RADIO SHACK COLOR COMPUTER MAGAZINE

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DYNAMIC COLOR NEWS

We are now in our fourth year. The purpose of DCN is to provide instruction on Basic and Machine Language Programming, Computer Theory, Operating Techniques, Computer Expansion, Product Reviews, New Products plus provide answers to questions from our subscribers. Included in each issue are Basic Programs with detailed comments so you can understand the purpose of each line. We show how to write machine language subroutines and call them from your Basic programs. Also we show how to interface your computer with hardware projects. Did you know that the joystick port can be used for many hardware applications such as digital voltmeters and thermometers? We showed how to build these in recent issues. We ran a series showing how EPROMS can be used for containing data and programs? Due to popular demand a Ham Radio section is included. DCN is written in a non technical style and is designed to be a learning tool.

TOPICS

* CoCo 3
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* Assembly Language

PROGRAMS

Electronic Billboard
Check Book
Gas Mileage
Character Generator
Card Shuffling
Word Processing
Alarm Clock
Morse Code
Bomber Chase (Game)
Address File with Sort
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Sound Generator
Grade Book
Inventory
Graphics Draw
Bank Switching
Antenna Design
Graphics zoom
Terminal Program
Loan Interest
Chords (Music)
Disk File
Lucky Money
Invoice

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Ham Radio
Measuring Light
ML Programming
Color Computer 3

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The purpose of this magazine is to provide instruction on Basic & Machine Language programming, Computer theory, operating techniques, computer expansion, plus provide answers to questions from our subscribers.

The submission of questions, operating hints, and solutions to problems to be published in this magazine are encouraged. All submissions become the property of Dynamic Electronics if the material is used. We reserve the right to edit all material used and not to use material which we determine is unsuited for publication.

We encourage the submission of Basic and Machine Language Programs as well as articles. All Programs must be well documented so the readers can understand how the program works. We will pay for programs and articles based upon their value to the magazine. Material sent will not be returned unless return postage is included. Basic & ML programs should be sent on a tape or disk & comments should be sent as a DAT or BIN file.

DYNAMIC COLOR NEWS

June/July 1987

Editor and Publisher
Bill Chapple W4GQC

Secretary
Dean Chapple

CONTENTS

256K & 512K MEMORY UPGRADES

We are closing out these **Banker** RAMS by J & R Electronics. These upgrade the older **D, E, F or 285** and earlier CoCo 2 computers with **4164** memory chips and a socketed SAM (6883) chip. Features include:

* Fast 35/40 Track Ramdisk (2 Ramdisks with 512K)
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Two plug in assemblies will upgrade the new CoCo-2 computers to 256K. Two miniature toggle switches allow independently selecting any one of the 4-64K memories. Features include:

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* Load any combination of programs into the banks. Quickly switch from one to the other.
* Easy solderless installation requires drilling two small holes for the switches.

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128K MEMORIES

Same as the ME-18 except has one switch and 2-64K memories with Memory Manager Software. Upgrades the new CoCo-2 Computers to 128K. **Order ME-10A $39.95**

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MEMORY MANAGER - A complete set of software for managing the second 32K memory bank in 64K or larger computers. Run Basic programs in each bank or use the Ramdisk for program storage. Available free with our memory upgrades. $21.95 Disk or Tape.

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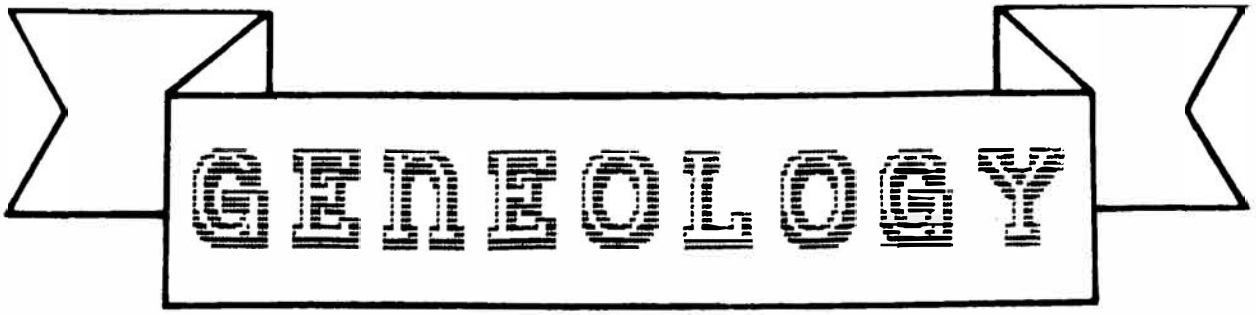

We have had many requests for a geneology program. This program is provided by T & D Subscription Software (See their advertisement on page 8) and is used by permission.

This is a home management program that will allow you to trace your family tree both backward and forward. It is best to start with the oldest known relative and work forward. When you get to the menu page, press V to View/Edit the tree. Then press E to edit. Then enter the correct surname, first name, and spouse's name. Press 5 for every child that they had and then press 6 to put in their names and marital statuses. If you go back to the previous menu, you can use the arrow keys to go back and forth examining different levels and columns. The children have already been placed in a higher level. You can now repeat the cycle with them and print them out neatly on the printer.

```
1 REM COPYRIGHT (C) T&D SOFTWARE
    1987        geneology
2 PMODE0:GOTO60000
50 REM
52 IFPEEK(116)=&H7F THENCLEAR600
   0:MY=6:MX=14:MK=10:KK=150 ELS
   ECLER2000:MY=6:MX=8:MK=8:KK=1
   00
53 DIM P$(30),CP$(6,MX,2),CP(6,M
   X,MK+1),KD$(KK),KF(KK)
54 CP$(0,1,0)="<<SURNAME>>":CP$(
   0,1,1)="<<FIRST NAME>>":CP$(0
   ,1,2)="<<SPOUSE NAME>>":CP(0,
   1,0)=1:CP(0,1,1)=0
57 IFPEEK(&HC000)=68 THENDN=1 EL
   SEDN=-1
60 CLS:PRINT:PRINT"              gen
   eology":PRINT
61 PRINT" THIS PROGRAM WILL HELP
    YOU      KEEP TRACK AND MAKE
    NEAT PRINT  OUTS OF YOUR FAM
   ILY TREE.
62 PRINT" THE CONTROLS ARE EASY
   TO USE    AND ALLOW YOU TO ED
   IT AND SAVE  DATA."
63 PRINT" THIS PROGRAM CAN WORK
   FORWARD   AND BACKWARD, BUT I
   T IS BEST    IF YOU START WIT
   H OLDEST KNOWN  RELATIVES AND
    WORK YOUR WAY      FORWARD."
69 GOSUB9000:CLS:PRINT@64
70 PRINT" THIS PROGRAM CAN HOLD
   A MAXI-   MUM OF 7 GENERATION
   S BY 12      FAMILIES WIDE WI
   TH 10 KIDS PER  FAMILY IN A 3
   2K SYSTEM."
71 PRINT" FOR A 16K SYSTEM, THE
   MAXIMUM   IS 7 GENERATIONS BY
    8 FAMILIES  WIDE WITH 8 KIDS
    PER FAMILY."
72 PRINT" THE PROGRAM WORKS LIKE
    THIS:    GENERATIONS ARE NUM
   BERED FROM   0 TO 7, 0 BEING
   THE OLDEST.":GOSUB9000:CLS:PR
   INT@64
73 PRINT" START AT LEVEL 0, PUT
   IN THE    NAMES. THEN SET THE
    NUMBER OF   CHILDREN IN THAT
    FAMILY. NEXT,  EDIT THE NAME
   S OF THE CHILDREN  TO BE CORR
   ECT. WHEN A CHILD IS  INITIAL
   IZED, IT IS CLASSIFIED   AS '
   S'INGLE. AS LONG AS ITS
74 PRINT" STATUS IS NOT CHANGED
   THE       CHILD WILL BE LISTE
   D ONLY       WITHIN THAT FAMI
   LY BLOCK.":GOSUB8000:PRINT" W
   HEN THAT CHILD GETS MARRIED
     AND YOU CHANGE THE STATUS O
   N    THE COMPUTER, THAT CHILD
    IS     AUTOMATICALLY TRANSFE
   RRED TO
75 PRINT" NEXT HIGHER GENERATION
    (LEVEL)  ALONG WITH HIS/HER
   SPOUSE.      LATER ON, WHEN T
   HEY HAVE        CHILDREN, AND
    THEIR CHILDREN    MARRY, THE
   Y TOO WILL BE AUTO-   MATICAL
   LY MOVED TO THE NEXT     GENE
   RATION TO START THEIR OWN
76 PRINT" 'FAMILY BLOCK'."
77 GOSUB9000
80 CLS:PRINT@32
82 PRINT"          geneology menu
   "
```

```
84 PRINT
86 PRINT"       i/o device = ";:
   IF DN=1 THENPRINT"disk" ELSEP
   RINT"tape"
87 PRINT
88 PRINT"     C. CHANGE I/O DEVI
   CE            L. LOAD DATA FI
   LE               S. SAVE DATA
    FILE
90 PRINT"     V. VIEW/EDIT TREE
                 P. PRINT TREE
                    Q. QUIT"
92 PRINT:PRINT"          your ch
   oice?"
94 K$=INKEY$:IFK$="" THEN94
95 P=INSTR("CLSVPQ",K$):IFP=0 TH
   EN94
96 ON P GOTO 99,100,110,120,300,
   990
99 IFDN=1 THEN DN=-1:GOTO80 ELSE
   DN=1:GOTO80
100 PF$="LOAD":GOSUB10000:IFF$="
    " THEN80
101 OPEN"I",#DN,F$
102 FORI=0TO MY:FORJ=1TO MX:FORK
   =0TO2:LINE INPUT#DN,CP$(I,J,K
   ):NEXT:FORK=0TO MK+1:INPUT#DN
   ,CP(I,J,K):NEXT:NEXT:NEXT
103 INPUT#DN,NK
104 FORI=1TO NK:LINE INPUT#DN,KD
   $(I):INPUT#DN,KF(I):NEXT
109 CLOSE:GOTO80
110 PF$="SAVE":GOSUB10000:IFF$="
    " THEN80
111 OPEN"O",#DN,F$
112 FORI=0TO MY:FORJ=1TO MX:FORK
   =0TO2:PRINT#DN,CP$(I,J,K):NEX
   T:FORK=0TO MK+1:PRINT#DN,CP(I
   ,J,K):NEXT:NEXT:NEXT
113 PRINT#DN,NK
114 FORI=1TO NK:PRINT#DN,KD$(I):
   PRINT#DN,KF(I):NEXT
119 CLOSE:GOTO80
120 X=1:Y=0
130 GOSUB1000
140 PRINT@481,"ARROWS/LEVEL  E/E
   DIT  M/MENU";
142 K$=INKEY$:IFK$="M" THEN80
143 IFK$="E" THEN150
144 IFK$="B THEN145 ELSEIFK$=CHR
   $(10) THEN146 ELSEIFK$=CHR$(8
   ) THEN147 ELSEIFK$=CHR$(9) TH
   EN148 ELSE142
145 IFY=0 THEN142 ELSEY=Y-1:GOTO
   130
146 IFY=MY THEN142 ELSEY=Y+1:GOT
   O130
147 IFX=1 THEN142 ELSEX=X-1:GOTO
   130
148 IFX=MX THEN 142 ELSEX=X+1:GC
   TO130
150 PRINT@480,STRING$(31,32);:PR
   INT@480," PRESS 1-6 TO EDIT -
    0 TO QUIT";:PRINT@96,"1";:PR
   INT@160,"2";:PRINT@192,"3";:P
   RINT@224,"4";:PRINT@256,"5 AD
   D";:PRINT@288,"6";
155 K$=INKEY$:IFK$="" THEN155 EL
   SEIFK$="0" THEN130
156 K=VAL(K$):IFK<1 OR K>6 THEN1
   55
157 ON K GOTO 160,162,164,166,16
   8,170
160 PRINT@106,"";:LINE INPUT T$:
   IFT$<>"" THENCP$(Y,X,0)=T$
161 GOSUB1000:GOTO150
162 PRINT@173,"";:LINE INPUT T$:
   IFT$<>"" THENCP$(Y,X,1)=T$
163 GOSUB1000:GOTO150
164 PRINT@206,"";:LINE INPUT T$:
   IFT$<>"" THENCP$(Y,X,2)=T$
165 GOSUB1000:GOTO150
166 IFCP(Y,X,0) THEN155
167 CP(Y,X,0)=1:CP(Y,X,1)=0:GOSU
   B1000:GOTO150
168 IFCP(Y,X,1)=10 THEN155 ELSEC
   P(Y,X,1)=CP(Y,X,1)+1:NK=NK+1:
   KD$(NK)="CHILD":KF(NK)=0:A=CP
   (Y,X,1):CP(Y,X,1+A)=NK
169 GOSUB1000:GOTO150
170 IFCP(Y,X,1)=0 THEN155 ELSEPR
   INT@480,STRING$(31,32);:PRINT
   @480," ARROWS MOVE STAR E/EDI
   T Q/QUIT";
171 PT=1
172 PRINT@320+(PT-1)*16,"*";
173 K$=INKEY$:IFK$=CHR$(8) THEN1
   80 ELSEIFK$=CHR$(9) THEN182
174 IFK$="E" THEN185 ELSEIFK$="Q
    " THEN150 ELSE173
180 IFPT=1 THEN173 ELSEPRINT@320
   +(PT-1)*16," ";:PT=PT-1:GOTO1
   72
182 IFPT=CP(Y,X,1) THEN173 ELSEP
   RINT@320+(PT-1)*16," ";:PT=PT
   +1:GOTO172
185 PRINT@480," 1/EDIT NAME 2/ED
   IT MAR. STATUS";
187 K$=INKEY$:IFK$="1" THEN190
188 IFK$="2" THEN194 ELSE187
190 PRINT@321+(PT-1)*16,"";:LINE
    INPUT T$:IFT$<>"" THENKD$(CP
   (Y,X,PT+1))=T$
191 GOSUB1000:GOTO170
194 A=CP(Y,X,PT+1):IFKF(A) THEN1
   99
195 KF(A)=1:NG=Y+1:IFNG>MY THEN1
   99
196 F=0:FORI=1TO MX:S$=CP$(NG,I,
   0):IFS$="" THENF=I:I=100
```

```
197 NEXT:IFF=Ø THEN199 ELSECP$(N
   G,F,Ø)=CP$(Y,X,Ø):CP$(NG,F,1)
   =KD$(A):CP$(NG,F,2)="<SPOUSE
   NAME>":CP(NG,F,Ø)=1:CP(NG,F,1
   )=Ø
199 GOSUB1ØØØ:GOTO15Ø
3ØØ CLS:PRINT@64
3Ø1 PRINT" SINCE ONLY A PORTION
   OF THE     ENTIRE TREE MAY BE
    PRINTABLE    ON A STANDARD W
   IDTH PRINTER,     YOU MUST SPE
   CIFY WHICH COLUMN    TO START
   WITH. THIS WAY YOU      CAN PR
   INT OUT THE ENTIRE TREE    3 C
   OLUMNS AT A TIME  AND TAPE"
3Ø2 PRINT" THE SHEETS TOGETHER T
   O MAKE      ONE VERY W I D E S
   HEET.":PRINT
3Ø3 PRINT" (1-";:Z=MX-2:IFZ<1Ø T
   HENPRINTUSING"#";Z;:PRINT")?
   "; ELSEPRINTUSING"##";Z;:PRIN
   T")? ";
3Ø4 LINE INPUT A$:SC=VAL(A$):IFS
   C=Ø THEN8Ø
3Ø5 IF SC<1 OR SC>Z THEN3ØØ
3Ø9 FORY=Ø TO6
31Ø FORQ=1TO3Ø:P$(Q)=STRING$(8Ø,
   32):NEXT
32Ø FORX=SC TO SC+2
33Ø IFCP$(Y,X,Ø)="" THEN 37Ø
334 T$="*"+CP$(Y,X,Ø)+"*":IFLEN(
   T$)<23 THENT$=STRING$((24-LEN
   (T$))/2,32)+T$
335 MID$(P$(1),(X-SC)*24+1,LEN(T
   $))=T$
336 N1$=LEFT$(CP$(Y,X,1),1Ø):N2$
   =LEFT$(CP$(Y,X,2),1Ø)
337 IFLEN(N1$)<1Ø THEN N1$=" "+N
   1$:GOTO337
338 T$=N1$+" & "+N2$
34Ø MID$(P$(2),(X-SC)*24+1,LEN(T
   $))=T$
342 T$=".":MID$(P$(3),(X-SC)*24+
   12,LEN(T$))=T$
344 MID$(PG(4),(X-SC)*24+12,1)=T
   $
345 T$="...........":MID$(P$(5)
   ,(X-SC)*24+6,LEN(T$))=T$
346 T$=".           .":MID$(P$(6)
   ,(X-SC)*24+6,LEN(T$))=T$
348 NK=CP(Y,X,1):IFNK=Ø THEN37Ø
35Ø FOR U=1 TO NK STEP 2:V=CP(Y,
   X,U+1)
352 T$=LEFT$(KD$(V),8)+" ":IFKF(
   V) THENT$=T$+"M" ELSET$=T$+"S
   "
355 MID$(P$(6+U),(X-SC)*24+1,12)
   =T$:V=CP(Y,X,U+2)
356 T$=LEFT$(KD$(V),8)+" ":IFKF(
   V) THENT$=T$+"M" ELSET$=T$+"S
   "
357 IFU=NK AND INT(NK/2)<>NK/2 T
   HEN36Ø
358 MID$(P$(6+U),(X-SC)*24+12,12
   )=T$
36Ø NEXT U
37Ø NEXT X
371 FORQ=1TO3Ø:IFP$(Q)=STRING$(8
   Ø,32) THENP$(Q)=""
372 NEXT Q
375 FORQ=1TO3Ø
376 IFP$(Q)="" THEN378
377 PRINT#-2,P$(Q)
378 NEXT Q
379 PRINT#-2
38Ø NEXT Y
399 GOTO8Ø
99Ø CLS:PRINT@232,"ok to quit? y
   /n"
991 K$=INKEY$:IFK$="N" THEN8Ø
992 IFK$<>"Y" THEN991
999 END
1ØØØ CLS:EF=Ø:S$=CP$(Y,X,Ø):F1$=
   CP$(Y,X,1):F2$=CP$(Y,X,2)
1Ø2Ø CLS:PRINT
1Ø3Ø PRINT"     LEVEL "Y;" COLUM
   N "X
1Ø35 IFS$="" THENEF=1:PRINT:PRIN
   T" SURNAME: empty":GOTO1Ø6Ø
1Ø4Ø PRINT
1Ø5Ø PRINT" SURNAME: ";S$
1Ø6Ø PRINT
1Ø7Ø PRINT" FIRST NAME: ";F1$
1Ø8Ø IF CP(Y,X,Ø) THENPRINT" SPO
   USE NAME: ";F2$ ELSE PRINT
1Ø9Ø PRINT"      MARRIED? ";:IF
   CP(Y,X,Ø) THENPRINT"YES" ELSE
   PRINT"NO"
11Ø5 IF CP(Y,X,Ø)=Ø THEN1999
111Ø PRINT"      NUMBER OF CHILD
   REN: ";CP(Y,X,1)
112Ø N=CP(Y,X,1):IFN=Ø THEN12ØØ
1125 PRINT"        -- CHILDREN -
   -"
113Ø FOR I=1 TO N
1135 IFKF(CP(Y,X,I+1)) THEN ST$=
   "M" ELSE ST$="S"
114Ø PRINT@321+(I-1)*16,USING"%
          % !";LEFT$(KD$(CP(Y,
   X,I+1)),12);ST$;
115Ø NEXT
12ØØ REM
1999 RETURN
8ØØØ GOSUB9ØØØ:CLS:PRINT@32:RETU
   RN
9ØØØ PRINT@484,"press any key to
    continue";
9Ø1Ø IFINKEY$="" THEN9Ø1Ø
9Ø2Ø RETURN
1ØØØØ CLS:PRINT@228,PF$+" FILENA
   ME: ";:LINE INPUT F$:RETURN
6ØØØØ PCLEAR1:GOTO5Ø
```

6809 PROGRAMMING

by

JOHN BALLS

PART # 14

A LITTLE MORE MATH

The largest number that can be represented in 16 bits is 65,535. Sometimes we may need to deal with numbers larger then that. We can accomplish this by putting together one byte adds or subtracts using the ADC or SBC instructions. The ADC and the SBC commands, adds and subtracts numbers using the carry condition code. The ADC and the SBC can be used with the 8 bit A or B registers. The ADC adds numbers like the normal ADD instruction except, that the current result held in the carry is added to the result. For example, if we added the numbers 100 + 200 then the result would of course be 300 but, since an 8 bit register can only hold a value of 0 to 255 the overflow sets the carry condition code bit. If we added the two numbers above using an 8 bit add the result held in the register would be 45 and the carry would be set.

```
200+100=300
45+255=300  result+carry
```

The ADC instruction takes advantage of this fact by adding in the carry for you. Here is how we can use the ADC instruction to perform multiple-precision addition.

4-BYTE ADD:

```
MATH  LDX #NUM1+3 ;POINT TO LSB
      LDY #NUM2+3 ;LSB OF 2ND
      LDU #RES+3  ;TO RESULT
      LDB #4      ;4 BYTES
      ANDCC #$FE  ;CLEAR CARRY
LOOP  LDA ,X      ;GET OPER
      ADCA ,Y     ;ADD 2ND #
      STA  ,U     ;SAVE RESU
      LEAX -1,X   ;DO NEXT
      LEAY -1,Y
      LEAU -1,U
      DECB        ;COUNT-1
      BNE  LOOP
      SWI
NUM1  FDB  $A013
      FCB  $F067
NUM2  FDB  $E0E0
      FDB  $10FE
RES   FDB  0
      FDB  0
      END
```

In the above routine we start by pointing the X register to the least significant byte (LSB) of the first number and the Y register to the LSB of the second number we want to add together. Then we add the LSB and then the MSB of the numbers. We next point to U register where we will place our result. Then since we are adding four byte number we load the count in the B register with four. We could change this to any value we wanted just be sure to align the X, Y and U registers accordingly. On the next line we "mask" the carry code using the AND operation, this clears the carry for the first addition since we don't want to add the carry in the first time around. Then beginning at loop we load the A register with a byte of the first number and then ADC the second numbers to it storing the result in the U register.

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We do subtraction in the same manner except, this time the carry holds a borrow from a next higher byte.

4-BYTE SUBTRACTION:

```
MINUS   LDX   #NUM1+3
        LDY   #NUM2+3
        LDU   #RES+3
        LDB   #4
        ANDCC #$FE
LOOP    LDA   ,X
        SBCA  ,Y
        STA   ,U
        LEAX  -1,X
        LEAY  -1,Y
        LEAU  -1,U
        DECB
        BNE    LOOP
        SWI
NUM1    FDB   $1Ø47
        FDB   $ØØ76
NUM2    FDB   $6798
        FDB   $32FØ
RES     FDB   Ø
        FDB   Ø
        END
```

MULTIPLICATION

If you remember from a past part of this series I showed you how to use the built in MUL instruction to perform 8 bit multiplication. Since the MUL instruction used the two 8 bit A and B registers, we found out that the highest multiply we could perform was 255 * 255 = 65,Ø25. We can perform higher precision multiplcation by doing two seperate multiplications and a little addition. Here we will multiply a two byte number with a one byte number leaving a three byte result.

```
MULT    LDA   NUM2
        LDB   NUM1+1
        MUL
        STD   RES+1
        LDA   NUM2
        LDB   NUM1
        MUL
        ADDB  RES+1
        ADCA  #Ø     ;ADD IN CARRY
        STD   RES
        SWI
NUM1    FDB   $FFFØ
NUM2    FCB   $67   ;MULTIPLER
RES     FDB   Ø
        FCB   Ø
        END
```

DIVISION

We will next see how to divide a two byte number by a one byte number. We do this division by a method known as "restoring division" by subtracting the divisor from the dividend, if the subtaction goes we add one to the answer, if the subtraction doesn't go we "restore" the dividend by adding the divisor back to the dividend. We check this subtraction by testing the carry flag. If the Carry is set (1) the subtraction will go otherwise we add the divisor back to the dividend and try again. Remember that we are dealing with binary numbers.

```
MATH LDX DIVI   ;GET DIVIDEND
     LDA DIVS   ;GET DIVISOR
     PSHS X,A   ;SAVE THEM
     CLRA
     LDB 1,S    ;GET BYTE
                ;OFF STACK
     BSR DIV    ;PERFORM DIVIDE
     STB 1,S    ;SAVE RESULT
     LDB 2,S    ;GET LSB
     BSR DIV
     STB 2,S
     PULS B,X   ;GET QUOTIENT
     SWI
DIV  LDX #8     ;COUNTER
DIV1 LSLB
     ROLA       ;SHIFT D REG
     ORB #1     ;SET Q BIT TO 1
     BCC  DIV2  ;NO CARRY?
     SUBA 2,S   ;SUB GOES
     BRA OUT
DIV2 SUBA 2,S
     BHS OUT
     ANDB #$FE  ;RESET BIT
     ADDA 2,S   ;RESTORE DIV
OUT  LEAX -1,X
     BNE DIV1
     RTS
DIVI FDB $Ø3E8
DIVS FDB $75
     END
```

In the above the X register will contain the answer and the A register will contain the remainder of the division. In the above routines we have been dealing with unsigned numbers. To discover the sign of a number we look at the Most Significant bit of the byte designated as the "sign bit". If this bit is set (1) the number is negative if reset (Ø) the number is positive. If we assembled the Assembly statement LDA #-1 you would see the the number -1 was represented by the hex value of $FF or 255. We can find the value of a negative number by using taking the two's complement of the number and adding one.

EXAMPLE:

-1 = 1 1 1 1 1 1 1 1

TWO'S COMPLEMENT
Ø Ø Ø Ø Ø Ø Ø Ø

PLUS ONE
Ø Ø Ø Ø Ø Ø Ø 1

To perform this in Assembler we would do the following using the COM instruction.

```
START LDA #-1
      COMA
      ADDA #1
```

The 68Ø9's instruction set has a command that will perform this function for us called the NEG or Negate instruction. The NEG works with the A or B registers or a memory and performs a two's complement on them and adds one. In effect this command changes a negative number into a positive one and visa versa.

```
NEGA
NEGB
NEG  MEMORY
```

To do Signed math, we perform unsigned arithmetic operations then use the EOR Exclusive Or instruction to obtain the correct sign. The sign of a math operation is the EOR of the two operands or numbers.

Ø EOR Ø = Ø
Ø EOR 1 = 1
1 EOR Ø = 1
1 EOR 1 = Ø

Remember the the MSB bit holds the sign of a number. If both numbers are positive their sign byte will be zero and the resulting number will be positive. If either number is negative, the sign bit = 1. Let's perform a signed multiply.

```
SIGN  LDA  NUM1
      EOR  NUM2   ;CHECK SIGNS
      PSHS CC     ;SAVE RESULT
      LDD  NUM1
      BPL  PLUS   ;IF +
      LDD  #Ø
      SUBD NUM1   ;MAKE NEG
      STD  NUM1
PLUS  LDA  NUM2
      BPL  PL2    ;IF +
      NEGA        ;MAKE IT NEG
      STA NUM2
PL2   BSR MULT
      PULS CC     ;GET SIGN BACK
      BPL  FIN    ;END IF +
      LDD  #Ø
      SUBD RES
      STD  RES    ;- RESULT IN D
FIN   SWI
MULT  LDA NUM2
      LDB NUM1+1
      MUL
      STD RES+1
      LDA NUM2
      LDB NUM1
      MUL
      ADDB RES+1
      ADCA #Ø
      STD  RES
      RTS
NUM1  FDB  $Ø3E8
NUM2  FCB  $75
RES   FDB  Ø
      FCB Ø
      END
```

In the above the answer will be in RES. As you can see from the above routines that these math function take quite a bit of work to implement in Assembly language. In a future issue I will show you how to use the Floating Point Math routines that Basic uses to perform its math.

INTERFACING COMPUTERS

MEASURING LIGHT

In this series we have been showing how to use the various ports on the computer. We covered the serial port and gave a terminal program for transferring programs and data to another computer or device.

For the past few months we have been looking at using the joystick ports for various applications. There are 4 joystick ports within the computer. Each joystick plug contains two ports. The term "port" means a connector for bringing information into the computer or taking information from the computer. For color computers there are 4 joystick ports, one serial port, and one expansion port. The serial port is used for a printer and the expansion port can be used for a disk drive or cartridge.

The joystick ports accept voltages from Ø to 5 volts. This voltage is converted into a digital word by the JOYSTK (X) command where X is a value from Ø to 3. An analog to digital converter converts the joystick voltage to a value from Ø to 63. We can use the joystick port for other purposes if we can apply a voltage from Ø to 5 volts to the port.

This month we want to look at measuring light using a joystick port. Fortunately a photo resistor is readily available at Radio Shack and other electronic supply stores. These are called Cadmium Sulfide (Cds) Photo cells. A photo cell is a resistor that changes value with light. It has the characteristic of decreasing resistance as more light is detected.

Refer to our basic joystick circuit in Figure 1. Pin 1 is

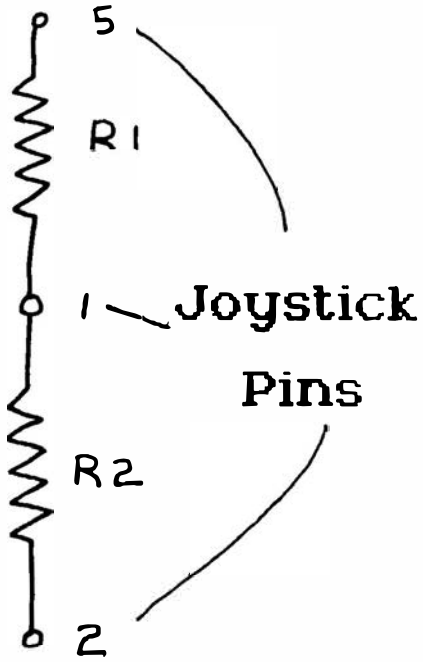


FIGURE 1

the input to the computer and its voltage is what is detected by the joystick command. To measure light we will let the photo cell be R1. The value of R2 should be about 1K.

We do not have a device for measuring light like we do for voltage or temperature. However we can tell when it is normal room light, dark,or very bright. We could establish a light level and easily build a controller to turn on outside lights at dark and turn them on when the sun comes up. Color computers are very good for controlling devices and are used for this purpose by many industries. The cassette relay can be used to turn on a larger relay for controlling devices. Of course it can be controlled by the MOTOR ON and MOTOR OFF commands.

SOFTWARE

After wiring the photocell to a joystick plug as shown in Figure 1, write a simple program similar to the following:

```
10 A=JOYSTK(0)
20 ?@0,A
30 GOTO 10
```

To get a feel for the numbers versus light hold the photo cell in bright light and look at the number on the screen. Then cover the photo cell and look at the number. These will be the limits. Then place the photo cell in normal room light. The program can be expanded to print comments about the light.

For controlling lights with the motor we could add lines.

```
10 A=JOYSTK(0)
20 ?@0,A;X$
25 IF A<=30 THEN MOTOR ON:
   X$="LIGHTS ON
26 IF A>32 THEN MOTOR
   OFF:X$="LIGHTS OFF
30 GOTO 10
```

Notice lines 25 and 26 turn the motor on or off depending upon the light intensity. We picked 30 and 32 as levels to turn the motor relay on and off. The numbers may be different depending upon the photo cell used and the amount of light needed.

Next month we will cover a different subject. As you can see from our discussion of the joystick ports, there are many things the computer can be made to do with only a minimum of effort.

RENEWAL TIME?

The date beside your name on the address label indcates the last issue you will receive. Send in your renewal if you want to continue receiving technical information on Color Computers. This is the last issue for those with **6/87**.

PART 4 (FINAL)

In this series we have been looking at methods of using Eraseable Programmable Read Only Memories (EPROMS). The operating instructions for a computer are contained in Read Only Memory (ROM) chips. Information is not lost when power is removed from these chips. Have you ever wondered how your computer initializes memory and displays the message after turning on the power? There is a power on reset routine that is programmed into the ROM and causes the microprocessor to go through the initialization process.

The ROMS used in the computer are all produced from a mask and have the same pattern. The pattern can not be changed. On the other hand, EPROMS can be erased and reprogrammed with different patterns. The basic, extended basic, and disk basic ROMS can be duplicated by an EPROM. For a disk controller, several disk operating systems can be placed in EPROMS and selected as needed. In the preceeding editorials we have given details for wiring a control circuit to an EPROM. The voltages and signals are present within the computer and the control circuit and EPROM chip can be mounted on top of other chips. We also showed how to select 8K banks using a 27128 or 27256 EPROM.

Let's give a word of warning for those who may be interested in purchasing an EPROM programmer. There are two types of EPROMS. The older types required 21 volts for programming. The newer types require about 12 volts. We would recommend the newer types because chips for the higher voltage are not being manufactured now. So when you purchase an EPROM programmer make sure it will program the newer chips such as the 27265 and 27512 unless you have a good source for the older chips. The 27512 contains 8-8K bytes. This can hold a lot of information.

ADDRESSING THE EPROMS

There are two places in the memory map that an EPROM can occupy. For a cassette system, an EPROM can occupy the area reserved for a cartridge or the disk controller. This starts at 49152 ($C000). The second area is the top 8K which starts at 57344 ($E000).

To use the cartridge port an EPROM can be placed in a cartridge. The EPROM is enabled when pin 32 of the expansion port goes low. To use the upper memory, a circuit similar to Figure 3 on page 9 of our April issue can be used to select the EPROM and deselect the disk drive.

PROGRAMMING THE EPROM

There are some things to be aware of when programming the EPROM. First of all the memory where the programming occurs is not the same as the memory the EPROM will be using. For example our EPROMS are programmed from the 8K of memory starting at 8192 ($2000). This will be address 0000 for the EPROM.

MACHINE LANGUAGE PROGRAMS

For machine language programs the procedure is simple. Just place the bytes into memory starting at 8192 or whatever memory your programmer uses. When the data is correct then program the EPROM. If the EPROM is to be used in a cartridge then you might want to disconnect the trace from pins 7 and 8. These cause the computer to automatically start and run the machine language program in the cartridge. If you want to call the machine language program from basic then you can exec 49152 when it is needed. If you have several machine language subroutines then each can be accessed as needed by the EXEC command. For example suppose a second program starts at 2K in the EPROM. Then the execute address will be 49152 + 2000 or 51152. So type EXEC 51152 to access this program.

If the EPROM is in upper memory then the start address is 57344. The execution address will be 57344 + the offset. A machine language program that is at 3000 from the start of the EPROM will be accessed by exec 60344.

BASIC PROGRAMS IN EPROMS

A little knowlege of how Basic works is required to put Basic in EPROMS. Let's look at the first few bytes of memory containing a basic program.

M - Contains a 0
M+1, M+2 Vector to next line
M+3, M+4 Statement number

For basic programs we let them start at 8193. The values in locations 25 and 26 form a vector that points to the start of basic. These values should be 32 and 1 for basic to start at 8193. To initialize basic for this area do the following:

```
POKE 8192,0: POKE 25,32:NEW
```

Now the basic program can be loaded from a cassette or disk and modified or edited as needed. Next the EPROM can be burned. Our EPROM software is a machine language program which we can access by the EXEC command.

RUNNING BASIC PROGRAMS FROM EPROMS

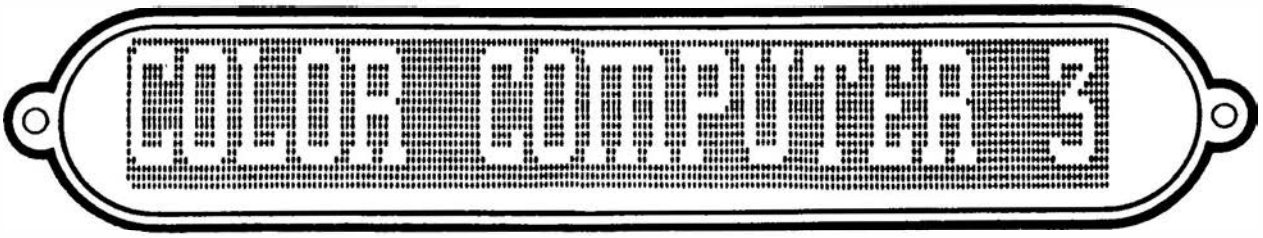
After the EPROM has been programmed and installed, the basic program can be run by doing a memory poke. If the EPROM occupies the expansion port, then POKE 25,192. If the EPROM occupies the upper 8K of memory then POKE 25,225. You can return to the normal basic operating location by poking the appropriate value into 25. To find out the normal value in 25 just ?PEEK(25) when the computer is turned on. If this number is 38 and it is desireable to run the EPROM program in upper memory, then poke 25,225. Then to return just poke 25,38.

MOVING EPROM PROGRAMS TO MEMORY

The PCLEAR command can be used to move EPROM programs down into the lower RAM. To do this the end of program vector must be placed in locations 27 and 28. If basic and machine language programs are both contained in the EPROM, then both can be moved. The first EPROM program should be the basic program. Then let the vector in 27,28 point to the end of the EPROM. Then enter PCLEAR X where X is the number of graphics pages to clear and the program and data will be moved to lower memory.

CONCLUSION

EPROMS are permanent memory devices that can contain programs and data. They can be erased and reprogrammed at any time. An EPROM can be programmed to replace the basic, extended, and disk basic ROMS. For disk use, several different operating systems can be contained within an EPROM. These can be switch selected. Basic programs can be run from the EPROM by poking a value into location 25. Machine language programs can be run by entering EXEC X where X is the location in memory where the program starts.



In this series we have been looking at programs and presenting information on the color computer 3. Although the CC3 seems to be compatible with the earlier computers in the CC2 or 32 character display mode, it has some remarkable differences.

For example it uses a memory manager that moves 8K blocks of memory by doing simple memory pokes. We showed how to do this last month. It also has high resolution graphics modes and special commands for using them. This month we want to look at a few of the graphics commands and give a program that will allow lines, circles, boxes, and filled boxes to be drawn. Also the program allows an area to be erased that is marked by a box.

There are some things that are needed that are not included with the computer's book. We have discovered a few of them and are using one in this program in line 70. The memory poke prevents the high resolution screen from erasing when it is recalled. This allows us to return to the command mode and enter variables. We do this by entering HSCREEN 0. Then we return to the graphics screen by entering HSCREEN S where S is the graphics screen resolution from 1 to 4.

When running the program the background color is entered, the cursor locations, and then the resolution. The resolution is a number from 1 to 4 with 4 being the largest. These are summarized as follows:

HSCREEN	Grid Pos	Colors
1	320 X 192	4
2	320 X 192	16
3	640 X 192	2
4	640 X 192	4

After entering the variables the computer goes to the selected high resolution screen. The cursor blinks at the X and Y locations. Pressing an arrow key moves the cursor which is composed of 4 dots. This makes it easy to see. It will move 9 dots in the direction of the arrow. To change this press * and then enter the number for the dots to move with the arrow keys.

Press "C" to draw a circle with the cursor as center. Then enter the radius.

Press "L" to draw a line from the last marked point to the cursor. To mark a point press "M".

Press "B" to draw a box through the marked point and the cursor. Press "F" to draw a filled box. Press "E" to erase everything within the box.

We reserved "T" for writing text on the screen at the cursor's location. This feature did not work. If you have a fix for this we would appreciate hearing from you.

There is much more that we can do with this program but it does demonstrate how to draw using the high resolution graphics. Next month we will have more information on the color computer 3.

OPERATING HINT

Disable COCO 3 high resolution screen clear. To prevent the high resolution screen from clearing POKE &HE6C6,33.

COLOR COMPUTER 3

GRAPHICS DEMO PROGRAM

```
10 PRINT"COLOR COMPUTER 3
20 PRINT"DEMONSTRATION PROGRAM
30 PRINT"cOPYRIGHT (c) 1987
40 PRINT"dYNAMIC eLECTRONICS iNC
50 PRINT
60 INPUT"ENTER COLOR";CL
70 POKE &HE6C6,&H21'PREVENT ERAS
   ING SCREEN WHEN RETURNING TO
   IT
80 INPUT"ENTER X AND Y";X,Y 'CUR
   SOR LOCATION
90 INPUT "ENTER SCREEN NUMBER 1-
   4";S:Z=9
100 HSCREEN S 'Z IS THE NUMBER O
   F LOCATIONS THE CURSOR MOVES
   WITH ARROW KEYS
110 GOSUB 280 'BLINK THE CURSOR
120 X$=INKEY$:IF X$=""THEN 110
130 IF X$="*" THEN HSCREEN 0:INP
   UT"MULTIPLIER 1-9";Z:GOTO100
   'CHANGE ARROW MULTIPLIER
140 IF X$=CHR$(8) THEN X=X-Z:GOT
   O100 'LEFT ARROW
150 IF X$=CHR$(9) THEN X=X+Z:GOT
   O100 'RIGHT ARROW
160 IF X$=CHR$(10) THEN Y=Y+Z:GO
   TO100 'DOWN ARROW
170 IF X$=CHR$(94) THEN Y=Y-Z:GO
   TO100 'UP ARROW
180 IF X$="M" THEN X1=X:Y1=Y:GOT
   O100 'MARK PRESENT CURSOR LOC
   ATION
190 IF X$="L" THEN HLINE (X,Y)-(
   X1,Y1),PRESET:GOTO100 'DRAW A
    LINE
200 IF X$="B" THEN HLINE (X,Y)-(
   X1,Y1),PRESET,B:GOTO100 'DRAW
    A BOX
210 IF X$="E" THEN HLINE (X,Y)-(
   X1,Y1),PSET,BF:GOTO110 'ERASE
    AREA ENCLOSED BY THE BOX
220 IF X$="F" THEN HLINE (X,Y)-(
   X1,Y1),PRESET,BF:GOTO 110 'DR
   AW A FILLED BOX
230 IF X$="C" THEN HSCREEN 0:INP
   UT"RADIUS";R:HSCREEN S:HCIRCL
   E (X,Y),R,0:GOTO110 'DRAW A C
   IRCLE
240 IF X$="T" THEN HSCREEN 0:INP
   UT"ENTER MESSAGE";T$:HSCREEN
   S:HPRINT (X,Y),T$:GOTO110 'WR
   ITE TEXT TO SCREEN
250 GOTO100
260 'THE FOLLOWING CREATES A CUR
   SOR. IT CONSISTS OF 4 DOTS WH
   ICH ARE RESET AND SET.
270 'BY USING 4 DOTS WE CREATE A
    LARGE EASY TO SEE CURSOR.
280 A=HPOINT (X,Y):B=HPOINT(X+1,
   Y):C=HPOINT (X,Y+1):D=HPOINT(
   X+1,Y+1):HRESET (X,Y):HRESET(
   X+1,Y):HRESET (X,Y+1):HRESET
   (X+1,Y+1):GOSUB 320
290 HSET(X,Y,A):HSET (X+1,Y,B):H
   SET (X,Y+1,C):HSET(X+1,Y+1,D)
   :GOSUB 320
300 '
310 RETURN
320 FOR P=1 TO 2:NEXTP:RETURN 'D
   ELAY
330 '
```

HAM RADIO & COMPUTERS

by

Bill Chapple W4GQC

We have had a very good response for this series from both hams and experimenters. As the title implies, we are showing applications for using computer software and hardware for ham radio use. From the input I have received, there is quite a demand for additional software. The commercial interfaces do not have software for the color computers. Most of the software is for the commodore computers.

There are several methods of interfacing color computers to a ham transceiver. The first approach is to use the ASCII port. This is the approach we used and gave a circuit diagram for constructing an interface. With this approach receiver audio is supplied to the interface and the output of the interface goes to the key jack of the transceiver. This approach has the advantage that it can be used with any computer that has an ASCII port.

The second approach would be to use the cassette port. The audio output from the transceiver could go into this jack similar to the way audio tones are fed to the computer from the cassette recorder. For transmitting, the audio signal from the computer would have to be fed into the mike jack of the transceiver. This will be the approach we will take for transmitting and receiving radio teletype (RTTY) and slow scan television (SSTV). This approach could also be used for Morse code transmission and reception.

A third approach would be to place software and hardware in a program pack or cartridge that plugs into the expansion jack. This will be harder to build but will have the advantage of allowing the software to be preprogrammed into an EPROM.

MORSE TERMINAL

Back in 1954 when I studied for my ham license, learning the Morse code was a serious problem for me. There was nobody in my town that I knew of who was a ham. I rented a code practice set with some punched tapes for study. This helped some but I memorized the information on the tapes and did not get my speed up to the 5 words per minute required for the novice class license. We had to appear at an FCC office for the exams and I failed the novice a couple of times. Finally I purchased a code practice oscillator. I would record Morse code onto a tape recorder and then play it back. To arrange the characters so I could not recognize them, I would send a sentence backward in groups of 5 letters.

This method did the trick as I passed my novice license about the same time I graduated from high school. In those days there were no computers. To automatically send code you had to either use a "bug" or electronic keyer. The bug was a mechanical device with a lever. The lever was moved to the left for dashes and to the right for dots. Dots were automatically sent when the lever was moved to the right. An electronic keyer had a paddle arrangement similar to the "bug" except that both dashes and dots were automatically sent. This had the advantage that all dashes and dots were of equal length. For send-

ing with a hand key the dots and dashes would slightly vary. A person with good sending with a hand key was easy to copy. Copying code from an electronic keyer was really easy due to the uniformity of the elements. I still use an electronic keyer with my mobile rig. I like to work mobile code (CW). The keyer is easy to use and requires only one hand.

Back in the fifties there were no means for copying code. Now with computers, the computer can assemble the code bits and print the character. For transmitting we can just press the keys and the equivalent code will be transmitted.

This month we are finishing the Morse code terminal program. We have shown how to send code from the computer and how to use the computer for copying and printing the code in previous editorials in this series. We have put these two functions together into one program. Let's look at the things we wanted our terminal program to do.

When listening for stations we would want to type in their call letters for stations that the program would not copy. I call this the scratch pad mode. When we want to call a station we want to go to the transmit mode. And for receiving the characters we want to move to the receive mode.

The program asks to enter variables for the color computer 3 and double speed if desired. Double speed is needed for copying the faster stations. The program will copy stations up to about 40 words a minute. It automatically adjusts for different speeds. This is done with lines 630 and 640. A machine language subroutine at 31031 does the timing. This is called in line 520. The machine language subroutine is read into memory by conventional READ and DATA statements.

After selecting double speed you need to select the transmit rate. The smaller the number,

the higher the rate. Select 9 as a start. To increase speed use the right arrow and use the "-" key to decrease speed.

After selecting the variables the program is in the receive mode. Tune in a station on the receiver or transceiver and the program will track the speed and start printing the characters on the screen. A lot of stations do not send proper code so the program can not decode them correctly. If too much time is left between characters each bit will be decoded as a word. The screen will be filled with E and T characters. For example a W will be displayed as ETT. To go to the scratch pad section to write notes to the screen press the down arrow. Use the up arrow to return to the receive mode. Static (QRN) and interference (QRM) will cause errors and the correct character will not be displayed.

To transmit press any key and then start transmitting. If you have a transceiver with full break in operation then this is all that you will have to do. To go back to the receive mode from the transmit mode press the up arrow.

If you wish to save the program make sure it is not in the double speed mode. The easy way to return to normal speed is to press the break key and again run the program. Then select normal speed. The program can be saved to a cassette or disk.

In past editorials in Dynamic Color News we have presented two programs that might be of interest especially for cassette users. The first program is the Multiprogram Manager. This allows programs to be easily stacked within the 32K of memory normally usable. This was presented our first year. The second program is the RAMDISK program we presented in issue 2-10. This allows the second 32K of memory in 64K computers to be used for programs. You can store the ham programs in the second 32K memory bank and load them as needed.

NEXT MONTH

We will have a different subject next month. We have received requests for more software so we will have software next month before taking on another hardware project. Let me point out that the interface circuit we presented is very easy to build. Most hams have given up on building equipment because of its complexity. Add the CW filter we presented plus the improved tone detector and you can really enjoy the Morse Terminal. 73's - Bill.

MORSE TERMINAL PROGRAM

```
5 DIM A$(130),N$(130)
6 GOSUB 1190:POKE65312,0
10 CLS:PRINT"MORSE CODE TERMINAL
    PROGRAM
20 PRINT"cOPYRITE (c) 1987
30 PRINT"dYNAMIC eLECTRONICS iNC

40 PRINT
50 INPUT"ENTER 1 FOR COLOR COMPU
   TER 3";C3
60 IF C3=1 THEN 90
70 INPUT"ENTER 1 FOR DOUBLE SPEE
   D";DS:IF DS=1 THEN POKE 65495
   ,1 ELSE POKE 65494,0
80 GO TO 100
90 INPUT"ENTER 1 FOR DOUBLE SPEE
   D";DS:IF DS=1 THEN POKE 65497
   ,0 ELSE POKE 65496,0
99 '
100 FOR J=30000 TO 30056:READ A:
   POKEJ,A:NEXTJ
101 '
105 PRINT"THIS IS THE SETS UP TH
   E KEYER SECTION
110 INPUT"ENTER SPEED-LARGE VALU
   E FOR SLOW SPEEDS";Z
115 CLS
120 PRINT"PRESS RIGHT ARROW TO I
   NCREASE":PRINT"SPEED
125 PRINT"PRESS - KEY TO DECREAS
   E SPEED
130 PRINT"@ KEY SENDS THE BT CHA
   RACTER.
140 PRINT"PRESS DOWN ARROW TO WR
   ITE NOTES ON THE SCREEN.
150 PRINT"AGAIN PRESS THE DOWN A
   RROW TO":PRINT"RETURN TO TRAN
   SMIT MODE.
160 PRINT"PRESS UP ARROW TO GO T
   O RECEIVE MODE
```

```
199 '
272 FOR J=0 TO 129:A$(J)=CHR$(32
    ):NEXTJ
280 A$(5)="A":A$(24)="B"
290 A$(26)="C":A$(12)="D"
300 A$(2)="E":A$(18)="F
310 A$(14)="G":A$(16)="H"
320 A$(4)="I":A$(23)="J
330 A$(13)="K":A$(20)="L
340 A$(7)="M":A$(6)="N
350 A$(15)="O":A$(22)="P
360 A$(29)="Q":A$(10)="R
370 A$(8)="S":A$(3)="T
380 A$(9)="U":A$(17)="V
390 A$(11)="W":A$(25)="X
400 A$(27)="Y":A$(28)="Z
410 A$(63)="0":A$(47)="1
420 A$(39)="2":A$(35)="3
430 A$(33)="4":A$(32)="5
440 A$(48)="6":A$(56)="7
450 A$(60)="8":A$(62)="9
460 A$(85)=".":A$(115)=",
470 A$(76)="?":A$(97)="*
500 '
520 EXEC30031
540 A=PEEK(29999)
550 X=256*PEEK(29990)+PEEK(29991
    )
590 IF A=0 THEN 682
630 IF X>(6*S) THEN S=2*S
640 IF X<(S/2) THEN S=S/2
645 IF S=0 THEN S=2
646 'EXEC 30041
650 W=0:IF X>=2*S THEN W=1
660 Q=2*Q+W
670 IF Q>=128 THEN Q=0
680 GOTO 520
682 P$=INKEY$:IF P$=""THEN 685 E
    LSE 1330
685 IF X<S/2 THEN 520
690 PRINTA$(Q);:IF X>5*S THEN PR
    INT" ";
700 Q=1
710 GOTO 520
720 DATA 79,95,253,117,38,182,25
    5,34,132,1,177,117,47,38,15,2
    52
730 DATA 117,38,195,0,1,16,131,2
    55,220,36,3,32,229,18,57
740 '30031-30045
750 DATA 182,255,34,132,1,183,11
    7,47,32,211,125,117,40,38,10
760 DATA 125,117,41,38,5,134,2,1
    83,117,41,57,
800 '
1080 PRINT"THIS IS THE KEYER SEC
    TION
1090 INPUT"ENTER SPEED-LARGE VAL
    UE FOR SLOW SPEEDS";Z
1100 CLS
```

```
1110 PRINT"PRESS RIGHT ARROW TO
   INCREASE":PRINT"SPEED
1120 PRINT"PRESS - KEY TO DECREA
   SE SPEED
1130 PRINT"@ KEY SENDS THE BT CH
   ARACTER.
1140 PRINT"PRESS DOWN ARROW TO W
   RITE NOTES ON THE SCREEN.
1150 PRINT"AGAIN PRESS THE DOWN
   ARROW TO":PRINT"RETURN TO TRA
   NSMIT MODE.
1155 PRINT"PRESS UP ARROW TO GO
   TO RECEIVE MODE
1160 'SET UP ARRAY FOR CHARACTER
   S
1180 'EMPTY THE ARRAY
1190 FOR K=0 TO 99:N$(K)="":NEXT
    K
1200 'DEFINE THE CHARACTERS
1210 N$(8)="IIIIIIII" 'ERROR BAC
   K SPACE
1220 N$(46)="IDIDID":N$(44)="DDI
   IDD":N$(63)="IIDDII"' . , ?
1230 N$(64)="DIIID":N$(47)="DIID
   I" ' BT  /
1240 N$(48)="DDDDD":N$(49)="IDDD
   D"' 0 & 1
1250 N$(50)="IIDDD":N$(51)="IIID
   D" '2 & 3
1260 N$(52)="IIIID":N$(53)="IIII
   I":N$(54)="DIIII":N$(55)="DDI
   II"'4,5,6,7
1270 N$(56)="DDDII":N$(57)="DDDD
   I":N$(65)="ID":N$(66)="DIII"'
   8,9,A,B
1280 'N$(65)=A
1290 N$(67)="DIDI":N$(68)="DII":
   N$(69)="I":N$(70)="IIDI":N$(7
   1)="DDI":N$(72)="IIII":N$(73)
   ="II"'C,D,E,F,G,H,I
1300 N$(74)="IDDD":N$(75)="DID":
   N$(76)="IDII":N$(77)="DD":N$(
   78)="DI":N$(79)="DDD":N$(80)=
   "IDDI"'J,K,L,M,N,O,P
1310 N$(81)="DDID":N$(82)="IDI":
   N$(83)="III":N$(84)="D":N$(85
   )="IID":N$(86)="IIID":N$(87)=
   "IDD"'Q,R,S,T,U,V,W
1320 N$(88)="DIID":N$(89)="DIDD"
   :N$(90)="DDII"'X,Y,Z
1325 RETURN
1330 GO SUB 1350
1340 GO TO 1330
1350 'ENTER CHARACTER TO SEND
1360 'WAIT FOR KEY TO BE PRESSED
1370 P$=INKEY$:IF P$="" THEN 137
   0
1380 IF P$=CHR$(10) THEN 1590
1385 IF P$=CHR$(94) THEN 520
1390 'IF KEY IS - DECREASE SPEED
1400 P=ASC(P$):IF P=45THEN Z=Z+1
   :GO TO 1370
1410 'INCREASE SPEED FOR RIGHT A
   RROW P=9
1420 IF P=9 THEN Z=Z-1:GO TO 137
   0
1430 IF Z=0 THEN Z=1
1440 PRINTP$;
1450 P=ASC(P$):IF P<33 THEN 1370
1460 N=P
1470 IF N$(N)="" THEN PRINTCHR$(
   8);:RETURN
1480 L=LEN(N$(N))
1490 '
1500 'THIS DECODES THE CHARACTER
1510 FOR J=1 TO L:X$=MID$(N$(N),
   J,1):IF X$="D" THEN Y=3 ELSE
   IF X$="I" THEN Y=1
1520 W=Y*Z
1530 IF W<1 THEN W=1
1540 'SEND DOT OR DASH
1550 POKE65312,2:FOR PP=1 TO 4*W
   :NEXT PP:POKE65312,0:FOR P=1
   TO Z:NEXT
1560 NEXT J
1570 RETURN
1580 'THIS PRINTS COMMENTS ON SC
   REEN
1590 X$=INKEY$:PRINTX$;
1600 IF X$=CHR$(10) THEN 1330
1605 IF X$=CHR$(94)THEN 520
1610 GOTO 1590
1620 '
```

OPERATING HINT

Programs can be stacked by changing vectors in locations 25-28. Do a memory peek and write down the values. Let V=PEEK(27) + 2. Poke this value into 25. POKE 256*V, Ø: NEW. The new program can now be loaded. This occupies memory above your first program. You can return to the first program by restoring the original values in 25-28.

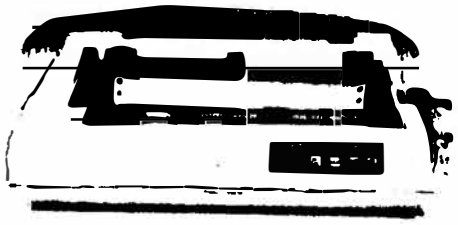
SEIKOSHA PRINTERS

For some time we have been looking for a printer for color computers that does not require an interface and has excellent features like an Epson. We found a double bargain in the Seikosha SP-1000AS. Not only does it have the features we desire in a printer, it is available from us for only $229.95 + $5 shipping complete with a cable to plug into your color computer. No longer do you have to wait for the printer to print your text. A 2.6K buffer will free your computer while the printer finishes its assignment. The printer accepts data at the 9600 baud rate. This means that you can quickly send a page or more of text to the printer and then start a different task with the computer. There are many programs that are Epson compatible. This ad is done on a SP-1000AS with our Epson codes in our word processor and COCO MAX.

With the SP-1000A your computer can print 40, 48, 68, or 136 characters per line. It can print 35 seperate character styles including 13 double width and 3 reversed styles. You get Pica, Elite, Condensed and Italics plus true superscripts and subscripts. All this can be done automatically through commands right from your keyboard. You will hardly know the printer is working because it is one of the quietest printers that we have seen.

FEATURES

* Impact dot matrix method of printing.
* 100 (Draft mode), 20 cps (Near Letter Quality) print speed
* Functions include Underline, Bold Print & Double Striking.
* Many print character sets including Pica, Elite, Elongated, Proportional, Condensed, Italics, Super/Subscript and Italic Super/Subscripts.
* Adjustable tractor and friction feed.
* Automatic paper loading function.
* Paper empty detector.
* Right, left margin set function.
* Self-test and Automatic printing.
* 2 year warranty.



As a special we are including our **DYPRINT** package at no extra charge. This will allow you to print banners or blown up graphics pictures.

Order SP-1000AS for COCO & specify tape or disk software for DYPRINT. Give street address for UPS. Cost $229.95 +$5 shipping.

DYNAMIC ELECTRONICS Inc.
Box 896 (205) 73-2758
Berry, AL 35546

IBM™ TURBO CLONES

PHASE I Turbo-XT 300

These are excellent quality complete systems with a **1 year warranty**. They contain **dual** disk drives, **640K** of memory, a **monitor** and public domain **software**. **Serial, parallel,** and **game** ports are included.

Standard Features

- NEC V-20 Microprocessor (8088-2)
- 4 and 8 MHZ clock speeds
- Socket for Math Co-Processor
- 640K RAM installed on Motherboard
- 2- 360K Floppy Disk Drives
- Floppy Controller Card
- AT Style Keyboard
- Serial, Parallel, and Game Ports
- Battery Backed Clock and Calender
- 150 Watt UL Approved Power Supply
- FCC Class B Approval
- MS-DOS 3.1 and Manual
- GW-Basic
- Runs Nortons SI at 3.0

System Price including monitor with all cables:

		Hard Disk Drives		
		20MEG	30MEG	40MEG
1.	**TTL Mono-Graphics**	**$977**	1417	1467	1837
2.	**Mono-Composite (CGA)**	977	1417	1467	1837
3.	**Color Graphics (CGA)**	1247	1667	1717	2087
4.	**Enhanced Graphics**	1647	2067	2117	2487
5.	**Nec Multi-Sync (EGA)**	1814	2242	2292	2662

10 Public Domain Software Disks including **Spreadsheet, Word Processor with Spelling Checker, Data Base Manager, Etc.**

Six outlet surge protector.

Sheikosha 1000I printer $200 with cable with **computer purchase.**

CHECKS, VISA & MC CARDS. Add $15 UPS shipping.

DYNAMIC ELECTRONICS Inc.
Box 896 (205) 773-2758
Evergreen, AL 36540

CALENDAR

14 15 16 17 18 19 20

21 22 23 24 25 26 27

28 29 30

This program prints a calendar on the screen for any month or year. Do you want to see what the calendar looked like the month and year you were born? Just enter these variables when you run the program and the calender will be printed on the screen. The right and left arrow keys move the calendar backward or forward one year while the up and down keys move the calendar backward or forward a month. This program is public domain software.

```
5 'PUBLIC DOMAIN SOFTWARE
10 REM    CALENDAR
15 CLS:DIM N$(12),D(12)
20 FOR M = 1 TO 12
25 READ N$(M),D(M)
30 NEXT M
35 DATA JANUARY,31,FEBRUARY,28,M
   ARCH,31,APRIL,30,MAY,31
40 DATA JUNE,30,JULY,31,AUGUST,3
   1,SEPTEMBER,30
45 DATA OCTOBER,31,NOVEMBER,30,D
   ECEMBER,31
50 PRINT:PRINT"          THE ARROW
   S CAUSE THE     FOLLOWING:":P
   RINT
55 PRINT"  UP ARROW     - BACK 1
   MONTH,                    SAME
    YEAR"
60 PRINT"  DOWN ARROW   - FORWARD
    1 MONTH,                 SAME
    YEAR"
65 PRINT"  LEFT ARROW   - BACK 1
   YEAR,                     SAME
    MONTH
70 PRINT"  RIGHT ARROW - FORWARD
    1 YEAR,                  SAME
    MONTH"
75 INPUT" ENTER THE NUMBER OF TH
   E          MONTH,YEAR ( 09,198
   3 )";M,Y
80 REM   CALCULATE THE FIRST DAY
    OF THE MONTH
85 IF Y<1 THEN RUN
90 D=1:REM  INIT DAY OF WEEK
95 C=INT((Y-1)/100) : REM  NUMBE
   R OF CENTURIES
100 D=D+C*36524 : REM  DAYS IN C
   ENTURIES
105 D=D+INT(C/4) : REM  LEAP DAY
   S EACH 4TH CENTURY
110 N=(Y-1)-C*100 : REM  PREVIOU
   S YEARS IN THIS CENTURY
115 D=D+N*365 : REM  DAYS IN PRE
   VIOUS YEARS EXCEPT LEAP DAYS
120 D=D+INT(N/4): REM  LEAP DAYS
    EXCEPT CURRENT YEAR
125 IF Y/100<>INT(Y/100)THEN135:
    REM  NOT CENTURY YEAR
130 PRINTCHR$(V)
135 IF Y/4<>INT(Y/4)THEN145 : RE
   M  NOT A LEAP YEAR
140 L=1 :REM  LEAP DAY COUNTER
145 IF M=1 THEN 170
150 FOR I = 1 TO M-1
155 D=D+D(I) : REM ADD DAYS IN P
   REVIOUS MONTHS
160 IF I=2 THEN D=D+L : REM ADD
   LEAP DAY
165 NEXT I
170 F=D-7*INT(D/7)+1 : REM FIRST
    DAY OF THE WEEK
175 REM  PRINT ONE MONTH
180 CLS:PRINTCHR$(23)
185 IF M<>2 THEN L=0 : REM  NO L
   EAP DAY THIS MONTH
190 PRINT@41,N$(M)Y
195 PRINT:PRINT"   S   M   T   W
      T   F   S":PRINT
200 PRINTSTRING$((F-1)*4,32);
205 FOR D = 1 TO D(M)+L
```

```
210 PRINTUSING"####";D;
215 IF(D+F-1)/7<>INT((D+F-1)/7)T
   HEN225
220 PRINT:PRINT
225 NEXT D
230 L=0 : REM  TURN OFF LEAP YEA
   R COUNTER
235 REM  ARROWS
240 A$=INKEY$
245 IFA$=CHR$(94)THEN 270
250 IFA$=CHR$(10)THEN 285
255 IFA$=CHR$(8) THEN Y=Y-1:GOTO
   80
260 IFA$=CHR$(9) THEN Y=Y+1:GOTO
   80
265 GOTO240
270 M=M-1 : REM  BACK ONE MONTH
275 IFM=0 THEN Y=Y-1:M=12
280 GOTO80
285 M=M+1 : REM FORWARD ONE MONT
   H
290 IF M=13 THEN Y=Y+1:M=1
295 GOTO80
```

EDITOR'S COMMENTS

This has been a hectic month for me. Some things happened that caused us to be further behind than we had been. First of all I had a very bad case of Summer flu. I have heard that this was the worst kind and I believe it. I was out of commmission for about 10 days. As a result we are so far behind on the June issue that we decided to combine June and July. Everybody's subscription will be increased by one month.

We made an important decision this month. Due to local demand, we have started selling IBM clones, printers, and accessories. We are located right off of interstate 65 on highway 36. The amount of local business we have had has been very insignificant. Now things have changed and potential customers have been stopping by and asking us if we sell computers. We now have an excellent line of clones and printers. You might wonder why this is important for color computer owners. The impact on Dynamic Color News is that now we have another source of income besides our mail order business and magazine subscriptions. This will allow us to expand our magazine by purchasing more programs and articles.

The response to our ham radio section is very good. There is very little support for the color computer by equipment manufactures. For example if you purchase a computer interface, software is available for a Commodore, IBM compatible, and some of the other computers. I don't know why they left out the color computer because it seems to be about the easiest to interface. We have looked at using the RS-232 port but the cassette port can also easily be used. Sending signals to a tape recorder would be similar to sending signals to the microphone input of a transmitter. For detecting received signals the audio from a transceiver could be fed into the cassette jack. Data is sent into the computer through this port by varying the frequency of the audio. This is exactly what radio teletype does although the format is a little different.

In our Interfacing Computers we are looking at measuring light using the joystick port. In this series we have given many uses for this port and before we finish we want to show how to build a power controller so you can use your computer to control air conditioners, heaters, and motors. Color computers have a very good microprocessor and can be used for many hardware applications.

We appreciate the letters we have received. Keep them coming as they help us decide on future subjects.

PRODUCT REVIEWS

This section is open to all producers and dealers of color computer products. We will review your product free of charge and write an editorial on the product. We do not use a rating system but will explain what the product does, and what can be expected from it. Any comments about the review from the firm submitting the product will be printed in a later issue.

ASSEMBLY LANGUAGE PROGRAMMING for the COCO

Laurence Tepolt has written an addendum to his Assembly Language Programming book. This consists of a 59 page well written and informative book for the color computer 3. It is a source of information on the color computer 3. The first chapter gives an overview of the color computer 3. This includes wiring details of the cassette, joystick, and serial I/O connectors. Also a description of the registers used in the CC-3 is included. The second chapter is called COLORS and MONITORS and discusses the various colors. It also explains the pallette registers.

The third chapter discusses the memory. Details of how the memory manager works are included. The fourth chapter discusses the high resolution displays. The addresses for registers that select various options are given. The Fifth chapter discusses low resolution displays and compares the operation with the original color computers.

Chapter 6 covers interrupts and compares their use with the earlier computers. The last chapter is called "CONCLUDING DETAILS". It provides additional information on the CC-3.

Although the title of the book implies assembly language programming, it also contains much useful information about the color computer 3. The book sells for only $12.00 +$1 s/h. TEPCO, 30 Water Street, Portsmouth, RI 02871.

DRAYON SOFTWARE
affordable CoCo software

Are you tired of the incredibly high prices other software companies charge? Do you want good software at a fair price? Do you hate answering yes over and over again? If so, try Drayon Software. Each program below is only $6, which includes postage and handling.

Disk Minizap

With this program you can alphabetize your disk directories, print directory listings on your printer, or view and edit any sector on the disk. Backup directories can be made also.
Available on DISK only.

Mini Ledger

If you have a small business or want to keep track of a home budget, Mini Ledger is for you. Keep track of credits and debits, and the computer tallies up the totals. Then print the ledger on your printer.
Available on DISK only.

Word Processor

Type reports, essays, etc., edit them, save them to disk, then print them on your printer. The program formats the ends of lines for you, so you don't have to. Other features: six baud rates, embedded printer control codes.
Available on TAPE or DISK.

ORDERING INFORMATION

Please make check or money order payable to Drayon Software. Washington state residents include 7.5% sales tax.

DRAYON SOFTWARE
P.O. Box 2516
Renton, WA 98056

NEW PRODUCTS

This section is available free for producers and dealers of color computer products. These products have not been reviewed by us but are included for our reader's information.

LOTZALUK

LOTZALUK is a machine language program for the COCO 1, 2, & 3. It lets a user study the history of a LOTTO game just as a handicapper sudies the horses. Valuable data on California LOTTO 6/49 game is included. The cost is $29.95 for disk. William G. Brigance, SR., 1001 Fairweather Drive, Sacramento, CA 95833, (916) 927-6062.

INVENTORY MANAGER

Forrest Enterprises has a disk package of business software for managing store inventory and printing out product purchase orders. It helps you keep track of inventory changes and lets you order items from your item data files for printing a purchase order on plain 80 column paper for mailig to your supplier. A 64K computer is required with RSDOS or JDOS. Specify Coco 1, 2, or 3 and your DOS type when ordering. The cost is $25. Forrest Enterprises. 1521 Lancelot, Borger, TX 79007.

ASSEMBLY LANGUAGE PROGRAMMING for the COCO 3

TEPCO has published an addendum to their Assembly Language Programming book. It describes the COCO 3 enhancements and how to use them with assembly language. See our review in this issue. The cost is only $12 + $1 s/h. TEPCO, 30 Water St., Portsmouth, RI 02871.

Questions and Answers

These are questions that have been asked us. If you have a question that you would like for us to answer send it to us at Box 896, Hartselle, AL 35640. We will print our answers here. For a personal reply send $10 with your question.

The following is an answer to the question printed in the MAY ISSUE. The question was regarding **VIP Writer.**

ANSWER: The solution to your problem with VIP Writer becomes easy if you understand why the machine crashes. When VIP is checking memory, it is going through upper RAM and storing and loading bytes of data. This is compata ble to a check to see if you have 64K or not. VIP does this check on memory from $8000 to $FF00. On a CoCo 2, it works fine, swince the interrupts are no doubt disabled, and the machine isn't using BASIC. But on the CoCo 3, memory from $FE00 to $FEFF contains vital I/O values for the GIME and MMU chips. When VIP goes poking around in upper memory to do the test, it also goes through this memory. On a CoCo 2, this is free RAM, and won't make a difference. But if you do it to a CoCo 3, it's like madly pushing numbers through the GIME and MMU I/O bytes, and thus the chips go berserk, thus resulting in a crash.

The best way to solve the problem is to change the top count value from $FF00 to $FE00. This way VIP will stop in time to keep the CoCo 3 from crashing. I personally have disassembled a few programs and made them work on the CoCo 3 by this method. Try disassembling VIP (if it"s legal to do so) and changing the $FF00 values to $FE00. Or use VIP zap to find the bytes to change. Whatever the case, make a backup copy before you try any modifications.

Some versions of VIP will work on the CoCo 3, and others won't. The ones that won't must be modified by simply decreasing the top address of the memory test routines by 256. I hope this is of some help.

We thank you for this reply. We wanted to give you credit but we lost your letter. If you will drop us a note we will give you credit in the next issue. The same letter contained the following question: - Editor

+ + +

QUESTION: I am very interested in the temperature guage apparatus for measuring the temperature with CoCo. I noticed in the ad that it was $12.95 for CC-Therm and $19.95 for CC-Therm 2. What's the difference? I plan to use this to tell the temperature outside as people log onto my BBS (which is homemade, but of good quality.) Please tell me the difference between them, and which one do you recommend for BBS use.

ANSWER: CC-Therm has 1 thermistor and CC-Therm 2 has two thermistors. CC-Therm should serve your purpose if you just want to give the outside temperature.

OPERATING HINT

Basic programs can be transferred between two computers using the serial port either directly or through telephone lines with a modem. Both computers must have a terminal program. If the computers are the same types then each byte of a basic or machine language program can be transferred. For different type computers, the files must be in ASCII.

I saw your ad in the May '87 issue of CoCo Ads, and would very much appreciate a free sample of your magazine and a Dynamic Electronics Catalog. My 64K CoCo 2 is about three years old. I also have DEC dual disk drives, a DCM-3 Modem, and a DMP-100 printer. Unfortunately, I use a TV that is going bad as a momitor. Hopefully I will get a CoCo 3 within the year. Here is some food for thought that has been eating my brain. There has been talk about 'blitter' of graphics processor chips for the Amiga and (not yet available) for the Atari ST. These chips supposedly take a load off the CPU and allow spectacular graphics feats such as being able to display all colors at once. I wonder if there will ever be a such thing for the CoCo 3 so it can display all 64 colors at once? I know there are programs to do this, but I understand they take too much processor time to allow the computer to do anything else.

I read that the CoCo 3 has, besides the 640x192 mode, a 640x225 mode. I wonder why this wasn't implemented by Tandy and if there is any way to access this mode?

Wouldn't be great with a blitter chip and 225 lines resolution? Just think, 64 colors on a 640 x 225 screen.

ANSWER: We have not heard of the blitter chip. If it were available it would probaby be hard to implement it with the dedicated hardware configuration of the COCO 3. The earlier computers had sockets which allowed us to modify things a little by making adapters. It may be possible to add some other chip to the COCO 3 but it would not be an easy task. The software would have to be modified to incorporate the changes. We do not know if the 640 X 225 screen is available for the CC-3. If it is we do not know how to use it.

Dear Bill:

I enjoyed the sample copy of your Radio Shack Color Computer magazine very much. I have got the first color computer in the grey case and I also have the Color Computer 3.

I am looking for the following software that will run on the CC-3: packet radio, C.W. and RTTY without a interface. Could you help me with these programs? I can pay you for the discs or send you some blank discs. Thank you very much and keep up the good work.

Sincerely - Johnny E. Carr

ANSWER: I have seen some software that does not require an interface. You will have to use your cassette port and wire the microphone and audio out of your transceiver to a cassette plug. You might look back through the Ham radio magazines and maybe you can find some software. Also the Rainbow Magazine has had a few ham radio articles.

+ + +

Dear Bill,

Thank you very much for your extremely interesting Co Co magazine. I particularly appreciate the tutorial approach that you use. I find it very interesting and useful.

Being also a Ham I find that section particularly interesting. In hamming I am not very active on the air and much prefer building equipment to operation. This bias also carries over to the COCO being more interested in the theory of operation of both the hard and software, thus your magazine fits my requirements much better than the other magazines which are much more oriented.

I am enclosing some QSL cards. The ones from the "Weatherships"

are quite unique. I obtained a 2nd class radio operators certificate in 1939 then spent 4 years as a radar technician in the R.C.A.F. in England and North Africia during WW II. After a year of radio operator, I transferred to the meteorological branch as a radiosonde technician. I spent 4 years in the arctic weather stations then in 1952 on the weatherships. The first was a converted R.C.N. frigate then in 1967 a specially designed vessel "QUADRA". I retired in 1979.

My present equipment is a 64K CoCo II, Gemini 10X printer and tape. Well, Bill OM, that gives you a thumb-nail sketch of one of your subscribers and the reason for my preference of your magazine.

Hope that you find the QSL's interesting and that you and your FB magazine prosper. Keep up the good work.

Vy 73 - J.H. Scarlett

ANSWER: Thank you Mr. Scarlett for your nice letter and the QSL cards. QSL cards are exchanged by hams and contain information about the station and contacts. Mr. Scarlett's cards had pictures of ships on the front. We tried reproducing them but they did not reproduc well enough to print. A large number of our subscribers are retired. Mr Scarlett lives in Canada and we appreciate his nice comments.

+ + +

Dear Sirs:

I have a question regarding the POKE used when copying ROM paks to tape (POKE 65314,54). I have heard that plugging in the ROM paks while COCO is on can easily blow COCO's chip. On the other han, I've also heard that this POKE not only disables the autostart of ROM paks, but also will cure the risk of COCO's chips. Is this true? If not, how could you fix the ROM port so as not to have this risk? Thank you.

Sincerly- Andrew Bartels

ANSWER: It is not a good idea to plug a device into the expansion port with the computer on. If you have a multipak interface, then put the cartridge in an unused slot. Next do the memory poke and select the cartridge. A memory poke will not damage the computer.

+ + +

NOTE: We have several other letters which we will print next month. We appreciate your taking the time to write. Let us know what you need and this will help us choose future subject. Keep the letters comming. - Bill

CLASSIFIED ADS

1. 10 cents a word, $3 minimum.
2. Name, Address, & Telephone listed free.
3. Send payment with ad.
4. Closing date 1st of the preceeding month. Ex. Nov ad closing is Oct. 1.
5. No X-Rated ads.

PREMIUM QUALITY DISKS. You don't have to pay a lot for QUALITY disks. Our disks are boxed in tens complete with labels, sleeves, and write protect tabs. Don't confuse these with cheaper disks as they carry a lifetime waranty and will be replaced should they become defective. DSK-1 SSDD for CoCo $6.95 /box, DSK-2 DSDD for MSDOS $7.95 /box. Add $1.50 S/H. Dynamic Electronics, Box 896, Hartselle, AL 35640. (205) 773-2758

DISPLAY ADS

(Rate sheet 2 - March 1986)
Closing 1st of preceeding month.

Pages	1 time	2 times	3 times
*2	25	23	22
1	30	27	25
1/2	23	20	18
1/3	19	17	15
1/4	15	13	12

* We can use colored paper at no extra charge if ads are on both sides.

We can do ads in Red, Blue, or Brown. No all one color ads will be accepted. For color ads send artwork for each color. Add 40% for each color. Example: One page black and red for 3 times costs $25 + 10.00 = $35.00 each month.

Artwork must be camera ready and can be enlarged or reduced at no extra cost. Rates are per page or fraction thereof. Enclose payment with ad copy. No X-Rated ads.

DYNAMIC COLOR NEWS SUBJECT INDEX

We have listed our subjects by Volume and Issue. Our first issue, Vol 1-1, was February 1984. The first and second year we printed 11 issues each. This listing is complete through Volume 4-5 or June/July 1987.

Basic Programming

ML Programming

Articles

Programs

Hardware Projects

Product Reviews

ADVERTISER'S INDEX

We would appreciate it if you would let these advertisers know that you saw their advertisement in **Dynamic Color News**.

****
* Please sign me up for one year for DYNAMIC COLOR NEWS. I want *
* to receive instruction on programming, Computer Theory, Operating *
* Techniques, Computer Expansion, plus information on New Products, *
* and Product Reviews. I understand that there will be no charge *
* for answers to questions printed in the Magazine. *
*
* Cost $15 USA, $18 Canada & Mexico, $30 other foreign. *
* 10% club discounts for 5 or more subscriptions. *
*
* Name _____ Mail payment to *
* Address _____ Dynamic Electronics Inc *
* City _____ P. O. Box 896 *
* State & Zip _____ Hartselle, AL 35640 *
* Enclosed is a check ___ *
* charge to VISA ___ MC ___ Number _____Exp._____ *
*
****

DYNAMIC ELECTRONICS INC.
P. O. Box 896 (205) 773-2758
Hartselle, AL 35640

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