1E 45                  =       'E
07320: DB1F 47                  =       'G
07330: DB20 55                  =       'U
07340: DB21 4E                  =       'N
07350: DB22 44                  =       'D
07360: DB23 4F                  =       'O
07370: DB24 53                  =       'S
07380: DB25 3A                  =       ':
07390: DB26 A0                  =
07400:

>Q

SOURCE SPACE: START 2A00 END C000          CURR-MAX 5D61 FREE 025247
SYMBOL TABLE: START C000 END CE00 CURR-MAX C2A0 FREE 02912
              STILL PLACE FOR 0364 ENTRIES
XREF   TABLE: START CE00 END D800 CURR-MAX D319 FREE 01255
              STILL PLACE FOR 0251 ENTRIES

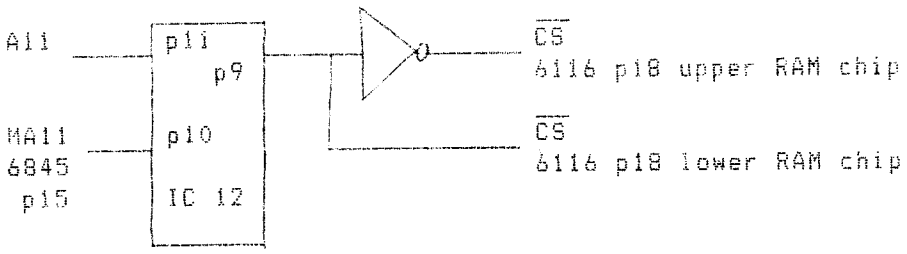
>00
```

Mr. J.C.Rix
3, Sutton Drove,
SEAFORD,
SUSSEX, BN25 3EU
ENGLAND.

Elektor VDU card modifications

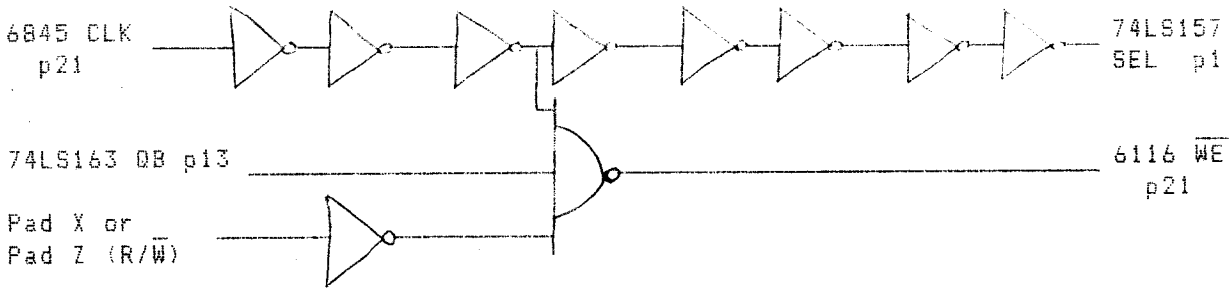
4k RAM

This is a very straightforward alteration involving the addition of an extra 6116 RAM chip mounted 'piggyback' on the existing 6116. On both 6116's pin 18 is splade out separately and connected as diagram below. One of the multiplexers is not used in the original design so I have used this for the additional address line (A11).



Non flicker

This alteration will remove the annoying screen flicker caused by processor access. I used two type 74LS04 chips for the inverters, and re-used N32 (3 input NAND gate).



If any of your members have a better solution to the screen flicker problem I would be pleased to hear about it.

New CENTRONIC routine for the 2 MHz JUNIOR/OCTOPUS 65

Author :Coen Boltjes 015-136812 VIDIBUS 400029830
Translator :Elya van der Veer

After reading the Elektuur Computer Special Issue 2 I stepped up the frequency of the clock of my DOS-Junior to 2 MHz. After testing the computer appeared to function well, without the faster I/O chips modelas.(I only use a 65C02) Also, it appeared that the waiting loops for the drive did not have to be adjusted. (A TEAC FD55-BV is used) I did have to change the CENTRONIC routine for the printer. The VIA is programmed in such a way that a handshake-pulse is provided automaticly when new data are presented. However, the size of the pulse is dependent on the frequence of the clock of the computer. If the frequence is doubled the size of the pulse will be 500 nS. This appeared to be sufficinet for my EPSON MX-80 matrix printer, but my BROTHER CE-50 needed more. Therefore, a new programme has been devised generating a larger pulse.
After the initiating steps the character is put on the data lines. Then, at CENTRP a waiting loop is executed in order to stabilize the signals. This enables one to use longer connection cables. The delay caused by the loop can be ignored in comparison with the time needed to wait for the printer which usually does not exceed 100 Char/sec. Then, the strobe pulse is generated by writing into the VAPCR $0C and $0E successively. The pulse is now 3uS, which can be enlarged by adding some NOP-instructions if nescessary. The length of the programme is smaller than the Paperware 4 routine. Thence, it can replace the old one. Furthermore, it is possible to use the new routine somewhere else by adjusting the outputvector #4 ($2317). In that case the vectoradress must be one less than the starting adress of the routine. The routine can also be applied to the OCTOPUS 65. Then, one should take into account that the communication is different here, so that addresses and masks must be adjusted.

```
                        ;NEW CENTRO-ROUTINE WITH SOFTWARE
                        ;STOBE OUTPUT FOR 2-MHZ JUNIOR/OCTOPUS
                        ;
                        ;VIA DEFENITIONS:
                        ;     PA0-PA7        DATA OUTPUT
                        ;     CA1            /ACK INPUT
                        ;     CA2            /STB OUTPUT
                        ;     PB1            /PE INPUT
                        ;     PB0            SEL INPUT
                        ;
                        ;VIA ADRESSES
                        ;
F800=                   VAPBD  =$F800
F801=                   VAPAD  =VAPBD+$1
F802=                   VAPBDD=VAPBD+$2
F803=                   VAPADD=VAPBD+$3
F80C=                   VAPCR  =VAPBD+$C
F80D=                   VAIFR  =VAPBD+$D
                        ;
2363=                   AHOLD  =$2363
F3E2                    *=$F3E2
                        ;
F3E2 A9FF    INIT       LDA #$FF
F3E4 8D03F8             STA VAPADD      ;PA0-PA7 OUTPUT
F3E7 A90E               LDA #$0E
F3E9 8D0CF8             STA VAPCR       ;CA1 NEGATIVE SENSITIVE
                        ;               ;CA2 HIGH OUTPUT
F3EC AD02F8             LDA VAPBDD      ;LOAD OLD DD-REGISTER
F3EF 29FC               AND #$FC
F3F1 8D02F8             STA VAPBDD      ;PA0-PA1 INPUT
F3F4 AD00F8 CENTRO      LDA VAPBD       ;LOAD PE & SEL INPUT
F3F7 4901               EOR #$01        ;INVERT SELECT BIT
F3F9 2903               AND #$03        ;ONLY BIT 0 AND 1
F3FB D025               BNE END         ;=>NOT SELECTED OR PAPER EMPTY
F3FD AD6323             LDA AHOLD
F400 8D01F8             STA VAPAD       ;CHAR. ON DATA LINES
F403 A200               LDX #$00        ;INIT. DATA SET-UP TIME
F405 E8      CENTRP     INX
F406 D0FD               BNE CENTRP      ;=>SETUP TIME NOT ENDED
F408 A90C               LDA #$0C
```

```
410 F40A 8D0CF8           STA VAPCR      ;CLEAR STROBE OUTPUT
420 F40D A90E             LDA #$0E
430 F40F 8D0CF8           STA VAPCR      ;AND SET IT
440 F412 AD00F8 CENTRQ    LDA VAPBD      ;LOAD PE AND SEL
450 F415 4901             EOR #$01
460 F417 2903             AND #$03
470 F419 D007             BNE END        ;=>NOT SELECTED OR PAPER EMPTY
480 F41B AD0DF8           LDA VAIFR
490 F41E 2902             AND #$02
500 F420 F0F0             BEQ CENTRQ     ;=>NO ACKNOWLEDGE
510 F422 AD0DF8 END       LDA VAIFR      ;LOAD FLAGS
520 F425 0903             ORA #$03       ;SET BITS 0 AND 1
530 F427 8D0DF8           STA VAIFR      ;RESET CA1 AND CA2
540 F42A 60               RTS
550                .END
```

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All prices only for European (C.E.P.T.)-countries.

DISASSEMBLER FOR 65(C)02 (Rockwell version)
Nico de Vries, The Netherlands.
Derived from the program originally written for the Apple][by Wozniak and Baum.
This routine in machinecode will run directly on Commodore PET, but easy to adapt to other machines.
Send cheque of Hfl. 25,00 to W.L.v.Pelt (eurocheque 15,50)

DISASSEMBLER FOR 65(C)02 (Synertek/GTE version)
Nico de Vries, The Netherlands.
Refer the announcement above.
Send cheque of Hfl. 25,00 to W.L.v.Pelt (eurocheque 15,50)

WRITE- AND READROUTINE FOR ELEKTOR'S JUNIOR-COMPUTER
Dick Blok, The Netherlands. With thanks to Sebo Woldringh for his advices. Machinecode.
Send cheque of Hfl. 15,00 to W.L.v.Pelt (eurocheque 5,50)

LARGE CHARACTERS WITH THE MICROLINE-80 PRINTER
Frans Bakx, The Netherlands.
A set of subroutines in 6502-machinecode to print large characters: 3 lines high and 4 normal characters width.
Send cheque of Hfl. 15,00 to W.L.v.Pelt (eurocheque 5,50)

DATBAS. A database-program written in Basic for Elektor's JUNIOR-computer with VDU-card and OHIO Scientific OS-65D V3.3 disk operating system.
Jan van Heuven, The Netherlands. Modified by Fernando Lopes, Portugal.
Send cheque of Hfl. 30,00 to W.L.v.Pelt (eurocheque 20,50)

VDU ROTATING NEWSPAPER.
Ivo van Rijssel, The Netherlands. Translated by Frank Bens
Machinecode-program for Elektor's JUNIOR-computer with VDU
Send cheque of Hfl. 15,00 to W.L.v.Pelt (eurocheque 5,50)

TYPE-AHEAD AND PRINTER BUFFER
Marcel Visser, The Netherlands.
Machinecode-program for APPLE][with DOS 3.3 or DIVERSI-DOS.
Send cheque of Hfl. 20,00 to W.L.v.Pelt (eurocheque 10,50)

CENTRONICS PRINTER INTERFACE DEVICE 4 OR 5 ON COMMODORE 64
Ruud Uphoff, The Netherlands. Machinecode.
Send cheque of Hfl. 15,00 to W.L.v.Pelt (eurocheque 5,50)

TOKENIZED Microsoft Basic Keywords and addresses KIM-1 and Elektor's JUNIOR KB-9 Basic.
W.L. van Pelt, The Netherlands.
Send cheque of Hfl. 14,50 to W.L.v.Pelt (eurocheque 5,00)

TOKENIZED Microsoft Basic Keywords and addresses SYM-1 Basic.
W.L. van Pelt, The Netherlands.
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TOKENIZED Microsoft Basic Keywords and addresses AIM-65 Basic.
W.L. van Pelt, The Netherlands.
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TOKENIZED Microsoft Basic Keywords and addresses APPLEsoft
W.L. van Pelt, The Netherlands.
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TOKENIZED Microsoft Basic Keywords and addresses CBM 40XX and CBM 80XX. Commodore Basic 4.0.
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TOKENIZED Microsoft Basic Keywords and addresses C - 16 Commodore Basic 3.5.
Nico de Vries, The Netherlands.
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TOKENIZED Microsoft Basic Keywords and addresses CBM 30XX Commodore asic 2.0.
Nico de Vries, The Netherlands.
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TOKENIZED Microsoft Basic Keywords and addresses VIC-20 Commodore Basic V2.
Nico de Vries, The Netherlands.
Send cheque of Hfl. 14,50 to W.L.v.Pelt (eurocheque 5,00)

PATCHES ON KIM-1 MICROSOFT BASIC FOR ELEKTOR'S JUNIOR-comp
Koen van Nieuwenhove, Belgium/W.L. van Pelt, The Netherl.
With PMODE, TRACE, STEP RESET, PRINTER PG., VIDEO, AUTO, RENUMBER, DATASAVE, EDIT LINE, APPEND.
Send cheque of Hfl. 24,50 to W.L.v.Pelt (eurocheque 15,00)

MICRO-WARE Assembler/Editor with bank-switching
Complete sourse-listing (Disassembler not included)
Author: Fernando Lopes, Portugal.
System: Elektor's JUNIOR-computer with VDU and OS65-D DOS
With new commands: PUT FILE, PUT TT, LOAD FILE, LOAD TT, toggle centronics flag, return to kernal, and modified error routine, and new subroutines DECBPF, INCBPF, SETPM-SETSC-SETPF, PRTDAT to read data and time from the Real Time Clock and to print it in the header lines, SETBKO-SWAPDN-SAVBNK-RSTBNK to manage the bankswitching, LINE NUMBERS.
Refer : DE 6502 KENNER, May 1986, p.44-47
Hardware article "Bank Switching for the JUNIOR-computer" by Fernando Lopes, Portugal.
Send cheque of Hfl. 45,00 to W.L.v.Pelt (eurocheque 35,50)

ENQUETE onder de leden van de KIM Gebruikersclub Nederland.

Het bestuur van de KIM Gebruikersclub Nederland heeft besloten een enquete onder de leden te houden, teneinde in staat te zijn een beleid te voeren dat gebaseerd is op de wensen en ideeen van de leden.

U vindt de enquete op de middenpagina's van dit nummer. De enquete kan in twee delen gesplitst worden. Het eerste deel is bedoeld om het bestuur een idee te geven van het bestand aan systemen binnen de club en wat de drijfveren zijn van diegenen die zich met deze computers bezig houden. Dit betreft de vragen 1 tot en met 5.
Het tweede deel (vraag 6) bevat vragen die het bestuur moeten helpen om een goed beleid voor de toekomst uit te stippelen.

Deelname aan de enquete is geheel vrijwillig, terwijl u ook niet verplicht bent alle vragen te beantwoorden.

Teneinde de deelnemers aan deze enquete enigszins te belonen voor hun moeite heeft het bestuur een aantal presentjes beschikbaar gesteld die verloot zullen worden onder diegenen die niet anoniem aan de enquete deelnemen. Bestuursleden zijn van deze verloting uitgesloten. Beschikbaar zijn de volgende presentjes:

10 EPROMs 2764
10 paar diskettes, (5.25 inch, leeg)
5 SRAMs 4364 (8k x 8)

De verloting zal plaatsvinden op de bijeenkomst te Rijswijk (Zh.) op 15 november 1986. De Voorzitter zal dan uit de inzendingen de winnaars trekken.

Wilt u de ingevulde enquete voor 1 oktober 1986 gefrankeerd sturen naar:

N. de Vries
Mari Andriessenrade 49
2907 MA Capelle aan den IJssel
Nederland

Het bestuur dankt u alvast voor de genomen moeite.

ENQUIRY among the members of the KIM Gebruikersclub Nederland.

The executive committee of the KIM gebruikersclub Nederland has decided to hold an enquiry among the members of the club, in order to be able to develop a policy based on the ideas and wishes of the members themselves.

You will find the Dutch version of the enquiry in the middle of this issue. However, if you prefer an enquiry in English, please apply for one at the address below. You will then receive the same document, written in English.
This enquiry is comprised of two parts. The first part is meant to give the committee an idea of the number of systems our members own and use, and what purposes they are used for. The questions 1 through 5 are meant for this purpose.
The second part (question 6) contains questions to help develop a policy for the future.

Participation in this enquiry is completely voluntary. It is also not mandatory to answer all questions.

To encourage you to participate, the committee has available some little presents. These are to be raffled among those participants that have filled in their names and addresses on the questionnaire. Members of the committee are excluded from the raffle. The following presents are available:

10 EPROMs 2764
10 sets of two diskettes (5.25 inch, empty)
5 SRAMs 4364 (8k x 8)

The raffle will take place on the club meeting in Rijswijk on November 15th 1986. The chairman will then draw the winner from the enquiries received before the closing date.

Please return the completed questionnaire before October 1st 1986, postage paid, to:

N. de Vries
Mari Andriessenrade 49
2907 MA Capelle aan den IJssel
The Netherlands

The committee thanks you in advance for your trouble.

```
                        1               PUT  CHESS1.1
                       )1
                       )2
                       )3
                       )4
                       )5
                       )6
                       )7
                       )8
                       )9
                       )10
                       )11
                       )12
                       )13
                       )14
                       )15
                       )16
                       )17
                       )18
                       )19
                       )20
                       )21
                       )22
                       )23   ZETI     EQU  $00
                       )24   ZETII    EQU  $01
                       )25   ZETIII   EQU  $02
                       )26   PROM     EQU  $03
                       )27   NAAR     EQU  $04
                       )28   VAN      EQU  $05
                       )29   NZET     EQU  $06
                       )30   ITZ      EQU  $07
                       )31   ZWRD     EQU  $08
                       )32   STUK     EQU  $09
                       )33   ROCO     EQU  $0A
                       )34   WRDE     EQU  $0B
                       )35   NIVO     EQU  $0C
                       )36   CZA      EQU  $0D
                       )37   CZO      EQU  $0E
                       )38   PZET     EQU  $0F
                       )39   CZET     EQU  $10
                       )40   MAXI     EQU  $11
                       )41   MAXII    EQU  $12
                       )42   EPS      EQU  $13
                       )43   HULP     EQU  $14
                       )44   CKAZ     EQU  $15
                       )45
                       )46            ORG  $16
0016: 84 83 85
0019: 86 82 85
001C: 83 84    )47    BORD     DFB  $84,$83,$85,$86,$82,$85,$83,$84
001E: 80 80 80
0021: 80 80 80
0024: 80 80    )48             DFB  $80,$80,$80,$80,$80,$80,$80,$80
0026: 00 00 00
0029: 00 00 00
002C: 00 00    )49             DFB  0,0,0,0,0,0,0,0
002E: 00 00 00
0031: 00 00 00
0034: 00 00    )50             DFB  0,0,0,0,0,0,0,0
0036: 00 00 00
0039: 00 00 00
003C: 00 00    )51             DFB  0,0,0,0,0,0,0,0
003E: 00 00 00
0041: 00 00 00
0044: 00 00    )52             DFB  0,0,0,0,0,0,0,0
0046: C1 C1 C1
0049: C1 C1 C1
004C: C1 C1    )53             DFB  $C1,$C1,$C1,$C1,$C1,$C1,$C1,$C1
004E: C4 C3 C5
0051: C6 C2 C5
0054: C3 C4    )54             DFB  $C4,$C3,$C5,$C6,$C2,$C5,$C3,$C4
0056: 00 05 0A
0059: 13 1C 0E
005C: 0A       )55    PTZ      DFB  $00,$05,$0A,$13,$1C,$0E,$0A
```

```
*****  *****  ******  *****  *****
*****  *****          *****  *****
*****  *****  THOR I   *****  *****
*****  *****          *****  *****
*****                         *****
*****     SCHAAKPROGRAMMA     *****
*****  *****  ******  *****  *****
*****  *****  ******  *****  *****

DOOR :    FRANS RAAIJMAKERS
          HOOGVENSESTRAAT 87
          5017 CB TILBURG
          TEL.: 013 - 366563

SYSTEEM : JUNIOR MET INTERFACE-KAART EN 4K RAM
          VANAF $2000, OF VERGELIJKBAAR SYSTEEM.
          DISPLAY : 7 SEGMENT-DISPLAY.


ZERO PAGE LOKATIES

PROMOTIESTUK
NAARVELD BESTE ZET
VANVELD BESTE ZET
CODE PROMOTIESTUK
NAARVELD ZET IN ONDERZOEK
VANVELD ZET IN ONDERZOEK
AANTAL GELDIGE ZETTEN PER NIVO
INDEXTABEL ZETMOGELIJKHEDEN
ZETWAARDE PER NIVO
STUK DAT WORDT GESLAGEN
ROCHADE-CODE
WAARDE VAN DE STELLING
MOMENTELE ONDERZOEKDIEPTE
CODE ZET AANBRENGEN
CODE ZET ONGELDIG
HOOGSTE AANTAL ZETTEN OP NIVO 2
CODE SOORT ZET
MAXIMALE ZOEKDIEPTE ALGEMEEN
MAXIMALE ZOEKDIEPTE SLAGZETTEN
VELDNUMMER PION EN PASSANT TE SLAAN
TEMP VOOR ALGEMENE DOELEINDEN
CODE KLEUR AAN ZET
```

```
005D: 01 01 00
0060: 03 05 03
0063: 08        )57   TSW      DFB  1,1,0,3,5,3,8
0064: 05 0F A4
0067: 24 00 15
006A: 1F B4     )58   TZET     DFB  $05,$0F,$A4,$24,$00,$15,$1F,$B4
006C: 34 0C 06
006F: 16 22 A2
0072: 26 36     )59          DFB  $34,$00,$06,$16,$22,$A2,$26,$36
0074: A6 B6 00
0077: 2E 3E AE
007A: BE 66     )60          DFB  $A6,$B6,$00,$2E,$3E,$AE,$BE,$66
007C: 76 E6 F6
007F: 00 06 16
0082: 22 A2     )61          DFB  $76,$E6,$F6,$00,$06,$16,$22,$A2
0084: 00 04 07
0087: 38 3C 3F )62   RCTI     DFB  $00,$04,$07,$38,$3C,$3F
008A: 40 C0 80
008D: 10 30 20 )63   RCTII    DFB  $40,$C0,$80,$10,$30,$20
               )64
               )65   WIS      EQU  $90          ;WISSEL STADIUM BEREKENING
               )66   OZET     EQU  $91          ;P-ZET VAN DE BESTE ZET TOT NU TOE
               )67   TEMP2    EQU  $92          ;TEMP VOOR ALGEMEEN GEBRUIK
               )68   TEMP3    EQU  TEMP2+1      ;IDEM
               )69   TEMP4    EQU  TEMP2+2      ;IDEM
               )70   TEMP5    EQU  TEMP2+3      ;IDEM
               )71   TEMP6    EQU  TEMP2+4      ;IDEM
               )72   TEMP7    EQU  TEMP2+5      ;IDEM
               )73   TEMP8    EQU  TEMP2+6      ;IDEM
               )74   TEMP9    EQU  TEMP2+7      ;IDEM
               )75   TEMPA    EQU  TEMP2+8      ;IDEM
               )76   TEMPB    EQU  TEMP2+9      ;IDEM
               )77   TEMPC    EQU  TEMP2+$0A    ;IDEM
               )78   TEMPD    EQU  TEMP2+$0B    ;IDEM
               )79   TEMPE    EQU  TEMP2+$0C    ;IDEM
               )80   TEMPF    EQU  TEMP2+$0D    ;IDEM
               )81   KAZ      EQU  $A0          ;KLEUR AAN ZET
               )82   KWIS     EQU  $A1          ;KLEURWISSEL
               )83   STKWRDKAZEQU  $A2          ;STUKWAARDE KLEUR AAN ZET
               )84   STKWRDKNAZEQU $A3          ;STUKWAARDE KLEUR NIET AAN ZET
               )85   STKNUMKAZEQU  $A4          ;AANTAL STUKKEN KLEUR AAN ZET
               )86   STKNUMKNAZEQU $A5          ;AANTAL STUKKEN KLEUR NIET AAN ZET
               )87   STELWRDLOBEQU $A6          ;STELLINGWAARDE LOW ORDER BYTE
               )88   STELWRDHOBEQU $A7          ;STELLINGWAARDE HIGH ORDER BYTE
               )89   STUKWRDLOBEQU $A8          ;STUKWAARDE LOW ORDER BYTE
               )90   STUKWRDHOBEQU $A9          ;STUKWAARDE HIGH ORDER BYTE
               )91   VELDTELLEREQU $AA          ;VELDBEHEERSING STUK IN ONDERZOEK
               )92   KONKNAZ  EQU  $AB          ;POSITIE KONING KLEUR NIET AAN ZET
               )93   STUKIO   EQU  $AC          ;SOORT STUK IN ONDERZOEK
               )94   POSITIO  EQU  $AD          ;POSITIE STUK IN ONDERZOEK
               )95   SLASTUK  EQU  $AE          ;STUK OP HET NAARVELD
               )96   DAMKNAZ  EQU  $AF          ;AANWEZIGHEID DAME KLEUR NIET AAN ZET
               )97   VANVELDHEXEQU $B0          ;VANVELD IN HEXADECIMAAL FORMAAT
               )98   VERTREKHEXEQU $B1          ;VANVELD IN DE MOMENTELE STELING
               )99   VERTREKREKEQU $B2          ;IDEM IN REKENFORMAAT
               )100  EERSTEVELDEQU $B3          ;EERSTE VELD VAN DE LIJN REKENFORMAAT
               )101  BITSTUKIOEQU  $B4          ;BITKODE STUK IN ONDERZOEK
               )102  BITKAZ   EQU  $B5          ;BITKODE PIONNEN KLEUR AAN ZET
               )103  BITKNAZ  EQU  $B6          ;IDEM KLEUR NIET AAN ZET
               )104  BITKAZR  EQU  $B7          ;BITKODE PIONNEN KLEUR AAN ZET RECHTS
               )105  BITKNAZR EQU  $B8          ;IDEM KLEUR NIET AAN ZET
               )106  BITKAZL  EQU  $B9          ;BITKODE PIONNEN KLEUR AAN ZET LINKS
               )107  BITKNAZL EQU  $BA          ;IDEM PIONNEN KLEUR NIET AAN ZET
               )108  RES1     EQU  $BB          ;GERESERVEERD
               )109  RES2     EQU  $BC          ;IDEM
               )110  RES3     EQU  $BD          ;IDEM
               )111  POSWRDLOBEQU  $BE          ;WAARDE BESTE ZET TOT DAN TOE LOB
               )112  POSWRDHOBEQU  $BF          ;WAARDE BESTE ZET TOT DAN TOE HOB
               )113
               )114
               )115          ORG  $C0
00C0: 00 00 00
00C3: 27 46 66
00C6: 17 00 00 )116  PIONTAB  DFB  $00,$00,$00,$27,$46,$66,$17,$00,$00
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00C9: 05 05 00
00CC: 10 19 12
00CF: 2D
00D0: 07 FF F7
00D3: F8 F9 01
00D6: 09 08
00D8: 91 90 89
00DB: 99 09 10
00DE: 11 01
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)118  STUKTAB   DFB   $05,$05,$00,$10,$19,$12,$2D

)119  DIRHEX    DFB   $07,$FF,$F7,$F8,$F9,$01,$09,$08

)120  DIRDEC    DFB   $91,$90,$89,$99,$09,$10,$11,$01
)121              ORG   $E1
)122  KEYBUF    EQU   $E1          ; TOETSBUFFER
)123              ;
)124              ORG   $F9
)125  DISP1     EQU   $F9          ; DISPLAYBUFFER
)126  DISP2     EQU   DISP1+1      ; IDEM
)127  DISP3     EQU   DISP1+2      ; IDEM
)128              ;
)129              ;                  MONITOR ADRESSEN
)130              ;
)131  SCANDS    EQU   $1D8E        ; TOON INHOUD DISPLAYBUFFER
)132  GETKEY    EQU   $1DF9        ; HAAL TOETS VAN HEX-PAD
)133              ;
)134              ;                  PIA ADRESSEN
)135              ;
)136  PAD       EQU   $1A80        ; POORT A DATA REGISTER
)137  PBD       EQU   $1A82        ; POORT B DATA REGISTER
)138              ;
)139              ;                  PIA TIMER ADRES
)140              ;
)141  TIMER     EQU   $1AF4        ; CLK1T, DISABLE TIMER IRQ
)142              ;
)143              ;                  VECTOR ADRESSEN
)144              ;
)145  NMIVECTLOBEQU $1A7A
)146  NMIVECTHOBEQU $1A7B
)147  IRQVECTLOBEQU $1A7E
)148  IRQVECTHOBEQU $1A7F
)149              ;
)150              ;                  SCHAAKMONITOR ADRESSEN
)151              ;
)152              ;  TD/DS       EQU $0590 ; TOETSDETEKTIE/DISPLAY
)153              ;  MAINSMON    EQU $05A5 ; HOOFDROUTINE SCHAAKMONITOR
)154              ;  CODEMON     EQU $05F3 ; CODE-ROUTINE
)155              ;  VELDKODMON  EQU $05FC ; VELDKONTROLE EN KODERING
)156              ;  PLUSMON     EQU $0629 ; STUK VERPLAATSEN
)157              ;  DAMON       EQU $064F ; STUK PLAATSEN/VERWIJDEREN
)158              ;  ADMON       EQU $0683 ; BORD VEGEN
)159              ;  PCMON       EQU $068D ; NIEUWE PARTIJ
)160              ;
)161              ;                  POSVAL ADRESSEN
)162              ;
)163              ;  ADD         EQU $2000 ; ADD
)164              ;  TOTAL       EQU $200E ; TOTAL
)165              ;  MULTIPLY    EQU $2022 ; MULTIPLY
)166              ;  DIVIDE      EQU $2077 ; DIVIDE
)167              ;  SCAN        EQU $20DA ; SCAN
)168              ;  KODEER      EQU $20FA ; KODEER
)169              ;  VELDTEST    EQU $2111 ; VELDKONTROLE
)170              ;  NAARVELD    EQU $212F ; NAARVELD
)171              ;  AFSTAND     EQU $2140 ; AFSTAND
)172              ;  EERSTEVELD  EQU $2174 ; EERSTE VELD
)173              ;  STATUSI     EQU $219C ; STATUS I
)174              ;  STATUSII    EQU $21E0 ; STATUS II
)175              ;  PAARD       EQU $2227 ; PAARD
)176              ;  LOPER       EQU $22A2 ; LOPER
)177              ;  DAME        EQU $2318 ; DAME
)178              ;  TOREN       EQU $238D ; TOREN
)179              ;  PION        EQU $246E ; PION
)180              ;  KONINGI     EQU $2582 ; KONING I
)181              ;  KONINGII    EQU $266C ; KONING II
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                    )183                                ; INITPOS    EQU $2707 ; INITIALISERING
                    )184                                ; MAINSPOS   EQU $2787 ; STUURROUTINE
                    )185                                ;
                    )186                                ; REPRESENTATIE VAN DE STUKKEN
                    )187                                ;
                    )188                                ; LEEG VELD  = 00
                    )189                                ; WITTE PION = 80  ZWARTE PION = C1
                    )190                                ; KONING     = 82  KONING      = C2
                    )191                                ; PAARD      = 83  PAARD       = C3
                    )192                                ; TOREN      = 84  TOREN       = C4
                    )193                                ; LOPER      = 85  LOPER       = C5
                    )194                                ; DAME       = 86  DAME        = C6
                      2             PUT   CHESS1.2
                    )1                                  ;
                    )2              ORG   $2000
2000: 4C 95 2C      )3              JMP   PCMON         ; INITIALISEREN
2003: A5 9B         )4    ADD       LDA   TEMPB         ; TEL DE MOMENTELE WAARDE
2005: 18            )5              CLC                 ; BIJ DE STUKWAARDE
2006: 65 A8         )6              ADC   STUKWRDLOB    ; EN BEWAAR RESULTAAT
2008: 85 A8         )7              STA   STUKWRDLOB
200A: A5 9C         )8              LDA   TEMPC
200C: 65 A9         )9              ADC   STUKWRDHOB
200E: 85 A9         )10             STA   STUKWRDHOB
2010: 60            )11             RTS
2011: A5 A6         )12   TOTAL     LDA   STELWRDLOB   ; TEL STUKWAARDE
2013: 85 9B         )13             STA   TEMPB         ; BIJ STELLINGWAARDE
2015: A5 A7         )14             LDA   STELWRDHOB    ; MET BEHULP VAN ADD
2017: 85 9C         )15             STA   TEMPC         ; EN BEWAAR RESULTAAT
2019: 20 00 20      )16             JSR   $2000
201C: A5 A8         )17             LDA   STUKWRDLOB
201E: 85 A6         )18             STA   STELWRDLOB
2020: A5 A9         )19             LDA   STUKWRDHOB
2022: 85 A7         )20             STA   STELWRDHOB
2024: 60            )21             RTS
2025: 84 97         )22   MULTIPLY  STY   TEMP7         ; RESET
2027: 84 98         )23             STY   TEMP8
2029: 84 9B         )24             STY   TEMPB
202B: 84 9C         )25             STY   TEMPC
202D: A5 99         )26   M1        LDA   TEMP9         ; NEEM ABSOLUTE WAARDE
202F: F0 48         )27             BEQ   OUTM          ; VERMENIGVULDIGER
2031: 10 09         )28             BPL   M2            ; JUMP OUT ALS VERM = 0
2033: 49 FF         )29             EOR   #$FF          ; SIGN = -1 ALS
2035: 18            )30             CLC                 ; VERM = NEGATIEF
2036: 69 01         )31             ADC   #1
2038: 85 99         )32             STA   TEMP9
203A: C6 97         )33             DEC   TEMP7
203C: A5 9A         )34   M2        LDA   TEMPA         ; NEEM ABSOLUTE WAARDE
203E: F0 39         )35             BEQ   OUTM          ; VERMENIGVULDIGTAL
2040: 10 09         )36             BPL   M3            ; JUMP OUT ALS VERMT = 0
2042: 49 FF         )37             EOR   #$FF          ; SIGN +1 ALS
2044: 18            )38             CLC                 ; VERMT = NEGATIEF
2045: 69 01         )39             ADC   #1
2047: 85 9A         )40             STA   TEMPA
2049: E6 97         )41             INC   TEMP7
204B: 46 9A         )42   M3        LSR   TEMPA         ; SCHUIF VERMT NAAR RECHTS
204D: 90 0D         )43             BCC   M4            ; JUMP ALS CARRY = 0
204F: A5 99         )44             LDA   TEMP9         ; TEL VERMT BIJ PROD
2051: 18            )45             CLC
2052: 65 9B         )46             ADC   TEMPB
2054: 85 9B         )47             STA   TEMPB
2056: A5 98         )48             LDA   TEMP8
2058: 65 9C         )49             ADC   TEMPC
205A: 85 9C         )50             STA   TEMPC
205C: 06 99         )51   M4        ASL   TEMP9         ; SCHUIF VERM NAAR LINKS
205E: 26 98         )52             ROL   TEMP8         ; JMP TOTDAT VERMT=0
2060: A5 9A         )53             LDA   TEMPA
2062: D0 E7         )54             BNE   M3
2064: A5 97         )55   M5        LDA   TEMP7         ; NEEM 2 KOMPLEMENT VAN PROD
2066: F0 11         )56             BEQ   OUTM          ; ALS SIGN () 0
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2068: A5 9B     )58              LDA  TEMPB
206A: 49 FF     )59              EOR  #$FF
206C: 18        )60              CLC
206D: 69 01     )61              ADC  #1
206F: 85 9B     )62              STA  TEMPB
2071: A5 9C     )63              LDA  TEMPC
2073: 49 FF     )64              EOR  #$FF
2075: 69 00     )65              ADC  #0
2077: 85 9C     )66              STA  TEMPC
2079: 60        )67   OUTM       RTS
207A: 84 96     )68   DIVIDE     STY  TEMP6       ; RESET
207C: 84 9B     )69              STY  TEMPB
207E: 84 9C     )70              STY  TEMPC
2080: A5 98     )71   D1         LDA  TEMP8       ; TEST DEELTAL
2082: D0 06     )72              BNE  D1A
2084: A5 97     )73              LDA  TEMP7
2086: F0 54     )74              BEQ  OUTD        ; JUMP OUT ALS DEELTAL = 0
2088: A5 98     )75              LDA  TEMP8       ; SCHUIF DEELTAL ZOVER
208A: 30 08     )76   D1A        BMI  D2          ; MOGELIJK LINKS
208C: C6 96     )77   D1A1       DEC  TEMP6       ; HOUDT AANTAL SHIFTS
208E: 06 97     )78              ASL  TEMP7       ; BIJ IN TEMP6
2090: 26 98     )79              ROL  TEMP8
2092: 10 F8     )80              BPL  D1A1
2094: A5 9A     )81   D2         LDA  TEMPA       ; TEST DELER
2096: D0 06     )82              BNE  D2A         ; JUMP OUT ALS DELER = 0
2098: A5 99     )83              LDA  TEMP9
209A: F0 40     )84              BEQ  OUTD
209C: A5 9A     )85              LDA  TEMPA
209E: 30 08     )86   D2A        BMI  D2A1
20A0: E6 96     )87   D2A2       INC  TEMP6       ; SCHUIF DELER ZOVER MOGELIJK LINKS
20A2: 06 99     )88              ASL  TEMP9       ; HOUDT AANTAL SHIFTS BIJ IN TEMP6
20A4: 26 9A     )89              ROL  TEMPA
20A6: 10 F8     )90              BPL  D2A2
20A8: A5 96     )91   D2A1       LDA  TEMP6       ; JUMP OUT ALS TEMP6 ( 0 :
20AA: 30 30     )92              BMI  OUTD        ; DAN IS DELER ) DELTAL
20AC: 38        )93   D3         SEC              ; TREK DEELTAL VAN DELER AF
20AD: A5 97     )94              LDA  TEMP7
20AF: E5 99     )95              SBC  TEMP9
20B1: 85 97     )96              STA  TEMP7
20B3: A5 98     )97              LDA  TEMP8
20B5: E5 9A     )98              SBC  TEMPA
20B7: 85 98     )99              STA  TEMP8
20B9: 90 08     )100  D4         BCC  D4A         ; DRAAI CARRY IN QUOTIENT
20BB: 26 9B     )101             ROL  TEMPB       ; TEL DELER BIJ DEELTAL
20BD: 26 9C     )102             ROL  TEMPC       ; ALS CARRY = 0
20BF: F0 13     )103             BEQ  D5
20C1: D0 11     )104             BNE  D5
20C3: 26 9B     )105  D4A        ROL  TEMPB
20C5: 26 9C     )106             ROL  TEMPC
20C7: 18        )107             CLC
20C8: A5 97     )108             LDA  TEMP7
20CA: 65 99     )109             ADC  TEMP9
20CC: 85 97     )110             STA  TEMP7
20CE: A5 98     )111             LDA  TEMP8
20D0: 65 9A     )112             ADC  TEMPA
20D2: 85 98     )113             STA  TEMP8
20D4: 46 9A     )114  D5         LSR  TEMPA       ; SCHUIF DELER NAAR RECHTS
20D6: 66 99     )115             ROR  TEMP9       ; DECREMENTEER SHIFTTELLER
20D8: C6 96     )116             DEC  TEMP6
20DA: 10 D0     )117             BPL  D3          ; JUMP TOTDAT SHIFTTELLER ( 0
20DC: 60        )118  OUTD       RTS
20DD: A6 B0     )119  SCAN       LDX  VANVELDHEX  ; X = VANVELD
20DF: CA        )120  SCAN1      DEX
20E0: 30 18     )121             BMI  SCANOUT     ; JUMP ALS X ( 0
20E2: B5 16     )122             LDA  BORD,X      ; A = BORD
20E4: F0 F9     )123             BEQ  SCAN1       ; JUMP ALS BORD = GEEN STUK
20E6: 85 94     )124             STA  TEMP4
20E8: 29 0F     )125             AND  #$0F
20EA: C5 AC     )126             CMP  STUKIO
20EC: D0 F1     )127             BNE  SCAN1       ; JUMP ALS STUK () STUKIO
20EE: A5 94     )128             LDA  TEMP4
20F0: 29 40     )129             AND  #$40
20F2: 45 A1     )130             EOR  KWIS
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20F4: D0 E9     )132             BNE  SCAN1        ; JUMP ALS KLEUR <> KWIS
20F6: 86 B0     )133             STX  VANVELDHEX   ; SAVE VANVELD
20F8: F0 02     )134             BEQ  SCANOUT2
20FA: A9 FF     )135 SCANOUT     LDA  #$FF         ; KEER TERUG MET A=FF : ALLE VELDEN GEHAD
20FC: 60        )136 SCANOUT2    RTS
20FD: A5 B1     )137 KODEER      LDA  VERTREKHEX   ; BEREKEN VERTIKALE
20FF: 4A        )138             LSRA              ; KOORDINAAT
2100: 4A        )139             LSRA
2101: 4A        )140             LSRA
2102: 85 94     )141             STA  TEMP4
2104: A5 B1     )142             LDA  VERTREKHEX   ; BEREKEN HORIZONTALE
2106: 29 07     )143             AND  #7           ; KOORDINAAT
2108: 0A        )144             ASLA
2109: 0A        )145             ASLA
210A: 0A        )146             ASLA
210B: 0A        )147             ASLA
210C: 05 94     )148             ORA  TEMP4        ; NEEM KOORDINATEN BIJ ELKAAR
210E: 18        )149             CLC               ; TEL 11 BIJ RESULTAAT
210F: 69 11     )150             ADC  #$11
2111: 85 B2     )151             STA  VERTREKREK   ; RESULTAAT IN VERTREKREK
2113: 60        )152             RTS
2114: B5 D8     )153 VELDKONTRL  LDA  DIRDEC,X     ; HAAL DECIMALE RICHTINGTABEL
2116: 18        )154             CLC
2117: F8        )155             SED               ; TEL OP BIJ VERTREKREK
2118: 65 B2     )156             ADC  VERTREKREK   ; RESULTAAT IS NAARVELD
211A: D8        )157             CLD
211B: 85 94     )158             STA  TEMP4        ; NAARVELD IN TEMP4
211D: 29 0F     )159             AND  #$0F
211F: F0 0E     )160             BEQ  OUTVK1       ; KONTROLEER GELDIGHEID NAARVELD
2121: C9 09     )161             CMP  #9
2123: F0 0A     )162             BEQ  OUTVK1       ; JUMP ALS NAARVELD = ONGELDIG
2125: A5 94     )163             LDA  TEMP4
2127: 29 F0     )164             AND  #$F0
2129: F0 04     )165             BEQ  OUTVK1
212B: C9 90     )166             CMP  #$90
212D: D0 02     )167             BNE  OUTVK2       ; JUMP ALS NAARVELD = GELDIG
212F: A9 FF     )168 OUTVK1      LDA  #$FF
2131: 60        )169 OUTVK2      RTS
2132: B5 D0     )170 NAARVELD    LDA  DIRHEX,X     ; HAAL HEXADECIMALE RICHTINGTABEL
2134: 18        )171             CLC
2135: 65 B1     )172             ADC  VERTREKHEX   ; TEL OP BIJ VERTREKHEX
2137: 85 B1     )173             STA  VERTREKHEX
2139: 86 9D     )174             STX  TEMPD        ; NAARVELD IS NIEUW VERTREKVELD
213B: AA        )175             TAX
213C: B5 16     )176             LDA  BORD,X       ; HAAL STUK VAN NAARVELD
213E: 85 AE     )177             STA  SLASTUK      ; EN ZET DAT IN SLASTUK
2140: A6 9D     )178             LDX  TEMPD
2142: 60        )179             RTS
2143: A5 99     )180 AFSTAND     LDA  TEMP9        ; HAAL EERSTE VELD
2145: 29 0F     )181             AND  #$0F         ; DISTILLEER VERTIKALE KOORDINAAT
2147: 85 9B     )182             STA  TEMPB
2149: A5 9A     )183             LDA  TEMPA        ; HAAL TWEEDE VELD
214B: 29 0F     )184             AND  #$0F         ; DISTILLEER VERTIKALE KOORDINAAT
214D: 38        )185             SEC
214E: E5 9B     )186             SBC  TEMPB        ; BEREKEN HET VERSCHIL
2150: 10 05     )187             BPL  AFST1
2152: 49 FF     )188             EOR  #$FF         ; BEREKEN ABSOLUTE WAARDE
2154: 18        )189             CLC
2155: 69 01     )190             ADC  #1
2157: 85 9C     )191 AFST1       STA  TEMPC        ; SAVE RESULTAAT
2159: A5 99     )192             LDA  TEMP9        ; HAAL EERSTE VELD
215B: 29 F0     )193             AND  #$F0         ; DISTILLEER HORIZONTALE KOORDINAAT
215D: 85 9B     )194             STA  TEMPB
215F: A5 9A     )195             LDA  TEMPA        ; HAAL TWEEDE VELD
2161: 29 F0     )196             AND  #$F0         ; DISTILLEER HORIZONTALE KOORDINAAT
2163: 38        )197             SEC
2164: E5 9B     )198             SBC  TEMPB        ; BEREKEN HET VERSCHIL
2166: 10 05     )199             BPL  AFST2
2168: 49 FF     )200             EOR  #$FF         ; BEREKEN ABSOLUTE WAARDE
216A: 18        )201             CLC
216B: 69 01     )202             ADC  #1
216D: 4A        )203 AFST2       LSRA              ; SCHUIF RESULTAAT IN RECHTER NIBBLE
216E: 4A        )204             LSRA
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216F: 4A        )206            LSRA
2170: 4A        )207            LSRA
2171: 18        )208            CLC
2172: 65 9C     )209            ADC  TEMPC       ; TEL RESULTATEN BIJ ELKAAR
2174: 85 9C     )210            STA  TEMPC       ; RESULTAAT IN TEMPC
2176: 60        )211            RTS
2177: A5 A1     )212  FIRSTVELDLDA  KWIS         ; ZET LOOPRICHTING UIT
2179: F0 04     )213            BEQ  FV1
217B: A2 07     )214            LDX  #7          ; ZWART = 7
217D: D0 02     )215            BNE  FV1A
217F: A2 03     )216  FV1       LDX  #3          ; WIT = 3
2181: A5 B0     )217  FV1A      LDA  VANVELDHEX  ; ZET VAN IN VERTREK
2183: 85 B1     )218            STA  VERTREKHEX
2185: 84 B4     )219            STY  BITSTUKIO   ; ZET BITSTUKIO OP 01
2187: E6 B4     )220            INC  BITSTUKIO
2189: 20 FD 20  )221  FV2       JSR  KODEER
218C: 20 14 21  )222            JSR  VELDKONTR
218F: C9 FF     )223            CMP  #$FF
2191: F0 07     )224            BEQ  FV3         ; JUMP ALS A=FF : ONGELDIG
2193: 20 32 21  )225            JSR  NAARVELD
2196: 06 B4     )226            ASL  BITSTUKIO
2198: D0 EF     )227            BNE  FV2         ; JUMP TOTDAT LIJN OP IS
219A: A5 B1     )228  FV3       LDA  VERTREKHEX  ; RESULTAAT IN EERSTEVELD
219C: 85 B3     )229            STA  EERSTEVELD
219E: 60        )230            RTS
219F: A5 A1     )231  STATUSI   LDA  KWIS        ; ZET LOOPRICHTING UIT
21A1: F0 04     )232            BEQ  STAT1
21A3: A2 03     )233            LDX  #3          ; ZWART = 3
21A5: D0 02     )234            BNE  STAT2
21A7: A2 07     )235  STAT1     LDX  #7          ; WIT = 7
21A9: 84 95     )236  STAT2     STY  TEMP5       ; RESET
21AB: 84 96     )237            STY  TEMP6
21AD: 84 97     )238            STY  TEMP7
21AF: E6 95     )239            INC  TEMP5       ; TEMP5 = EERSTEVELD
21B1: 20 FD 20  )240  STAT3     JSR  KODEER
21B4: 20 14 21  )241            JSR  VELDKONTR
21B7: C9 FF     )242            CMP  #$FF
21B9: D0 01     )243            BNE  STAT4       ; JUMP ZOLANG ER GELDIGE VELDEN ZIJN
21BB: 60        )244            RTS
21BC: 20 32 21  )245  STAT4     JSR  NAARVELD
21BF: 06 95     )246            ASL  TEMP5       ; LEFT SHIFT TEMP5 VOOR IEDERE ZET
21C1: A5 AE     )247            LDA  SLASTUK     ; HAAL SLASTUK
21C3: F0 EC     )248            BEQ  STAT3       ; JUMP ALS SLASTUK = 0
21C5: 29 07     )249            AND  #7
21C7: C9 02     )250            CMP  #2
21C9: 10 E6     )251            BPL  STAT3       ; JUMP ALS SLASTUK () PION
21CB: A5 AE     )252            LDA  SLASTUK
21CD: 29 40     )253            AND  #$40
21CF: 45 A1     )254            EOR  KWIS
21D1: D0 08     )255            BNE  STAT5       ; JUMP NAAR PION KAZ
21D3: A5 95     )256            LDA  TEMP5       ; BEWAAR PIONPOSITIE KNAZ IN TEMP6
21D5: 05 96     )257            ORA  TEMP6
21D7: 85 96     )258            STA  TEMP6
21D9: D0 D6     )259            BNE  STAT3
21DB: A5 95     )260  STAT5     LDA  TEMP5       ; BEWAAR PIONPOSITIE KAZ IN TEMP7
21DD: 05 97     )261            ORA  TEMP7
21DF: 85 97     )262            STA  TEMP7
21E1: D0 CE     )263            BNE  STAT3
21E3: A2 05     )264  STATUSII  LDX  #5          ; ZET LOOPRICHTING NAAR RECHTS
21E5: A5 B3     )265            LDA  EERSTEVELD  ; EERSTEVELD IN VERTREKHEX
21E7: 85 B1     )266            STA  VERTREKHEX
21E9: 20 FD 20  )267            JSR  KODEER
21EC: 20 14 21  )268            JSR  VELDKONTR
21EF: C9 FF     )269            CMP  #$FF
21F1: D0 06     )270            BNE  STATII1     ; JUMP ALS A = FF : GEEN RIJ
21F3: 84 B7     )271            STY  BITKAZR     ; ZET BITKODE AANVALER EN
21F5: 84 B8     )272            STY  BITKNAZR    ; VERDEDIGERS RECHTS OP 00
21F7: F0 0D     )273            BEQ  STATII2
21F9: E6 B1     )274  STATII1   INC  VERTREKHEX  ; VERTREKVELD LIGT RIJ NAAR RECHTS
21FB: 20 9F 21  )275            JSR  STATUSI
21FE: A5 96     )276            LDA  TEMP6
2200: 85 B7     )277            STA  BITKAZR     ; VERDEDIGERS RECHTS IN BITKAZR
2202: A5 97     )278            LDA  TEMP7       ; AANVALLERS RECHTS IN BITKNAZR
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2204: 85 B8     )280            STA  BITKNAZR
2206: A2 01     )281  STATII2   LDX  #1          ; ZET LOOPRICHTING NAAR LINKS
2208: A5 B3     )282            LDA  EERSTEVELD ; EERSTEVELD IN VERTREKHEX
220A: 85 B1     )283            STA  VERTREKHEX
220C: 20 FD 20  )284            JSR  KODEER
220F: 20 14 21  )285            JSR  VELDKONTR
2212: C9 FF     )286            CMP  #$FF
2214: D0 06     )287            BNE  STATII3    ; JUMP ALS A = FF : GEEN RIJ
2216: 84 B9     )288            STY  BITKAZL    ; ZET BITKODE AANVALLERS EN
2218: 84 BA     )289            STY  BITKNAZL   ; VERDEDIGERS LINKS OP 00
221A: F0 0D     )290            BEQ  STATIIOUT
221C: C6 B1     )291  STATII3   DEC  VERTREKHEX ; VERTREKVELD LIGT RIJ NAAR LINKS
221E: 20 9F 21  )292            JSR  STATUSI
2221: A5 96     )293            LDA  TEMP6
2223: 85 B9     )294            STA  BITKAZL    ; VERDEDIGERS LINKS IN BITKAZL
2225: A5 97     )295            LDA  TEMP7
2227: 85 BA     )296            STA  BITKNAZL   ; AANVALLER LINKS IN BITKNAZL
2229: 60        )297  STATIIOUTRTS
                 3              PUT  CHESS1.3
222A: A9 40     )1    PAARD     LDA  #$40       ; VANVELD = 40
222C: 85 B0     )2              STA  VANVELDHEX
222E: A9 03     )3              LDA  #3         ; STUK = PAARD
2230: 85 AC     )4              STA  STUKIO
2232: 84 A8     )5              STY  STUKWRDLOB ; RESET STUKTELLER
2234: 84 A9     )6              STY  STUKWRDHOB
2236: 20 DD 20  )7    STARTP    JSR  SCAN
2239: C9 FF     )8              CMP  #$FF       ; A <> FF : STUK GEVONDEN
223B: D0 04     )9              BNE  P1         ; VERWERK
223D: 20 11 20  )10             JSR  TOTAL
2240: 60        )11             RTS             ; RETURN
2241: A5 B0     )12   P1        LDA  VANVELDHEX ; P1 KODEERT POSITIE VAN HET STUK
2243: 85 B1     )13             STA  VERTREKHEX
2245: 20 FD 20  )14             JSR  KODEER
2248: 85 AD     )15   P2        STA  POSITIO    ; AFSTAND PAARD EN KONING KNAZ
224A: 85 99     )16             STA  TEMP9
224C: A5 AB     )17             LDA  KONKNAZ
224E: 85 9A     )18             STA  TEMPA
2250: 20 43 21  )19             JSR  AFSTAND
2253: A9 05     )20             LDA  #5
2255: 38        )21             SEC             ; 5 - AFSTAND PAARD EN KONING KNAZ
2256: E5 9C     )22             SBC  TEMPC
2258: 85 99     )23             STA  TEMP9
225A: A9 0C     )24             LDA  #$0C       ; WEEGFAKTOR IS +12
225C: 85 9A     )25             STA  TEMPA
225E: 20 25 20  )26             JSR  MULTIPLY
2261: 20 03 20  )27             JSR  ADD
2264: A5 AD     )28   P3        LDA  POSITIO    ; AFSTAND PAARD - CENTRUM
2266: 85 99     )29             STA  TEMP9
2268: A9 44     )30             LDA  #$44       ; CENTRUM = 44
226A: 85 9A     )31             STA  TEMPA
226C: 20 43 21  )32             JSR  AFSTAND
226F: 85 94     )33             STA  TEMP4
2271: A9 55     )34             LDA  #$55       ; CENTRUM = 55
2273: 85 9A     )35             STA  TEMPA
2275: 20 43 21  )36             JSR  AFSTAND
2278: 18        )37             CLC
2279: 65 94     )38             ADC  TEMP4
227B: 85 94     )39             STA  TEMP4
227D: A9 06     )40             LDA  #6         ; 6 - AFSTAND PAARD - CENTRUM
227F: 38        )41             SEC
2280: E5 94     )42             SBC  TEMP4
2282: 85 99     )43             STA  TEMP9
2284: A9 10     )44             LDA  #$10       ; WEEGFAKTOR IS +16
2286: 85 9A     )45             STA  TEMPA
2288: 20 25 20  )46             JSR  MULTIPLY
228B: 20 03 20  )47             JSR  ADD
228E: 20 77 21  )48   P4        JSR  FIRSTVELD  ; ONTWIKKELING
2291: A5 B4     )49             LDA  BITSTUKIO
2293: C9 01     )50             CMP  #1         ; NIET ONTWIKKELD INDIEN BITVELD = 01
2295: D0 9F     )51             BNE  STARTP

2297: A9 A2     )53             LDA  #$A2
```

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2299: 85 9B     )54
229B: A9 FF     )55
229D: 85 9C     )56
229F: 20 03 20  )57
22A2: 4C 36 22  )58
22A5: A9 40     )59   LOPER
22A7: 85 B0     )60
22A9: A9 05     )61
22AB: 85 AC     )62
22AD: 84 A8     )63
22AF: 84 A9     )64
22B1: 84 AA     )65   STARTL
22B3: 20 DD 20  )66
22B6: C9 FF     )67
22B8: D0 04     )68
22BA: 20 11 20  )69
22BD: 60        )70
22BE: A2 08     )71   L1
22C0: A5 B0     )72   L2
22C2: 85 B1     )73
22C4: CA        )74
22C5: CA        )75
22C6: 30 27     )76
22C8: 20 FD 20  )77   L3
22CB: 20 14 21  )78
22CE: C9 FF     )79
22D0: F0 EE     )80
22D2: 20 32 21  )81
22D5: A5 AE     )82
22D7: F0 0E     )83
22D9: 29 40     )84
22DB: 45 A1     )85
22DD: D0 08     )86
22DF: A5 AE     )87
22E1: 29 07     )88
22E3: C9 02     )89
22E5: 30 D9     )90
22E7: E6 AA     )91   L4
22E9: A5 AE     )92
22EB: F0 DB     )93
22ED: D0 D1     )94
22EF: A5 AA     )95   L5
22F1: 38        )96
22F2: E9 07     )97
22F4: 85 99     )98
22F6: A9 0C     )99
22F8: 85 9A     )100
22FA: 20 25 20  )101
22FD: 20 03 20  )102
2300: A5 B0     )103  L6
2302: 85 B1     )104
2304: 20 77 21  )105
2307: A5 B4     )106
2309: C9 01     )107
230B: D0 A4     )108
230D: A9 92     )109
230F: 85 9B     )110
2311: A9 FF     )111
2313: 85 9C     )112
2315: 20 03 20  )113
2318: 4C B1 22  )114
231B: A9 40     )115  DAME
231D: 85 B0     )116
231F: A9 06     )117
2321: 85 AC     )118
2323: 84 A8     )119
2325: 84 A9     )120
2327: 84 AA     )121  STARTD
2329: 20 DD 20  )122
232C: C9 FF     )123
232E: D0 04     )124
```

```
        STA  TEMPB       ; WEEGFAKTOR IS -94
        LDA  #$FF
        STA  TEMPC
        JSR  ADD
        JMP  STARTP
LOPER   LDA  #$40        ; VANVELD = 40
        STA  VANVELDHEX  ; STUK = LOPER
        LDA  #5
        STA  STUKIO
        STY  STUKWRDLOB  ; RESET STUKTELLER
        STY  STUKWRDHOB
STARTL  STY  VELDTELLER  ; RESET VELDTELLER
        JSR  SCAN
        CMP  #$FF        ; A <> FF : STUK GEVONDEN
        BNE  L1          ; VERWERK
        JSR  TOTAL
        RTS
L1      LDX  #8          ; X = RICHTING
L2      LDA  VANVELDHEX  ; ZOEK IN VOLGENDE RICHTING
        STA  VERTREKHEX
        DEX              ; WERK RICHTING BIJ
        DEX
        BMI  L5          ; ALLE RICHTINGEN GEHAD
L3      JSR  KODEER      ; ZOEK IN DEZELFDE RICHTING
        JSR  VELDKONTR
        CMP  #$FF
        BEQ  L2          ; FF=GEEN GELDIG VELD, VOLGENDE RICHTING
        JSR  NAARVELD
        LDA  SLASTUK
        BEQ  L4          ; NAARVELD IS LEEG
        AND  #$40
        EOR  KWIS
        BNE  L4          ; STUK KNAZ
        LDA  SLASTUK
        AND  #7
        CMP  #2
        BMI  L2          ; PION KNAZ
L4      INC  VELDTELLER  ; L4 : TELT DE VELDEN
        LDA  SLASTUK
        BEQ  L3          ; NAARVELD=LEEG: DOORGAAN IN ZELFDE RICHTING
        BNE  L2          ; NAARVELD HEEFT STUK: VOLGENDE RICHTING
L5      LDA  VELDTELLER  ; L5 : VERWERKT DE VELDTELLER
        SEC
        SBC  #7          ; AANTAL VELDEN - 7
        STA  TEMP9
        LDA  #$0C        ; WEEGFAKTOR = 12
        STA  TEMPA
        JSR  MULTIPLY
        JSR  ADD
L6      LDA  VANVELDHEX  ; ONTWIKKELING
        STA  VERTREKHEX
        JSR  FIRSTVELD
        LDA  BITSTUKIO
        CMP  #1          ; NIET ONTWIKKELD INDIEN BITVELD = 01
        BNE  STARTL
        LDA  #$92        ; WEEGFAKTOR IS -110
        STA  TEMPB
        LDA  #$FF
        STA  TEMPC
        JSR  ADD
        JMP  STARTL
DAME    LDA  #$40        ; VANVELD = 40
        STA  VANVELDHEX
        LDA  #6          ; STUK = DAME
        STA  STUKIO
        STY  STUKWRDLOB  ; RESET STUKTELLER
        STY  STUKWRDHOB
STARTD  STY  VELDTELLER  ; RESET VELDTELLER
        JSR  SCAN
        CMP  #$FF        : A <> FF : STUK GEVONDEN
        BNE  DEEN        ; VERWERK
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2330: 20 11 20 )126                JSR  TOTAL
2333: 60       )127                RTS                ; RETURN
2334: A5 B0    )128  DEEN          LDA  VANVELDHEX    ; DEEN KODEERT POSITIE VAN HET STUK
2336: 85 B1    )129                STA  VERTREKHEX
2338: 20 FD 20 )130                JSR  KODEER
233B: 85 AD    )131                STA  POSITIO
233D: A2 08    )132  DTWEE         LDX  #8            ; X = RICHTING
233F: A5 B0    )133  DDRIE         LDA  VANVELDHEX    ; ZOEK IN VOLGENDE RICHTING
2341: 85 B1    )134                STA  VERTREKHEX
2343: CA       )135                DEX                ; WERK RICHTING BIJ
2344: 30 15    )136                BMI  DZES          ; ALLE RICHTINGEN GEHAD
2346: 20 FD 20 )137  DVIER         JSR  KODEER        ; ZOEK IN DEZELFDE RICHTING
2349: 20 14 21 )138                JSR  VELDKONTR
234C: C9 FF    )139                CMP  #$FF
234E: F0 EF    )140                BEQ  DDRIE         ; FF = GEEN GELDIG VELD
2350: 20 32 21 )141                JSR  NAARVELD
2353: E6 AA    )142  DVIJF         INC  VELDTELLER    ; DVIJF TELT DE VELDEN
2355: A5 AE    )143                LDA  SLASTUK
2357: F0 ED    )144                BEQ  DVIER         ; NAARVELD=LEEG: DOORGAAN IN ZELFDE RICHTING
2359: D0 E4    )145                BNE  DDRIE         ; NAARVELD HEEFT STUK: VOLGENDE RICHTING
235B: A5 AA    )146  DZES          LDA  VELDTELLER    ; DZES VERWERKT DE VELDTELLER
235D: 85 99    )147                STA  TEMP9
235F: A5 A5    )148                LDA  STKNUMKNAZ
2361: 4A       )149                LSRA
2362: 4A       )150                LSRA               ; WEEGFAKTOR = 9 - AANTAL STUKKEN KNAZ
2363: 4A       )151                LSRA
2364: 4A       )152                LSRA
2365: 85 98    )153                STA  TEMP8
2367: A9 09    )154                LDA  #9
2369: 38       )155                SEC
236A: E5 98    )156                SBC  TEMP8
236C: 85 9A    )157                STA  TEMPA
236E: 20 25 20 )158                JSR  MULTIPLY
2371: 20 03 20 )159                JSR  ADD
2374: A5 AD    )160  DZEVEN        LDA  POSITIO       ; AFSTAND DAME - KONING KNAZ
2376: 85 99    )161                STA  TEMP9
2378: A5 AB    )162                LDA  KONKNAZ
237A: 85 9A    )163                STA  TEMPA
237C: 20 43 21 )164                JSR  AFSTAND
237F: A5 9C    )165                LDA  TEMPC
2381: 85 99    )166                STA  TEMP9
2383: A9 F8    )167                LDA  #$F8          ; WEEGFAKTOR IS -8
2385: 85 9A    )168                STA  TEMPA
2387: 20 25 20 )169                JSR  MULTIPLY
238A: 20 03 20 )170                JSR  ADD
238D: 4C 27 23 )171                JMP  STARTD
2390: A9 40    )172  TOREN         LDA  #$40          ; VANVELD = 40
2392: 85 B0    )173                STA  VANVELDHEX
2394: A9 04    )174                LDA  #4            ; STUK = TOREN
2396: 85 AC    )175                STA  STUKIO
2398: 84 A8    )176                STY  STUKWRDLOB    ; RESET STUKTELLER
239A: 84 A9    )177                STY  STUKWRDHOB
239C: 84 AA    )178  STARTT        STY  VELDTELLER    ; RESET VELDTELLER
239E: 20 DD 20 )179                JSR  SCAN
23A1: C9 FF    )180                CMP  #$FF          ; A <> FF : STUK GEVONDEN
23A3: D0 04    )181                BNE  T1            ; VERWERK
23A5: 20 11 20 )182                JSR  TOTAL
23A8: 60       )183                RTS
23A9: A5 B0    )184  T1            LDA  VANVELDHEX    ; KODEER POSITIE VAN HET STUK
23AB: 85 B1    )185                STA  VERTREKHEX
23AD: 20 FD 20 )186                JSR  KODEER
23B0: 85 AD    )187                STA  POSITIO
23B2: A2 09    )188  T2            LDX  #9            ; X = RICHTING
23B4: A5 B0    )189  T3            LDA  VANVELDHEX    ; ZOEK IN VOLGENDE RICHTING
23B6: 85 B1    )190                STA  VERTREKHEX
23B8: CA       )191                DEX                ; WERK RICHTING BIJ
23B9: CA       )192                DEX
23BA: 30 34    )193                BMI  T7            ; ALLE RICHTINGEN GEHAD
23BC: 20 FD 20 )194  T4            JSR  KODEER        ; ZOEK IN DEZELFDE RICHTING
23BF: 20 14 21 )195                JSR  VELDKONTR
23C2: C9 FF    )196                CMP  #$FF
23C4: F0 EE    )197                BEQ  T3            ; FF=GEEN GELDIG VELD: ZELFDE RICHTING
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23C6: 20 32 21 )199           JSR  NAARVELD
23C9: A5 AE    )200           LDA  SLASTUK
23CB: F0 1B    )201           BEQ  T6          ; NAARVELD = LEEG
23CD: 29 40    )202           AND  #$40
23CF: 45 A1    )203           EOR  KWIS
23D1: D0 15    )204           BNE  T6          ; STUK KNAZ
23D3: A5 AE    )205           LDA  SLASTUK
23D5: 29 07    )206           AND  #7
23D7: C9 02    )207           CMP  #2
23D9: 30 D9    )208           BMI  T3          ; PION KNAZ
23DB: C9 04    )209           CMP  #4
23DD: D0 09    )210           BNE  T6          ; STUK <> TOREN KAZ
23DF: A9 50    )211  T5       LDA  #$50        ; DUBBELE TORENS
23E1: 85 9B    )212           STA  TEMPB       ; WEEGFAKTOR IS +80
23E3: 84 9C    )213           STY  TEMPC
23E5: 20 03 20 )214           JSR  ADD
23E8: E6 AA    )215  T6       INC  VELDTELLER ; T6 TELT DE VELDEN
23EA: A5 AE    )216           LDA  SLASTUK
23EC: F0 CE    )217           BEQ  T4          ; NAARVELD=LEEG: DOORGAAN IN ZELFDE RICHTING
23EE: D0 C4    )218           BNE  T3          ; NAARVELD HEEFT STUK: VOLGENDE RICHTING
23F0: A5 AD    )219  T7       LDA  POSITIO     ; T7 VERWERKT DE VELDTELLER
23F2: 85 99    )220           STA  TEMP9       ; TEVENS DE AFSTAND TOREN - KONING KNAZ
23F4: A5 AB    )221           LDA  KONKNAZ
23F6: 85 9A    )222           STA  TEMPA
23F8: 20 43 21 )223           JSR  AFSTAND
23FB: A5 AA    )224           LDA  VELDTELLER
23FD: 38       )225           SEC              ; VELDTELLER -AFSTAND
23FE: E5 9C    )226           SBC  TEMPC
2400: 85 99    )227           STA  TEMP9
2402: A9 10    )228           LDA  #$10        ; WEEGFAKTOR IS 16
2404: 85 9A    )229           STA  TEMPA
2406: 20 25 20 )230           JSR  MULTIPLY
2409: 20 03 20 )231           JSR  ADD
240C: 20 77 21 )232           JSR  FIRSTVELD   ; T9 : ZEVENDE LIJN
240F: A5 B4    )233           LDA  BITSTUKIO
2411: C9 40    )234           CMP  #$40
2413: D0 09    )235           BNE  T10         ; BITKODE <> 40 : GEEN ZEVENDE LIJN
2415: A9 DC    )236           LDA  #$DC        ; WEEGFAKTOR = +220
2417: 85 9B    )237           STA  TEMPB
2419: 84 9C    )238           STY  TEMPC
241B: 20 03 20 )239           JSR  ADD
241E: A5 B3    )240  T10      LDA  EERSTEVELD ; T10 : OPEN LIJN
2420: 85 B1    )241           STA  VERTREKHEX
2422: 20 9F 21 )242           JSR  STATUSI
2425: A5 96    )243           LDA  TEMP6
2427: D0 45    )244           BNE  OUTT        ; JUMP: LIJN NIET OPEN OF HALF OPEN
2429: A5 97    )245           LDA  TEMP7
242B: D0 0C    )246           BNE  T11         ; JUMP, HALF OPEN LIJN
242D: A9 50    )247           LDA  #$50
242F: 85 9B    )248           STA  TEMPB       ; WEEGFAKTOR IS +80
2431: 84 9C    )249           STY  TEMPC
2433: 20 03 20 )250           JSR  ADD
2436: 98       )251           TYA
2437: F0 35    )252           BEQ  OUTT
2439: A5 97    )253  T11      LDA  TEMP7       ; T11 : HALF OPEN LIJN
243B: 84 B4    )254           STY  BITSTUKIO   ; B4 WORDT BITKODE VERST DOORGESCHOVEN
243D: E6 B4    )255           INC  BITSTUKIO   ; PION KNAZ
243F: 18       )256           CLC
2440: 4A       )257  T11A     LSRA
2441: B0 04    )258           BCS  T11B
2443: 06 B4    )259           ASL  BITSTUKIO
2445: D0 F9    )260           BNE  T11A
2447: 20 E3 21 )261  T11B     JSR  STATUSII
244A: A5 B4    )262           LDA  BITSTUKIO   ; INDIEN PION KNAZ VERDEDIGD IS,
244C: 0A       )263           ASLA             ; GEEN HALF OPEN LIJN
244D: AA       )264           TAX
244E: 25 B8    )265           AND  BITKNAZR    ; VERDEDIGING RECHTS ?
2450: D0 1C    )266           BNE  OUTT
2452: 8A       )267           TXA
2453: 25 BA    )268           AND  BITKNAZL    ; VERDEDIGING LINKS ?
2455: D0 17    )269           BNE  OUTT
2457: A5 B4    )270           LDA  BITSTUKIO   ; INDIEN PION NIET AANVALBAAR,
2459: 4A       )271           LSRA             ; GEEN HALF OPEN LIJN
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245A: 4A        )273             LSRA              ; AANVAL RECHTS ?
245B: AA        )274             TAX
245C: 25 B7     )275             AND  BITKAZR
245E: D0 05     )276             BNE  T12          ; LIJN = HALF OPEN
2460: 8A        )277             TXA
2461: 25 B9     )278             AND  BITKAZL      ; AANVAL LINKS ?
2463: F0 09     )279             BEQ  OUTT
2465: A9 20     )280  T12        LDA  #$20         ; WEEGFAKTOR IS +32
2467: 85 9B     )281             STA  TEMPB
2469: 84 9C     )282             STY  TEMPC
246B: 20 03 20  )283             JSR  ADD
246E: 4C 9C 23  )284  OUTT       JMP  STARTT
2471: A9 40     )285  PION       LDA  #$40         ; VANVELD = 40
2473: 85 B0     )286             STA  VANVELDHEX
2475: A5 A1     )287             LDA  KWIS
2477: F0 06     )288             BEQ  PIOA
2479: A9 01     )289             LDA  #1           ; STUK = ZWART PION
247B: 85 AC     )290             STA  STUKIO
247D: D0 02     )291             BNE  PIOB
247F: 84 AC     )292  PIOA       STY  STUKIO       ; STUK = WITTE PION
2481: 84 A8     )293  PIOB       STY  STUKWRDLOB   ; RESET STUKTELLER
2483: 84 A9     )294             STY  STUKWRDHOB
2485: 20 DD 20  )295  STARTPI    JSR  SCAN
2488: C9 FF     )296             CMP  #$FF         ; A <> FF : STUK GEVONDEN
248A: D0 04     )297             BNE  PI1          ; VERWERK
248C: 20 11 20  )298             JSR  TOTAL
248F: 60        )299             RTS               ; RETURN
2490: A5 B0     )300  PI1        LDA  VANVELDHEX   ; KODEER POSITIE VAN HET STUK
2492: 85 B1     )301             STA  VERTREKHEX
2494: 20 FD 20  )302             JSR  KODEER
2497: 85 AD     )303             STA  POSITIO
2499: 20 77 21  )304  PI2        JSR  FIRSTVELD    ; VOORBEREIDING
249C: A5 B3     )305             LDA  EERSTEVELD   ; B1 = EERSTEVELD
249E: 85 B1     )306             STA  VERTREKHEX
24A0: 20 9F 21  )307             JSR  STATUSI      ; MAAK UITGEBREIDE BITVOORSTELLING
24A3: A5 96     )308             LDA  TEMP6        ; VAN PIONNEN FORMATIE
24A5: 85 B5     )309             STA  BITKAZ       ; PIONNEN KAZ
24A7: A5 97     )310             LDA  TEMP7
24A9: 85 B6     )311             STA  BITKNAZ      ; PIONNEN KNAZ
24AB: 20 E3 21  )312             JSR  STATUSII
24AE: A2 00     )313  PI3        LDX  #0           ; OPMARS
24B0: A5 B4     )314             LDA  BITSTUKIO    ; BEREKEN RIJNUMMER
24B2: E8        )315  PI3A       INX
24B3: 4A        )316             LSRA
24B4: D0 FC     )317             BNE  PI3A
24B6: 86 B2     )318             STX  VERTREKREK   ; SAVE RIJNUMMER
24B8: CA        )319             DEX
24B9: CA        )320             DEX
24BA: 86 99     )321             STX  TEMP9        ; RIJNUMMER - 2
24BC: A5 AD     )322             LDA  POSITIO
24BE: 4A        )323             LSRA
24BF: 4A        )324             LSRA              ; BEREKEN LIJNNUMMER
24C0: 4A        )325             LSRA
24C1: 4A        )326             LSRA
24C2: AA        )327             TAX
24C3: B5 C0     )328             LDA  $C0,X        ; HAAL OPMARSTABEL
24C5: 85 9A     )329             STA  TEMPA
24C7: 20 25 20  )330             JSR  MULTIPLY
24CA: 20 03 20  )331             JSR  ADD
24CD: A2 FF     )332  PI4        LDX  #$FF         ; MEERDERHEID UIT 3
24CF: A5 B5     )333             LDA  BITKAZ
24D1: F0 01     )334             BEQ  PI4A
24D3: E8        )335             INX               ; X+1 : PION KAZ OP DE LIJN
24D4: A5 B6     )336  PI4A       LDA  BITKNAZ
24D6: F0 01     )337             BEQ  PI4B
24D8: CA        )338             DEX               ; X-1 : PION KNAZ OP DE LIJN
24D9: A5 B7     )339  PI4B       LDA  BITKAZR
24DB: F0 01     )340             BEQ  PI4C
24DD: E8        )341             INX               ; X+1 : PION KAZ RECHTS
24DE: A5 B8     )342  PI4C       LDA  BITKNAZR
24E0: F0 01     )343             BEQ  PI4D
24E2: CA        )344             DEX               ; X-1 : PION KNAZ RECHTS
24E3: A5 B9     )345  PI4D       LDA  BITKAZL
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24E5: F0 01     )347              BEQ  PI4E
24E7: E8        )348              INX                ; X+1 : PION KAZ LINKS
24E8: A5 BA     )349  PI4E        LDA  BITKNAZL
24EA: F0 01     )350              BEQ  PI4F
24EC: CA        )351              DEX                ; X-1 : PION KNAZ LINKS
24ED: 8A        )352  PI4F        TXA
24EE: 30 10     )353              BMI  PI5           ; GEEN MEERDERHEID UIT 3 ALS X<0
24F0: A6 B2     )354              LDX  VERTREKREK    ; RIJNUMMER - 2
24F2: CA        )355              DEX
24F3: CA        )356              DEX
24F4: 86 99     )357              STX  TEMP9
24F6: A9 10     )358              LDA  #$10          ; WEEGFAKTOR IS +16
24F8: 85 9A     )359              STA  TEMPA
24FA: 20 25 20  )360              JSR  MULTIPLY
24FD: 20 03 20  )361              JSR  ADD
2500: A5 B6     )362  PI5         LDA  BITKNAZ       ; VRIJPION
2502: D0 1F     )363              BNE  PI6           ; PION KNAZ OP DE LIJN
2504: A5 B8     )364              LDA  BITKNAZR
2506: D0 1B     )365              BNE  PI6           ; PION KNAZ RECHTS
2508: A5 BA     )366              LDA  BITKNAZL
250A: D0 17     )367              BNE  PI6           ; PION KNAZ LINKS
250C: A5 B2     )368              LDA  VERTREKREK
                 4                PUT  CHESS1.4
250E: 85 99     )1                STA  TEMP9         ; KWADRATEER RIJNUMMER
2510: 85 9A     )2                STA  TEMPA
2512: 20 25 20  )3                JSR  MULTIPLY
2515: A5 9B     )4                LDA  TEMPB
2517: 85 99     )5                STA  TEMP9
2519: A9 10     )6                LDA  #$10          ; WEEGFAKTOR IS +16
251B: 85 9A     )7                STA  TEMPA
251D: 20 25 20  )8                JSR  MULTIPLY
2520: 20 03 20  )9                JSR  ADD
2523: A5 B4     )10   PI6         LDA  BITSTUKIO     ; DUBBELPION
2525: 45 B5     )11               EOR  BITKAZ
2527: F0 0B     )12               BEQ  PI7
2529: A9 D8     )13               LDA  #$D8
252B: 85 9B     )14               STA  TEMPB         ; WEEGFAKTOR IS -40
252D: A9 FF     )15               LDA  #$FF
252F: 85 9C     )16               STA  TEMPC
2531: 20 03 20  )17               JSR  ADD
2534: A5 B7     )18   PI7         LDA  BITKAZR       ; GEISOLEERDE PION
2536: D0 0F     )19               BNE  PI8           ; PION KAZ RECHTS
2538: A5 B9     )20               LDA  BITKAZL
253A: D0 0B     )21               BNE  PI8           ; PION KAZ LINKS
253C: A9 38     )22               LDA  #$38
253E: 85 9B     )23               STA  TEMPB         ; WEEGFAKTOR IS -200
2540: A9 FF     )24               LDA  #$FF
2542: 85 9C     )25               STA  TEMPC
2544: 20 03 20  )26               JSR  ADD
2547: A5 B4     )27   PI8         LDA  BITSTUKIO     ; ACHTERGEBLEVEN PION
2549: 4A        )28               LSRA
254A: AA        )29               TAX
254B: 25 B7     )30               AND  BITKAZR
254D: D0 33     )31               BNE  OUTPI         ; JUMP OUT : PION KAZ RECHTS
254F: 8A        )32               TXA
2550: 25 B9     )33               AND  BITKAZL
2552: D0 2E     )34               BNE  OUTPI         ; JUMP OUT : PION KAZ LINKS
2554: 8A        )35               TXA
2555: 4A        )36               LSRA
2556: AA        )37               TAX
2557: 25 B7     )38               AND  BITKAZR
2559: D0 27     )39               BNE  OUTPI         ; JUMP OUT : RECHTS VERDEDIGBAAR
255B: 8A        )40               TXA
255C: 25 B9     )41               AND  BITKAZL
255E: D0 22     )42               BNE  OUTPI         ; JUMP OUT : LINKS VERDEDIGBAAR
2560: 84 95     )43               STY  TEMP5
2562: A5 B4     )44               LDA  BITSTUKIO
2564: 0A        )45               ASLA
2565: 0A        )46               ASLA
2566: AA        )47               TAX                ; AANVAL RECHTS

2567: 25 B8     )49               AND  BITKNAZR
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2569: F0 02     )50                BEQ  PI8A
256B: C6 95     )51                DEC  TEMP5        ; TELLER -1
256D: 8A        )52   PI8A         TXA               ; AANVAL LINKS ?
256E: 25 BA     )53                AND  BITKNAZL
2570: F0 02     )54                BEQ  PI8B
2572: C6 95     )55                DEC  TEMP5        ; TELLER -1
2574: A5 95     )56   PI8B         LDA  TEMP5
2576: 85 99     )57                STA  TEMP9        ; TELLER IS FAKTOR (0, -1 OF -2)
2578: A9 28     )58                LDA  #$28         ; WEEGFAKTOR IS +40
257A: 85 9A     )59                STA  TEMPA
257C: 20 25 20  )60                JSR  MULTIPLY
257F: 20 03 20  )61                JSR  ADD
2582: 4C 85 24  )62   OUTPI        JMP  STARTPI
2585: A9 40     )63   KONINGI      LDA  #$40
2587: 85 B0     )64                STA  VANVELDHEX   ; VANVELD = 40
2589: A9 02     )65                LDA  #2           ; STUK = KONING
258B: 85 AC     )66                STA  STUKID
258D: 84 A8     )67                STY  STUKWRDLOB   ; RESET STUKTELLER
258F: 84 A9     )68                STY  STUKWRDHOB
2591: 84 95     )69   STARTKI      STY  TEMP5        ; RESET HULPVELDEN
2593: 84 96     )70                STY  TEMP6
2595: 84 AA     )71                STY  VELDTELLER   ; RESET VELDTELLER
2597: 20 DD 20  )72                JSR  SCAN
259A: C9 FF     )73                CMP  #$FF
259C: D0 22     )74                BNE  KI1          ; A <> FF : STUK GEVONDEN
259E: A5 A5     )75                LDA  STKNUMKNAZ   ; BEREKEN AANTAL STUKKEN KNAZ
25A0: 4A        )76                LSRA
25A1: 4A        )77                LSRA
25A2: 4A        )78                LSRA
25A3: 4A        )79                LSRA
25A4: 18        )80                CLC
25A5: 65 AF     )81                ADC  DAMKNAZ      ; RESULTAAT + AF
25A7: 38        )82                SEC
25A8: E9 02     )83                SBC  #2           ; RESULTAAT - 02
25AA: F0 13     )84                BEQ  KIRET
25AC: 30 11     )85                BMI  KIRET        ; JUMP OUT : GEEN NOODZAAK TOT VERDEDIGING
25AE: AA        )86                TAX               ; VERMENIGVULDIG RESULTAAT MET STELLINGWAARD
25AF: 18        )87   KIA          CLC               ; (MULTIPLY IS MAAR 8 BIT BREED)
25B0: A5 A6     )88                LDA  STELWRDLOB   ; DEZE ROUTINE OPEREERT DIREKT
25B2: 65 A8     )89                ADC  STUKWRDLOB
25B4: 85 A6     )90                STA  STELWRDLOB   ; OP DE STELLINGWAARDE
25B6: A5 A7     )91                LDA  STELWRDHOB
25B8: 65 A9     )92                ADC  STUKWRDHOB
25BA: 85 A7     )93                STA  STELWRDHOB
25BC: CA        )94                DEX
25BD: D0 F0     )95                BNE  KIA
25BF: 60        )96   KIRET        RTS
25C0: A5 B0     )97   KI1          LDA  VANVELDHEX   ; KODEER POSITIE VAN HET STUK
25C2: 85 B1     )98                STA  VERTREKHEX
25C4: 20 FD 20  )99                JSR  KODEER
25C7: 85 AD     )100               STA  POSITIO
25C9: A2 08     )101  KI2          LDX  #8           ; X = RICHTING
25CB: A5 B0     )102  KI3          LDA  VANVELDHEX   ; ZOEK IN VOLGENDE RICHTING
25CD: 85 B1     )103               STA  VERTREKHEX
25CF: CA        )104               DEX
25D0: 30 1F     )105               BMI  KI4          ; ALLE RICHTINGEN GEHAD
25D2: 20 FD 20  )106               JSR  KODEER
25D5: 20 14 21  )107               JSR  VELDKONTR
25D8: C9 FF     )108               CMP  #$FF
25DA: F0 EF     )109               BEQ  KI3          ; FF = ONGELDIG VELD
25DC: 20 32 21  )110               JSR  NAARVELD
25DF: A5 AE     )111               LDA  SLASTUK
25E1: D0 04     )112               BNE  KI3A
25E3: E6 95     )113               INC  TEMP5        ; TEMP5 TELT LEGE VELDEN IN LOOPBEREIK
25E5: D0 E4     )114               BNE  KI3
25E7: 29 40     )115  KI3A         AND  #$40
25E9: 45 A1     )116               EOR  KWIS
25EB: D0 DE     )117               BNE  KI3          ; STUK KNAZ
25ED: E6 96     )118               INC  TEMP6        ; TEMP6 TELT STUKKEN KAZ IN LOOPBEREIK
25EF: D0 DA     )119               BNE  KI3
25F1: A5 95     )120  KI4          LDA  TEMP5
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25F3: D0 0B     )122            BNE  KI5
25F5: A9 F8     )123            LDA  #$F8        ; WEEGFAKTOR IS -8
25F7: 85 9B     )124            STA  TEMPB
25F9: A9 FF     )125            LDA  #$FF
25FB: 85 9C     )126            STA  TEMPC
25FD: 20 03 20  )127            JSR  ADD
2600: A5 96     )128  KI5       LDA  TEMP6       ; VERWERK STUKKEN KAZ IN LOOPBEREIK
2602: C9 02     )129            CMP  #2
2604: 10 15     )130            BPL  KI6
2606: C9 01     )131            CMP  #1
2608: D0 06     )132            BNE  KI5A
260A: A9 F0     )133            LDA  #$F0        ; WEEGFAKTOR IS -16 VOOR 1 STUK
260C: 85 9B     )134            STA  TEMPB
260E: D0 04     )135            BNE  KI5B
2610: A9 E1     )136  KI5A      LDA  #$E1        ; WEEGFAKTOR IS -31 VOOR GEEN STUK
2612: 85 9B     )137            STA  TEMPB
2614: A9 FF     )138  KI5B      LDA  #$FF
2616: 85 9C     )139            STA  TEMPC
2618: 20 03 20  )140            JSR  ADD
261B: 20 77 21  )141  KI6       JSR  FIRSTVELD   ; VERDEDIGING
261E: A5 B4     )142            LDA  BITSTUKIO
2620: 29 03     )143            AND  #3
2622: F0 11     )144            BEQ  KI6B        ; KONING TE VEEL NAAR VOREN
2624: A5 AD     )145            LDA  POSITIO     ; MAAK BITKODE VAN KONINGSPOSITIE
2626: 4A        )146            LSRA             ; IN HORIZONTALE RICHTING
2627: 4A        )147            LSRA
2628: 4A        )148            LSRA
2629: 4A        )149            LSRA
262A: AA        )150            TAX
262B: 38        )151            SEC
262C: 98        )152            TYA
262D: 6A        )153  KI6A      RORA
262E: CA        )154            DEX
262F: D0 FC     )155            BNE  KI6A
2631: 29 E3     )156            AND  #$E3
2633: D0 0B     )157            BNE  KI7         ; KONING STAAT VEILIG GENOEG
2635: A9 F0     )158  KI6B      LDA  #$F0        ; WEEGFAKTOR IS -31
2637: 85 9B     )159            STA  TEMPB
2639: A9 FF     )160            LDA  #$FF
263B: 85 9C     )161            STA  TEMPC
263D: 20 03 20  )162            JSR  ADD
2640: A5 B3     )163  KI7       LDA  EERSTEVELD  ; PION VOOR DE KONING
2642: 85 B1     )164            STA  VERTREKHEX
2644: 20 9F 21  )165            JSR  STATUSI
2647: A5 96     )166            LDA  TEMP6
2649: D0 0B     )167            BNE  KI8         ; PION KAZ AANWEZIG
264B: A9 D7     )168            LDA  #$D7        ; WEEGFAKTOR IS -41
264D: 85 9B     )169            STA  TEMPB
264F: A9 FF     )170            LDA  #$FF
2651: 85 9C     )171            STA  TEMPC
2653: 20 03 20  )172            JSR  ADD
2656: 20 E3 21  )173  KI8       JSR  STATUSII    ; PION OP AANGRENZENDE LIJNEN
2659: A5 B7     )174            LDA  BITKAZR
265B: D0 0F     )175            BNE  OUTKI       ; PION KAZ RECHTS
265D: A5 B9     )176            LDA  BITKAZL
265F: D0 0B     )177            BNE  OUTKI       ; PION KAZ LINKS
2661: A9 DC     )178            LDA  #$DC        ; WEEGFAKTOR IS -36
2663: 85 9B     )179            STA  TEMPB
2665: A9 FF     )180            LDA  #$FF
2667: 85 9C     )181            STA  TEMPC
2669: 20 03 20  )182            JSR  ADD
266C: 4C 91 25  )183  OUTKI     JMP  STARTKI
266F: A9 40     )184  KONINGII  LDA  #$40        ; VANVELD = 40
2671: 85 B0     )185            STA  VANVELDHEX
2673: A9 02     )186            LDA  #2          ; STUK = KONING
2675: 85 AC     )187            STA  STUKIO
2677: 84 A8     )188            STY  STUKWRDLOB  ; RESET STUKTELLER
2679: 84 A9     )189            STY  STUKWRDHOB
267B: 84 96     )190  STARTKII  STY  TEMP6       ; RESET HULPVELD
267D: 20 DD 20  )191            JSR  SCAN
2680: C9 FF     )192            CMP  #$FF
2682: D0 04     )193            BNE  KII1        ; A <> FF : STUK GEVONDEN
2684: 20 11 20  )194            JSR  TOTAL
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2687: 60        )196                RTS
2688: A5 B0     )197  KII1    LDA   VANVELDHEX ; KODEER POSITIE VAN HET STUK
268A: 85 B1     )198          STA   VERTREKHEX
268C: 20 FD 20  )199          JSR   KODEER
268F: 85 AD     )200          STA   POSITIO
2691: A2 40     )201  KII2    LDX   #$40       ; X = RICHTING
2693: CA        )202  KII3    DEX                ; SCAN BORD
2694: 30 21     )203          BMI   KII4         ; FF = ONGELDIG VELD
2696: B5 16     )204          LDA   BORD,X
2698: F0 F9     )205          BEQ   KII3         ; VELD = LEEG
269A: 29 07     )206          AND   #7
269C: C9 02     )207          CMP   #2
269E: 10 F3     )208          BPL   KII3         ; STUK = GEEN PION
26A0: 86 B1     )209          STX   VERTREKHEX
26A2: 20 FD 20  )210          JSR   KODEER
26A5: 85 99     )211          STA   TEMP9
26A7: A5 AD     )212          LDA   POSITIO
26A9: 85 9A     )213          STA   TEMPA
26AB: 20 43 21  )214          JSR   AFSTAND
26AE: A5 96     )215          LDA   TEMP6        ; TEMP6 TELT AFSTAND KONING - PIONNEN
26B0: 18        )216          CLC
26B1: 65 9C     )217          ADC   TEMPC
26B3: 85 96     )218          STA   TEMP6
26B5: D0 DC     )219          BNE   KII3
26B7: A5 96     )220  KII4    LDA   TEMP6        ; VERWERK DE AFSTAND
26B9: F0 29     )221          BEQ   KII5         ; GEEN PIONNEN
26BB: 85 97     )222          STA   TEMP7
26BD: 84 98     )223          STY   TEMP8        ; BEREKEN QUOTIENT TOTALE AFSTAND/PIONNEN
26BF: A5 A3     )224          LDA   STKWRDKNAZ
26C1: 29 0F     )225          AND   #$0F
26C3: 85 99     )226          STA   TEMP9
26C5: A5 A5     )227          LDA   STKNUMKNAZ
26C7: 29 0F     )228          AND   #$0F
26C9: 18        )229          CLC
26CA: 65 99     )230          ADC   TEMP9
26CC: 85 99     )231          STA   TEMP9
26CE: 84 9A     )232          STY   TEMPA
26D0: 20 7A 20  )233          JSR   DIVIDE
26D3: A5 9B     )234          LDA   TEMPB
26D5: 38        )235          SEC
26D6: E9 06     )236          SBC   #6           ; RESULTAAT - 6
26D8: 85 99     )237          STA   TEMP9
26DA: A9 B2     )238          LDA   #$B2         ; WEEGFAKTOR IS -78
26DC: 85 9A     )239          STA   TEMPA
26DE: 20 25 20  )240          JSR   MULTIPLY
26E1: 20 03 20  )241          JSR   ADD
26E4: A5 AD     )242  KII5    LDA   POSITIO      ; AFSTAND KONING - CENTRUM
26E6: 85 99     )243          STA   TEMP9
26E8: A9 44     )244          LDA   #$44         ; CENTRUM = 44
26EA: 85 9A     )245          STA   TEMPA
26EC: 20 43 21  )246          JSR   AFSTAND
26EF: 85 98     )247          STA   TEMP8
26F1: A9 55     )248          LDA   #$55         ; CENTRUM = 55
26F3: 85 9A     )249          STA   TEMPA
26F5: 20 43 21  )250          JSR   AFSTAND
26F8: 18        )251          CLC
26F9: 65 98     )252          ADC   TEMP8
26FB: 85 99     )253          STA   TEMP9
26FD: A9 F0     )254          LDA   #$F0         ; WEEGFAKTOR IS -16
26FF: 85 9A     )255          STA   TEMPA        ;
2701: 20 25 20  )256          JSR   MULTIPLY
2704: 20 03 20  )257          JSR   ADD
2707: 4C 7B 26  )258  KIIOUT   JMP   STARTKII
270A: A5 A0     )259  INIT    LDA   KAZ
270C: 85 A1     )260          STA   KWIS         ; KLEURWISSEL = KLEUR
270E: A0 00     )261          LDY   #0           ; Y=00 GEDURENDE HELE PROGRAMMA
2710: A2 07     )262          LDX   #7           ; RESET ALLE TELLERS
2712: 94 A2     )263  IIA     STY   STKWRDKAZ,X
2714: CA        )264          DEX
2715: 10 FB     )265          BPL   IIA
2717: 84 AF     )266          STY   DAMKNAZ      ; RESET AF
2719: A9 40     )267          LDA   #$40
271B: 85 B0     )268          STA   VANVELDHEX
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271D: A6 B0     )270  I3       LDX  VANVELDHEX ; SCAN BORD
271F: CA        )271           DEX
2720: 30 67     )272           BMI  OUTINIT    ; FF = ONGELDIG VELD
2722: 86 B0     )273           STX  VANVELDHEX ; HAAL VELD
2724: B5 16     )274           LDA  BORD,X
2726: F0 F5     )275           BEQ  I3         ; VEELD = LEEG
2728: 85 AE     )276           STA  SLASTUK
272A: 29 40     )277           AND  #$40
272C: 45 A1     )278           EOR  KWIS
272E: D0 1F     )279           BNE  I5         ; STUK KNAZ
2730: A5 AE     )280  I4       LDA  SLASTUK    ; STUK KAZ
2732: 29 07     )281           AND  #7
2734: 48        )282           PHA             ; TEL STUKWAARDE IN A2
2735: AA        )283           TAX             ; C9-CF = TABEL
2736: B5 C9     )284           LDA  STUKTAB,X
2738: 18        )285           CLC
2739: 65 A2     )286           ADC  STKWRDKAZ
273B: 85 A2     )287           STA  STKWRDKAZ
273D: 68        )288           PLA
273E: C9 02     )289           CMP  #2         ; PION ?
2740: 10 04     )290           BPL  I4A
2742: E6 A3     )291           INC  STKWRDKNAZ ; TEL AANTAL PIONNEN IN A3
2744: D0 D7     )292           BNE  I3
2746: A5 A3     )293  I4A      LDA  STKWRDKNAZ ; TEL AANTAL STUKKEN IN A3
2748: 18        )294           CLC
2749: 69 10     )295           ADC  #$10
274B: 85 A3     )296           STA  STKWRDKNAZ
274D: D0 CE     )297           BNE  I3
274F: A5 AE     )298  I5       LDA  SLASTUK    ; STUK KNAZ
2751: 29 07     )299           AND  #7
2753: 48        )300           PHA             ; TEL STUKWAARDE IN A4
2754: AA        )301           TAX             ; C9-CF = TABEL
2755: B5 C9     )302           LDA  STUKTAB,X
2757: 18        )303           CLC
2758: 65 A4     )304           ADC  STKNUMKAZ
275A: 85 A4     )305           STA  STKNUMKAZ
275C: 68        )306           PLA
275D: C9 02     )307           CMP  #2         ; PION ?
275F: 10 04     )308           BPL  I5A
2761: E6 A5     )309           INC  STKNUMKNAZ ; TEL AANTAL PIONNEN IN A5
2763: D0 B8     )310           BNE  I3
2765: A5 A5     )311  I5A      LDA  STKNUMKNAZ
2767: 18        )312           CLC             ; TEL AANTAL STUKKEN IN A5
2768: 69 10     )313           ADC  #$10
276A: 85 A5     )314           STA  STKNUMKNAZ
276C: A5 AE     )315  I6       LDA  SLASTUK    ; KONING KNAZ
276E: 29 07     )316           AND  #7
2770: C9 02     )317           CMP  #2         ; STUK KONING ?
2772: D0 0B     )318           BNE  I7
2774: A5 B0     )319           LDA  VANVELDHEX ; BEWAAR POSITIE KONING KNAZ
2776: 85 B1     )320           STA  VERTREKHEX ; WANT DIE IS VAAK NODIG
2778: 20 FD 20  )321           JSR  KODEER
277B: 85 AB     )322           STA  KONKNAZ
277D: D0 9E     )323           BNE  I3
277F: C9 06     )324  I7       CMP  #6         ; DAM KNAZ
2781: D0 9A     )325           BNE  I3
2783: A9 02     )326           LDA  #2
2785: 85 AF     )327           STA  DAMKNAZ    ; AF=2 : INDIEN DAME AANWEZIG
2787: D0 94     )328           BNE  I3         ; ANDERS 0
2789: 60        )329  OUTINIT  RTS
278A: 48        )330  STUUR    PHA             ; SAVE AKKU
278B: A9 36     )331           LDA  #$36
278D: 8D 80 1A  )332           STA  PAD        ; STUUR DISPLAYS
2790: A9 12     )333           LDA  #$12
2792: 8D 82 1A  )334           STA  PBD
2795: 20 0A 27  )335  SI       JSR  INIT       ; DOE HOOFDSUBS BEHALVE DE KONING
2798: 20 2A 22  )336           JSR  PAARD
279B: 20 A5 22  )337           JSR  LOPER
279E: 20 1B 23  )338           JSR  DAME
27A1: 20 90 23  )339           JSR  TOREN
27A4: 20 71 24  )340           JSR  PION
27A7: A5 AF     )341           LDA  DAMKNAZ    ; DOE KONINGII ALS AF <> 0 EN ALS
27A9: D0 0C     )342           BNE  SIA        ; ALS STUKWAARDE KNAZ < 70: ANDERS KI
```

```
27AB: A5 A4     )344            LDA  STKNUMKAZ
27AD: C9 46     )345            CMP  #$46
27AF: 10 06     )346            BPL  SIA
27B1: 20 6F 26  )347            JSR  KONINGII
27B4: 98        )348            TYA
27B5: F0 03     )349            BEQ  S2
27B7: 20 85 25  )350  SIA       JSR  KONINGI
27BA: A5 A6     )351  S2        LDA  STELWRDLOB ; ONDERZOEK OF STELLINGWAARDE  =
27BC: C5 BE     )352            CMP  POSWRDLOB  ; DE TOT DAN TOE BESTE ZET
27BE: D0 0D     )353            BNE  S3
27C0: A5 A7     )354            LDA  STELWRDHOB ; MAAK IN DAT GEVAL PZET
27C2: C5 BF     )355            CMP  POSWRDHOB  ; GELIJK AAN OZET
27C4: D0 07     )356            BNE  S3
27C6: 85 0F     )357            STA  PZET
27C8: 85 91     )358            STA  OZET
27CA: 98        )359            TYA
27CB: F0 2B     )360            BEQ  S6         ; GELIJKE WAARDE
27CD: A5 A6     )361  S3        LDA  STELWRDLOB ; VERGELIJK STELLINGWAARDE MET DE
27CF: 49 FF     )362            EOR  #$FF       ; TOT DAN TOE BESTE WAARDE
27D1: 18        )363            CLC
27D2: 65 BE     )364            ADC  POSWRDLOB  ; TEL 1-KOMPLEMENT VAN STELLINGWAARDE
27D4: A5 A7     )365            LDA  STELWRDHOB ; BIJ WAARDE TOT DAN TOE BESTE ZET
27D6: 49 FF     )366            EOR  #$FF
27D8: 65 BF     )367            ADC  POSWRDHOB
27DA: 70 04     )368  S4        BVS  S4A        ; BESLIS DE BESTE ZET
27DC: 10 14     )369            BPL  S5A
27DE: 30 02     )370            BMI  S5
27E0: 30 10     )371  S4A       BMI  S5A
27E2: A5 A7     )372  S5        LDA  STELWRDHOB ; ONTHOUD GROOTSTE WAARDE EN
27E4: 85 BF     )373            STA  POSWRDHOB  ; MANIPULEER N-ZET EN O-ZET ZODANIG
27E6: A5 A6     )374            LDA  STELWRDLOB ; DAT SCHAAKPROGRAMMA DE BESTE ZET
27E8: 85 BE     )375            STA  POSWRDLOB  ; VOLGENS POSVAL DUET
27EA: 84 0F     )376            STY  PZET
27EC: A5 01     )377            LDA  ZETII      ; PZET=0 : OZET=1
27EE: 85 91     )378            STA  OZET       ; OF OZET=0 : PZET=1
27F0: D0 06     )379            BNE  S6
27F2: 84 91     )380  S5A       STY  OZET
27F4: A5 01     )381            LDA  ZETII
27F6: 85 0F     )382            STA  PZET
27F8: 8C 82 1A  )383  S6        STY  PBD        ; SCHAKEL DISPLAYS UIT
27FB: 68        )384  S7        PLA             ; SLOTROUTINE
27FC: A6 0F     )385            LDX  PZET
27FE: E4 91     )386            CPX  OZET
2800: D0 03     )387            BNE  OUTALL
2802: CD F4 1A  )388            CMP  TIMER
2805: 4C 2F 2B  )389  OUTALL    JMP  BIF
```

Letter to the Editor

Dear Willem,

I've read your call for more papers to be written in English in the April edition of DE 6502 KENNER. Although I cannot agree with your remark on Dutch sounding like Chinese to some of us, I'm nevertheless strongly in favour of using English as the preferred means of communication between the members of our club.
In Mathematics, German authors are usually requested by the editors of German scientific journals to submit their papers in English. The argument goes as follows: Nothing will be lost (every German scientist has a certain command of the English language) and much can be gained (only think of potential readers from China, Japan, or the Arabic Countries). I cannot see why the same argument should not apply to the activities of our club. I'm sure the English-speaking members of our club will appreciate the double effort the rest of us have to spend with our publications: We first have to find out how to say what we want to say, and then find out how to say it in English. They will certainly forgive us for occasionally maltreating the beloved language of Shakespeare, Wilde, and Shaw.

Fred Behringer, München

```
1 REM "Ø D I N S U P E R T E A M"
2 REM BY GERARD KEET
3 REM RØDENBURG NØ.3
4 REM 1965BL HEEMSKERK
5 REM TEL.02510-39763
7 PRINT CHR$(12);
8 DIM B(35,2)
10 DIM A$(35), A(35,6)
11 INPUT "STANDEN INLEZEN? <J/N>: ";Z$
12 IF Z$<>"J" THEN 100
20 PRINT CHR$(12):PRINT:PRINT
23 PRINT "  DE ØDIN-SUPERTEAM-STAND WØRDT NU DØØR HET"
24 PRINT "  PRØGRAMMA GEMAAKT ØP BASIS VAN DE"
25 PRINT "  KØMPETITIESTANDEN, DIE EERST INGELEZEN"
26 PRINT "  WØRDEN."
27 PRINT "  AL MET AL DUURT HET ZØ'N 5 MINUTEN"
28 PRINT "  VØØRDAT DE STAND ØP HET SCHERM VERSCHIJNT."
29 PRINT "  RUSTIG AFWACHTEN DUS MAAR."
32 FØR I=1 TØ 9:PRINT "*";CHR$(21);CHR$(26);:NEXT
33 PRINT "*********************************************";
34 FØR I=1 TØ 9:PRINT CHR$(21);CHR$(10);"*";:NEXT:PRINT
35 PRINT "*********************************************"
100 DATA "DS","DAMESSENIØREN","HS","HERENSENIØREN","DJ"
110 DATA "DAMESJUNIØREN","HJ","HERENJUNIØREN","MA"
120 DATA "MEISJESADSPIRANTEN","JA","JØNGENSADSPIRANTEN"
130 DATA "MP","MEISJESPUPILLEN","JP","JØNGENSPUPILLEN","MW"
140 DATA "MEISJESWELPEN","JW","JØNGENSWELPEN"
145 DATA "DV","DAMESVETERANEN"
200 TT=1:TG=0:TP=0:TS=0:KW=24576
210 IF Z$<>"J" THEN 520
300 PØKE 6777,1
310 X=USR(&"0B02",0)
320 X=USR(&"14BC",0)
520 IF PEEK(KW)=48 THEN 800
530 CAT$=CHR$(PEEK(KW))+CHR$(PEEK(KW+1))
540 TW=KW+5
550 TEAM$=""
560 FØR CW=TW TØ TW+3
570 TEAM$=TEAM$+CHR$(PEEK(CW)):NEXT CW
580 IF TEAM$="ØDIN" THEN 600
590 TW=TW+22:IF TW<KW+5+12*22 THEN 550
595 KW=KW+5+12*22: GØTØ 520
600 NR$=CHR$(PEEK(TW+5)):IF NR$<>" " THEN 620
610 NR$="1"
620 READ HCAT$
630 IF HCAT$<>CAT$ THEN 620
640 READ A$(TT):A$(TT)=A$(TT)+" "+NR$
650 G$=CHR$(PEEK(TW+12))+CHR$(PEEK(TW+13))
660 P$=CHR$(PEEK(TW+14))+CHR$(PEEK(TW+15))
670 V$=CHR$(PEEK(TW+16))+CHR$(PEEK(TW+17))+CHR$(PEEK(TW+18))
680 T$=CHR$(PEEK(TW+19))+CHR$(PEEK(TW+20))+CHR$(PEEK(TW+21))
690 A(TT,1)=VAL(G$):A(TT,2)=VAL(P$):A(TT,3)=VAL(V$):A(TT,4)=VAL(T$)
692 IF A(TT,1)<>0 THEN 700
694 A(TT,5)=INT(A(TT,2)*100)/100
696 A(TT,6)=INT((A(TT,3)-A(TT,4))*100)/100
698 GØTØ 720
```

```
700 A(TT,5)=INT(A(TT,2)*100/A(TT,1))/100
710 A(TT,6)=INT((A(TT,3)-A(TT,4))*100/A(TT,1))/100
720 TG=TG+A(TT,1):TP=TP+A(TT,2):TS=TS+A(TT,3)-A(TT,4)
730 TT=TT+1:RESTØRE
740 GØTØ 590
800 A(TT,5)=INT(TP*100/TG)/100
810 A(TT,6)=INT(TS*100/TG)/100
900 FØR I=1 TØ TT-2
910 FØR J=I+1 TØ TT-1
920 IF A(I,5)>A(J,5) THEN 1000
930 IF A(I,5)<A(J,5) THEN 970
940 IF A(I,6)>=A(J,6) THEN 1000
970 HA$=A$(I):A$(I)=A$(J):A$(J)=HA$
980 H=A(I,5):A(I,5)=A(J,5):A(J,5)=H
990 H=A(I,6):A(I,6)=A(J,6):A(J,6)=H
1000 NEXT J
1010 NEXT I
1020 GØSUB 1100:REM PRINT
1030 GØSUB 4010:REM VUL AAN
1040 PRINT CHR$(12);CHR$(18);
1050 GØSUB 3010:REM PRINT UITLEG
1060 GØSUB 1100:REM PRINT DEFINITIEF
1090 END
1100 PRINT CHR$(18)
1120 PRINT "PLAATS";TAB(11)"TEAM";TAB(36)"PUNTEN";TAB(56)"SALDØ"
1121 PRINT
1130 FØR I=1 TØ TT-1
1132 X$=STR$(A(I,5)):Y$=STR$(A(I,6))
1133 U$=STR$(B(I,0)):V$=STR$(B(I,1)):W$=STR$(B(I,2))
1135 GØSUB 1510
1140 PRINT I;"(";U$;")";TAB(11)A$(I);TAB(35)X$;
1141 PRINT TAB(45)"(";RIGHT$(V$,4);")";TAB(54)Y$;TAB(63)"(";W$;")"
1150 NEXT I:PRINT
1170 X$=STR$(A(TT,5)):Y$=STR$(A(TT,6))
1171 V$=STR$(B(TT,1)):W$=STR$(B(TT,2))
1180 GØSUB 1510
1240 PRINT "VERENIGINGSTØTAAL";TAB(35);X$;TAB(45)"(";RIGHT$(V$,4);
1241 PRINT ")";TAB(54)Y$;TAB(63)"(";W$;")"
1245 PRINT:PRINT
1246 PRINT SPC(71);
1250 PRINT CHR$(20)
1260 RETURN
1500 REM EDIT GETALLEN NAAR XX.XX
1510 IF I>9 THEN 1530
1520 PRINT " ";
1530 Z$=V$
1531 GØSUB 1610
1532 V$=Z$
1540 Z$=W$
1541 GØSUB 1610
1542 W$=Z$
1550 Z$=X$
1551 GØSUB 1610
1552 X$=Z$
1560 Z$=Y$
1561 GØSUB 1610
```

```
1562 Y$=Z$
1590 RETURN
1600 REM EDIT Z$
1610 IF LEFT$(Z$,1)="-" THEN 1615
1612 Z$=MID$(Z$,2)
1615 IF LEN(Z$)=6 THEN 2000
1620 IF LEN(Z$)=5 THEN 1990
1630 IF LEN(Z$)<4 THEN 1700
1640 IF LEFT$(Z$,1)="-" THEN 1660
1650 Z$=" "+Z$:GØTØ 1990
1660 IF MID$(Z$,2,1)="." THEN 1680
1670 Z$=Z$+"0":GØTØ 1990
1680 Z$="-0"+RIGHT$(Z$,3):GØTØ 1990
1700 IF LEN(Z$)<3 THEN 1800
1710 IF LEFT$(Z$,1)<>"-" THEN 1730
1720 Z$="-0"+RIGHT$(Z$,2)+"0":GØTØ 1990
1730 IF LEFT$(Z$,1)<>"." THEN 1750
1740 Z$=" 0"+Z$:GØTØ 1990
1750 Z$=" "+Z$+"0":GØTØ 1990
1800 IF LEN(Z$)=1 THEN 1900
1810 IF LEFT$(Z$,1)="." THEN 1830
1820 Z$=Z$+".00":GØTØ 1990
1830 Z$=" 0"+Z$+"0":GØTØ 1990
1900 Z$=" "+Z$+".00"
1990 Z$=" "+Z$
2000 RETURN
3000 REM PRINTEN UITLEG
3010 PRINT "*****************************************"
3011 PRINT "*                                       *"
3012 PRINT "*     Ø D I N   S U P E R T E A M       *"
3013 PRINT "*                                       *"
3014 PRINT "*****************************************"
3015 PRINT:PRINT
3020 PRINT "MET DE SUPERTEAMSTAND KUNNEN DE PRESTATIES VAN DE TEAMS"
3030 PRINT "VAN ØNZE VERENIGING ØNDERLING VERGELEKEN WØRDEN."
3040 PRINT "DE CIJFERS KØMEN ALS VØLGT TØT STAND:"
3050 PRINT "HET TØTAAL AANTAL WEDSTRIJDPUNTEN EN HET DØELSALDØ"
3060 PRINT "WØRDEN GEDEELD DØØR HET AANTAL GESPEELDE WEDSTRIJDEN."
3070 PRINT "DEZE GETALLEN ZIE JE IN DE TWEE KØLØMMEN."
3080 PRINT "DE PUNTEN ZIJN BELANGRIJKER DAN HET SALDØ, NET ALS IN DE"
3090 PRINT "KØMPETITIE ZELF. "
3100 PRINT "VØØRBEELD: EEN TEAM HEEFT IN ZES WEDSTRIJDEN NEGEN PUNTEN"
3110 PRINT "GEHAALD EN EEN DØELSALDØ VAN 21 PØSITIEF."
3120 PRINT "HET GEMIDDELDE AANTAL WEDSTRIJDPUNTEN (KØLØM 1) IS DAN"
3130 PRINT "9:6=1.50, HET DØELSALDØ (KØLØM 3) IS 21:6=3.50":PRINT
3140 PRINT "TUSSEN HAAKJES DE VØRIGE STAND."
3150 PRINT
3190 RETURN
4000 REM INPUT ØUDE STAND
4010 FØR I=1 TØ TT-1
4020 PRINT "TEAM "I;:INPUT "<PLTS,PNT,SALDØ>: ";B(I,0),B(I,1),B(I,2)
4030 NEXT I
4090 RETURN
Ok
```

6502-Tracer for the MON/DOS65 computer.

Author: Rene Hettfleisch, The Netherlands.
System: MON/DOS65 computer

While programming in the assembly-language, a tracer is a handy expedient to trace errors in a program. For this I use the "6502-tracer" of J. Ruppert (Elektor Holland nr. 244, Feb. 1984, page 2-66, 2-67), which I adjusted to MON/DOS65. The working of the tracer will be explained in this article. The original program is given in a hexdump in the article mentioned above. By this the following memory-locations have to be changed:

051C : old $7E, new $FE (change of interrupt-vector)
051D : old $1A, new $CE
0521 : old $7F, new $FF
0522 : old $1A, new $CE

06A1 : old $8F, new $27 (change of PRBYT)
06A2 : old $12, new $E0

06A6 : old $34, new $00 (change of PRCHA)
06A7 : old $13, new $E0

Furthermore there will be a little program added before and behind the original program; refer the source-listing. The program starts at $046B and ends at $072E. The program can be used as a utility by saving it on the system-disk and next you have to give the file the "command-mode" by using the SETMODE-RWDC filename.

After starting the tracer the program will ask the start-address to be traced. Before doing this the program to be traced has to be loaded into the memory. Watch the overlap of the tracerprogram by this. When the startaddress is entered the tracing will be started. It would be wise to send the output to the printer (output-device 2 and 3), because the tracing can't be interrupted in the meantime, after which the tracing can continue. The tracing can be stopped finally by depressing a random key (this causes an interruption). When at the end of the program which had to be traced, a RTS ($60) will be set, the tracing will be stopped here.

After the tracing has been stopped, a RESET has to be given, after which DOS65 has to be restarted. The reason for this is that the IRQ-pointer will be detoured and I won't be able to get it back normally, so the computer is blocked. However, you can live with this.
Good luck with the tracer!

```
046B            TRACER ORG    $046B

                TEMPORARIES AND BUFFERS

    ED 00       START  *      $00ED
    FE CE       IRQ    *      $CEFE
    69 04       IRQSAV *      $0469
    0E C1       VAIER  *      $C10E

                MON65 SUBROUTINES

    0F E0       STRING *      $E00F
    0C E0       INKEY  *      $E00C
    09 E0       OUT    *      $E009
    48 E0       CONVRT *      $E048


046B 20 0F E0  BEGIN  JSR     STRING
046E 1B               =       $1B
046F 69               =       'i
0470 0A               =       $0A
0471 20               =       '
0472 36               =       '6
0473 35               =       '5
0474 30               =       '0
0475 32               =       '2
0476 2D               =       '-
0477 74               =       't
0478 72               =       'r
0479 61               =       'a
047A 63               =       'c
047B 65               =       'e
047C 72               =       'r
047D 20               =       '
047E 1B               =       $1B
047F 6E               =       'n
0480 0D               =       $0D
0481 0A               =       $0A
0482 0A               =       $0A
0483 47               =       'G
0484 69               =       'i
0485 76               =       'v
0486 65               =       'e
0487 20               =       '
0488 73               =       's
0489 74               =       't
048A 61               =       'a
048B 72               =       'r
048C 74               =       't
048D 61               =       'a
048E 64               =       'd
048F 72               =       'r
0490 65               =       'e
0491 73               =       's
0492 73               =       's
0493 3A               =       ':
0494 20               =       '
0495 00               =       $00
0496 A9 00            LDAIM   $00
0498 85 ED            STA     START
049A 85 EE            STA     START  +01

049C 20 0C E0  GETCHR JSR     INKEY  GET CHARACTER FROM
049F AA               TAX            KEYBOARD
04A0 C9 0D            CMPIM   $0D    IF RETURN
04A2 D0 0E            BNE     GTCHRA
04A4 20 00 E0         JSR     OUT    PRINT CR
04A7 A9 0A            LDAIM   $0A
04A9 20 00 E0         JSR     OUT    PRINT LF TWO TIMES
04AC 20 00 E0         JSR     OUT
04AF 4C E6 04         JMP     BEGINA

04B2 C9 7F     GTCHRA CMPIM   $7F     IF DELETE
04B4 F0 1C            BEQ     DELETE GO TO DELETE
04B6 20 48 E0         JSR     CONVRT CONVERT ASCII TO
04B9 30 E1            BMI     GETCHR BINARY
04BB A8               TAY            IF VALID CHARACTER
04BC 8A               TXA
04BD 20 00 E0         JSR     OUT    PRINT CHARACTER
04C0 98               TYA
04C1 0A               ASLA           STORE CHAR IN START
04C2 0A               ASLA
04C3 0A               ASLA
04C4 0A               ASLA
04C5 A0 04            LDYIM   $04

04C7 0A        LOOPA  ASLA
04C8 26 ED            ROL     START
04CA 26 EE            ROL     START  +01
04CC 88               DEY
04CD D0 F8            BNE     LOOPA
04CF 4C 9C 04         JMP     GETCHR
```

```
04D2 20 0F E0  DELETE JSR    STRING  REMOVE CHAR FROM
04D5 08               =      $08     SCREEN
04D6 20               =      '
04D7 08               =      $08
04D8 00               =      $00
04D9 A0 04            LDYIM  $04

04DB 46 EE     LOOPB  LSR    START   +01 ERASE CHARACTER
04DD 66 ED            ROR    START
04DF 6A               RORA
04E0 88               DEY
04E1 D0 F8            BNE    LOOPB
04E3 4C 9C 04         JMP    GETCHR

04E6 AE FE CE  BEGINA LDX    IRQ     SAVE IRQ-VECTOR
04E9 AC FF CE         LDY    IRQ     +01
04EC 8E 69 04         STX    IRQSAV
04EF 8C 6A 04         STY    IRQSAV  +01
04F2 A9 23            LDAIM  END     PUSH END ON STACK
04F4 48               PHA
04F5 A9 07            LDAIM  END     /256
04F7 48               PHA
04F8 AD 0E C1         LDA    VAIER   STOP CLOCK
04FB 29 7F            ANDIM  $7F
04FD 8D 0E C1         STA    VAIER


0723 AE 69 04  END    LDX    IRQSAV  GET ORIGINAL IRQ-VECT
0726 AC 6A 04         LDY    IRQSAV  +01
0729 8E FE CE         STX    IRQ
072C 8C FF CE         STY    IRQ     +01
```

Use of cursor-control-keys ED.

Author: Rene Hettfleisch, The Netherlands
System: MON/DOS65 computer

The Full Screen Editor (ED) for DOS65 is an extended and good editor. I think many MON/DOS65 users will agree with me. In spite of it I think there is one disadvantage by the ED: the cursorcontrolling. My keyboard namely has cursor-control-keys which generates the usually codes:

```
BackSpace      : $08
Horizontal Tab : $09
Line Feed      : $0A
Vertical Tab   : $0B
```

By ED the following keys have to be used for the cursor-control: ^S, ^D, ^X and ^E. I think it is awkward, also because my keyboard doesn't repeat the control-characters.

The solution I found is as follows:
the keyboard-interrupt-routine of DOS65 (which loads the characters of the keyboard), will be detoured by a little program which changes the cursor-control-characters $08, $09, $0A and $0B into ^S, ^D, ^S and ^E resp. ED now recognizes the character of the cursor-control-keys really as cursor-control-keys.

The little program you need for this, is as followes:

```
0E00 AD 11 C1    LDA    $C111
0E03 29 FF       ANDIM  $FF
0E05 C9 08       CMPIM  $08
0E07 D0 05       BNE    $0E0E
0E09 A9 13       LDAIM  $13
0E0B 4C 26 0E    JMP    $0E26
0E0E C9 09       CMPIM  $09
0E10 D0 05       BNE    $0E17
0E12 A9 04       LDAIM  $04
0E14 4C 26 0E    JMP    $0E26
0E17 C9 0A       CMPIM  $0A
0E19 D0 05       BNE    $0E20
0E1B A9 18       LDAIM  $18
0E1D 4C 26 0E    JMP    $0E26
0E20 C9 0B       CMPIM  $0B
0E22 D0 02       BNE    $0E26
0E24 A9 05       LDAIM  $05
0E26 4C 48 AB    JMP    $AB48

0E29 A2 00       LDXIM  $00
0E2B A0 0E       LDYIM  $0E
0E2D 8E 3B AB    STX    $AB3B
0E30 8C 3C AB    STY    $AB3C
0E33 60          RTS

0E34 A2 43       LDXIM  $43
0E36 A0 AB       LDYIM  $AB
0E38 4C 2D 0E    JMP    $0E2D
```

The conversion-program uses the addresses $0E00-$0E28. At $0E29 starts the program that detoured the pointer in the interrupt-program at $0E00. On $0E34 starts the program that sets the pointer in the original position.

To adjust ED the following steps must be proceeded:

1. Rename the editor after itself and in such a way that this only can be called by the command EDITOR and not by the command ED. This goes as follows (refer page 24, 25 DOS65 manual):

   ```
   RENAME EDITOR DUMMY
   RENAME DUMMY EDITOR
   ```

2. Enter the program from $0E00 and save it as ED1 with startaddress $0E29. Give the file the command-mode (SETMODE -RWDC ED1).

3. Open a file named as ED in the following way:

   ```
   CREATE ED
   ED1
   EDITOR
   GO 0E34
   ^D
   ```

   Now the editor can be called with the command ED. The disadvantage of this method is that after the command ED has been given a filename can't be entered at once. The editor first comes in the command-mode, after which a file has to be loaded. The advantage of making use of the cursor-control-keys is much more than the disadvantage.

The English paperware-service contains for instance:

- DATBAS; database for Elektor's JUNIOR with OHIO-DOS. Basic.
  Jan van Heuven, The Netherlands. Transl: F. Lopes, Portugal.
- VDU ROTATING NEWSPAPER. For JUNIOR with VDU. Machinecode.
  Ivo van Rijssel, The Netherlands. Transl: F. Bens, Holland.
- Centronics Printer Interface; device 4 or 5 on Commodore 64.
  Ruud Uphoff, The Netherlands. Machinecode.
- The MC68000 microprocessor; a new processor in our club.
  Gert van Opbroek, The Netherlands. Article.
- Disassembler for 65C02 (Rockwell version). Machinecode.
  Nico de Vries, The Netherlands.
- Disassembler for 65C02 (Synertek/GTE version).
  Nico de Vries, The Netherlands. Machinecode.

Octopus disks

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System : Octopus 65 with OHIO DOS

After installation of a second disk drive on my Octopus 65 (this one now wired as drive A, and the original drive as drive B), it was impossible to boot the system on most disks. I was a novice in the personal computer area, and invoke assistance from more experienced Octopus users. I was advised that the problem could arise from the head step rate and the delay step rate as read from track of a disk on start up of the system. It took me a lot of trials to arrive at the values as now used on all disks (except the source disks #6,7,8,9, and the FORTH disk #10). By exchanging the two drives I could test whether the system could be booted with the new track 0.

The values as found for my drives (Mitsubishi M4853-342 used with double step-rate, so 40 tracks) are

address 26A3 03 steprate
address 26A5 D2 delay step rate

The track-to-track access time specified for this drive is 6 milliseconds. At 1 MHz clock frequency the value on 26A3 of 03 represents a step rate of 6 m For a 2 MHz system, this values would have to be 06 for 6 ms.

For other beginning users, please find the applicable instructions below. You will need at least one disk / drive combination that is able to boot your system. This disk must contain the COP/TO file (on track 36), because you need so called Track-zero read/write utility.

- Boot up the system.
- exit from the BEXEC* program by hitting the return key (further called <CR>)
- jump to DOS by entering EXIT and <CR> (system responds with A*)
- enter CA 0200=36,1 <CR> (to load COP/TO i.e. the track 0 read write utility)
- enter GO 0200 <CR> (start the utility)
- enter 2 <CR> (select choice 2 from the menu of the utility)
- enter R6200 <CR> (read track 0 into memory starting at address 6200)
- enter E <CR> (exit the utility)
- enter RE M (jump to the monitor program)
- enter 66A3 and a space (display contents of address 66A3)
- enter the required value and a slash i.e. 03/ (change step rate)
- enter 66A5 and a space (display contents of address 66A5)
- enter the required value and a slash i.e. D2/ (change delay step rate)
- enter .OS65D (go back to DOS)
- enter GO 0200 <CR> (start track 0 R/W utility again)
- enter 2 <CR> (select choice 2 from the menu)
- enter W6200/2200,8 <CR> (write the changed track 0 to disk)

Now you have created a disk that may be able to boot up your system. Please note that the required values for address 26A3 and 26A5 may be different for each drive (refer to the manual of the drive).

It appears to be very usefull first to make a back-up copy of a disk, before you start changing the contents as described before.

I got another hint to solve a printer hang i.e. the printer stops printing before reaching the end of a file. This problem can be solved by changing address 25A9 from 48 to 60 in the same way as described before.

Please note that the MSB of each address is 6 i.s.o 2 when using this method, due to the fact that data loaded into memory from address 2200 at boot up, are now loaded from 6200.