Radio Shack Color Computer

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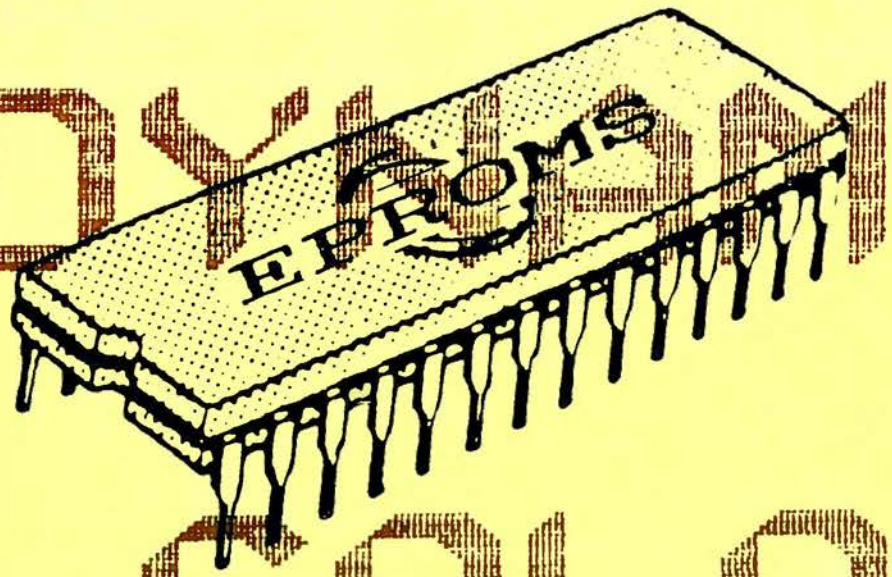
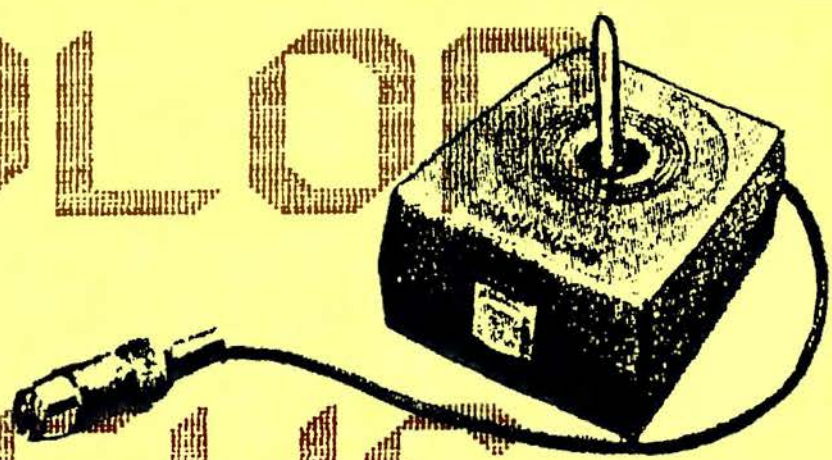
DYNASTIC COLOR NEWS





COLOR COMPUTER 3
ML PROGRAMMING
HAM RADIO
JOYSTICKS
EPROMS

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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

March, 1987

Editor and Publisher
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Secretary
Dean Chapple

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OWARE

OWARE is a two player game of African origin. It is played with 48 pebbles and a piece of wood with 12 hollowed out places. Use the right and left arrow keys to move the cursor to the 'Hollow' from which you want to take the markers and then press <ENTER>. The object of the game is to make captures and work out the best score. This program is provided by T & D Software (see their advertisement on page 8) and is used by permission.

```
1 REM COPYRIGHT (C) T&D SOFTWARE
    1986      oware
2 PMODE0:GOTO60000
10 CLEAR:CLEAR100:C=3:S=2:P=0:CR
   =0:GOSUB10000:DIMO(11):FORX=0
    TO11:O(X)=4:NEXT
15 CLS:PRINT@45,"oware":PRINT@16
   4,"HIGH SPEED POKE (Y/N)";:IN
   PUTHP$:IFHP$="Y" THENPOKE6549
   5,0 ELSEIFHP$="N" THENPOKE654
   94,0 ELSE15
16 PRINT@294,"INSTRUCTIONS (Y/N)
   ";:INPUTIN$:IFIN$="Y"THEN2000
   0 ELSEIFIN$<>"N" THEN16 ELSE1
   00
20 COLORC:FORW=1 TO LEN(P$):A=AS
   C(MID$(P$,W,1)):IFA=32 THENP1
   $=LD$(27):GOTO40 ELSEIFA=48 T
   HENP1$=LD$(15):GOTO40 ELSEIFA
   <48 ORA>90 ORA<65 ANDA>57 THE
   NNEXT
30 IFA<48 THENRETURNELSEIFA<64 T
   HENP1$=LD$(A-21):GOTO40 ELSEP
   1$=LD$(A-64)
40 DRAW"S"+STR$(S)+";BM"+STR$(H)
   +","+STR$(V)+P1$:H=H+12:NEXT:
   RETURN
50 IFX<6 THENH=(X*42)+5:V=40 ELS
   EH=((X-6)*42)+5:V=90
52 FORPT=1 TOO(X):CIRCLE(H,V),1,
   C:V=V+10
54 IFX<6 ANDV>70 THENV=40:H=H+5
   ELSEIFX>5 ANDV>120 THENV=90:H
   =H+5
55 SOUNDV+100,1:NEXTPT:RETURN
60 I$=INKEY$:IFI$=""THEN60 ELSER
   ETURN
70 COLORC:IFP=0 THENH=(CR*42)+2:
   V=32 ELSEH=((CR-6)*42)+2:V=82
72 LINE(H,V)-(H+3,V+3),PSET,BF:R
   ETURN
80 PRINT@485,"any key to continu
   e";:GOSUB60:RETURN
100 PMODE4,1:PCLS:SCREEN1,1:LINE
   (0,30)-(252,130),PSET,BF:COLO
   R0:LINE(0,80)-(252,80),PSET:F
   ORX=0 TO210 STEP42:LINE(X,30)
   -(X,130),PSET:NEXT:COLOR3:DRA
   W"BM245,25;L10F3BH3E3;BM235,1
   35;R10G3BE3H3"
110 P$="OWARE":C=3:H=96:V=10:GOS
   UB20:C=0:FORX=0 TO11:GOSUB50:
   NEXT
120 C=3:P$="3 INITIALS":H=10:V=1
   70:GOSUB20:P$="PLAYER 1":H=10
   :V=190:GOSUB20
130 S=4:FORX=1 TO3:GOSUB60:P$=I$
   :N1$=N1$+I$:H=X*12:V=25:GOSUB
   20:NEXTX:COLOR0:LINE(94,190)-
   (106,180),PSET,BF:P$="2":H=94
   :V=190:S=2:GOSUB20
140 S=4:FORX=1 TO3:GOSUB60:P$=I$
   :N2$=N2$+I$:H=X*12:V=145:GOSU
   B20:NEXTX:COLOR0:LINE(10,190)
   -(150,160),PSET,BF
150 S=2:P$="ARROW KEYS FOR CURSO
   R":H=3:V=170:GOSUB20:P$="THEN
    ENTER":H=66:V=190:GOSUB20
160 GOSUB70:IFC=0 THENC=3 ELSEC=
   0
170 I$=INKEY$:IFI$="" THEN160
180 IFI$=CHR$(8) THENSOUND(CR*20
   )+20,1:C=3:GOSUB70:CR=CR-1:IF
   CR<0+(P*6) THENCR=5+(P*6):GOT
   O160
190 IFI$=CHR$(9) THENSOUND(CR*20
   )+20,1:C=3:GOSUB70:CR=CR+1:IF
   CR>5+(P*6) THENCR=0+(P*6):GOT
   O160
```

```
195 IFI$="Q" THEN300
200 IFI$=CHR$(13) THENSOUND100,2
   :IFO(CR)=0 THEN160 ELSEC=3:GO
   SUB70:GOTO220
210 GOTO160
220 X=CR:GOSUB50:R=O(CR):O(CR)=0
   :S=0:C=0
230 FORY=1 TOR+INT(O(CR)/12):IFX
   <6 THENX=X-1 ELSEX=X+1
232 IFX=CR THENNEXTY:GOTO262
235 IFX=12 THENX=5 ELSEIFX=-1 TH
   ENX=6
236 O(X)=O(X)+1
260 GOSUB50:C=0:NEXTY
262 IFP=0 ANDX>5 ANDO(X)=2 ORP=0
   ANDX>5 ANDO(X)=3 THENS1=S1+O(
   X):C=3:GOSUB50:O(X)=0
263 IFP=1 ANDX<6 ANDO(X)=2 ORP=1
    ANDX<6 ANDO(X)=3 THENS2=S2+O
   (X):C=3:GOSUB50:O(X)=0
265 H=48:V=25+(P*120):IFP=0 THEN
   P$=STR$(S1) ELSEP$=STR$(S2)
270 IFVAL(P$)>0 THENCOLOR0:LINE(
   H,V)-(H+140,V-10),PSET,BF:FOR
   Y=1 TOVAL(P$):CIRCLE(H,V-3),1
   ,3:H=H+5:IFH>175 THENH=48:V=V
   -5:NEXTELSENEXT
275 P=ABS(P-1):FORY=P*6 TO(P*6)+
   5:IFO(Y)>0 THEN280 ELSENEXT:G
   OTO310
280 CR=P*6:GOTO160
300 FORX=0 TO 11:T=T+O(X):NEXT:S
   1=S1+INT(T/2):S2=S2+INT(T/2)
310 CLS:PRINT@192,N1$":"S1:PRINT
   @224,N2$":"S2:IFS1>S2 THENN$=
   N1$ ELSEIFS2>S1 THENN$=N2$ EL
   SEIFS1=S2 THENN$="TIE GAME"
320 PRINT@298,"THE WINNER IS"
330 PRINT@320+INT((32-LEN(N$))/2
   ),N$:SOUNDRND(200),1:PRINT@39
   0,"PLAY AGAIN (Y/N)";:PA$=INK
   EY$:IFPA$=""THENPRINT@324,STR
   ING$(8,32):GOTO330
340 IFPA$="Y"THENRUN ELSEIFPA$="
   N"THENENDELSE330
10000 DIM LD$(38):LD$(1)="U8R8D4
   L8BR8D4BR4":' A
10001 LD$(2)="U8R6F2D2L8BR8D2G2L
   6BR12":' B
10002 LD$(3)="U8R8BD8L8BR12":' C
10003 LD$(4)="U8R6F2D4G2L6BR12":
   ' D
10004 LD$(5)="U8R8BD4L8BD4R8BR4"
   :' E
10005 LD$(6)="U8R8BD4L8BD4BR12":
   ' F
10006 LD$(7)="U8R8BD4L4BR4D4L8BR
   12":' G
10007 LD$(8)="U8BR8D8BU4L8BD4BR1
   2":' H
10008 LD$(9)="BU8R8BL4D8BL4R8BR4
   ":' I
10009 LD$(10)="U4BU4BR8D8L8BR12"
   :' J
10010 LD$(11)="U8BR8G4L4BR4F4BR4
   ":' K
10011 LD$(12)="U8BD8R8BR4":' L
10012 LD$(13)="U8F4E4D8BR4":' M
10013 LD$(14)="U8F8U8BD8BR4":' N
10014 LD$(15)="U8R8D8L8BR12":' O
10015 LD$(16)="U8R8D4L8BD4BR12":
   ' P
10016 LD$(17)="U8R8D8H4BG4R8BR4"
   :' Q
10017 LD$(18)="U8R8D4L8BR4F4BR4"
   :' R
10018 LD$(19)="BU4U4R8BD4L8BR8D4
   L8BR12":' S
10019 LD$(20)="BU8R8BL4D8BR8":'
   T
10020 LD$(21)="U8BR8D8L8BR12":'
   U
10021 LD$(22)="BU8D4F4E4U4BD8BR4
   ":' V
10022 LD$(23)="U8BR8D8H4G4BR12":
   ' W
10023 LD$(24)="E8BL8F8BR4":' X
10024 LD$(25)="BU8F4E4BG4D4BR8":
   ' Y
10025 LD$(26)="BU8R8G8R8BR4":' Z
10026 LD$(27)="BR12":' SPACE
10027 LD$(28)="R2U8G2BE2BD8R2BR5
   ":REM 1
10028 LD$(29)="BU6U2R4D4L4D4R4BR
   5"
10029 LD$(30)="R4U4L3BR3U4L4BD8B
   R9"
10030 LD$(31)="BU8D4R4BL2U2D6BR7
   "
10031 LD$(32)="BU8R4BL4D4R4D4L4U
   1BD1BR9":REM 5
10032 LD$(33)="R4U3L4U5D8BR9"
10033 LD$(34)="BU8R4D8BR5"
10034 LD$(35)="U4R1U4R2D4L2R3D4L
   4BR9"
10035 LD$(36)="BU5U3R4D3L4BR4D5B
   R5"
10036 LD$(37)="E8BD8BR5"
10037 LD$(38)="BU4R5BD4BR5"
10038 RETURN
10039 COLORTT(S/8):DRAW"BM"+STR$
   (L)+",100"+TG$(S/8):RETURN
20000 CLS:PRINTTAB(10)"instructi
   ons":PRINTSTRING$(32,45);
```

```
20010 PRINT" OWARE (PRONOUNCED O
   -WAH'-RUH)  HAS BEEN PLAYED O
   N THE AFRICAN  GOLD COAST FOR
    MANY YEARS. IT ISUSUALLY PLA
   YED WITH 48 PEBBLES  AND A PI
   ECE OF WOOD WITH 12      HOLLO
   WED OUT PLACES."
20020 PRINT:PRINT:PRINT"IT IS A
   2 PLAYER GAME, AND EACH PLAYE
   R CONTROLS THE 4 HOLLOWS ONHI
   S SIDE OF THE BOARD.":GOSUB80
20030 CLS:PRINT" EACH PLAYER IN
   TURN TAKES ALL  OF THE MARKER
   S OUT OF ONE OF THEHOLLOWS ON
    HIS SIDE OF THE BOARDTHEN, M
   OVING HIS HAND COUNTER - CLOC
   KWISE, DROPS ONE OF THE      M
   ARKERS IN EACH OF THE HOLLOWS
     HE PASSES."
20040 PRINT:PRINT"IF HE HAS ENOU
   GH MARKERS TO GO  COMPLETELY
   AROUND THE BOARD, HE DOES NOT
    PUT A MARKER IN THE      HOLLO
   W FROM WHICH HE GOT THEM,  BU
   T GOES ON TO THE NEXT ONE.":G
   OSUB80
20050 CLS:PRINT" THE OBJECT OF T
   HE GAME IS TO   MAKE CAPTURES
   . THIS IS DONE WHENTHE LAST M
   ARKER PUT DOWN IS ON  YOUR OP
   PONENT'S SIDE OF THE      BOAR
   D AND MAKES THE TOTAL FOR  T
   HAT HOLLOW 2 OR 3."
20060 PRINT:PRINT:PRINT"IN THIS
   VERSION, THE COMPUTER  DOES
   MOST OF THE WORK FOR YOU.":GO
   SUB80
20070 CLS:PRINT" USE THE RIGHT A
   ND LEFT ARROW   KEYS TO MOVE
   THE CURSOR TO THE  'HOLLOW' F
   ROM WHICH YOU WANT TO TAKE TH
   E MARKERS. THEN PRESS     <ENT
   ER>"
20080 PRINT"THE COMPUTER WILL DO
    THE REST.  IT WILL DISTRIBUT
   E THE MARKERS, CHECK FOR A CA
   PTURE, ADJUST AND PRINT YOUR
   SCORE, AND REVERT     PLAY TO
   YOUR OPPONENT."
20090 PRINT:PRINT"IF YOU PRESS E
   NTER ON AN EMPTY  HOLLOW, NOT
   HING WILL HAPPEN.":GOSUB80
20100 CLS:PRINT" THE GAME CAN EN
   D IN 3 WAYS:":PRINT"1. WHEN N
   O MARKERS ARE LEFT ON  THE BO
   ARD.":PRINT"2. WHEN A PLAYER
   HAS NO MARKERS LEFT TO MOVE":
   PRINT"3. BY MUTUAL CONSENT WH
   EN THERE ARE SO FEW PIECES LE
   FT THAT IT  IS OBVIOUS THE PL
   AYERS COULD      ";
20110 PRINT"CHASE EACH OTHER FOR
   EVER. IN     THIS CASE, PRESS
   <Q> AND THE     PIECES REMAINI
   NG ON THE BOARD   WILL BE DIV
   IDED EVENLY BETWEEN  THE PLAY
   ERS AND THE SCORE WILL  BE AD
   JUSTED.":GOSUB80
20120 GOTO100
60000 PCLEAR4:GOTO10
```

OPERATING HINT

Disk Programs - You can quickly remove disk programs from a disk by typing "DIR" to display the programs. Then chain kill commands for the programs you don't want. Example: KILL "FIRST/BAS":KILL"PGM/BIN": KILL"LAST/DAT:<ENTER>. This saves having to type DIR after deleting each program.

INTERFACING COMPUTERS
JOYSTICKS - PART 3

In this series we have been looking at interfacing color computers with other devices. For the past couple of months we have been looking at using the joystick ports for measuring voltage. Basically the ports convert an analog voltage from Ø to 5 volts into a number from Ø to 63 by a 6 bit analog to digital converter.

There are two joystick ports on color computers. A joystick consists of two potentiometers or variable resistors. As the lever is moved on a joystick, the arm of a potentiometer is moved. A voltage of 5 volts is applied across the potentiometer. The arm which is the joystick input contains a voltage which represents the position of the joystick. Each joystick has two potentiometers, one for horizontal movement and one for vertical movement.

Fortunately connectors are available at Radio Shack stores that allow the ports to be used for measuring other quantities. With connectors we can wire up circuits for making different measurements. We have shown how to measue both dc and ac voltages. This month we want to show how to measure resistance.

OHM'S LAW

Ohm's law is a formula from electronics that relates voltage and current in a resistor. A resistor is a device that opposes the flow of current. A good example of resistance is water flowing in a pipe. The larger the pipe, the smaller the resistance which allows more water to flow. In electronics a small resistor will allow a larger current than a large resistor.

Voltage is the potential difference between two points. A battery has a + and - terminal. The potential of the battery is the voltage across the terminals.

Current is a movement of electrons through a conductor such as wire. Resistance opposes the flow of current. As previously stated the formula that relates voltage, current and resistance is called Ohm's law which is as follows:

E=I*R or R=E/I or I=E/R

where E is the voltage in volts, R is the resistance in ohms, and I is the current in amperes.

A voltage of 5 volts is available through a 1ØØ ohm resistor at the joystick pin 5. A series resistor RS should be connected from pin 5 to pin 1. Let R be the sum of these resistors. See Figure 1. Then to measure an unknown resistor RX the following equations can be derived.

(1) V=5*RX/(R+RX)

Solving equation (1) for RX gives

(2) RX=V*R/(5-V)

Now we can convert the joystick reading (JS) into a voltage with the following formula.

(3) V=5/64*JS

To get the resistance value we can convert the joystick reading into a voltage V with equation 3. Then we can use this value of V to determine the resistance in equation 2. Now let's write a program to calculate the resistance. Let's let R=1ØØØØ.

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JOYSTICK OHMMETER PROGRAM

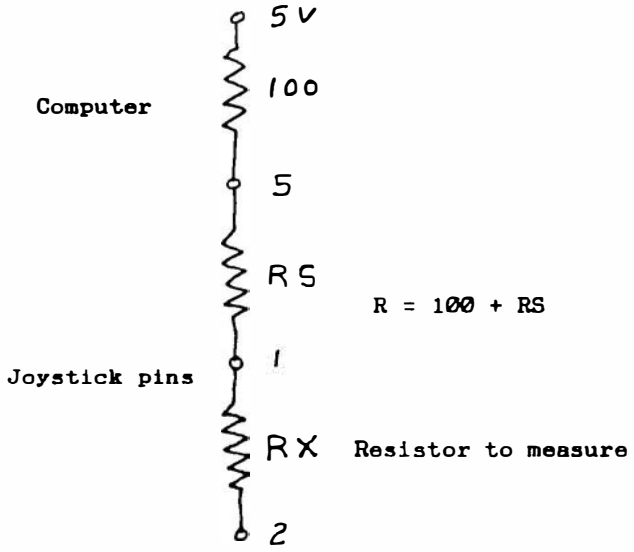
```
20 CLS:R=10000:JS=JOYSTICK(0):
   V=JS/64*5
30 RX=V*R/(5-V)
40 ?@0,"RESISTANCE="RX
50 FOR J=1 TO 500:NEXTJ
60 GOTO20
```

Different scale factors can be obtained by selecting various values for R. The following is a chart giving resistance values for joystick readings of 1 for a minimum and 63 for a maximum with resistors of 1000 and 10000 ohms for R.

R	MIN JS=1	MAX JS=63
1000	16	63000
10000	159	630000

One thing nice about a computer is that it is easy to see the results. For a multimeter sometimes it is hard to read the value from the proper scale. The value of the resistor is computed and printed on the screen. Although we have a resolution of only 64 steps or values, this is adequate for most measurement requirements.

Next month we will look at another application for using the joystick analog to digital converters. We can measure temperature, light intensity, and digitize voice. We want to show how to do these measurements in future editorials.



Joystick Voltmeter Schematic Diagram

Figure 1

OPERATING HINT

Patch around bad sectors: If you have a file in a bad sector on your disk and wish to save another copy of the file, then save it under a different name. This will force the file to be placed in a different sector. Rename the file in the bad sector and then you can use its name to rename the new file. The good file will then be loaded whenever it is called.

VINCENT VAN COCO

VINCENT VAN COCO is a comprehensive graphics editor for the 32K CoCo. Draw wonderful works of art with keyboard selected functions & a joystick or a mouse. Flip your picture upside down, shrink or enlarge it, scramble it, or even scroll it in any direction! It is all possible (and simple) with VINCENT VAN COCO!! Eight sample pictures are included with the program. See the review on page 195 of the April 1986 RAINBOW & on page 30 of the December '86 Dynamic Color News. Machine Language is used for quick, smooth response. Works on all CoCo's except for the Color Computer 3.

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ML PROGRAMMING by JOHN GALUS

PART #11.

BRANCH AND COMPARE

In this part we will examine the Branch and Compare instructions. These commands make it possible for a programmer to alter the flow of a program's logic, like Basic's IF/THEN statement. In Assembly language we Branch to a memory location usually represented by a LABEL. In a Compare we test the computers "flags" to see if a certain condition is being met. These flags are contained in what is called the Condition Code Register. The Condition Code register or CC is an eight bit (one byte) register that the microprocessor uses to reflect the result of a command or operation that has taken place within the computer. The CC register is composed of the following:

CONDITION CODE REGISTER

```
*************************
*E *F *H *I *N *Z *V *C *
*************************
```

E - PLACE ENTIRE STATE OF COMPUTER ON STACK.
F - FAST INTERRUPT.
H - HALF CARRY.
I - IRQ INTERRUPT.
N - NEGATIVE FLAG.
Z - ZERO FLAG
V - OVERFLOW.
C - CARRY.

For example, if the result of an operation was zero, the Z zero flag would be set. We use the Branch commands to test these flags. Branch instructions are "conditional". In other words if the condition we wish to test is true, then the program will jump to the memory address we specify. For example.

```
     LDA  #Ø
     BEQ  ZERO ....
     SWI          .
                  .
                  .
ZERO SWI..........
```

In the example we load the A register with zero, doing this sets the Z or Zero code. We then test the CC Z flag using the Branch BEQ (Branch if Equal). Since this condition is true, the Z flag is set, the program jumps to the location ZERO.

Editor's note: Set forces a bit to equal "1" and clear forces it to equal "Ø".

If in the example the Z flag were not set, (Not Equal to Zero) the program would have fell through to the next instruction which this time happens to be the SWI instruction. We can also use the Branch commands together with a Compare to test to see if a condition exists between a value held in a

register and another value. Example.

```
START   LDA  #2
        STA  $400
        LDB  #2
        CMPB $400
        BEQ  EQUAL
        BNE  NOEQU
        BLO  LESS
        SWI
EQUAL   SWI
NOEQU   SWI
LESS    SWI
        END
```

Notice how I use several Branches in the program. Depending on the values place in memory location $400 and the value in the B register, the above program will test the CC register and jump to the correct memory location. To EQUAL if the two values are equal or zero, NOEQU if the are not the same and LESS if the value in B is less then the value in $400.

Here is a list of some of most often used Branch commands.

```
BCC - BRANCH IF CARRY CLEAR C=0
BCS - BRANCH IF CARRY SET C=1
BEQ - BRANCH IF EQUAL Z=1
BHI - BRANCH IF HIGH
BLE - BRANCH IF <= ZERO
BLO - BRANCH IF BELOW
BLS - BRANCH IF < OR SAME
BMI - BRANCH IF MINUS
BNE - BRANCH IF NOT EQUAL
BPL - BRANCH IF PLUS
BRA - BRANCH ALWAYS
```

If you write long Assembly language programs you will soon find out the that a normal branch command will only work up to 129 bytes forward or 126 bytes backward in your Assembly language program. If this occurs in your program add a "L" before the branch instruction to signify a Long Branch is to be executed.

```
LBEQ
LBNE
```


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When we need to test the contents of two values held in a register or memory, we use the Compare (CMP) instruction. The Compare works by performing a subtraction on the number held in the prescribed register in the compare command with the value in the operand field. This operation sets the appropriate flags without altering either value. Here's an example:

```
START   LDA  #2
        CMPA #2
        BEQ  SAME
```

Any register may be used in a compare instruction by placing its name after the command.

CMP (register name)

The compare command is often used to determine if two items such as strings are equal. Here is an example of a pattern match routine that tests two strings to see if they are equal.

```
START   LDX  #MES1   ;POINT TO
                     ;FIRST STR$
        LDY  #MES2   ;POINT TO
                     ;SECOND STR$
        LDB  #3      ;LEN OF STR$
MATCH   LDA  ,X+     ;GET A CHAR
        CMPA ,Y+
        BNE  NOMAT
        DECB
        BNE  MATCH
        SWI
NOMAT   LDB  #-1     ;NO MATCH
        SWI
MES1    FCC  /ABC/
MES2    FCC  /ABC/
        END
```

In the preceeding routine if the first string is equal to the second string then the B register will equal zero, if not the same the B register is loaded with -1 to mark that the two strings are not the same. Another instuction similar to the compare is the test TST instruction. The TST can only be used with the A or B registers and only tests for a zero (Z set) or negative (N set) condition. Try and use these commands in your programs and examine their operation. In the next part of this series we will look at Indexing and Table handling.

These are collections of programs from Dynamic Color News.

DCN-1

1.* 64K all RAM
2.* 2- bank address file
3. Alarm Clock
4. Loan Interest
5. Character Generator
6.* Bank Switching
  * Won't work on CC-3

DCN-2

1. Check Book Program.
2. Ball Team Sort Program.
3. Card Shuffling
4. Student Study Program
5. Address File

DCN-3

1. Restore-Recover program lost after NEW command.
2. Fast Food
3. Bar Graph
4. Memory Peek & Poke
5. Graphics draw

DCN-4

1. Address File with Sort
2. Morse Code Generator
3. Star Constellations
4. Dueling Cannons

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There are two basic types of memories that are used in computers. The first kind is permanent memory which is contained in chips called read only memories (ROM). This type memory can not be changed but can contain instructions and programs. Examples are the basic, extended basic and disk basic ROMS. Other examples are the plug in cartridges that contain games and programs.

The second kind of memories are called random access memories (RAM). These come in two kinds. The first kind are static memories. They do not require any support circuitry but do have a small memory capacity. These are used in portable computers such as the Radio Shack model 100 and 102.

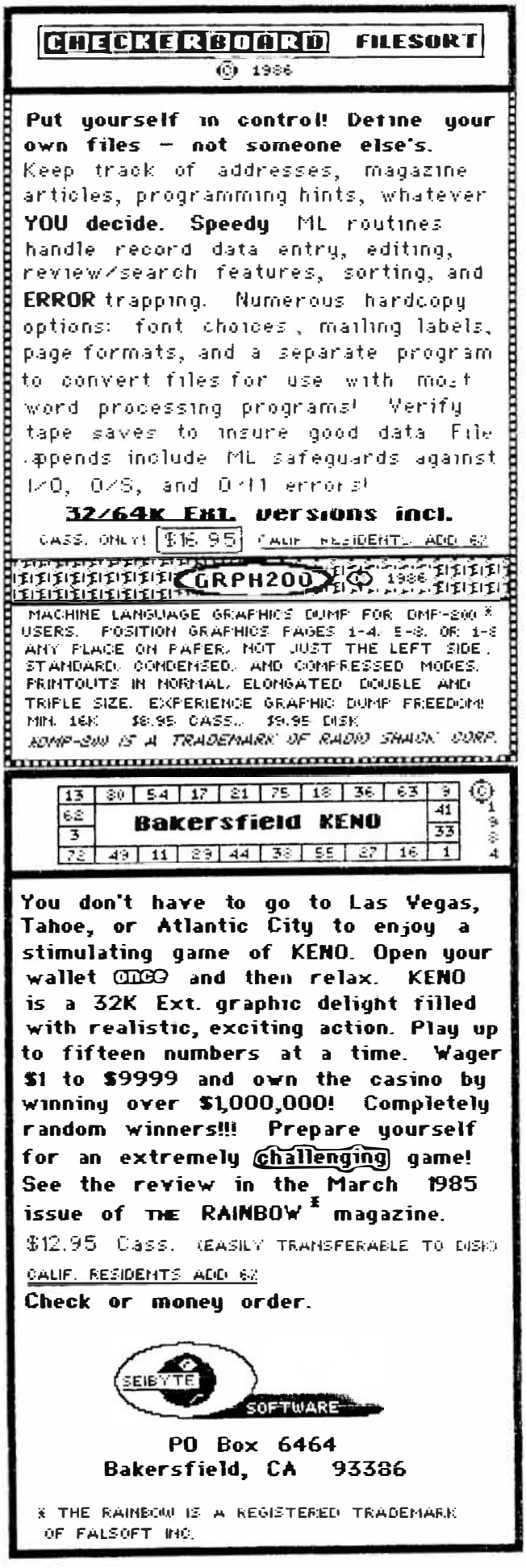
The second type of RAM is the dynamic memory. Familiar types are the 4164, 41256, and 44256. The 4164 contains 64K bytes by one bit, the 41256 contains 256K bytes by one bit, and the 44256 contains 64K bytes by 4 bits. The 4164 chips are used to upgrade the 8 chip D,E, 285, and Color Computer 2 computers. Two of the 41456 chips make up the RAM memory for the newer CoCo-2 and 4 of these give the 128K of RAM for the CoCo-3.

Now let's get back to our subject of EPROMS. An EPROM is an eraseable programable read only memory. To get involved with EPROMS you will need a programmer and an eraser. The programmer burns in the desired pattern and the eraser as the name implies erases or removes the pattern. The pattern is retained indefinitely without power being applied to the chip.

If you are interested in purchasing an EPROM programmer then you shGuld be aware that there are two types of EPROMS. The earlier ones, the 2764 and 27128 required about 21 volts for the programming voltage. The 27256 and 27512 EPROMS required about 12 volts for programming. So when you purchase a programmer, it is necessary to purchase one for the chips you want programmed. Some programmers can handle many different type chips but these are more expensive. As far as costs are concerned, a programmer will cost from $50 to $150 and an eraser can be purchased for under $50. The memory capacity for the common chips are as follows:

Type	Bits	Bytes
2732	32K	4K
2764	64K	8K
27128	128K	16K
27256	256K	32K
27512	512K	64K

The 2764 can contain the information for an extended basic or an extended disk basic ROM. Also most cartridge games can be contained within the 8K of memory of the 2764. The 27128 can contain both the basic and extended basic ROMS. The 27256 can contain 4-8K ROMS.



This chip could contain the Basic, Extended Color Basic, and Disk Basic data plus 8K more of information. As you can see this is quite a powerful chip. The 27512 can contain 8-8K blocks of data. This data can be programs or any other information.

USING EPROMS

We have used EPROMS to contain the Basic and Extended basic ROMS. We put the data for both ROMS in a 27128 with a logic gate to determine which half was active. We also have put programs in cartridges. This is very useful for a cassette system because a disk does not occupy the cartridge space. However a cartridge can be used with a disk drive if logic is included to force it to occupy the upper 8K or memory. Both the cartridge and cable could be connected together with a "Y" cable. Our first 96KX cartridge plugged in the expansion slot and a disk controller plugged into the cartridge. The logic circuitry was included within our cartridge to force the cartridge to use the upper memory and not conflict with the memory used by the disk drive.

Next month we will continue and show the control circuitry needed to force an EPROM to use the upper 8K of memory. Also we will explain what is required to put basic programs in cartridges. We have put several basic programs into cartridges with very good success.

This series was requested by one of our subscribers. If you have a subject you would like us to cover, please let us know and we will schedule it if we have not covered it.

OPERATING HINT

You can do memory peeks or pokes, or list part of your program, and then continue the program by typing "CONT ENTER". You do not loose your variables with this procedure.

COLOR COMPUTER 3

Last month we did not have an editorial on the Color Computer 3 because our computer had failed. It seems like we have had our share of problems with the computer and the multipack interface. We now have the problems resolved and are continuing this month with more information on the color computer 3.

If you are considering upgrading to the color computer 3, then let us give you a short comparision of what to expect over the other computers. First of all, all Radio Shack color computers use the 6809 family of microprocessors although the CC-3 uses the B version which is faster. Almost any task that could be accomplished on the the new CC-3 could be accomplished on the older ones. The lowercase characters, screen widths of 32, 40, and 80 characters, and advanced graphics will allow programs to be written that could not be run on the other computers. Also the older computers can be expanded to 512K either by internal memory expanders or a multipack cartridge. So if you have a computer that is serving your needs then keep it. If the new features of the color computer 3 are what you need then perhaps you should consider purchasing one.

The color computer 3 is easier to use than an IBM or one of the clones. These computers require a 1 or 2 minute delay after turning them on. The CC-3 is ready to operate within a second or two after applying power. With 512K of memory, it can compete with just about any computer.

Basically the color computer 3 is 100% compatible with other color computers for programs that use the lower 32K of the memory map. Since the CC-3 allows an all ram mode of operation, patches can be made with software to make it compatible with older software programs.

IMPROVING THE DISPLAY

There are a couple of memory pokes that really enhance the CC-3 in the 32 character mode. Since lower case characters are available in the 40 and 80 character displays, the computer's software contains the lower case characters. Reversed video is another feature that is desireable. With the older computers a hardware modification was required for reversed video. Also a hardware character generator board was required for lower case characters unless they were generated by graphics. The following program will give both lower case and reversed video. Because the characters are easy to read in the 32 character mode, it is nice to use this display when entering data. Whenever you want reversed video and the lower case characters run the following program first. Then load or run your other programs.

COLOR COMPUTER 3 DISPLAY FORMATTER

```
10 ?"THIS FORMATS THE DISPLAY
20 ?"FOR LOWER CASE CHARACTERS
30 ?"AND REVERSED VIDEO FOR A
40 ?"COLOR COMPUTER 3
50 POKE 65468,63:POKE 65469,0'
    REVERSED VIDEO
60 POKE 359,57:POKE 65314,16'
    LOWERCASE CHARACTERS
70 ?"NOW LOAD YOUR OTHER PROGRAMS
```

TR	A15	A14	A13	Add. range	MMU
Ø	Ø	Ø	Ø	X0000-X1FFF	FFAØ
Ø	Ø	Ø	1	X2000-X3FFF	FFA1
Ø	Ø	1	Ø	X4000-X5FFF	FFA2
Ø	Ø	1	1	X6000-X7FFF	FFA3
Ø	1	Ø	Ø	X8000-X9FFF	FFA4
Ø	1	Ø	1	XA000-XBFFF	FFA5
Ø	1	1	Ø	XC000-XDFFF	FFA6
Ø	1	1	1	XE000-XFFFF	FFA7
1	Ø	Ø	Ø	X0000-X1FFF	FFA8
1	Ø	Ø	1	X2000-X3FFF	FFA9
1	Ø	1	Ø	X4000-X5FFF	FFAA
1	Ø	1	1	X6000-X7FFF	FFAB
1	1	Ø	Ø	X8000-X9FFF	FFAC
1	1	Ø	1	XA000-XBFFF	FFAD
1	1	1	Ø	XC000-XDFFF	FFAE
1	1	1	1	XE000-XFFFF	FFAF

Let's take an example. Suppose we want to address $60000Ø. Let's write this out in binary format. The left bit is A18. Notice the left 6 bits form the hex word 3Ø.

11Ø ØØØØ ØØØØ ØØØØ ØØØØ

The left 6 bits correspond to the 6 data bits that should be loaded into the MMU to force it to address the extended memory at $60000Ø.

Next month we will continue with our discussion of the Color Computer 3. It is a very powerful computer and an understanding of its operation will make it more enjoyable and useful.

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 **3/87** .

MEMORY MANAGEMENT

The 68Ø9 series of microprocessors can only address 64K of memory. The Color Computer 3 is expandable to 512K of memory. How is the extra memory selected? For addressing 64K of memory 16 address lines are required. For 512K of memory 19 address lines are needed.

MEMORY MANAGEMENT UNIT (MMU)

The MMU contains 16 registers which hold six bits. These registers are called task registers and are used by the computer to select an 8K segment of memory. The task register bit is bit Ø of memory location $FF91 and is used to select the register set. The data in the task register will select the following memory addresses:

Bit	D5	D4	D3	D2	D1	DØ
Addr	A18	A17	A16	A15	A14	A13

The MMU select line is bit 6 of $FF9Ø. It is active low and addresses A13 to A15 determine the 8K address block. Address AØ to A3 determine which of the MMU registers will be selected.

The following is a table showing how the 8K blocks are selected. The X preceeding the addresses can be any value from Ø to 7. Notice that A15,A14, A13, and TR select the MMU's 16 registers which are at locations FFAØ to FFAF.

OPERATING HINT

Define Strings first for multiple saves. If you need to make multiple saves to cassette or disk then define the program name first. Example type X$="COMPUTER"<ENTER>. Then for each save type "(C)SAVE X$ <ENTER>. This saves having to type the name each time.

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.

SUPER RAMDISK

The super ram disk is a hardware package in a metal case the size of a disk controller. It plugs into an expansion slot of a multipak expander and provides 256K or 512K of memory. One of the nice features of this cartridge is that the computer does not have to be modified to use the extra memory. It provides one or two ramdisks and works with all versions of the color computer.

A ramdisk can be used like a disk to store programs. For a one drive system, a disk can be copied into a ramdisk and a backup disk can be made by using the backup command. This is much quicker and easier than doing the multiple disk swaps required with extended disk basic. The ramdisk software is a machine language program. To access it enter 'LOADM "RAMDISK"'. After the program loads type 'EXEC'. Instructions are included for selecting the slot which contains the ramdisk cartridge. Then the ramdisk can be initialized and the drive number selected. For a one drive system select drive 1,2, or 3 and for a two drive system select drive 2 or 3 for the ramdisk. The software is menu oriented and easy to use. After returning to basic, programs can be saved to the ramdisk like any other disk.

COLOR COMPUTER 3

256K MEMORY
(NEW PRODUCT)

Add another 128K of memory to your color computer 3. Its like having two computers in one package. Each memory is independent and is selected by a small toggle switch. Programs and all pointers are saved when memories are deselected which means that a program can be continued without any loading when the memory is reselected.
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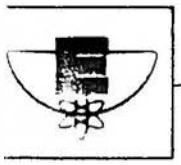

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##########

We reviewed a 256K ramdisk but a 512K version is available. Instructions are included for adding additional memory banks to increase the memory of the cartridge to a million bytes (1M).

Also included within the ramdisk is a mini-expansion bus. Several add-ons are available for this bus. Accessories such as a parallel printer adapter, real time clock, and EPROM programmer are available.

We found the super ram disk to be easy to use. It is especially useful for the Korean color computer 2 which can not easily be upgraded. It also works with the Color Computer 3. Super RAMDISK sells for $119.95 + S/H. C.R.C. Computer Inc., 1Ø8Ø2 Lajeunesse Suite 1Ø2, Montreal,Quebec, Canada H3L 2E8

HIRES FONT MONIFIER

How would you like to change the characters that are displayed on the high resolution screen of your Color Computer 3? The HIRES Font Modifier will allow you to modify each pixel of any character to create your own character sets. The modified character set can be saved to disk.

The procedure for modifying a font is to load "MODIFIER". Then a font to be modified can be loaded. To locate a character press the "L" key and type in the character or a "C" can be pressed and the ASCII value of the character can be entered. The right and left arrow keys can be used to scroll the characters up or down increasing or decreasing their ASCII values.

After a character is selected, pressing the "M" key causes the program to go to the modify mode. A grid is drawn and colored elements represent the pixels and a cursor. The cursor can be moved by arrow keys or the joystick. If a pixel is to be changed then press the joystick button or the space bar. The "F1" key will reverse each pixel of the character and the "F2" key will erase the entire character. Pressing the "ENTER" key ends the modify mode.

Instructions are given for using the fonts with basic or machine language programs. A program is composed usng 3 fonts you select. To select a font from basic type "POKE 32767,N: EXEC" when N is the font number from Ø to 2.

Also included is a demo program that demonstrates the different character sets. There are 8 character sets that come with the program.

We found the program to be very professional and complete. It could be used with a word processor to display the same characters that would be printed on a printer. The program sells for $29.95 +$3 S/H. Spectrum Projects, P.O. Box 264, Howard Beach, NY 11414.

ART GALLERY

Art Gallery is a program that allows displaying of graphics pictures. The pictures must be a PMODE 3 or 4 graphics picture. There are several methods of presenting the pictures. These are Simple Vertical Transition, Simple Horizontal Transition, Opening Curtains, Closing Curtains, Nested Squares, Inverted, Mirror, Negatives, Slices, Cross, and Blocks. With all of these options a very impressive display of the pictures can be obtained.

The program is written in basic with a machine language program. Included with the disk are several sample pictures with the extension "PIC". When the program is run it is necessary to enter the PMODE (3 or 4) and a Ø or 1 for the graphics screen. Next the picture file extension should be entered. For the pictures on the disk enter "PIC". For COCOMAX pictures enter "MAX" for the extension. Next the special effects as mentioned earlier should be entered. Then insert the disk containing the pictures

and press the enter key. The pictures with the selected extension are displayed. One picture can be displayed or all of them. For displaying all of the pictures, the viewing time in seconds from Ø to 9ØØ can be selected. Also the number of times for displaying the pictures can be selected.

The program is easy to use. The sample pictures can be used to see how each of the display methods work. Art Gallery sells for $19.95 + S/H. Tothian Software, Inc. Box 663, Rimersburg, PA 16248

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. We prefer that new product information be sent on a disk as an ASCII file although a printed description is acceptable.

OS-9 Level 2

Radio Shack, a division of Tandy Corporation, announced today the availability of OS-9 Level two, the user-friendly operating system for the popular color computer 3.

Developed by Radio Shack and Microware Systems Corporation and licensed to Tandy, OS-9 Level Two is a multi-user, multi-tasking ooperating system which includes BASICO9 and numerous other utilities.

The operating system features a windowing and graphics kernel system which allows multiple tasks to run simultaneously and a powerful memory management system with memory protection inherent in its operation. OS-9 Level II also affords a high-level of system I/O's including file and record locking.

Available at all Radio Shack Stores, Radio Shack Computer Centers and participating dealers nationwide, suggested retail price of OS-9 Level II (Cat. No. 26-3Ø31) is $79.95.

VCR FILE

Sunrise Software proudly announces its latest software for the Color Computer market, VCR FILE. It operates on all three models of the Color Computer and requires 32K of memory, one disk drive, & optional printer.

VCR File is shipped with a complete operators manual and is not copy protected. It is run protected. A code plug is also supplied with the program and manual. The program can store over 75Ø entries of movies or camcorder programs. It sorts, to the screen, or optional printer. It also calculates the amount of tape available on the cassetts entered on the file.

The VCR FILE is also easily adaptable to the other collections of information, such as, LP recordings, audio cassetts, reel to reel audio tapes, computer tape or disk records, and other similar appllications. $19.95 plus $2.ØØ shipping. Sunrise Software, 89Ø1 NW 26 St., Sunrise FL. 33322

BACK ISSUES

Back issues of **DYNAMIC COLOR NEWS** are available for **$1.95** each, **3 for $5**, or **12 for $15 pp**.

Foreigners other than Canada add **$2** for Air Mail postage.

HAM RADIO & COMPUTERS

by

Bill Chapple W4GQC

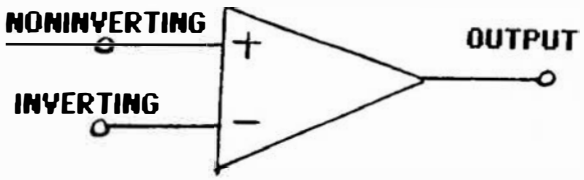
In this series we are giving applications for using color computer for ham radio. Most of the applications will involve software but we are also covering hardware items. There are some tasks that are easier to do with hardware. This is especially true for people with some hardware experience and limited programming ability. One of the purposes of Dynamic Color News has been to provide instruction in programming. Radio Shack Color Computers are very powerful, but they are not of much use without proper instructions.

For our readers who are not active in ham radio, the principles we are covering here can be used for other applications. For example this month we are showing how to use the ASCII port to give a voltage that represents the presence of a tone. We will use this to decode Morse code, but it could be used whenever it is desired to know that an audio signal is present.

SOME ELECTRONICS

The electronic component around which we designed our tone decoder circuit is the analog comparator. The LM339 integrated circuit has 4 comparators in one 14 pin chip. Let me explain how a comparator works. We have been talking about voltage in our joystick voltmeter series so we can use voltage in our explanation.

The diagram of a comparator is shown in figure 1. It consists of a noninverting input (+), inverting input (-), and output. The operation is very



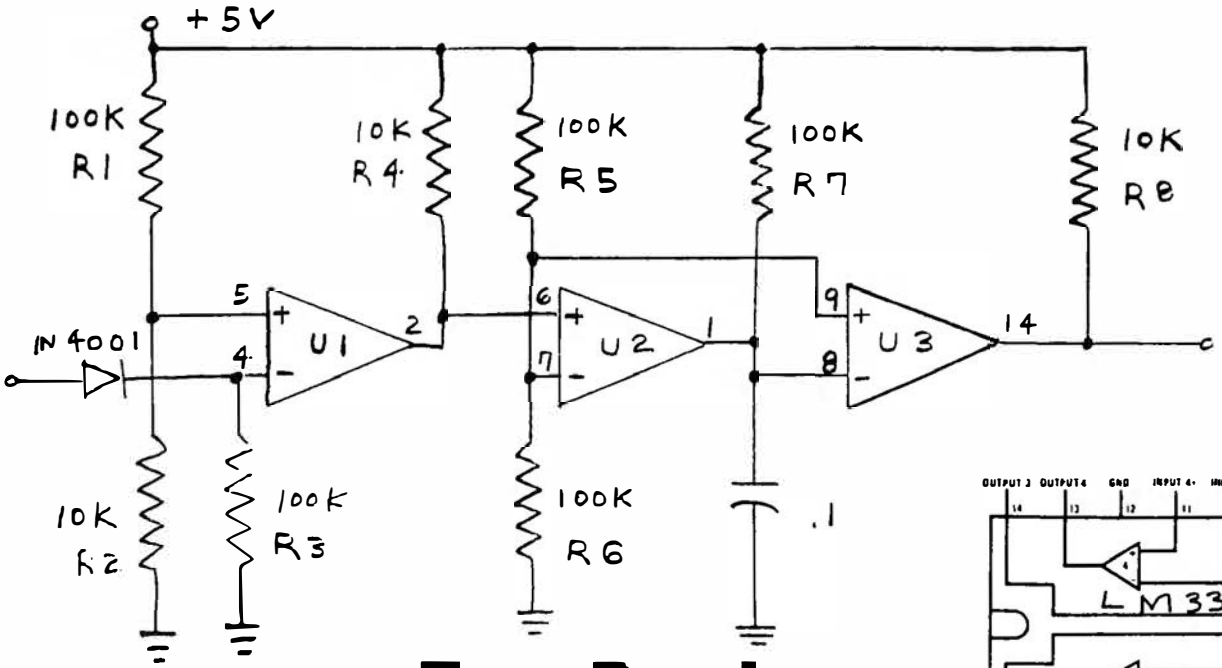
Analog Comparator

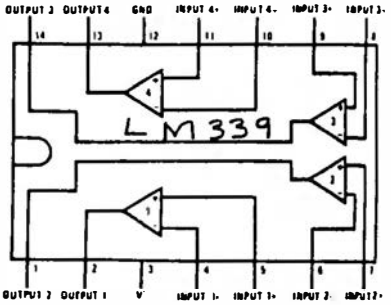
Figure 1

simple. The output goes to the supply voltage if the noninverting input has more voltage than the inverting input. The output swings to Ø or ground voltage if the inverting input is greater than the noninverting input. Let's take a couple of numerical examples. Assume we have a supply voltage of 5 volts which we will be using. The output will either be Ø or 5 volts. There are no in between values. Lets make a chart showing some random voltages on the + and - inputs and the output.

+ INPUT	- INPUT	OUTPUT
1.25	3	Ø
3	2.9	5
4	3.5	5
4	4.2	Ø

A Comparator has very high gain and will switch states if the input voltage differences are in the order of 1/1ØØØ of a volt. This makes it very useful for designing circuits where a large change in voltage is required for a small change in input.





Tone Decoder
Figure 2

A schematic diagram of the tone decoder is shown in Figure 2. We used 3 of the 4 comparators in the LM 339 package and labelled them U1, U2, and U3. The first stage converts the audio into 5 volt pulses. Resistors R1 and R2 divide the 5 volts down and puts a voltage of about .5 volts to the + input of U1. The diode and R3 allow only the positive variations of the audio to be applied to the -input of U1. The output of U1 is at 5 volts until the audio signal exceeds the reference on the + input. Then the output goes to ground.

We want a 5 volt change in signal when a tone is present. It is now necessary to smooth out the variations. Notice that R5 and R6 divide the 5 volts to 2.5 volts since the resistors are equal. This is applied to the - input of U2 and the + input of U3. The capacitor and resistor R7 smooth out the variations.

Now let's look at the outputs of each comparator with no input.

U1	U2	U3
5	5	Ø

Using the simple rule for comparators notice that each condition changes when a signal is applied to U1.

U1	U2	U3
Ø	Ø	5

Now when the output of U1 goes to 5 volts after the first half of the audio cycle, the output of U2 is held low by the capacitor. The capacitor and R7 must be of large enough value to keep the - input to U3 low during the negative half cycle of the audio tone. Therefore the output of U3 stays low as long as the tone is present.

A pin out of the LM 339 is also shown in Figure 2. Pin 12 must be connected to ground and pin 3 must be connected to 5 volts. The input to the tone decoder should come from a ham receiver. I mounted an RCA type jack on my cabinet and used a tee to connect to the output of my CW filter. The output of the tone decoder should go to pin 2 of the 1488 in our ASCII interface circuit presented in our January 1987 issue. This is the TTL input of the 1488 which gives ASCII output.

To verify the operation of the tone decoder, two color computers were used. One was a color computer 3 into which we loaded a Morse code program. A CW filter was connected to the sound output of the CC-3 through a tee connector. The filter was needed to provide amplification since the sound output from the computer is at a low level. The output of the filter was connected to the input of the tone decoder.

The output of the interface was connected to the serial jack of the second computer. The following program provides timing for the tone or absence of a tone. This type timing can be used to complete the Morse code copier which we will present next month. The program displays the relative time between transitions from a tone to no tone. The Morse characters can be recognized by observing the times on the screen.

TONE TIMING PROGRAM

```
10 X=1:C=0' INITIALIZE
    VARIABLES
20 A=PEEK(65314) AND 1 'LOOK AT
    STATE OF ASCII INPUT PORT
30 IF X<>A THEN 100'BRANCH IF
    THE STATE OF THE PORT HAS
    CHANGED
40 C=C+1:GOTO 20 'INCREASE
    COUNTER AND CONTINUE
100 ?X;C 'X=STATE OF THE PORT,
    C=COUNTER
110 X=A:C=0:GOTO 20 'INITIALIZE
    VARIABLES
```

Next month we will continue with software and write a program to receive Morse code using the interface and tone decoder presented here. It is possible to connect the speaker and microphone of a transceiver to the cassette port on a color computer. We may consider using this approach for other applications, but decided on continuing with the ASCII port for the Morse code copier project. The hardware interface will work on other types of computers using their ASCII port.

HAM RADIO PROGRAMS

This is a collection of 3 programs for Ham Radio use. These are supplied on tape or disk and are Color **Computer 3** compatible.

MORSE - This program allows a key to be pressed and then sounds the Morse equivalent. The speed is varied with the right and left arrows. It also will send random characters. This is an excellent tool for developing code speed for the the Novice, Technician, or General class licenses.

DX - Consists of two parts. The first part allows notes to be typed onto the screen. The second part allows the countries for a letter or number prefix to be displayed. To go from one part to the other press the down arrow. The notes are reprinted after going to the DX section. This provides a way to write notes for your QSO's and eliminates DX station lists.

ANTENNA - An antenna design program that calculates the dimensions for a wide spaced Yagi antenna of up to 4 elements. Simply run the program and enter the desired frequency. The dimensions will be printed in feet and inches.

Order **HR-1** **$11.95** tape or disk + $3 shipping

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HARTSELLE, AL 35640

OPERATING HINT

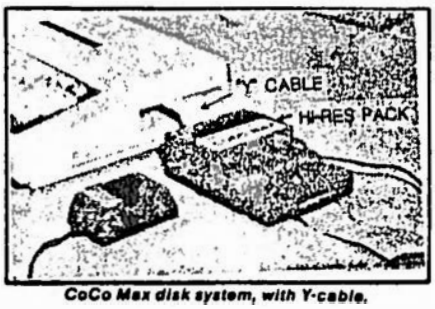
You can disable the cartridge port with POKE 65314,54. Enable it with POKE 65315,52.

CoCo Max™ II

You'll use it all the time and love using it.

What is CoCo Max?

Simply the most incredible graphic and text creation "system" you have ever seen. A Hi-Res Input Pack (more on the pack later) is combined with high speed machine language software. The result will dazzle you.



CoCo Max disk system, with Y-cable.

Is CoCo Max for you?

Anyone who has ever held a pencil or a crayon for fun, school or business will love it. A 4 year-old will have fun doodling, a 15 year-old will do class projects and adults will play with it for hours before starting useful applications (illustrations, cards, artwork, business graphics, flyers, charts, memos, etc.) This is one of the rare packages that will be enjoyed by the whole family.

What made CoCo Max an instant success?

First there's nothing to learn, no syntax to worry about. Even a child who can't read will enjoy CoCo Max. Its power can be unleashed by simply ***pointing*** and ***clicking*** with your mouse or joystick. With ***icons*** and ***pull down menus,*** you control CoCo Max intuitively; it works the same way you think.

Don't be misled by this apparent simplicity. CoCo Max has more power than you thought possible. Its blinding speed will astound you.

It lets you work on an area 3.5 times the size of the window on the screen. It's so friendly that you will easily recover from mistakes: The ***undo*** feature lets you revert to your image prior to the mistake. As usual, it only takes a single click.

Later, we will tell you about the "typesetting" capabilities of CoCo Max II, but first let's glance at a few of its graphic creation tools:

With the ***pencil*** you can draw free hand lines, then use the ***eraser*** to make corrections or changes. For straight lines, the convenient ***rubber-banding*** lets you preview your lines before they are fixed on your picture. It's fun and accurate. Lines can be of any width and made of any color or texture.

The ***paint brush,*** with its 32 selectable brush shapes, will adapt to any job, and make complicated graphics or calligraphy simple.

For special effects, the ***spray can*** is really fun: 86 standard colors and textures, all available at a click. It's like the real thing except the paint doesn't drip.

CoCo Max will instantly create many shapes: circles, squares, rectangles (with or without rounded corners), ellipses, etc. Shapes can be filled with any pattern. You can also add hundreds of custom patterns to the 86 which are included.

The ***Glyphics*** are 58 small drawings (symbols, faces, etc.) that can be used as rubber stamps. They're really great for enhancing your work without effort.

Pull down menus

Zoom in!

Control Over Your Work

CoCo Max's advanced "tools" let you take any part of the screen, (text or picture) and perform many feats:

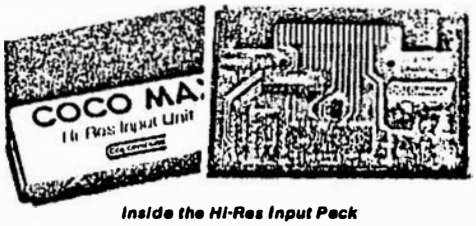
• You can move it around • Copy it • Shrink or enlarge it in both directions • Save it on the electronic ***Clipbook*** • Flip it vertically or horizontally • Rotate it • Invert it • Clear it, etc. etc.

All this is done instantly, and you can always ***undo*** it if you don't like the results.

For detail work, the ***fat bits*** (zoom) feature is great, giving you easy control over each pixel.

To top it all, CoCo Max II works in color. Imagine the pictures in this ad in color. If you own a Radio Shack CGP-220 or CGP-115, you can even print your work in full color!

There is so much more to say, such as the capability to use CoCo Max images with your BASIC programs, the possibility to use CoCo Max's magic on any standard binary image file. There are also many advanced features such as the incredible ***lasso***.



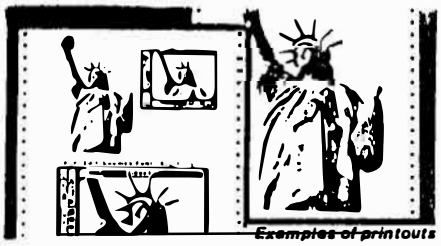
Inside the Hi-Res Input Pack

Why a Hi-Res Input Pack?

Did you know that the CoCo joystick input port can only access 4096 positions (64x64)? That's less than 10% of the Hi-Res screen, which has 49152 pointsl (256x192). You lose 90% of the potential. The Hi-Res Input Pack distinguishes each of the 49152 distinct joystick or mouse positions. That's the key to CoCo Max's power. The pack plugs into the rom slot (like a rom cartridge). Inside the pack is a high speed multichannel analog to digital converter. Your existing joystick or mouse simply plugs into the back of the Hi-Res Pack.

Electronic Typesetting...

You'll be impressed with CoCo Max's capability. Text can be added and moved around anywhere on the picture. (You can also rotate, invert and flip it...) At a click, you can choose from 14 built in ***fonts*** each with 16 variations. That's over 200 typestyles!



Examples of printouts

Printing Your Creations

There are a dozen ways to print your work. All are available with a click of your joystick (or mouse) without exiting CoCo Max. Your CoCo Max disk includes drivers for over 30 printers!

All the CoCo Max pictures are unretouched screen shots or printouts (Epson RX-80).

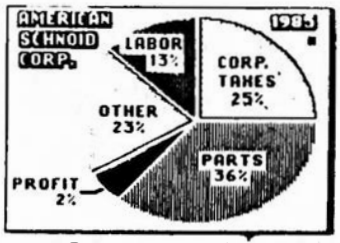
CoCo Max II™

The whole family will enjoy CoCo Max. Here are a few examples of the possibilities.

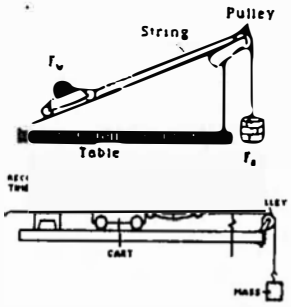
All these pictures are **unretouched** screen photos or printouts (on an Epson RX-80).

1 *Publish a newsletter or bulletin*

2 *Fun for children while stimulating creativity.*

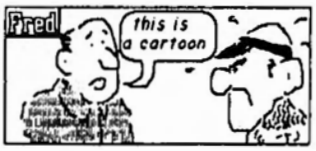


3 *Business graphs, charts, diagrams. Also memos*

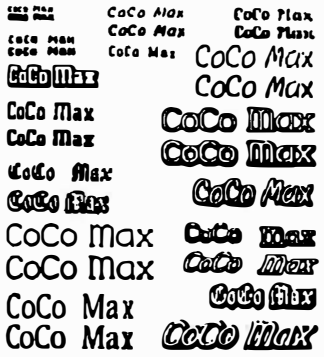


4 *Junior's homework and science projects. Term papers too!*

7 *Video portrait (with optional digitizer).*

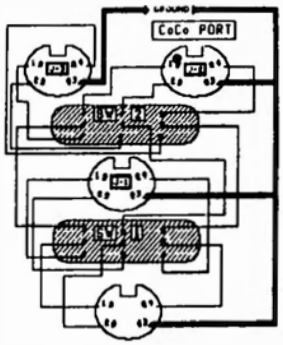


8 *This is a cartoon.*



5 *Over 200 typestyles to choose from! generate flyers.*

6 *A new way to express your imagination.*



9 *schematics and floor plans.*

10 *Logos and letterheads.*

System Requirements:

Any 64K CoCo and a standard joystick or mouse. (The koala pad and the track ball work, but are not recommended.)
Disk systems need a Multi-Pak or our Y-Cable.
CoCo Max is compatible with any Radio Shack DOS and ADOS.
Note: the tape version of CoCo Max includes almost all the features of CoCo Max II except *Shrink, Stretch, Rotate,* and *Glyphics.* Also, it has 5 fonts instead of 14.
CoCo Max is not compatible with JDOS, DoubleDOS, MDOS, OS-9, the X-pad, and Daisy Wheel Printers.

Printers Supported:

Epson MX, RX, FX and LX series, Gemini, Star, Micronix, Delta 10, 10X, 15, 15X, SG-10, Okidata 82A, 92, 93, C. Itoh Pro-writer, Apple Image-writer, Hewlett-Packard Thinkjet, Radio Shack DMP 100, 105, 110, 120, 200, 400, 500, Line Printer 7, Line Printer 8, TRP-100, CGP-220. (DMP-130 use Line Printer 8), PMC printers, Gorilla Banana.
Color printing: CGP-200, CGP-115

Pricing

CoCo Max on tape $69.95
with Hi-Res Pack and manual.
CoCo Max II (disk only) $79.95
with Hi-Res Pack and manual.
Upgrade: CoCo Max to CoCo Max II
New disk and manual $19.95
New features of CoCo Max II: 14 fonts and glyphic font, dynamic shrink and stretch, rotate, multiple drive capability, 68 page scrapbook, point and click file load, color printer drivers, full error reporting.
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Font Editor Option

A font is a set of characters of a particular style. CoCo Max includes 15 fonts. You can create new fonts of letters, or even symbols or graphics with the font editor. Examples: set of symbols for electronics, foreign alphabets, etc. $19.95

Video Digitizer DS-69

This new Low Cost Digitizer is the next step in sophistication for your CoCo Max system. With the DS-69 you will be able to digitize and bring into CoCo Max a frame from any video source: VCR, tuner, or video camera. Comes complete with detailed manual and C-SEE software on disk. Multi-Pak is required.
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BASIC PROGRAMMING

In this series we have been showing how to use basic commands and write useful programs. For the past few months we have been looking at an address file that will handle a large number of addresses. We need a little more time to work out the details on the address file so this month we are looking at another application.

Microcomputers are very powerful and can be effectively used for business applications. For example Radio Shack color computers are used extensively for industrial controllers. There are several reasons for this. Two obvious one are price and adaptability. We have been showing how to use them for interfacing devices in our Interfacing Computers section.

Also they are very powerful for doing calculations. We have compared them with IBM computers and their clones and do not find color computers to be inferior at all. In fact they are easier to use. At least you do not have to wait a minute or two for them to initialize when power is turned on.

This month we want to look at a business application. We developed an invoice program for this editorial. Let's look at a few principles we are using in this program.

STR$

The STR$ command can be used to convert a variable into a string. This can be used to simplify print formats especially if you want to print results to the screen and printer. Lets assume we have an item X$ that sells for X. To print both of thes, we can combine them into one string and have only one print command. This is very useful if we want to print to the screen and a printer. Look at the following:

```
10 X$="10 # HAMMER  ":X=15.65
20 S$=STR$(X)
30 P$=X$+S$:IF P=1 THEN ?#-2,
    ?P$
```

Notice we have only one print command in line 30 although we are printing X$ and X. We used this technique in printing the items ordered both to the screen and the printer.

ARRAYS

We set up arrrays for 50 store items. We used the READ-DATA method of entering the items for sale into an array. Only a small number or items were entered but this number can be expanded up to the limit. The array X$(J) contains the original items for sale and the array X(J) is the value of these items.

We reserved 3 arrays for the items ordered by the customer. These we called Y$(W), Y(W), and Z(W). We used the variable W to indicate the order we picked items. The array Z(W) contains the number of the item ordered. IF Y$(X) is HAMMERS then Y(X) is the value of one hammer and Z(X) is the number of hammers the customer ordered.

There is another array for the customer's name and address. It has 5 elements and is designated C$(J).

MENU

The program is menu oriented. You can select the various parts of the order. For example the type order such as a phone order or mail order can be selected. Also the amount of shipping and tax can be changed.

INVOICE PROGRAM

When running the program you are prompted to enter the date. Do not use a comma but use the format 3-10-87 or 10 March 87.

The items are printed and the total is printed to the right. For example if you order two SAWS then the number of SAWS is printed to the left, the price of each SAW is printed after the description, and the total is printed on the right.

The shipping and sales tax are included and printed after the items as well as the total sale.

This invoice program works and can be expanded to meet the requirements of any business. For example it would be desireable to center the business name and perhaps use special print characters. Also a thank you note could be printed at the bottom of the invoice.

```
10 PRINT"INVOICE PROGRAM
20 PRINT"COPYRIGHT (c) 1987
30 PRINT"dYNAMIC eLECTRONICS iNC
40 'VARIABLE LIST
50 'NI= NUMBER OF ITEMS FOR SALE
60 'IN=INVOICE NUMBER
70 'P=PRINTER STATUS 0=OFF 1=ON
80 'SM=SHIP METHOD 0=UPS 1=FCM
90 'T=TYPE ORDER 0=MAIL 1=PHONE
100 'SH=SHIPPING
110 'PT=PERCENT TAX
120 '
130 INPUT"ENTER DATE";DT$:P=1
140 'SET UP ARRAYS
150 DIM X$(51),X(51),Y$(51),Y(51
   ),Z(51),C$(5)
160 'READ DATA INTO THE ARRAYS
170 FOR J=1 TO 51
180 READ X$(J),X(J)
190 'CHECK FOR LAST DATA ITEM
200 IF X$(J)="" THEN NI=J-1:GOTO
    220
210 NEXT J
220 PRINT"THERE ARE"NI" ITEMS"
230 'PRINT THE MENU
240 PRINT"INVOICE #"IN
250 PRINT"1 ENTER CUSTOMER'S NAM
   E
260 IF P=0 THEN P$="PRINTER IS O
   FF" ELSE IF P=1 THEN P$="PRIN
   TER IS ON
270 PRINT"2 ENTER ITEMS ORDERED
280 IF SM=0 THEN S$="UPS" ELSE I
   F SM=1 THEN S$="FCM
290 PRINT"3 PRINT INVOICE
300 PRINT"4 ENTER INVOICE NUMBER
310 IF T=0 THEN T$="MAIL ORDER"
   ELSE IF T=1 THEN T$="PHONE OR
   DER
320 PRINT"5 "P$
330 PRINT"6 "S$
340 PRINT"7 SHIPPING="SH
350 PRINT"8 "T$
360 PRINT"9 % TAX="PT
370 INPUT"ENTER CHOICE";C
380 'BRANCH TO SUBROUTINE
390 ON C GO SUB 520,660,890,410,
   430,450,470,480,500
400 GOTO240
410 INPUT"ENTER INVOICE NUMBER";
   IN
420 RETURN
430 P=P+1:IF P>=2 THEN P=0
440 RETURN
450 SM=SM+1:IF SM>=2 THEN SM=0
460 RETURN
470 INPUT"ENTER SHIPPING";SH:RET
   URN
480 T=T+1:IF T>=2 THEN T=0
490 RETURN
500 INPUT "TAX PERCENTAGE";PT:RE
   TURN
510 '
520 PRINT"THIS ENTERS THE CUSTOM
   ER
530 INPUT"ENTER FIRST LINE";C$(1
   )
540 INPUT"ENTER SECOND LINE";C$(
   2)
550 INPUT"ENTER THIRD LINE";C$(3
   )
560 INPUT"ENTER CITY";C$(4)
570 INPUT"ENTER STATE & ZIP CODE
   ";C$(5)
580 CLS:PRINTC$(1):PRINTC$(2)
590 IF C$(3)="" THEN 600 ELSE PR
   INTC$(3)
600 PRINTC$(4);:PRINT","C$(5)
610 PRINT:PRINT"PRESS 1 IF THERE
    IS A MISTAKE
620 INPUT"OR ENTER TO RETURN TO
   MENU";X
630 IF X=1 THEN 520
```

A TRS-80 Color Computer
users magazine

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Addr_____

City_____

Zip _____
Please send all orders to

P D SOFTWARE
P O BOX 13256
HOUSTON, TX 77256

```
640 RETURN
650 '
660 PRINT"THIS SELECTS THE ITEMS
670 INPUT"ENTER 1 TO ADD TO LIST
    ";XX:IF XX=1 THEN W=W+1:GOTO7
    ØØ
680 W=1
690 FOR K=1 TO 51:Y(K)=Ø:Z(K)=Ø:
    NEXT K
700 FOR J=1 TO NI
710 PRINTJ;X$(J);X(J)
720 P$=INKEY$:IF P$="" THEN NEXT
    J
730 INPUT"ENTER ITEM NUMBER";A
740 INPUT"HOW MANY?";N
750 IF N=Ø THEN 24Ø
760 Y(W)=X(A):Z(W)=N
770 N$=STR$(N):Y$(W)=N$+" "+X$(A
    )
780 CLS:S=Ø:FOR J=1 TO W:
790 S=S+Y(J)*Z(J):PRINTJ;Y$(J);Y
    (J);Y(J)*Z(J)
800 NEXT J
810 ST=S*PT/1ØØ:PRINT"TAX="ST
820 PRINT"TOTAL="S
830 INPUT "PRESS ENTER TO CONTIN
    UE, PRESS E TO END PRESS K TO
     KILL LAST ENTRY";S$
840 IF S$="E" THEN 87Ø
850 IF S$="K" THEN PRINT"REPEAT
    LAST ENTRY":GOTO 7ØØ
860 W=W+1:GOTO 7ØØ
870 GOTO24Ø
880 '
890 'THIS PRINTS INVOICE
900 X$=DT$:GOSUB 123Ø:X$=" ":GOS
    UB 123Ø
910 X$="INVOICE # "+STR$(IN):GOS
    UB 123Ø:X$=" ":GOSUB 123Ø
920 'PRINT COMPANY NAME
930 X$="Jones Hardware Co.
940 GOSUB 123Ø
950 X$="205 First Ave.
960 GOSUB 123Ø
970 PRINT"Huntsville, AL 35810
980 IFP=1 THEN PRINT#-2, "Huntsv
    ille, AL 35810
990 PRINT:IF P=1 THEN PRINT#-2,
     " "
1000 X$="SOLD TO:":IFP=1THENGOSU
    B123Ø
1010 FORJ=1 TO 3:X$=C$(J):GOSUB1
    23Ø:NEXTJ
1020 PRINTC$(4)+",";:IFP=1THENPR
    INT#-2,C$(4)+",";
1030 X$=C$(5):GOSUB 123Ø
1040 X$=" ":GOSUB 123Ø
1050 X$="SHIPPED BY "+S$:GOSUB 1
    23Ø:X$=" ":GOSUB 123Ø
1060 '
```

```
107Ø 'THIS PRINTS THE ITEMS BOUG
   HT
108Ø S=Ø:FOR J=1 TO W
109Ø XQ=Y(J)*Z(J):XQ$=STR$(XQ)
11ØØ S=S+Y(J)*Z(J):PRINTJ;Y$(J);
   XQ
111Ø AZ$=STR$(J)+Y$(J)
112Ø AZ$=AZ$+STR$(Y(J))
113Ø AZ=LEN(AZ$)
114Ø FOR XA=AZ TO 4Ø:AZ$=AZ$+" "
   :NEXT XA
115Ø AZ$=AZ$+XQ$:IFP=1THENPRIINT
   #-2,AZ$
116Ø AZ$=""
117Ø NEXT J
118Ø ST=INT(PT*S)/1ØØ:PRINT"TAX=
   "ST:IF P=1 THEN PRINT#-2,"TAX
   ="ST
119Ø PRINT"SHIPPING ="SH:IFP=1TH
   EN PRINT#-2,"SHIPPING="SH
12ØØ S=S+ST+SH:X$="TOTAL =$"+STR
   $(S):GOSUB 123Ø
121Ø RETURN
122Ø 'PRINT SUBROUTINE
123Ø IF X$="" HEN RETURN
124Ø PRINTX$:IF P=1 THEN PRINT#-
   2,X$
125Ø RETURN
126Ø 'THESE ARE THE ITEMS
127Ø DATA #5 HAMMER,1Ø.25
128Ø DATA HAND SAW,8.35
129Ø DATA HACK SAW,4.95
13ØØ DATA CENTER PUNCH,1.95
131Ø DATA GAS PLIERS,3.39
132Ø DATA 6" ADJUSTABLE WRENCH,4
   .49
133Ø DATA 8" ADJUSTABLE WRENCH,6
   .95
134Ø DATA 1Ø" ADJUSTABLE WRENCH,
   8.95
135Ø DATA,,,
136Ø '
```

EDITORIAL

We are again operational with our Color Computer 3. We had problems with both our multipack interface and the CC-3. Both units were under warranty so we had them repaired at the Radio Shack Computer Center in Huntsville. This month we are again presenting information on this new computer plus some product reviews. There is much to learn and fortunately information is beginning to appear. One thing that I like about the support for color computers is that information about its operation is published in the magazines and newsletters. At first it appeared that some software would not be compatible with the new computers. However since the CC-3 can be operated in the all ram mode, it is easy to modify memory and provide patches for various software.

We are continuing with our joystick interfacing. This month we are looking at measuring resistance by using the joystick port. These ports are very valuable for measuring quantities and we will be showing how to use them for other measurements.

COMMENTS

In our programming series we are presenting a business program. Color computers are very adaptable to business applications. This month we are presenting an invoice program. Comments are included so you can customize the program for your own requirements.

For our ham radio section, we are showing how to make a tone decoder. If you are interested in using audio tones for other applications, then this article will be of interest to you. Next month we will give a Morse copier program using the tone decoder.

We are starting a new series on EPROMS. This is in response to the letters from our readers. If you are interested in putting programs in EPROMS then this series is for you.

I recently heard a comment that an IBM or clone was needed to play advanced games such as chess. We reviewed a fine chess game a few months back. As I have stated many times the color computers are as powerful as any and with the powerful graphics on the color computer 3, much better detail can be given.

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 3564Ø. We will print our answers here. For a personal reply send $1Ø with your question.

QUESTION: I saw your ad in QST magazine. Recently I purchased a color computer and wonder how I can use it with my ham station.

ANSWER: Last Summer we started a ham radio section and have covered some software. Also we showed how to build an interface circuit and a Morse code keyer. This month we show how to add a tone decoder as a first step towards a Morse code copier. There will be more subjects and projects coming. To answer the question, the color computer can also be used for teletype, packet radio, slow scan television, plus any other application involving a computer.

The following questions are from Dr. Patrick Conen in Canada. He wrote a long letter and has several questions. We do not have answers to all of them and would appreciate help if you have an answer.

QUESTION: I hope in future issues you can cover some points that 9Ø% of Color Computer owners want to read (judged from my membership of two CC Clubs). What partial upgrades are available for the CC1 and CC2 that will help give some of the features of the CC3? RAM can be increased to 128K, 256K, or 512K with upgrades from several different companies. Will these only be useful for Ram disks or can they be used to take 8K chunks of memory as the GIME chip does on the CC3? Will they be usable for OS-9 level II?

ANSWER: The 256K and 512K upgrades for the older computers had many options. Besides being used as a ramdisk they could be used to partition the computer into 64K or 32K banks. Programs could be placed in these banks and switched in when needed. This has an advantage in that all variables are preserved. This is not the case when programs are loaded from a ramdisk. OS-9 ramdisks are available for the older computers and OS-9 level 2 is advertised as being able to use all 512K for the CC-3. If you want consistency between the older computers and the CC-3 we would recommend using ramdisks and saving and loading files.

QUESTION: Most readers want to know in detail how the RAM memory increase could be used. The obvious use is to put into it a "C" compiler etc. for fast disk access. A 2nd use would be to put an editor, assembler, debug separately into each of the first three banks and put the created runable programme into the fourth bank. A 3rd use would be to load in a large database that can be searched, sorted etc. from the Ram disk, faster than from a real disk. A 4th use would be to have four 64K banks with word processor (WP), spreadsheet (SS), and database (DB) in 3 of them for fast transfers to the 4th bank and reloading and unloading each programme. This would have the advantages of each programme in full without the limitations of most of the integrated systems. I would love to have 256K or 512K and to try these for

business and write an article about it but nobody in this region has one and we are all waiting for someone else to try it and tell us about it.

ANSWER: The bank selection feature you mention is not available with all memory upgrades. It is available with some of the 512K and 256K upgrades for the older computers. We have 4-64K memories in our color computer 2. We can put different programs in the bank and go to them by switch selection. As stated previously this has the advantage that all variables are preserved. If you use a ramdisk, it will be about 20 or 30 times faster than a disk drive. For writing large business programs, it will be necessary to pull files from the ramdisk as needed. Using this method the computer does the housekeeping. This is easier than trying to keep track of memory chunks. All that is necessary is to keep track of file names and let the disk operating system keep track of the memory. We are working on a routine for this and will possibly have it ready next month so we can continue our address file program.

QUESTION: What happened to the Flex upgrade called FLEX from Frank Hogg Laboratories. This was able to use the 128K memory and presumably could use the 256 or 512K? The Flex programmes Dynacalc (SS), Dynastar (WP), and RMS (DB) were extremely good and I used them a great deal. I could use DS and RMS via the EXT Flex command which transferred control to a terminal. I was then able to use a much better keyboard and the 80 column display with my CC1.

ANSWER: We are not familar with FLEX so we can not comment on it.

QUESTION: Radio Shack now has a 3 1/2" double sided disk drive for the 1000 series which I believe won't work on either the CC or the model 100 because it has an edge card connector. Will the CC1,2,3 be able to use any of the other models of 3 1/2" DD available? Via OS-9 8" drives can be used and Flex also allows extensive disk drive control by software so that double sided 40 or 80 track drives are usable.

ANSWER: Almost any disk drive can be used with color computers with the proper controller. We don't know if a controller is available for the 3 1/2" drives. We have used IBM drives with color computers and they work well.

QUESTION: Can the GIME chip and any supporting chips be added to the CC1 or CC2 to increase the graphics display particularly the 80 column screen driver? I believe that Radio Shack was coming out with an 80 column driver for the CC1 and CC2, what happened to it?

ANSWER: The graphics resolution for the CC-1 & CC-2 is limited by the MC 6847 and the MC 6883. If you want to expand the display for these to 80 columns then we recommend an external graphics character generator. These used to sell for around $120. It may not be worth the cost to purchase these since a new CC-3 costs a little more. Another way to expand the characters is by software. This is the method used with the Telewriter word processor. We do not know about the Radio Shack 80 column driver.

QUESTION: As a Pathologist in Hospital Med School Laboratories, I would like to interface data from instruments etc. to the CoCo or host of 100's. How is this done?

ANSWER: The ASCII port of a computer could be used to interface other devices such as your instruments if the instruments provide an ASCII output. If they give TTL outputs then you could use circuits similar to those we presented in our ASCII interface. We write a lot of our editorials on our model 100 and transfer the files to a color computer by the ASCII port. We use a modified version of "DYTERM" which we recently printed.

QUESTION: I have an Electronic typewriter Brother EM2 with about a page memory only. Can this and IBM Selectrics etc. be hooked up at a reasonable price to download to cassette for saving part completed or for use as a printer for computer?

ANSWER: We are not familar with these. Some typewriters have computer interfaces. The instructions for these interfaces would have to be studied to see how to connect them to a computer. It may be more trouble and expense than it would be worth to try to use these considering you can purchase a new printer for around $200.

OPERATING HINT

Checking Tape Programs - You can check the programs on a cassette tape by using the SKIPF command. Load the tape and rewind it. Then type SKIPF"X where X is a file that is not on the tape. The name of each file will be displayed on the screen as they are found on the tape. If there is an error the computer will give an error message and stop the recorder. All files or programs before the recorder stopped are good. If the recorder goes to the end of the tape without indicating an error then all of the files are good. Press the rear reset button to reset the computer.

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