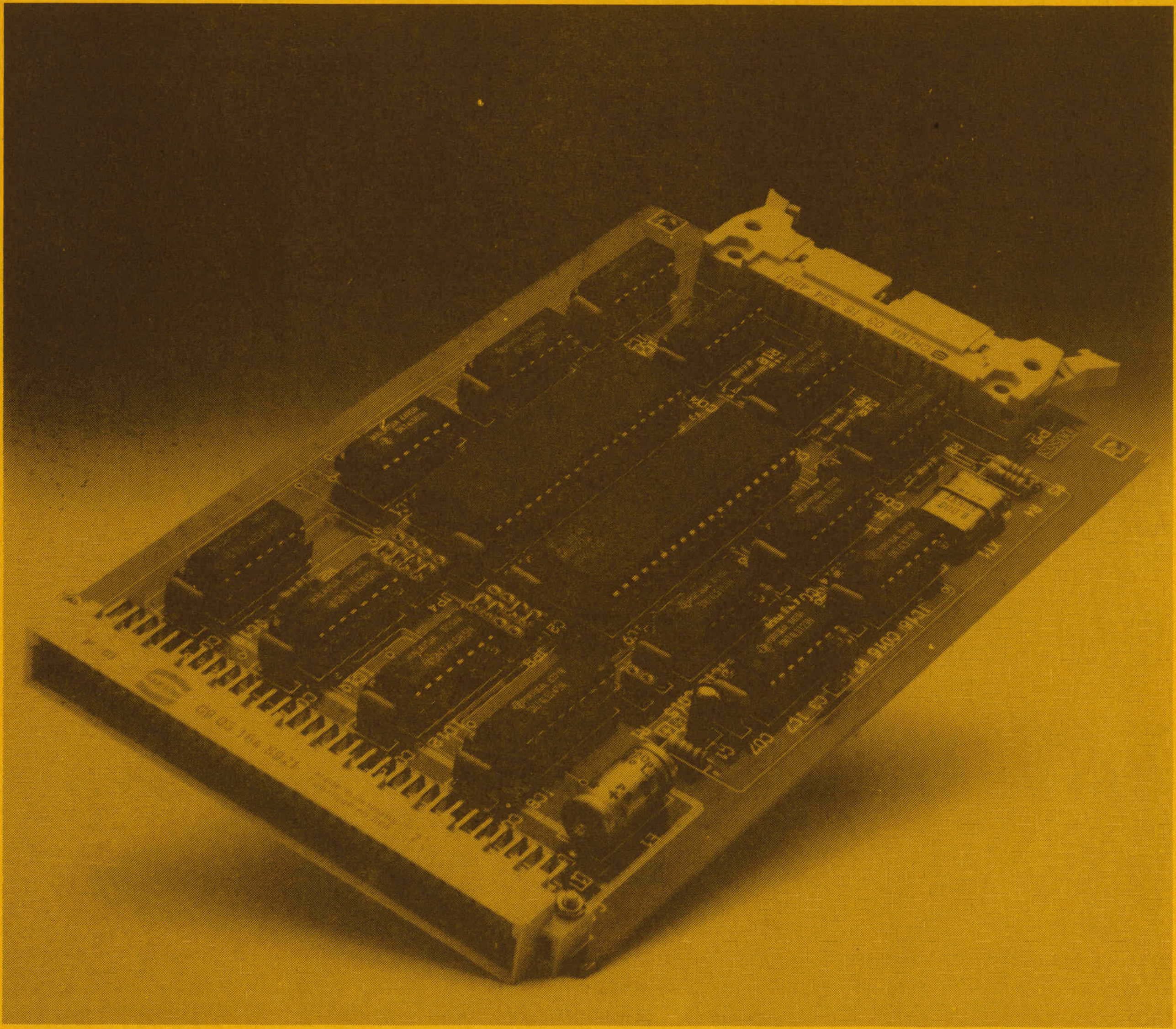
DE 6502 KENNER 45



Tiende Jaargang, Nr. 4
Augustus 1986

# DE 6502 KENNER

## ** DE 6502 KENNERS ** — EEN CLUB VOOR 6XXXX GEBRUIKERS

De vereniging heeft leden in Nederland, Belgie, Duitsland, Frankrijk, Spanje, Portugal, Amerika, Zambia, Denemarken. Het doel van de vereniging is: het bevorderen van de kennisuitwisseling tussen gebruikers van 6XXXX-computers, als COMMODORE-64, APPLE, CHE-1, PEARCOM, AIM-65, SYM, PET, BBC ATARI, VIC-20, BASIS 108, PROTON-computers, ITT-2020, OSI, ACC 8000, ACORN ELECTRON, SYSTEM 65, PC-100, PALLAS, MINTA FORMOSA; ORIC-1, STARLIGHT, CV-777, ESTATE III, SBC65/68, KIM, NCS, KEMPAC SYSTEM-4, Elektuur-computers (JUNIOR, en de OCTOPUS), LASER, maar ook 6800, 6809 en 68000-computers. De kennisuitwisseling wordt o.a. gerealiseerd door 6 maal per jaar DE 6502 KENNER te publiceren, door het houden van landelijke clubbijeenkomsten, door het instandhouden van een cassette-bibliotheek en door het verlenen van paperware-service. Regionale bijeenkomsten worden door de leden georganiseerd.

Verschijningsdata
DE 6502 KENNER 1985

derde zaterdag van
februari, april, juni,
augustus, oktober, december.

Bijeenkomsten van de club

derde zaterdag van
januari, maart, mei,
september, november.

Inlichtingen over de regio-bijeenkomsten:

Gerard van Roekel
Van der Palmstraat 11 - C
3135 LK Vlaardingen
Tel.: 010 - 351101

Redaktie-adres en informaties over paperware etc.

Willem L. van Pelt
Jacob Jordaensstraat 15
2923 CK Krimpen/IJssel.
Tel.: 01807 - 19881

De vereniging is volledig onafhankelijk, is statutair opgericht en ingeschreven bij de Kamer van Koophandel en Fabrieken voor Hollands Noorderkwartier te Alkmaar, onder nummer 634305.

Voorzitter:
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Redaktie DE 6502 KENNER:
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Leden:

| | | |
|---|---|---|
| Adri Hankel | (05490 - 51151 ) | Hardware/software/DOS65 |
| Erwin Visschedijk | (05490 - 71416 ) | Hardware/software/DOS65 |
| Gert van Opbroek | (01729 - 8636 ) | |
| Nico de Vries | (010 - 502239) | Hardware/software/PET |

Erevoorzitter: Siep de Vries
Ereleden : Mw. H. de Vries - Van der Winden
Anton Mueller
Lidmaatschap : HFl. 45,= per kalenderjaar, postrekening 3757649 t.n.v. Penningmeester KIM Gebruikers Club Ned., Krimpen/IJssel.

Advertenties : Tarieven op aanvraag bij de redaktie.

## ** DE 6502 KENNER ** — EEN BLAD VOOR 6XXXX GEBRUIKERS

DE 6502 KENNER is een uitgave van de KIM Gebruikers Club Nederland. Het blad wordt verstrekt aan leden van de club. DE 6502 KENNER wordt van kopij voorzien door leden van de club, bij de opmaak van een publikatie bijgestaan door de redaktie. De inzendingen van programma's dienen voorzien te zijn van kommentaar in de listings en zo mogelijk door een inleiding voorafgegaan. Publikatie van een inzending betekent niet dat de redaktie of het bestuur enige aansprakelijkheid aanvaardt voor de toepassing ervan. De inzendingen kunnen geschieden in assembly-source-listings, in Basic, in Basicode, Forth, Focal, Comal, Pascal, Fortran, Cobol, Logo Elan, etc. etc.
De leden schrijven ook artikelen over de door hen ontwikkel de hardware en/of aanpassingen daarop. Zij schrijven tevens artikelen van algemene aard of reageren op publikaties van andere inzenders.

DE 6502 KENNER IS EEN BLAD VAN EN DOOR DE LEDEN

Micro-ADE Assembler/Disassembler/Editor is een produkt van Micro Ware Ltd., geschreven door Peter Jennings en bestemd voor alle 6502-computers. De KIM Gebruikers Club Ned. heeft de copyrights verworven nadat ons lid Sebo Woldringh de 4 K KIM-1 versie uitbreidde tot 8 K KIM-1 versie. Adri Hankel paste deze aan voor de JUNIOR. Willem L. van Pelt stelde een nieuwe 8 K source-listing voor de JUNIOR samen.
De implementatie op andere systemen dan de KIM-1 en JUNIOR kan eenvoudig gebeuren door het aanpassen van de I/O-adressen, welke in de source-listing gemakkelijke te vinden zijn

FATE Format-lister/cond. Assembler/Tape-utilities/Editor is de door ons lid Rob Banen geschreven source-listing van een 12 K universeel systeem voor de JUNIOR-computer aan de hand van het universele disk operating system van de fa. Proton Electronics te Naarden, nu geschikt voor werken met tapes. FATE wordt beschikbaar gesteld met toestemming van Proton.

In de edities van DE 6502 KENNER worden regelmatig mededelingen gedaan over de door de club georganiseerde bijeenkomsten. Ook worden bestuurlijke mededelingen gedaan, naast informaties over hetgeen in de handel te koop is. Leden die iets te koop hebben of iets zoeken kunnen dit in de edities van DE 6502 KENNER bekend maken. Ook worden brieven aan de redaktie gepubliceerd, evenals specifieke vragen van leden. De edities worden samengesteld op basis van een groot aantal prioriteiten, welke door een redaktievergadering worden gehanteerd. Deze vergadering bestaat uit de vaste medewerkers zoals in de colofon vermeld. Het aantal inzendingen is groter dan in een enkele editie van minimaal 48 pagina's is te verwerken. Hierdoor kan het voorkomen dat een inzending eerst na enige tijd kan worden gepubliceerd.

DE CLUB HEEFT BEHOEFTE AAN MEER LEDEN. WIJ WILLEN MEER AAN KUNNEN BIEDEN DAN NU AL HET GEVAL IS. WERF DAAROM EEN LID!

WILT U EEN PRIJSLIJST? STUUR EEN GEFRANKEERDE ENVELOP AAN HET REDAKTIE-ADRES.

Een onafhankelijke jury kent jaarlijks een aantal aanmoedigingspremies toe aan auteurs van gepubliceerde artikelen in DE 6502 KENNER.

DE 6502 KENNER

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

Adres voor het inzenden van en reakties op artikelen voor DE 6502 KENNER:
Willem L. van Pelt
Jacob Jordaensstraat 15
2923 CK Krimpen a/IJssel
Tel.: 01807 - 19881

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Coen Boltjes

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Herman Zondag

Vertaalwerk:
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Willem van Asperen
Frank Bens
Albert v.d. Beukel
Rene Hettfleisch
Jaap de Hoop
Coen Kleipool (France)
Maarten van Lieshout

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.

I.v.m. auteurswetgeving aanvaardt de redaktie geen aansprakelijkheid voor inzendingen. Tenzij anders aangegeven, dient de inzending afkomstig te zijn van de inzender.

INHOUDSOPGAVE DE 6502 KENNER NR. 45 AUGUSTUS 1986

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 JI and JIE : 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.

## UITNODIGING CLUBBIJEENKOMST

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.

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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
 0  ( HEX/ASCII-DUMP )
 1
 2  HEX
 3  : .ROW CR 2 SPACES ." ADRES  " 10 0 DI I . SPACE LOOP CR ;
 4  : ?NON-PRINTING DUP 20 ( SWAP 7E ) OR ;
 5  : &TYPE 0 DO DUP I + C@ DUP ?NON-PRINTING IF DROP 2E THEN EMIT
 6    LOOP DROP ;
 7  : HDUMP 0 DO DUP I + C@ DUP 10 ( IF SPACE 30 EMIT 1 ELSE 3
 8    THEN .R LOOP DROP ;
 9  : A-LINE CR DUP 0 6 D.R SPACE 10 OVER OVER HDUMP
10    2 SPACES &TYPE ;
11  : DUMP .ROW OVER - 0 DO DUP I + A-LINE 10 +LOOP DROP CR ;
12  ;S
13
14
15
```

## NEWS FROM THE PAPERWARE SERVICE

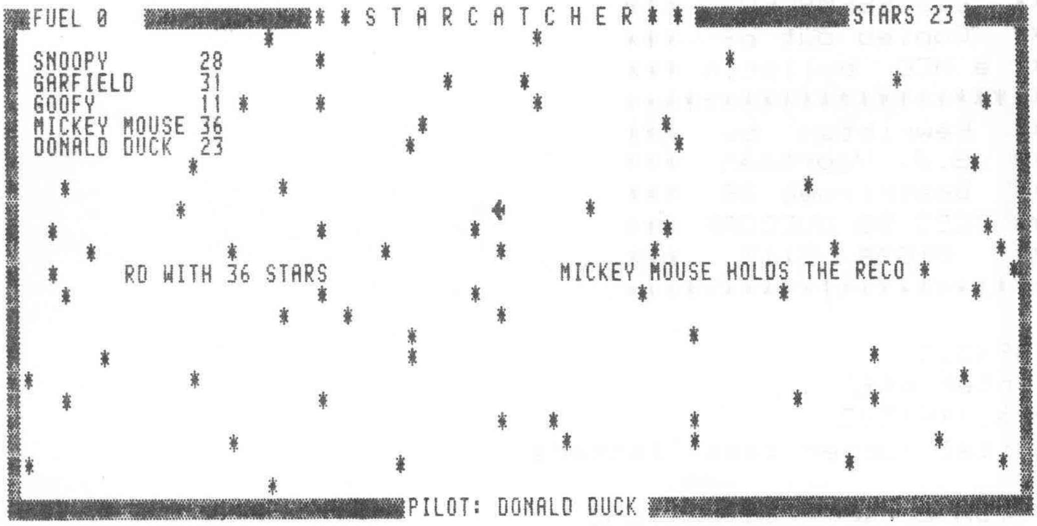
NEW NEW NEW NEW NEW NEW NEW NEW

### 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.



```
FUEL 0                * * S T A R C A T C H E R * *                STARS 23

 SNOOPY        28
 GARFIELD      31
 GOOFY         11
 MICKEY MOUSE  36
 DONALD DUCK   23


      RD WITH 36 STARS                          MICKEY MOUSE HOLDS THE RECO


                                PILOT: DONALD DUCK
```

```
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$<>"???" THENPRINT;~C%;C
;
650PRINTTAB(28);AC$
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,8,32,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,8,&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,8,&BD,LDA,8,&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
1230DEFPROConebyte:IF MN$="???" PRINTRIGHT$("00"+T$(OC%),2)::GOTO 1250
1240PRINT;RIGHT$("00"+T$(OC%),2)+"   ";
1250PROCpeek1
1260ENDPROC
1270
1280DEFPROCrel
1290IF (?(S-1))>127 P$="&"+STR$~((S-1)-(&FF-OP))
1300IF (?(S-1))<128 P$="&"+STR$~(S+OP)
1310ENDPROC
1320
1330DEFPROCfout
1340PRINT:VDU7,7:IF ERR=17 THEN END
1350REPORT:PRINT" at line ";ERL
1360ENDPROC
1370
1380DEFPROCpeek1:IF ?(S)>31 AND ?(S)<127 THEN AC$=AC$+CHR$(?(S)) ELSE AC$=AC$+"
"
1390ENDPROC
1400DEFPROCpeek2:IF (S?1)>31 AND (S?1)<127 THEN AC$=AC$+CHR$(S?1) ELSE AC$=AC$+
."
1410ENDPROC
1420DEFPROCpeek3:IF (S?2)>31 AND (S?2)<127 THEN AC$=AC$+CHR$(S?2) 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.

============================================================

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Send cheque of Hfl. 74,50 to W.L.v.Pelt (eurocheque 65,00)

## THE MC68000 MICROPROCESSOR; A NEW PROCESSOR IN OUR CLUB.

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### 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 commitee 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: 68008, 68000, 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:

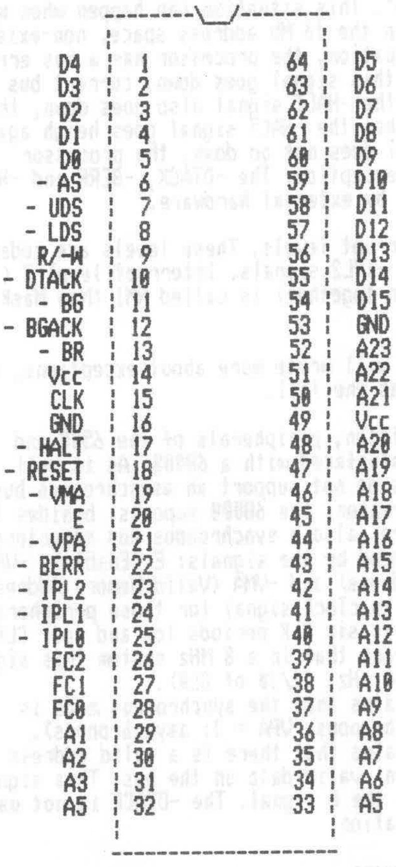
a) The 68008. This processor has all the features of a 68000 but has an 8 bit databus. The address bus of this processor is 24 bits wide.

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.



| | | | |
|---|---|---|---|
| D4 | 1 | 64 | D5 |
| D3 | 2 | 63 | D6 |
| D2 | 3 | 62 | D7 |
| D1 | 4 | 61 | D8 |
| D0 | 5 | 60 | D9 |
| - AS | 6 | 59 | D10 |
| - UDS | 7 | 58 | D11 |
| - LDS | 8 | 57 | D12 |
| R/-W | 9 | 56 | D13 |
| - DTACK | 10 | 55 | D14 |
| - BG | 11 | 54 | D15 |
| - BGACK | 12 | 53 | GND |
| - BR | 13 | 52 | A23 |
| Vcc | 14 | 51 | A22 |
| CLK | 15 | 50 | A21 |
| GND | 16 | 49 | Vcc |
| - HALT | 17 | 48 | A20 |
| - RESET | 18 | 47 | A19 |
| - VMA | 19 | 46 | A18 |
| E | 20 | 45 | A17 |
| - VPA | 21 | 44 | A16 |
| - BERR | 22 | 43 | A15 |
| - IPL2 | 23 | 42 | A14 |
| - IPL1 | 24 | 41 | A13 |
| - IPL0 | 25 | 40 | A12 |
| FC2 | 26 | 39 | A11 |
| FC1 | 27 | 38 | A10 |
| FC0 | 28 | 37 | A9 |
| A1 | 29 | 36 | A8 |
| A2 | 30 | 35 | A7 |
| A3 | 31 | 34 | A6 |
| A5 | 32 | 33 | A5 |

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.

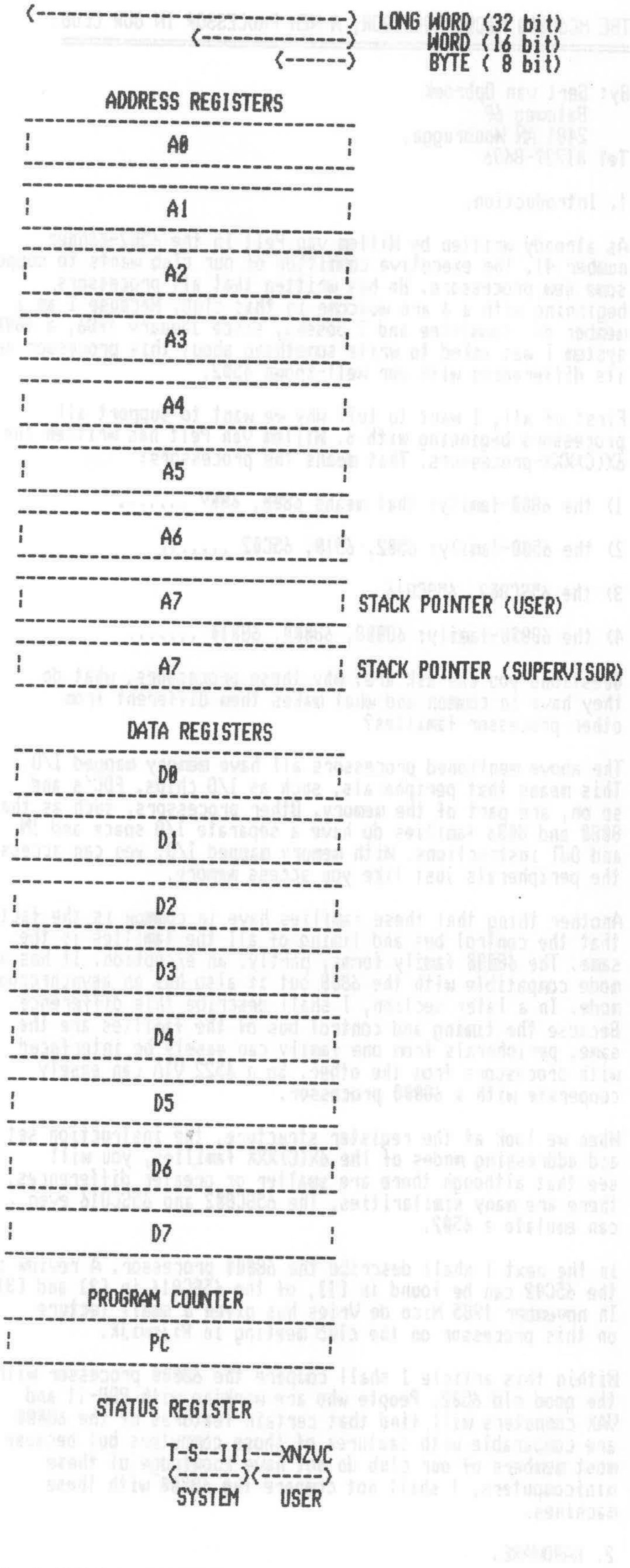


FIG. 2 INTERNAL RGISTERS

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 $000080 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:
```

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NUMBER    THE JUNIOR PROMOTING CY (W&J)  21:56:35 - TUE 17/JUN/86  PAGE 02
00790:                   *** Receive a digit ***
00800:
00810:                   Error-free numeric input routine:
00820:                    - check for a digit, decimal or hexadecinal
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:
```

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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:
```

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

```
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:
```

```
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
```

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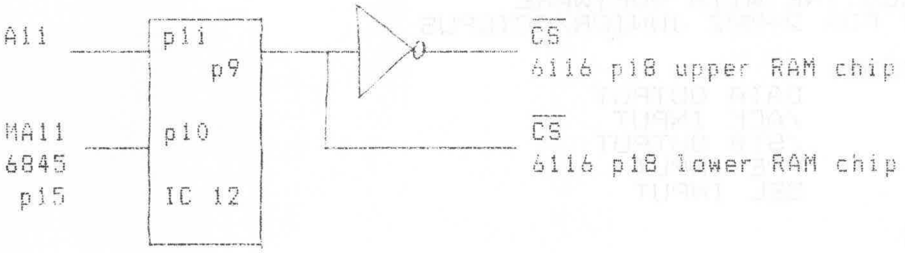
## Elektor VDU card modifications

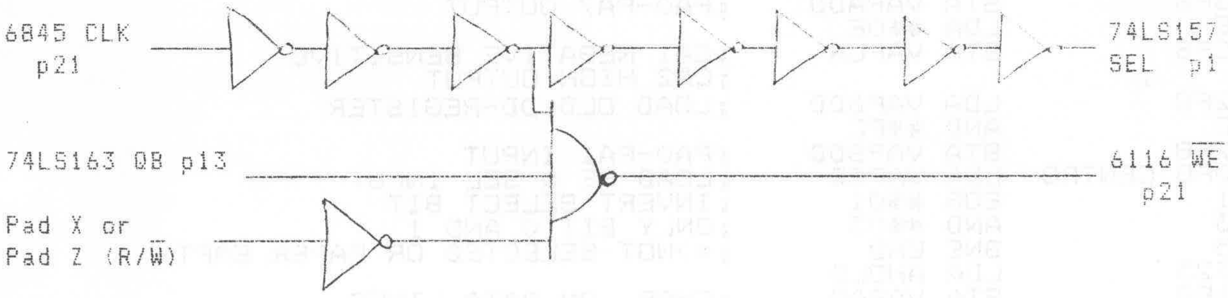
### 4k RAM

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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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)
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Dick Blok, The Netherlands. With thanks to Sebo Woldringh for his advices. Machinecode.
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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.
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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)

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Marcel Visser, The Netherlands.
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TOKENIZED Microsoft Basic Keywords and addresses AIM-65 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 APPLEsoft
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 CBM 40XX and CBM 80XX. Commodore Basic 4.0.
Nico de Vries, The Netherlands.
Send cheque of Hfl. 14,50 to W.L.v.Pelt (eurocheque 5,00)

TOKENIZED Microsoft Basic Keywords and addresses C - 16 Commodore Basic 3.5.
Nico de Vries, The Netherlands.
Send cheque of Hfl 14,50 to W.L.v.Pelt (eurocheque 5,00)

TOKENIZED Microsoft Basic Keywords and addresses CBM 30XX Commodore asic 2.0.
Nico de Vries, The Netherlands.
Send cheque of Hfl. 14,50 to W.L.v.Pelt (eurocheque 5,00)

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. Persoonsgegevens.

Indien u er de voorkeur aan geeft anoniem te blijven, kunt u verder gaan met de tweede vraag.
(U komt dan NIET in aanmerking voor de verloting).

A. Wat is uw naam?

.........................................

B. En uw adres?

.........................................

.........................................

C. Wat is uw beroep?

.........................................

D. Geslacht: [ ] Man [ ] Vrouw

E. En uw leeftijd?

[ ] jonger dan 15 jaar
[ ] tussen 15 en 25 jaar
[ ] tussen 25 en 35 jaar
[ ] tussen 35 en 45 jaar
[ ] tussen 45 en 55 jaar
[ ] tussen 55 en 65 jaar
[ ] ouder dan 65 jaar

F. Spreekt u Engels of kunt u Engels lezen?

[ ] Ja [ ] Redelijk [ ] Nee

## 2. Gegevens betreffende het computersysteem.

A. Welke computer(s) heeft u?

[ ] Junior
[ ] Apple ][
[ ] Acorn Atom
[ ] KIM
[ ] SYM
[ ] PET
[ ] DOS65
[ ] BBC
[ ] Acorn Electron
[ ] Proton
[ ] AIM
[ ] Commodore 64
[ ] CBM 30XX,40XX of 8032
[ ] OCTOPUS/SAMSON65/EC65
[ ] Geheel zelfgebouwd
[ ] Andere, n.l.,

.........................................

B. Hoe lang heeft u al een computer?

[ ] korter dan een jaar
[ ] 1 à 2 jaar
[ ] 3 à 4 jaar
[ ] langer, nl. .... jaar

C. Welk operating system gebruikt u?

[ ] OHIO OS65D
[ ] DOS65
[ ] Koen van Nieuwehove's DOS
[ ] Ik gebruik alleen de software in de (EP)ROMs van de computer
[ ] Andere, n.l.,

.........................................

D. Welke zaken maken deel uit van uw systeem?

[ ] Hex display en keyboard
[ ] Monitor/ASCII toetsenbord
[ ] Terminal
[ ] Teletype
[ ] Matrixprinter
[ ] Daisywheelprinter
[ ] Diskdrive(s), 5.25 inch
[ ] Diskdrive(s), 8 inch
[ ] Diskdrive(s), 3 of 3.5 inch
[ ] Winchesterdisk
[ ] Cassetterecorder
[ ] Modem
[ ] EPROM-programmer
[ ] ..................................

E. Waar gebruikt u uw systeem het meest voor?

[ ] Administratie, bedrijf
[ ] Administratie, privé
[ ] Tekstverwerking
[ ] Bestandsbeheer ('database')
[ ] Ontwikkelen van software
[ ] Ontwikkelen van hardware
[ ] Besturingen
[ ] Spelen van spelletjes
[ ] Imponeren van de buurman

## 3. Software.

A. Op welk niveau bent u aktief m.b.t. software?

[ ] Ik interesseer me uitsluitend voor hardware
[ ] Ik kopieer alleen software van anderen
[ ] Ik verbeter programma's van anderen
[ ] Ik schrijf zelf wel eens een programma
[ ] Ik schrijf de meeste programma's zelf
[ ] Ik schrijf alles zelf, operating systems, monitorprogramma's, enz.

B. In welke computertalen kunt u programmeren?

[ ] Hex
[ ] BASIC
[ ] PASCAL
[ ] Andere, n.l.
[ ] Assembler
[ ] FORTH
[ ] C

..........................................

C. In welke taal programmeert u voornamelijk?

[ ] Hex
[ ] BASIC
[ ] PASCAL
[ ] Andere, n.l.
[ ] Assembler
[ ] FORTH
[ ] C

..........................................

E. Heeft u een voorkeur voor een bepaalde assembler?

[ ] Moser (ASM/TED, MAE)
[ ] Micro-Ade
[ ] AS uit DOS65
[ ] Ik ken er maar een, n.l.

........................................

[ ] Andere,

........................................

F. Kunt u behalve de 6502 ook nog andere processoren in machinetaal programmeren?

[ ] 6800
[ ] 1802
[ ] SC/MP
[ ] 68000
[ ] ....................
[ ] Z80
[ ] 2650
[ ] 6809
[ ] 8086/8088

G. Wat vindt u van uw kennis van machinetaal/assembler?

[ ] Slecht
[ ] Ik me ermee redden
[ ] Voldoende
[ ] Ik ben er goed in

D. wat is uw favoriete computertaal, en waarom?

...................................................................................................

...................................................................................................

## 4. Hardware.

A. Op welk niveau bent u aktief m.b.t. hardware?

[ ] Ik heb er geen verstand van, ik koop alles.
[ ] Ik bouw wel eens een printje (bijv. van Elektuur)
[ ] Ik heb mijn complete systeem zelf gebouwd.
[ ] Ik ontwerp zelf hardware
[ ] Ik heb mijn complete systeem zelf ontworpen.

B. Zou u assemblagewerk voor de club willen doen (bijvoorbeeld DOS65 FDC-kaarten bouwen)?

[ ] Nee [ ] Ja

C. Kunt u zelf printjes maken?

[ ] Nee
[ ] Ja, maar ik vind het teveel werk.
[ ] Ik plak zelf printjes.
[ ] Ik ets zelf printjes.
[ ] Ik plak en ets printjes.
[ ] Ik werk met CAD/CAM.

D. Kunt u een datasheet van een IC lezen en interpreteren?

[ ] Ik snap er geen jota van.
[ ] Ik kijk alleen naar de pin-aansluitingen
[ ] Ik begrijp het meeste wel.
[ ] Ja.

## 5. De club.

A. Geef het clubblad eens een rapportcijfer (1-10)? .......

B. Wat vindt u van deze onderdelen/aspecten van het clubblad?

| | Goed | Gemiddeld | Slecht |
|---|---|---|---|
| Het redactionele praatje | [ ] | [ ] | [ ] |
| Uitnodiging voor de bijeenkomsten | [ ] | [ ] | [ ] |
| Alg. artikelen in verhalende stijl | [ ] | [ ] | [ ] |
| Assembler listings | [ ] | [ ] | [ ] |
| BASIC listings | [ ] | [ ] | [ ] |
| FORTH listings | [ ] | [ ] | [ ] |
| Hardware ontwerpen | [ ] | [ ] | [ ] |
| Aanprijzen van clubartikelen | [ ] | [ ] | [ ] |
| De opmaak | [ ] | [ ] | [ ] |

C. Schrijft u wel eens voor de 6502 Kenner?

[ ] Nooit
[ ] Af en toe
[ ] Weinig
[ ] Regelmatig

D. In welke taal moet het clubblad zijn?

[ ] Alleen maar in het Nederlands
[ ] Nederlands en een beetje Engels
[ ] Nederlands en Engels door elkaar
[ ] Nederlands en een beetje Duits
[ ] Nederlands en Duits door elkaar
[ ] In het Engels
[ ] In het Duits
[ ] Allerlei talen door elkaar

E. Welke artikelen moeten er meer in het clubblad verschijnen?

..................................................

..................................................

..................................................

..................................................

..................................................

F. Welke artikelen moeten er minder in het clubblad verschijnen?

..................................................

..................................................

..................................................

..................................................

..................................................

G. Heeft u nog verdere opmerkingen over het clubblad?

..................................................

..................................................

..................................................

..................................................

..................................................

## 6. Vragen om het toekomstig beleid te bepalen.

A. Wilt u aktief in de club zijn, en zo ja, waarin?

[ ] Nee, ik ben lid voor het blad.
[ ] Nee, ik heb er te weinig tijd voor
[ ] Ik zou artikelen willen schrijven
[ ] Ik zou hardware willen ontwikkelen
[ ] Ik zou software willen ontwikkelen
[ ] Ik zou een bijeenkomst willen (helpen) organiseren.
[ ] Ik zou in het bestuur willen zitten.
[ ] Ik zou spreekbeurten/lezingen willen houden
[ ] Ik zou vertaalwerk willen doen

B. De club heet thans KIM Gebruikersclub Nederland. Moet deze naam veranderen?

[ ] Geen mening
[ ] Nee
[ ] Ja, want ...........................

...................................................

C. Wat zou u een goede nieuwe naam voor de club vinden?
(Tips: 1. Geen CPU-nummer in de naam
2. geen merknamen in de naam
3. belicht het hobby-aspect
4. een Engelse naam mag ook
5. de naam moet gemakkelijk in het geheugen blijven hangen)

[ ] De 6502 Kenners
[ ] ENCC (Eerste Nederlandse Computer Club)
[ ] FDC (First Dutch Computerclub)
[ ] Club65+
[ ] Andere, bijv.:

..................................

..................................

D. Wij houden ons tot dusver alleen met de 6502 bezig. Moet(en) daar nog andere processor(s) bijkomen (bijv. 16-bit)?

[ ] Ja [ ] Nee

E. Moet de club processor-onafhankelijk worden?

[ ] Ja [ ] Nee

F. Wilt u uw antwoord op de vragen D. en E. misschien toelichten?

........................................

........................................

........................................

........................................

G. Ziet u een logische 'opvolger' voor de 6502?

[ ] 65C02
[ ] 6800
[ ] 6809
[ ] 65816/65802
[ ] 68000
[ ] Geen
[ ] Andere, n.l. ...............

H. Komt u wel eens op een club-bijeenkomst?

[ ] Nooit
[ ] Alleen bij mij in de buurt
[ ] Af en toe
[ ] Ik kom op alle bijeenkomsten

I. Wat vindt u van de bijeenkomsten?

[ ] Slecht [ ] Matig [ ] Goed

J. Wat vindt u van de lezingen op de bijeenkomsten?

[ ] Slecht [ ] Matig [ ] Goed

K. Heeft u nog suggesties voor de bijeenkomsten?

........................................

........................................

........................................

........................................

Dit was 't.
Bedankt voor uw tijd en moeite.

Het Bestuur.

```
                      PUT   CHESS1.1
                                  ;
                                  ; *****  *****  ******  *****  *****
                                  ; *****  *****          *****  *****
                                  ; *****  *****  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
                                  ;
                 ZETI     EQU  $00  ; PROMOTIESTUK
                 ZETII    EQU  $01  ; NAARVELD BESTE ZET
                 ZETIII   EQU  $02  ; VANVELD BESTE ZET
                 PROM     EQU  $03  ; CODE PROMOTIESTUK
                 NAAR     EQU  $04  ; NAARVELD ZET IN ONDERZOEK
                 VAN      EQU  $05  ; VANVELD ZET IN ONDERZOEK
                 NZET     EQU  $06  ; AANTAL GELDIGE ZETTEN PER NIVO
                 ITZ      EQU  $07  ; INDEXTABEL ZETMOGELIJKHEDEN
                 ZWRD     EQU  $08  ; ZETWAARDE PER NIVO
                 STUK     EQU  $09  ; STUK DAT WORDT GESLAGEN
                 ROCO     EQU  $0A  ; ROCHADE-CODE
                 WRDE     EQU  $0B  ; WAARDE VAN DE STELLING
                 NIVO     EQU  $0C  ; MOMENTELE ONDERZOEKDIEPTE
                 CZA      EQU  $0D  ; CODE ZET AANBRENGEN
                 CZO      EQU  $0E  ; CODE ZET ONGELDIG
                 PZET     EQU  $0F  ; HOOGSTE AANTAL ZETTEN OP NIVO 2
                 CZET     EQU  $10  ; CODE SOORT ZET
                 MAXI     EQU  $11  ; MAXIMALE ZOEKDIEPTE ALGEMEEN
                 MAXII    EQU  $12  ; MAXIMALE ZOEKDIEPTE SLAGZETTEN
                 EPS      EQU  $13  ; VELDNUMMER PION EN PASSANT TE SLAAN
                 HULP     EQU  $14  ; TEMP VOOR ALGEMENE DOELEINDEN
                 CKAZ     EQU  $15  ; CODE KLEUR AAN ZET
                                  ;
                          ORG  $16
0016: 84 83 85
0019: 86 82 85
001C: 83 84      BORD     DFB  $84,$83,$85,$86,$82,$85,$83,$84
001E: 80 80 80
0021: 80 80 80
0024: 80 80               DFB  $80,$80,$80,$80,$80,$80,$80,$80
0026: 00 00 00
0029: 00 00 00
002C: 00 00               DFB  0,0,0,0,0,0,0,0
002E: 00 00 00
0031: 00 00 00
0034: 00 00               DFB  0,0,0,0,0,0,0,0
0036: 00 00 00
0039: 00 00 00
003C: 00 00               DFB  0,0,0,0,0,0,0,0
003E: 00 00 00
0041: 00 00 00
0044: 00 00               DFB  0,0,0,0,0,0,0,0
0046: C1 C1 C1
0049: C1 C1 C1
004C: C1 C1               DFB  $C1,$C1,$C1,$C1,$C1,$C1,$C1,$C1
004E: C4 C3 C5
0051: C6 C2 C5
0054: C3 C4               DFB  $C4,$C3,$C5,$C6,$C2,$C5,$C3,$C4
0056: 00 05 0A
0059: 13 1C 0E
005C: 0A         PTZ      DFB  $00,$05,$0A,$13,$1C,$0E,$0A
```

```
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
```

```
DC9: 05 05 00
DCC: 10 19 12
DCF: 2D          STUKTAB  DFB  $05,$05,$00,$10,$19,$12,$2D
DD0: 07 FF F7
DD3: F8 F9 01
DD6: 09 08       DIRHEX   DFB  $07,$FF,$F7,$F8,$F9,$01,$09,$08
DD8: 91 90 89
DDB: 99 09 10
DDE: 11 01       DIRDEC   DFB  $91,$90,$89,$99,$09,$10,$11,$01
                          ORG  $E1
                 KEYBUF   EQU  $E1          ; TOETSBUFFER
                                            ;
                          ORG  $F9          ;
                 DISP1    EQU  $F9          ; DISPLAYBUFFER
                 DISP2    EQU  DISP1+1      ; IDEM
                 DISP3    EQU  DISP1+2      ; IDEM
                                            ;
                                            ; MONITOR ADRESSEN
                                            ;
                 SCANDS   EQU  $1D8E        ; TOON INHOUD DISPLAYBUFFER
                 GETKEY   EQU  $1DF9        ; HAAL TOETS VAN HEX-PAD
                                            ;
                                            ; PIA ADRESSEN
                                            ;
                 PAD      EQU  $1A80        ; POORT A DATA REGISTER
                 PBD      EQU  $1A82        ; POORT B DATA REGISTER
                                            ;
                                            ; PIA TIMER ADRES
                                            ;
                 TIMER    EQU  $1AF4        ; CLK1T, DISABLE TIMER IRQ
                                            ;
                                            ; VECTOR ADRESSEN
                                            ;
                 NMIVECTLOBEQU $1A7A
                 NMIVECTHOBEQU $1A7B
                 IRQVECTLOBEQU $1A7E
                 IRQVECTHOBEQU $1A7F
                                            ;
                                            ; SCHAAKMONITOR ADRESSEN
                                            ;
                                            ; TD/DS       EQU $0590 ; TOETSDETEKTIE/DISPLAY
                                            ; MAINSMON    EQU $05A5 ; HOOFDROUTINE SCHAAKMONITOR
                                            ; CODEMON     EQU $05F3 ; CODE-ROUTINE
                                            ; VELDKODMON  EQU $05FC ; VELDKONTROLE EN KODERING
                                            ; PLUSMON     EQU $0629 ; STUK VERPLAATSEN
                                            ; DAMON       EQU $064F ; STUK PLAATSEN/VERWIJDEREN
                                            ; ADMON       EQU $0683 ; BORD VEGEN
                                            ; PCMON       EQU $068D ; NIEUWE PARTIJ
                                            ;
                                            ; POSVAL ADRESSEN
                                            ;
                                            ; ADD         EQU $2000 ; ADD
                                            ; TOTAL       EQU $200E ; TOTAL
                                            ; MULTIPLY    EQU $2022 ; MULTIPLY
                                            ; DIVIDE      EQU $2077 ; DIVIDE
                                            ; SCAN        EQU $20DA ; SCAN
                                            ; KODEER      EQU $20FA ; KODEER
                                            ; VELDTEST    EQU $2111 ; VELDKONTROLE
                                            ; NAARVELD    EQU $212F ; NAARVELD
                                            ; AFSTAND     EQU $2140 ; AFSTAND
                                            ; EERSTEVELD  EQU $2174 ; EERSTE VELD
                                            ; STATUSI     EQU $219C ; STATUS I
                                            ; STATUSII    EQU $21E0 ; STATUS II
                                            ; PAARD       EQU $2227 ; PAARD
                                            ; LOPER       EQU $22A2 ; LOPER
                                            ; DAME        EQU $2318 ; DAME
                                            ; TOREN       EQU $238D ; TOREN
                                            ; PION        EQU $246E ; PION
                                            ; KONINGI     EQU $2582 ; KONING I
                                            ; KONINGII    EQU $266C ; KONING II
                                            ; INITPOS    EQU $2707 ; INITIALISERING
                                            ; MAINSPOS   EQU $2787 ; STUURROUTINE
                                            ;
                                            ; REPRESENTATIE VAN DE STUKKEN
                                            ;
                                            ; LEEG VELD  = 00
                                            ; WITTE PION = 80   ZWARTE PION = C1
                                            ; KONING     = 82   KONING      = C2
                                            ; PAARD      = 83   PAARD       = C3
                                            ; TOREN      = 84   TOREN       = C4
                                            ; LOPER      = 85   LOPER       = C5
                                            ; DAME       = 86   DAME        = C6
                        PUT  CHESS1.2
                                            ;
                        ORG  $2000
2000: 4C 95 2C          JMP  PCMON          ; INITIALISEREN
2003: A5 9B    ADD      LDA  TEMPB          ; TEL DE MOMENTELE WAARDE
2005: 18                CLC                 ; BIJ DE STUKWAARDE
2006: 65 A8             ADC  STUKWRDLOB     ; EN BEWAAR RESULTAAT
2008: 85 A8             STA  STUKWRDLOB
200A: A5 9C             LDA  TEMPC
200C: 65 A9             ADC  STUKWRDHOB
200E: 85 A9             STA  STUKWRDHOB
2010: 60                RTS
2011: A5 A6    TOTAL    LDA  STELWRDLOB     ; TEL STUKWAARDE
2013: 85 9B             STA  TEMPB          ; BIJ STELLINGWAARDE
2015: A5 A7             LDA  STELWRDHOB     ; MET BEHULP VAN ADD
2017: 85 9C             STA  TEMPC          ; EN BEWAAR RESULTAAT
2019: 20 00 20          JSR  $2000
201C: A5 A8             LDA  STUKWRDLOB
201E: 85 A6             STA  STELWRDLOB
2020: A5 A9             LDA  STUKWRDHOB
2022: 85 A7             STA  STELWRDHOB
2024: 60                RTS
2025: 84 97    MULTIPLY STY  TEMP7          ; RESET
2027: 84 98             STY  TEMP8
2029: 84 9B             STY  TEMPB
202B: 84 9C             STY  TEMPC
202D: A5 99    M1       LDA  TEMP9          ; NEEM ABSOLUTE WAARDE
202F: F0 48             BEQ  OUTM           ; VERMENIGVULDIGER
2031: 10 09             BPL  M2             ; JUMP OUT ALS VERM = 0
2033: 49 FF             EOR  #$FF           ; SIGN = -1 ALS
2035: 18                CLC                 ; VERM = NEGATIEF
2036: 69 01             ADC  #1
2038: 85 99             STA  TEMP9
203A: C6 97             DEC  TEMP7
203C: A5 9A    M2       LDA  TEMPA          ; NEEM ABSOLUTE WAARDE
203E: F0 39             BEQ  OUTM           ; VERMENIGVULDIGTAL
2040: 10 09             BPL  M3             ; JUMP OUT ALS VERMT = 0
2042: 49 FF             EOR  #$FF           ; SIGN +1 ALS
2044: 18                CLC                 ; VERMT = NEGATIEF
2045: 69 01             ADC  #1
2047: 85 9A             STA  TEMPA
2049: E6 97             INC  TEMP7
204B: 46 9A    M3       LSR  TEMPA          ; SCHUIF VERMT NAAR RECHTS
204D: 90 0D             BCC  M4             ; JUMP ALS CARRY = 0
204F: A5 99             LDA  TEMP9          ; TEL VERMT BIJ PROD
2051: 18                CLC
2052: 65 9B             ADC  TEMPB
2054: 85 9B             STA  TEMPB
2056: A5 98             LDA  TEMP8
2058: 65 9C             ADC  TEMPC
205A: 85 9C             STA  TEMPC
205C: 06 99    M4       ASL  TEMP9          ; SCHUIF VERM NAAR LINKS
205E: 26 98             ROL  TEMP8          ; JMP TOTDAT VERMT=0
2060: A5 9A             LDA  TEMPA
2062: D0 E7             BNE  M3
2064: A5 97    M5       LDA  TEMP7          ; NEEM 2 KOMPLEMENT VAN PROD
2066: F0 11             BEQ  OUTM           ; ALS SIGN <> 0
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2068: A5 9B     >58               LDA  TEMPB
206A: 49 FF     >59               EOR  #$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 VELDKONTRLDA  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 : ONGELDIE
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  ##$A2
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```
2299: 85 9B              STA  TEMPB        ; WEEGFAKTOR IS -94
229B: A9 FF              LDA  #$FF
229D: 85 9C              STA  TEMPC
229F: 20 03 20           JSR  ADD
22A2: 4C 36 22           JMP  STARTP
22A5: A9 40       LOPER  LDA  #$40         ; VANVELD = 40
22A7: 85 B0              STA  VANVELDHEX   ; STUK = LOPER
22A9: A9 05              LDA  #5
22AB: 85 AC              STA  STUKIO
22AD: 84 A8              STY  STUKWRDLOB   ; RESET STUKTELLER
22AF: 84 A9              STY  STUKWRDHOB
22B1: 84 AA       STARTL STY  VELDTELLER   ; RESET VELDTELLER
22B3: 20 DD 20           JSR  SCAN
22B6: C9 FF              CMP  #$FF         ; A <> FF : STUK GEVONDEN
22B8: D0 04              BNE  L1           ; VERWERK
22BA: 20 11 20           JSR  TOTAL
22BD: 60                 RTS
22BE: A2 08       L1     LDX  #8           ; X = RICHTING
22C0: A5 B0       L2     LDA  VANVELDHEX   ; ZOEK IN VOLGENDE RICHTING
22C2: 85 B1              STA  VERTREKHEX
22C4: CA                 DEX               ; WERK RICHTING BIJ
22C5: CA                 DEX
22C6: 30 27              BMI  L5           ; ALLE RICHTINGEN GEHAD
22C8: 20 FD 20    L3     JSR  KODEER       ; ZOEK IN DEZELFDE RICHTING
22CB: 20 14 21           JSR  VELDKONTR
22CE: C9 FF              CMP  #$FF
22D0: F0 EE              BEQ  L2           ; FF=GEEN GELDIG VELD, VOLGENDE RICHTING
22D2: 20 32 21           JSR  NAARVELD
22D5: A5 AE              LDA  SLASTUK
22D7: F0 0E              BEQ  L4           ; NAARVELD IS LEEG
22D9: 29 40              AND  #$40
22DB: 45 A1              EOR  KWIS
22DD: D0 08              BNE  L4           ; STUK KNAZ
22DF: A5 AE              LDA  SLASTUK
22E1: 29 07              AND  #7
22E3: C9 02              CMP  #2
22E5: 30 D9              BMI  L2           ; PION KNAZ
22E7: E6 AA       L4     INC  VELDTELLER   ; L4 : TELT DE VELDEN
22E9: A5 AE              LDA  SLASTUK
22EB: F0 DB              BEQ  L3           ; NAARVELD=LEEG: DOORGAAN IN ZELFDE RICHTING
22ED: D0 D1              BNE  L2           ; NAARVELD HEEFT STUK: VOLGENDE RICHTING
22EF: A5 AA       L5     LDA  VELDTELLER   ; L5 : VERWERKT DE VELDTELLER
22F1: 38                 SEC
22F2: E9 07              SBC  #7           ; AANTAL VELDEN - 7
22F4: 85 99              STA  TEMP9
22F6: A9 0C              LDA  #$0C         ; WEEGFAKTOR = 12
22F8: 85 9A              STA  TEMPA
22FA: 20 25 20           JSR  MULTIPLY
22FD: 20 03 20           JSR  ADD
2300: A5 B0       L6     LDA  VANVELDHEX   ; ONTWIKKELING
2302: 85 B1              STA  VERTREKHEX
2304: 20 77 21           JSR  FIRSTVELD
2307: A5 B4              LDA  BITSTUKIO
2309: C9 01              CMP  #1           ; NIET ONTWIKKELD INDIEN BITVELD = 01
230B: D0 A4              BNE  STARTL
230D: A9 92              LDA  #$92         ; WEEGFAKTOR IS -110
230F: 85 9B              STA  TEMPB
2311: A9 FF              LDA  #$FF
2313: 85 9C              STA  TEMPC
2315: 20 03 20           JSR  ADD
2318: 4C B1 22           JMP  STARTL
231B: A9 40       DAME   LDA  #$40         ; VANVELD = 40
231D: 85 B0              STA  VANVELDHEX
231F: A9 06              LDA  #6           ; STUK = DAME
2321: 85 AC              STA  STUKIO
2323: 84 A8              STY  STUKWRDLOB   ; RESET STUKTELLER
2325: 84 A9              STY  STUKWRDHOB
2327: 84 AA       STARTD STY  VELDTELLER   ; RESET VELDTELLER
2329: 20 DD 20           JSR  SCAN
232C: C9 FF              CMP  #$FF         ; A <> FF : STUK GEVONDEN
232E: D0 04              BNE  DEEN         ; VERWERK
```

```
2330: 20 11 20          JSR TOTAL
2333: 60                RTS              ; RETURN
2334: A5 B0    DEEN     LDA VANVELDHEX   ; DEEN KODEERT POSITIE VAN HET STUK
2336: 85 B1             STA VERTREKHEX
2338: 20 FD 20          JSR KODEER
233B: 85 AD             STA POSITIO
233D: A2 08    DTWEE    LDX #8           ; X = RICHTING
233F: A5 B0    DDRIE    LDA VANVELDHEX   ; ZOEK IN VOLGENDE RICHTING
2341: 85 B1             STA VERTREKHEX
2343: CA                DEX              ; WERK RICHTING BIJ
2344: 30 15             BMI DZES         ; ALLE RICHTINGEN GEHAD
2346: 20 FD 20 DVIER    JSR KODEER       ; ZOEK IN DEZELFDE RICHTING
2349: 20 14 21          JSR VELDKONTR
234C: C9 FF             CMP #$FF
234E: F0 EF             BEQ DDRIE        ; FF = GEEN GELDIG VELD
2350: 20 32 21          JSR NAARVELD
2353: E6 AA    DVIJF    INC VELDTELLER   ; DVIJF TELT DE VELDEN
2355: A5 AE             LDA SLASTUK
2357: F0 ED             BEQ DVIER        ; NAARVELD=LEEG: DOORGAAN IN ZELFDE RICHTING
2359: D0 E4             BNE DDRIE        ; NAARVELD HEEFT STUK: VOLGENDE RICHTING
235B: A5 AA    DZES     LDA VELDTELLER   ; DZES VERWERKT DE VELDTELLER
235D: 85 99             STA TEMP9
235F: A5 A5             LDA STKNUMKNAZ
2361: 4A                LSRA
2362: 4A                LSRA
2363: 4A                LSRA             ; WEEGFAKTOR = 9 - AANTAL STUKKEN KNAZ
2364: 4A                LSRA
2365: 85 98             STA TEMP8
2367: A9 09             LDA #9
2369: 38                SEC
236A: E5 98             SBC TEMP8
236C: 85 9A             STA TEMPA
236E: 20 25 20          JSR MULTIPLY
2371: 20 03 20          JSR ADD
2374: A5 AD    DZEVEN   LDA POSITIO      ; AFSTAND DAME - KONING KNAZ
2376: 85 99             STA TEMP9
2378: A5 AB             LDA KONKNAZ
237A: 85 9A             STA TEMPA
237C: 20 43 21          JSR AFSTAND
237F: A5 9C             LDA TEMPC
2381: 85 99             STA TEMP9
2383: A9 F8             LDA #$F8         ; WEEGFAKTOR IS -8
2385: 85 9A             STA TEMPA
2387: 20 25 20          JSR MULTIPLY
238A: 20 03 20          JSR ADD
238D: 4C 27 23          JMP STARTD
2390: A9 40    TOREN    LDA #$40         ; VANVELD = 40
2392: 85 B0             STA VANVELDHEX
2394: A9 04             LDA #4           ; STUK = TOREN
2396: 85 AC             STA STUKIO
2398: 84 A8             STY STUKWRDLOB   ; RESET STUKTELLER
239A: 84 A9             STY STUKWRDHOB
239C: 84 AA    STARTT   STY VELDTELLER   ; RESET VELDTELLER
239E: 20 DD 20          JSR SCAN
23A1: C9 FF             CMP #$FF         ; A <> FF : STUK GEVONDEN
23A3: D0 04             BNE T1           ; VERWERK
23A5: 20 11 20          JSR TOTAL
23A8: 60                RTS
23A9: A5 B0    T1       LDA VANVELDHEX   ; KODEER POSITIE VAN HET STUK
23AB: 85 B1             STA VERTREKHEX
23AD: 20 FD 20          JSR KODEER
23B0: 85 AD             STA POSITIO
23B2: A2 09    T2       LDX #9           ; X = RICHTING
23B4: A5 B0    T3       LDA VANVELDHEX   ; ZOEK IN VOLGENDE RICHTING
23B6: 85 B1             STA VERTREKHEX
23B8: CA                DEX              ; WERK RICHTING BIJ
23B9: CA                DEX
23BA: 30 34             BMI T7           ; ALLE RICHTINGEN GEHAD
23BC: 20 FD 20 T4       JSR KODEER       ; ZOEK IN DEZELFDE RICHTING
23BF: 20 14 21          JSR VELDKONTR
23C2: C9 FF             CMP #$FF
23C4: F0 EE             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  #$40
2587: 85 B0     >64            STA  VANVELDHEX  ; VANVELD = 40
2589: A9 02     >65            LDA  #2          ; STUK = KONING
258B: 85 AC     >66            STA  STUKIO
258D: 84 A8     >67            STY  STUKWRDLOB  ; RESET STUKTELLER
258F: 84 A9     >68            STY  STUKWRDHOB
2591: 84 95     >69   STARTKI  STY  TEMP5       ; RESET HULPVELDEN
2593: 84 96     >70            STY  TEMP6
2595: 84 AA     >71            STY  VELDTELLER  ; RESET VELDTELLER
2597: 20 DD 20  >72            JSR  SCAN
259A: C9 FF     >73            CMP  #$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
```

```
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
```

```
2687: 60                     RTS
2688: A5 B0         KII1     LDA   VANVELDHEX  ; KODEER POSITIE VAN HET STUK
268A: 85 B1                  STA   VERTREKHEX
268C: 20 FD 20               JSR   KODEER
268F: 85 AD                  STA   POSITIO
2691: A2 40         KII2     LDX   #$40        ; X = RICHTING
2693: CA            KII3     DEX               ; SCAN BORD
2694: 30 21                  BMI   KII4        ; FF = ONGELDIG VELD
2696: B5 16                  LDA   BORD,X
2698: F0 F9                  BEQ   KII3        ; VELD = LEEG
269A: 29 07                  AND   #7
269C: C9 02                  CMP   #2
269E: 10 F3                  BPL   KII3        ; STUK = GEEN PION
26A0: 86 B1                  STX   VERTREKHEX
26A2: 20 FD 20               JSR   KODEER
26A5: 85 99                  STA   TEMP9
26A7: A5 AD                  LDA   POSITIO
26A9: 85 9A                  STA   TEMPA
26AB: 20 43 21               JSR   AFSTAND
26AE: A5 96                  LDA   TEMP6       ; TEMP6 TELT AFSTAND KONING - PIONNEN
26B0: 18                     CLC
26B1: 65 9C                  ADC   TEMPC
26B3: 85 96                  STA   TEMP6
26B5: D0 DC                  BNE   KII3
26B7: A5 96         KII4     LDA   TEMP6       ; VERWERK DE AFSTAND
26B9: F0 29                  BEQ   KII5        ; GEEN PIONNEN
26BB: 85 97                  STA   TEMP7
26BD: 84 98                  STY   TEMP8       ; BEREKEN QUOTIENT TOTALE AFSTAND/PIONNEN
26BF: A5 A3                  LDA   STKWRDKNAZ
26C1: 29 0F                  AND   #$0F
26C3: 85 99                  STA   TEMP9
26C5: A5 A5                  LDA   STKNUMKNAZ
26C7: 29 0F                  AND   #$0F
26C9: 18                     CLC
26CA: 65 99                  ADC   TEMP9
26CC: 85 99                  STA   TEMP9
26CE: 84 9A                  STY   TEMPA
26D0: 20 7A 20               JSR   DIVIDE
26D3: A5 9B                  LDA   TEMPB
26D5: 38                     SEC
26D6: E9 06                  SBC   #6          ; RESULTAAT - 6
26D8: 85 99                  STA   TEMP9
26DA: A9 B2                  LDA   #$B2        ; WEEGFAKTOR IS -78
26DC: 85 9A                  STA   TEMPA
26DE: 20 25 20               JSR   MULTIPLY
26E1: 20 03 20               JSR   ADD
26E4: A5 AD         KII5     LDA   POSITIO     ; AFSTAND KONING - CENTRUM
26E6: 85 99                  STA   TEMP9
26E8: A9 44                  LDA   #$44        ; CENTRUM = 44
26EA: 85 9A                  STA   TEMPA
26EC: 20 43 21               JSR   AFSTAND
26EF: 85 98                  STA   TEMP8
26F1: A9 55                  LDA   #$55        ; CENTRUM = 55
26F3: 85 9A                  STA   TEMPA
26F5: 20 43 21               JSR   AFSTAND
26F8: 18                     CLC
26F9: 65 98                  ADC   TEMP8
26FB: 85 99                  STA   TEMP9
26FD: A9 F0                  LDA   #$F0        ; WEEGFAKTOR IS -16
26FF: 85 9A                  STA   TEMPA       ;
2701: 20 25 20               JSR   MULTIPLY
2704: 20 03 20               JSR   ADD
2707: 4C 7B 26      KIIOUT   JMP   STARTKII
270A: A5 A0         INIT     LDA   KAZ
270C: 85 A1                  STA   KWIS        ; KLEURWISSEL = KLEUR
270E: A0 00                  LDY   #0          ; Y=00 GEDURENDE HELE PROGRAMMA
2710: A2 07                  LDX   #7          ; RESET ALLE TELLERS
2712: 94 A2         IIA      STY   STKWRDKAZ,X
2714: CA                     DEX
2715: 10 FB                  BPL   IIA
2717: 84 AF                  STY   DAMKNAZ     ; RESET AF
2719: A9 40                  LDA   #$40
271B: 85 B0                  STA   VANVELDHEX
```

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271D: A6 B0     I3        LDX  VANVELDHEX ; SCAN BORD
271F: CA                  DEX
2720: 30 67               BMI  OUTINIT    ; FF = ONGELDIG VELD
2722: 86 B0               STX  VANVELDHEX ; HAAL VELD
2724: B5 16               LDA  BORD,X
2726: F0 F5               BEQ  I3         ; VEELD = LEEG
2728: 85 AE               STA  SLASTUK
272A: 29 40               AND  #$40
272C: 45 A1               EOR  KWIS
272E: D0 1F               BNE  I5         ; STUK KNAZ
2730: A5 AE     I4        LDA  SLASTUK    ; STUK KAZ
2732: 29 07               AND  #7
2734: 48                  PHA             ; TEL STUKWAARDE IN A2
2735: AA                  TAX             ; C9-CF = TABEL
2736: B5 C9               LDA  STUKTAB,X
2738: 18                  CLC
2739: 65 A2               ADC  STKWRDKAZ
273B: 85 A2               STA  STKWRDKAZ
273D: 68                  PLA
273E: C9 02               CMP  #2         ; PION ?
2740: 10 04               BPL  I4A
2742: E6 A3               INC  STKWRDKNAZ ; TEL AANTAL PIONNEN IN A3
2744: D0 D7               BNE  I3
2746: A5 A3     I4A       LDA  STKWRDKNAZ ; TEL AANTAL STUKKEN IN A3
2748: 18                  CLC
2749: 69 10               ADC  #$10
274B: 85 A3               STA  STKWRDKNAZ
274D: D0 CE               BNE  I3
274F: A5 AE     I5        LDA  SLASTUK    ; STUK KNAZ
2751: 29 07               AND  #7
2753: 48                  PHA             ; TEL STUKWAARDE IN A4
2754: AA                  TAX             ; C9-CF = TABEL
2755: B5 C9               LDA  STUKTAB,X
2757: 18                  CLC
2758: 65 A4               ADC  STKNUMKAZ
275A: 85 A4               STA  STKNUMKAZ
275C: 68                  PLA
275D: C9 02               CMP  #2         ; PION ?
275F: 10 04               BPL  I5A
2761: E6 A5               INC  STKNUMKNAZ ; TEL AANTAL PIONNEN IN A5
2763: D0 B8               BNE  I3
2765: A5 A5     I5A       LDA  STKNUMKNAZ
2767: 18                  CLC             ; TEL AANTAL STUKKEN IN A5
2768: 69 10               ADC  #$10
276A: 85 A5               STA  STKNUMKNAZ
276C: A5 AE     I6        LDA  SLASTUK    ; KONING KNAZ
276E: 29 07               AND  #7
2770: C9 02               CMP  #2         ; STUK KONING ?
2772: D0 0B               BNE  I7
2774: A5 B0               LDA  VANVELDHEX ; BEWAAR POSITIE KONING KNAZ
2776: 85 B1               STA  VERTREKHEX ; WANT DIE IS VAAK NODIG
2778: 20 FD 20            JSR  KODEER
277B: 85 AB               STA  KONKNAZ
277D: D0 9E               BNE  I3
277F: C9 06     I7        CMP  #6         ; DAM KNAZ
2781: D0 9A               BNE  I3
2783: A9 02               LDA  #2
2785: 85 AF               STA  DAMKNAZ    ; AF=2 : INDIEN DAME AANWEZIG
2787: D0 94               BNE  I3         ; ANDERS 0
2789: 60        OUTINIT   RTS
278A: 48        STUUR     PHA             ; SAVE AKKU
278B: A9 36               LDA  #$36
278D: 8D 80 1A            STA  PAD        ; STUUR DISPLAYS
2790: A9 12               LDA  #$12
2792: 8D 82 1A            STA  PBD
2795: 20 0A 27  SI        JSR  INIT       ; DOE HOOFDSUBS BEHALVE DE KONING
2798: 20 2A 22            JSR  PAARD
279B: 20 A5 22            JSR  LOPER
279E: 20 1B 23            JSR  DAME
27A1: 20 90 23            JSR  TOREN
27A4: 20 71 24            JSR  PION
27A7: A5 AF               LDA  DAMKNAZ    ; DOE KONINGII ALS AF <> 0 EN ALS
27A9: D0 0C               BNE  SIA        ; ALS STUKWAARDE KNAZ < 70: ANDERS KI
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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
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## 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

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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$(PEEK(TW+20))+CHR$(FEEK(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
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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 PR)NT "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
```

ØK

## 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    *      $E000
     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

Author : W. van Asperen
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 invoked 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 steprate, 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 ms 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 .0S65D (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)

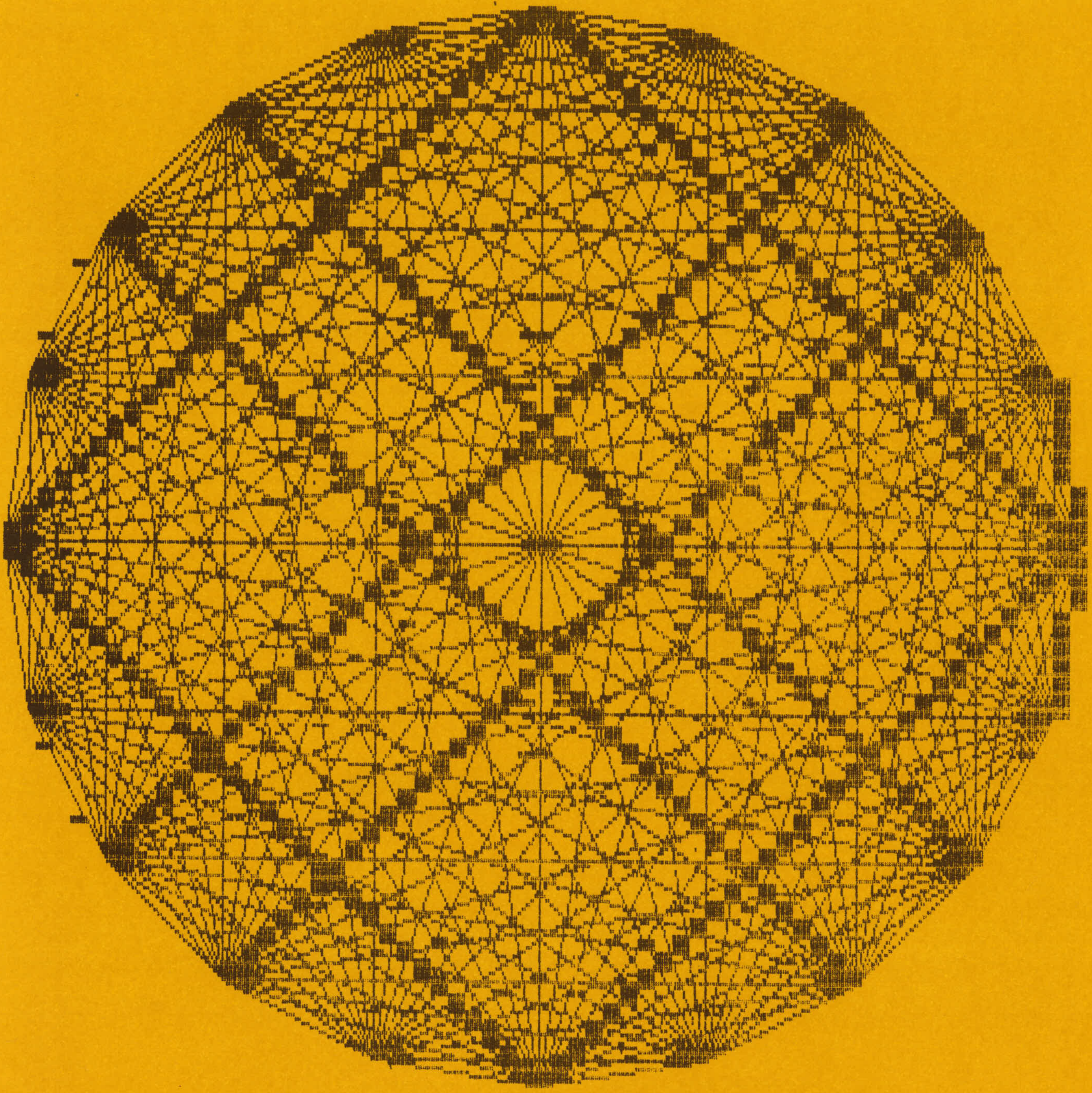
Now you have created a disk that may be able to boot up your system. Please note that the required values for address 26A3 and 26A5 may be different for each drive (refer to the manual of the drive).

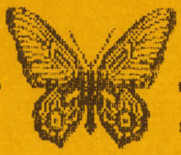
It appears to be very usefull first to make a back-up copy of a disk, before you start changing the contents as described before.

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.

# DE 6502 KENNER





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