

RADIO SHACK COLOR COMPUTER MAGAZINE

May 1987
Vol. 4 No.4

\$1.95



Measuring Temperature
Ham Radio
ML Programming
Color Computer 3
+ Much more

DYNAMIC COLOR NEWS is published monthly by DYNAMIC ELECTRONICS, INC., P.O. Box 896, Hartselle, AL 35640, phone (205) 773-2758. Bill Chapple, BA, BSE President; Dean Chapple, Sec. & Treas.; John Pearson, Ph. D. Consultant; Bob Morgan, Ph. D., Consultant.

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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.

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*   DYNAMIC COLOR NEWS   *
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*       May 1987         *
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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:

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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.
Order ME-18 \$99.95

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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

Upgrade 8-chip 4164 type 64K computers to 128K with Memory Manager software. ME-12 \$39.95

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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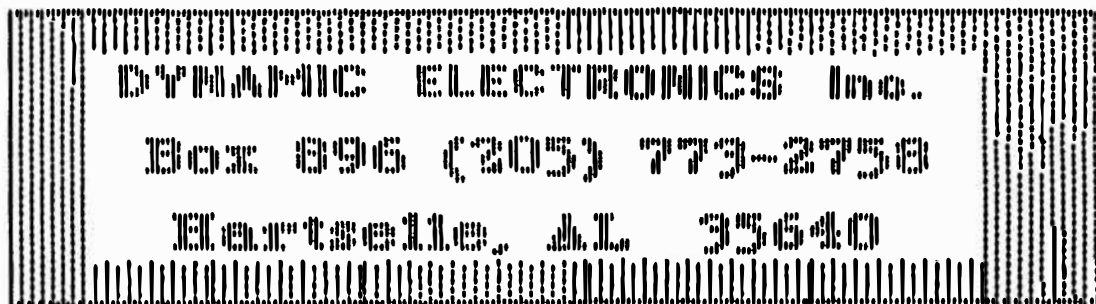
Battery backup prevents loss of programs due to power failures. Mounts under keyboard. Consists of dry rechargeable battery, control circuit, & miniature toggle switch. Will power a color computer for a couple of hours during a power failure. For CC-2 & older computers. Price reduced. \$39.95

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Disasm-Decimal Assembler \$9.95

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INTERFACING COMPUTERS

Digital Thermometer

Last month we discussed measuring temperature by using a joystick port. In previous issues we discussed measuring voltage and resistance using a joystick port. For computers joysticks are used to position spots on the screen usually in a graphics mode. The computer converts the voltage at the joystick port into a value from 0 to 63. There are 4 joystick ports for color computers and the voltage at a port can vary from 0 to 5 volts. The joystick voltage is converted to a digital word by an analog to digital converter in the computer. The digital word can have a value from 0 to 63.

The physical and electrical design of joystick ports make them a natural for many applications. Although we have covered a few, there are many more that can be considered. This month we want to continue with our thermometer. Temperature is something with which we are all concerned. Is it too cold or too hot? For ham radio, the temperature is usually given during a conversation. Most countries outside the United States use the centigrade scale for temperature. The computer of course can calculate the centigrade equivalent and display both fahrenheit and centigrade temperatures.

MEASURING OUTSIDE TEMPERATURE

Most of us would have to go outside and look at a thermometer to determine outside temperature. With a computer the outside temperature can be remotely measured from inside a building. To do this a temperature sensor

should be run from the computer to the outside. Last month we discussed using a thermistor as a temperature sensor. The thermistor can be placed in the temperature sensing area and linked to the computer by a cable.

COMPUTER CONTROL

The computer can be used to respond to various temperatures if the temperature is decoded by the computer. By using the joystick port, we can program the computer to calculate the temperature.

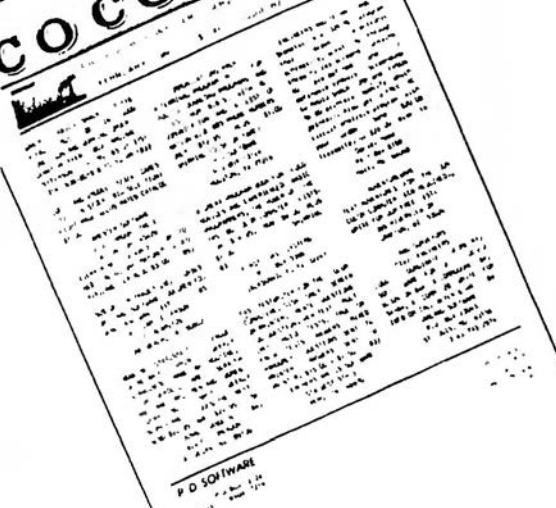
A computer can control a relay for applying power to a heater or air conditioner. The cassette motor can be used to drive a larger relay for high power control. As an example suppose it is desirable to turn an air conditioner on if the temperature is above 80 degrees. We desire it to be turned off if the temperature is 76 degrees or lower. This would be an easy program to write. Look at the following:

```
100 IF T>80 THEN MOTOR ON
110 IF T<76 THEN MOTOR OFF
```

DIGITAL THERMOMETER

We constructed a thermometer using a negative temperature coefficient thermistor of the type we discussed last month. The circuit consists of a 10K resistor to 5 volts and the thermistor from the resistor to ground. We constructed the circuit shown in Figure 1. The thermistor was soldered to the end of a 10 foot flat cable so that we could run it outside a window. The resistor and capaci-

COCO-ADS



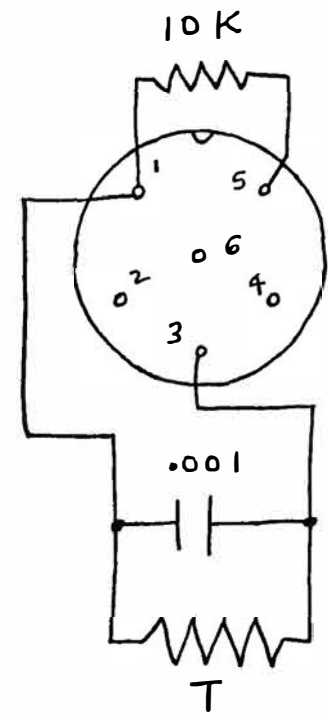
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THERMOMETER SCHEMATIC

FIGURE 1

tor were mounted in a plug that fits into a joystick connector. The capacitor prevents noise from being picked up and causing false readings.

ACCURACY

We compared the readings with the digital thermometer against an inexpensive thermometer we purchased. The digital thermometer seems to be accurate within a degree although we did not have an accurate standard. Since ice freezes at 32 degrees F we put the thermistor in a cup of ice. After a few seconds the computer indicated 31 degrees.

We also measured the temperature in a room by placing the thermistor and thermometer in an open window. The correlation was very close between the two devices. We noted that as the wind blew, the digital thermometer indicated a drop in temperature. Maybe this could also be used to indicate the relative wind velocity.

CONCLUSION

The thermometer performed as predicted from our measurements and calculations last month. We are offering this as a wired assembly, and if you are interested look for our advertisement in this issue.

The thermistor thermometer can be used for remote temperature measurements. We mentioned measuring outside temperature. Another application would be to measure the temperature inside a color computer. Heat buildup has always been a problem with color computers and the thermistor could be mounted inside the case to see how much the inside temperature rises. Temperature readings could be passed through modems or direct lines to other computers.

The joystick ports are very useful and we will look at a different application next month.

THERMOMETER SOFTWARE

The software for the thermometer is similar to what we had last month. It uses joystick 0 in line 70. This can be changed for joystick 1, 2, or 3 if the plug is wired for these. The temperature is printed at the top of the screen in both

Fahrenheit and Centigrade. This is line 150. Notice we used PRINT@0 to start at the top of the screen.

The temperature is automatically rounded up or down by using the PRINT USING commands in lines 170 and 180. Line 160 calculates the Centigrade equivalent of the Fahrenheit temperature.

```
10 CLS
20 ?"TEMPERATURE PROGRAM
30 ?"COPYRIGHT (c) 1987
40 ?"DYNAMIC eLECTRONICS INC.
50 '
60 R1=10000
70 JS=JOYSTK(0)
80 IF JS=63 THEN PRINT"JS=63":
  GOTO70
90 R=R1/(63/JS-1)
100 IF R<10500 THEN GOTO 140
110 IF R>25000 THEN GOTO 200
120 GOTO 190
130 '
140 T=-3.846E-3*R+117.38
150 PRINT@0,"THE TEMPERATURE
  IS";
160 C=5/9*(T-32)
170 PRINT USING "###";T;
180 PRINT"F";:PRINTUSING "###";C
  ;:PRINT"C":GOTO70
190 T=-2.276E-3*R+100.897:
  GOTO150
200 T=-9.333E-4*R+67.333:
  GOTO 150
```



If you own a small business or run a very busy household, then this accounts payable program may help you organize your bills. This program uses a menu structure and is very easy to use. It requires a disk and creates files on the disk for the data. This program is provided by T & D Subscription Software (see their advertisement on page 8) and is used by permission.

```
1 REM COPYRIGHT (C) T&D SOFTWARE
  1987 accounts payable
2 PMODE0:GOTO60000
3 N$=MID$(STR$(N),2)
4 IF LEN(N$)<5 THEN N$="0"+N$:GO
  TO4 ELSERETURN
5 K$=INKEY$:IFK$<>"Y" AND K$<>"N
  " THEN5 ELSERETURN
50 CLEAR2000:F1$="% % % !
  % % ####.##!":F2$="%
  % % ! %
  % ####.##!":DT$="010187
  ":DIM ND(12):FORI=1TO12:READ
```

```

ND(I):NEXT:DATA 31,29,31,30,3
1,30,31,31,30,31,30,31
60 GOSUB 40000
100 CLS:PRINT:PRINT"      acco
    unts payable
    main menu"
102 PRINT:PRINT"      date
    = ";DT$
104 PRINT
106 PRINT"      D. CHANGE DATE
          C. CREDITOR
          MENU      +. CREDI
          T ACCOUNT      -. DE
          BIT ACCOUNT      Q.
          QUIT"
108 PRINT
110 PRINT"      your choice?
"
120 K$=INKEY$:IFK$="" THEN 120
122 P=INSTR("DC;-Q",K$):IF P=0 T
HEN 120
125 ON P GOTO 130,200,500,600,99
0
130 CLS3:PRINT@226,"ENTER DATE (
MDDYY): ";:LINE INPUT A$:IFA
$="" THEN100 ELSEDT$=A$:IF LE
N(DT$)<>6 THEN130 ELSEM$=LEFT
$(DT$,2):D$=MID$(DT$,3,2):Y$=
RIGHT$(DT$,2)
132 M=VAL(M$):D=VAL(D$):Y=VAL(Y$
):IFM<1 OR M>12 THEN130
134 IF D<1 OR D>ND(M) THEN130
136 IF Y<1 THEN130
139 GOTO100
140 ' FORMAT CHECK
142 PMODE4:SCREEN1,1:PMODE3:PCLS
:LINE(0,56)-(255,136),PSET,B
199 GOTO199
200 CLS:PRINT:PRINT"      cre
ditor menu":PRINT
202 PRINT"      number of credito
rs = ";:GOSUB7000:PRINTLOF(1)
:CLOSE
204 PRINT
206 PRINT"      A. ADD A CREDITOR
          F. FIND A CRED
          ITOR      V. VIEW/EDI
          T CREDITOR      D. DISPL
          AY ACCOUNT      TR
          ANSACTIONS      P.
          PRINT ACCOUNT
          TRANSACTIONS
208 PRINT"      R. RETURN TO MAIN
MENU"
209 PRINT:PRINT"      your ch
oice?
210 K$=INKEY$:IFK$="" THEN210
212 P=INSTR("AFVDP",K$):IFP=0 T
HEN210

```

```

215 ON P GOTO220,250,270,300,400
,100
220 ' ADD
222 GOSUB7000:R=LOF(1):N=R+1:GOS
UB3
224 CLS:PRINT:PRINT"      THIS WI
LL BE CREDITOR
ACCOUNT #";N$"."
226 PRINT
228 LINE INPUT" NAME: ";NA$:IF N
A$="" THENCLOSE:GOTO200
229 LINE INPUT" ADDR: ";AD$
230 LINE INPUT" CITY: ";CT$:LINE
INPUT" PHON: ";PH$
240 PRINT:PRINT"      is this entry
correct? y/n"
241 GOSUB5:IFK$="N" THEN 224
242 LSET CN$=NA$:LSET CA$=AD$:LS
ET CP$=PH$:LSET CC$=CT$:PUT#1
,R+1:CLOSE
245 PRINT:PRINT"      another en
try? y/n"
246 GOSUB5:IFK$="Y" THEN220
249 GOTO200
250 ' FIND
252 GOSUB8000:IF S$="" THEN200
254 GOSUB7000:R=LOF(1):IFR>0 THE
N256
255 PRINT@290,"COULDN'T FIND "+S
$".";:CLOSE:GOSUB9000:GOTO200
256 F=0:I=1
257 CLS0:PRINT@232,"SEARCHING...
";:GET#1,I:IF LEFT$(CN$,LEN(S
$))<>S$ THEN 268
258 RC=I:GOSUB5000:F=RC
259 PRINT:PRINT"      is this the cor
rect entry? y/n"
260 GOSUB5:IFK$="Y" THEN276
268 I=I+1:IFI<=R THEN257
269 IFF=0 THEN255 ELSECLOSE:GOTO
200
270 ' VIEW/EDIT
272 GOSUB8100:GOSUB7000
274 R=LOF(1):IFR=0 OR RC>R THENC
LOSE:GOTO200
276 GET#1,RC:GOSUB5000
284 PRINT@485,"uP dOWN eDIT m
ENU";
285 K$=INKEY$:IFK$="" THEN285
286 IF K$="U" THEN290 ELSEIFK$="
D" THEN292 ELSEIFK$="E" THEN2
95 ELSEIFK$="M" THENCLOSE:GOT
O200 ELSE285
290 IF RC=R THEN285 ELSERC=RC+1:
GOTO276
292 IFRC=1 THEN285 ELSERC=RC-1:G
OTO276
295 GOSUB8900:PUT#1,RC:GOTO276
300 ' DISPLAY TRANS

```

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```

302 GOSUB 8500:GOSUB7000:GOSUB71
00:L2=LOF(2)
303 TL=0
304 FOR IL=LL TO UL
306 RC=IL:GET#1,RC:GOSUB5000
308 PRINT:SC=9
309 T2=0
310 FOR KK=1 TO L2:GET #2, KK
312 IF CVN(AC$)<>IL THEN 390
320 N=CVN(AC$):GOSUB3:PRINT USIN
G F1$;DA$;N$;FL$;DS$;CVN(AM$)
;TY$
322 IF TY$="+" THEN T2=T2+CVN(AM
$):TL=TL+CVN(AM$) ELSE T2=T2-C
VN(AM$):TL=TL-CVN(AM$)
380 SC=SC+1:IFSC=13 AND KK<>L2 T
HENGOSUB9000:CLS:SC=0
390 NEXT KK
391 PRINT:PRINT"TOTAL ACCNT #"N$
;:PRINTUSING" $#####.##+";T
2
392 GOSUB9000:CLS:SC=0
395 NEXT IL
396 PRINT@224," GRAND TOTAL
";:PRINT USING" $#####.##+
";TL
399 GOSUB9000:CLOSE:GOTO200
400 PD=-2:' PRINT TRANS
402 GOSUB8500:GOSUB7000:GOSUB710
0:L2=LOF(2)
403 TL=0
404 FOR IL=LL TO UL
406 RC=IL:GET#1,RC:GOSUB6000
409 T2=0
410 FOR KK=1 TO L2:GET#2, KK
412 IF CVN(AC$)<>IL THEN 480
420 N=CVN(AC$):GOSUB3:PRINT#PD,U
SING F2$;DA$;N$;FL$;DS$;CVN(A
M$);TY$
422 IF TY$="+" THEN T2=T2+CVN(AM
$):TL=TL+CVN(AM$) ELSE T2=T2-C
VN(AM$):TL=TL-CVN(AM$)
480 REM
490 NEXT KK
491 PRINT#PD," **** TOTAL ACCO
UNT #";N$;:PRINT#PD,USING"
$#####.##+";T2:PRINT
#PD
495 NEXT IL
496 PRINT#PD," **** GRAND TOTA
L **** ";:PRINT#PD,USING"
$#####.##+";TL
499 CLOSE:GOTO200
500 ' ADD CREDIT
502 GOSUB7000:R=LOF(1):GOSUB7100
:L2=LOF(2)
504 GOSUB8100:IF RC<1 OR RC>R TH
ENCLOSE:GOTO100
506 GET#1,RC:GOSUB5000
508 PRINT

```

```

510 PRINT" ENTER CREDIT AMOUNT:
";:LINE INPUT A$:AM=VAL(A$):I
FAM<0 THEN510
520 PRINT" ENTER CREDIT DESCRIPT
ION > ";:LINE INPUT A$
525 PRINT:PRINT" is this entry
correct? y/n"
526 GOSUB5:IFK$="N" THENCLOSE:GO
TO500
530 LSET FL$="*":LSET AC$=MKN$(R
C):LSET DA$=DT$:LSET TY$="+":
LSET DS$=A$:LSET AM$=MKN$(AM)
535 PUT#2,L2+1:CLOSE
540 PRINT:PRINT" enter anot
her? y/n"
545 GOSUB5:IFK$="Y" THEN500
599 CLOSE:GOTO100
600 ' ADD DEBIT
602 GOSUB7000:R=LOF(1):GOSUB7100
:L2=LOF(2)
604 GOSUB8100:IF RC<1 OR RC>R TH
ENCLOSE:GOTO100
606 GET#1,RC:GOSUB5000
608 PRINT
610 PRINT" ENTER DEBIT AMOUNT: "
;:LINE INPUT A$:AM=VAL(A$):IF
AM<0 THEN610
620 PRINT" ENTER DEBIT DESCRIPTI
ON > ";:LINE INPUT A$
625 PRINT:PRINT" is this entry
correct? y/n"
626 GOSUB5:IFK$="N" THENCLOSE:GO
TO600
630 LSET FL$=" ":LSET AC$=MKN$(R
C):LSET DA$=DT$:LSET TY$="-":
LSET DS$=A$:LSET AM$=MKN$(AM)
635 PUT#2,L2+1:CLOSE
640 PRINT:PRINT" enter anot
her? y/n"
645 GOSUB5:IFK$="Y" THEN600
699 CLOSE:GOTO100
700 ' WRITE CHECKS
990 CLS4:PRINT@231," OK TO QUIT?
Y/N ";
991 K$=INKEY$:IFK$="N" THEN100
992 IFK$<>"Y" THEN991
999 END
5000 CLS:PRINT@32:PRINT" ac
count #: ";:N=RC:GOSUB3:PRINT
N$:PRINT
5010 PRINT" NAME: ";CN$
5020 PRINT" ADDR: ";CA$
5025 PRINT" CITY: ";CC$
5030 PRINT" PHON: ";CP$
5099 RETURN
6000 PRINT #PD," Account #";:N=R
C:GOSUB3:PRINT#PD,N$
6010 PRINT #PD," Name :";CN$
6020 PRINT #PD," Address :";CA$
6030 PRINT #PD," City :";CC$

```

```

6040 PRINT #PD, " Phone   :";CP$
6050 PRINT#PD
6099 RETURN
7000 ' OPEN CREDITOR FILE
7010 OPEN"D",#1,"CREDITOR.REL",9
6
7020 FIEGD#1,24 AS CN$,24 AS CA$
,24 AS CC$,24 AS CP$
7099 RETURN
7100 ' OPEN TRANSACTION FILE
7110 OPEN"D",#2,"APTRANS.REL",43
7120 FIELD#2,1 AS FL$,5 AS AC$,6
AS DA$,1 AS TY$,20 AS DS$,5
AS AM$,5 AS EX$
7199 RETURN
8000 'PROMPT FOR CREDITOR NAME
8010 CLS0:PRINT@228,"ENTER SEARC
H NAME: ";:LINE INPUT S$:REU
RN
8100 'PROMPT FOR ACCOUNT NUMBER
8110 CLS0:PRINT@228,"ENTER ACCT
#: ";:LINE INPUT RC$:RC=VAL(R
C$)
8199 RETURN
8500 ' GET PRINT/DISP TRAN PARAM
8510 CLS:PRINT@198,"A. ALL CREDI
TORS R. A RANG
E OF ACCT # O. JUS
T ONE ACCT#"
8520 PRINT:PRINT" "+SF$+" wh
ich transactions"
8530 K$=INKEY$:IFK$="A" THEN8570
ELSEIFK$="R" THEN8580 ELSEIF
K$="O" THEN8590 ELSE8530
8570 GOSUB7000:UL=LOF(1):LL=1:CL
OSE:RETURN
8580 CLS:PRINT@232,"enter start
#: ";:LINE INPUT A$:LL=VAL(A$
)
8581 CLS:PRINT@232,"enter end #:
";:LINE INPUT A$:UL=VAL(A$)
8582 GOSUB7000:IF LL<1 OR LL>LOF
(1) OR UL<1 OR UL>LOF(1) OR L
L>UL THENCLOSE:GOTO8500
8589 CLOSE:RETURN
8590 GOSUB8100:GOSUB7000:IFRC<1
OR RC>LOF(1) THENCLOSE:GOTO85
00
8599 UL=RC:LL=RC:CLOSE:RETURN
8900 'EDITING ROUTINE PATCH
8905 GOSUB5000:PRINT@482,"edit N
ame Addr City Phon Quit";
8910 K$=INKEY$:IFK$="N" THEN 892
0 ELSEIFK$="A" THEN 8940 ELSE
IFK$="C" THEN 8960 ELSEIFK$="
P" THEN8980 ELSEIFK$="Q" THEN
RETURN ELSE8910
8920 CLS:PRINT@232,"ENTER NEW NA
ME: ";:LINE INPUT NA$:IF NA$=
"" THEN8990 ELSELSET CN$=NA$:
GOTO8990

```

```

8940 CLS:PRINT@232,"ENTER NEW AD
DR: ";:LINE INPUT AD$:IFAD$="
" THEN8990 ELSELSET CA$=AD$:G
OTO8990
8960 CLS:PRINT@232,"ENTER NEW CI
TY: ";:LINE INPUT CT$:IFCT$="
" THEN8990 ELSELSET CC$=CT$:G
OTO8990
8980 CLS:PRINT@232,"ENTER NEW PH
ON: ";:LINE INPUT PH$:IFPH$="
" THEN8990 ELSELSET CP$=PH$:G
OTO8990
8990 GOTO8905
9000 PRINT@484,"press [ENTER] to
continue";
9010 IFINKEY$<>CHR$(13) THEN9010
9020 RETURN
40000 REM OPENING PAGE & INSTR
UCTIONS
40010 CLS0
40020 PRINT@198," ACCOUNTS PAYAB
LE ";
40030 PRINT@290," instructions?
yES or nO ";
40040 K$=INKEY$:IFK$="N" THEN RE
TURN
40050 IF K$<>"Y" THEN40040
40060 CLS:PRINT@96
40070 PRINT" THIS ACCOUNTS PAYAB
LE PROGRAM USES RELATIVE DI
SK FILES TO STORE AND RET
RIEVE TWO KINDS OF INFORMA
TION."
40080 PRINT" THE CREDITOR DATA A
ND TRANS- ACTION DATA ARE
KEPT IN TWO SEPERATE FILE
S."
40085 GOSUB9000:CLS:PRINT@96
40090 PRINT" THERE ARE TWO MENUS
USED WITH THIS PROGRAM. TH
E FIRST MENU ALLOWS YOU TO
1) ACCESS A SECOND MEN
U 2) DEBIT AN ACCOUNT
AND 3) CREDIT AN
40095 PRINT" ACCOUNT. NOTE OPTIO
NS 2 AND 3. THESE OPTIONS EN
TER NEW TRANS- ACTIONS INTO
THE COMPUTER.
40100 GOSUB9000:CLS:PRINT@32
40110 PRINT" ACCESSING THE SECON
D MENU ALLOWS YOU TO AD
D AND EDIT CREDITOR ACCO
UNTS. YOU CAN ALSO DISPL
AY AND PRINT CREDITO
R AND TRANSACTION INFO
RMATION."
40120 PRINT" NOTE THAT BEFORE YO
U CAN DISPLAY OR PRINT
CREDITOR INFORMATION,
YOU MUST HAVE BOTH THE C
REDITORS ACCOUNT AND AT
LEAST ONE TRANSACTION ENTE
RED FOR THAT CREDITOR."

```

40130 GOSUB9000:CLS:PRINT@96
40140 PRINT" WHEN DISPLAYING AND
PRINTING INFORMATION, YOU
HAVE THE OPTION OF PRO
CESSING JUST 1 CREDITOR A
CCOUNT, A RANGE OF CREDITO
R ACCOUNTS, OR ALL CRED

ITOR ACCOUNTS."
40150 PRINT" THIS OPTION IS PROV
IDED FOR YOUR CONVENIENCE
"
40160 GOSUB9000
40999 RETURN
60000 PCLEAR1:GOTO50



PART 3

In this series we have been discussing Erasable Programmable Read Only Memories (EPROMS). These chips can contain either data or programs. The information can be erased by an ultra violet light and the chips reprogrammed. They are similar to and can replace the basic, extended, and disk basic Read Only Memories (ROM) in computers. Information programmed into EPROMS is permanent and is not lost when power is removed.

Last month we looked at the 27128 and 27256 EPROMS. We showed how we could manually access 8K blocks of data by physically connecting address lines A13 and A14 to VCC or GND. We also gave a circuit that would enable the EPROM only if the upper 8K of memory is addressed. For a disk system, the disk drive ROM is enabled if the upper 16K of memory is accessed. However the disk ROM only uses the lower 8K which leaves the upper 8K for an EPROM.

EPROM INSIDE THE COMPUTER

If you are willing to do a little soldering, an EPROM can be placed inside the computer.

Last month we gave a control circuit that used a 74LS42 integrated circuit. This chip can be mounted on top of the 74LS138. The +5V or VCC (pin 16) and gnd (pin 8) can be soldered to the 74LS138. The other pins of the 74LS42 can be bent out and either removed or soldered as needed.

A 28 pin socket can be soldered on top of the basic or extended basic ROM. This is almost a pin for pin correspondence for the color computer 2 and 3. For computers that had two 24 pin ROM chips a little extra wiring is required. The EPROM can then be inserted into this socket. The socket can be a zero force type with a lever to allow EPROMS to be quickly changed. One or two switches can be installed in the front of the computer to select 8K banks in the EPROM or to disable it if desired.

Figure 1 shows a wiring diagram for disabling the cartridge port and enabling an EPROM. The 74LS42 can be mounted on the 74LS138. Pins 8 and 16 of the 74LS42 can be soldered to pins 8 and 16 of the 74LS138. The other pins should be bent straight out and connected as shown. A trace goes from pin 12 of the

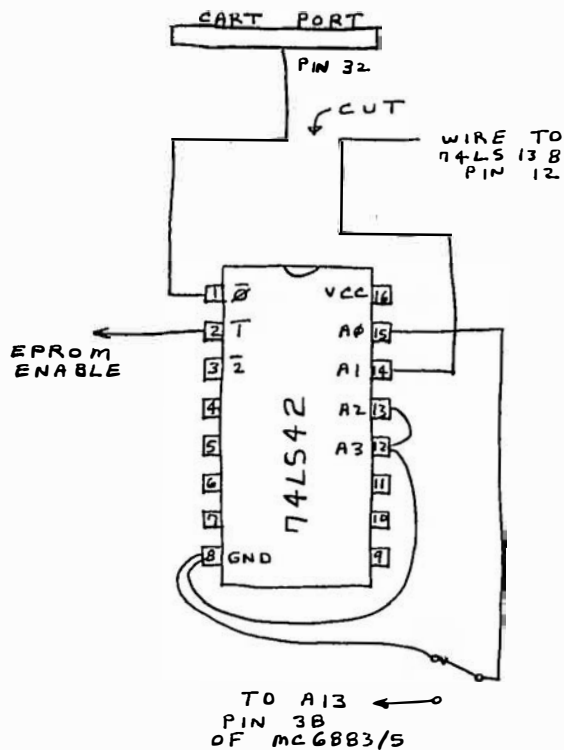


FIGURE 1

74LS138 through a resistor to pin 32 of the cartridge port. This connection needs to be broked. Then run a wire from pin 0 of the 74LS42 to pin 32 of the cartridge port. The other side of the cut should go to pin 14 of the 74LS42. A single pole double throw switch to disable the modification is shown at the bottom of the diagram. Its center should go to pin 15 of the 74LS42. It should connect to ground in one position and to A13 of the address bus. This can be obtained from pin 38 of the SAM chip or the MC6883/85. When the switch is connected to the ground position, the cartridge port works normally and the EPROM is not enabled. In the other position, the EPROM is enabled when the upper 8K of the memory map is addressed.

EPROM WIRING

The ROM inside the computer contains the signals required of the EPROM. The older D,E, and 285 or F boards used a 24 pin ROM. Its pin assignments are in Figure 2. A 28 pin socket can be soldered on top of the ROM with a little cross wiring.

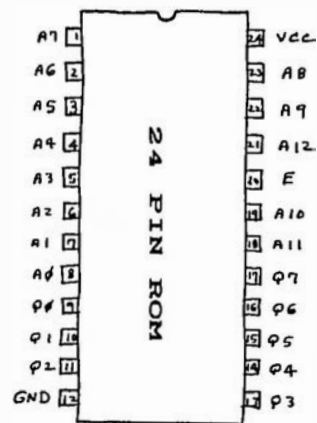


FIGURE 2

For the color computers 2 and 3 the pins on the ROM are almost identical to those on the EPROM. Refer to Figure 3. All pins should be soldered from the EPROM to the ROM except pins 20, 22, 26, and 27. Pin 20 is the enable pin and should go to pin 2 of the 74LS42 in Figure 1. Connect pin 22 to ground (GND). Pin 26 should go to the center pole of S1. Pin 27 should go to the center pole of S2 if 27256 EPROMS are used or to VCC if 27128 EPROMS are used. The switches could be wired for 27256 chips and S2 switched to the VCC position for 27128 EPROMS. This would allow either type to be used.

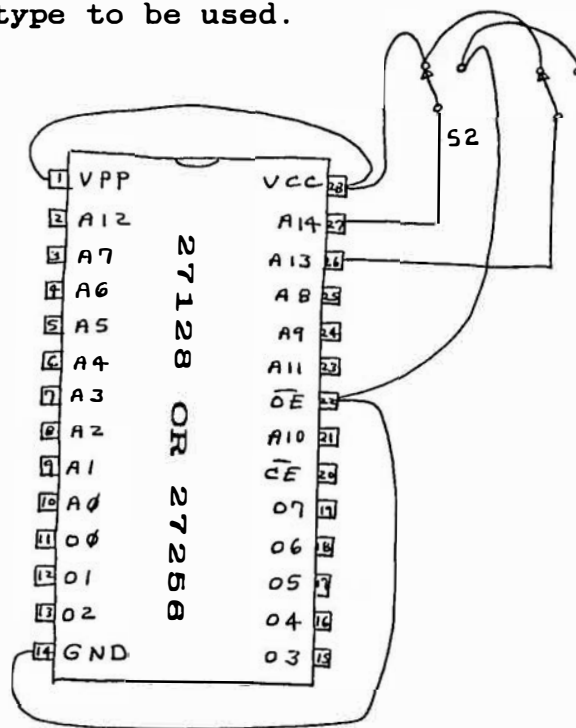


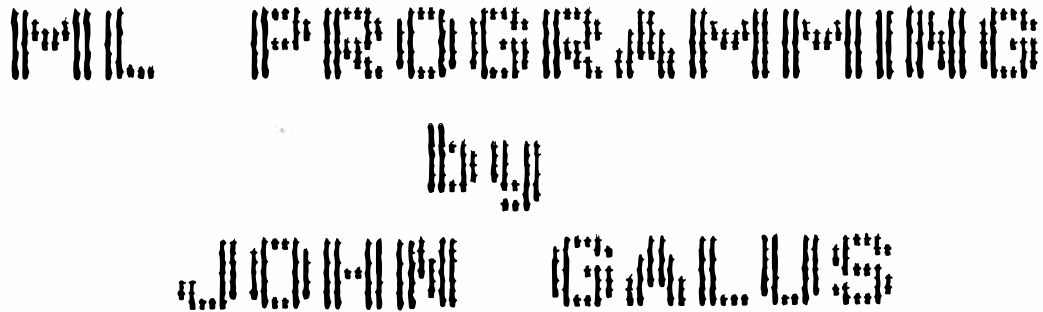
FIGURE 3

USING A "Y" CABLE

A "Y" cable can be modified if it is not feasible to put the EPROM inside the computer. A "Y" cable allows two devices to be connected to the expansion port. All the voltage and signals are available at both devices with a "Y" cable. Pin 32 of the EPROM cartridge would have to be broken from the cable

and connected to pin 2 of the 74LS42 as shown in figure 1. The modifications in figure 1 would have to be made. This will disconnect the disk drive when the cartridge is selected.

Next month we will discuss putting programs into EPROMS and finish this series. EPROMS are an excellent device for storing both machine language and basic programs.



PART #13.

In this part we will examine how to use the Stack and cover some of the commands that we didn't cover in past sections of this series. The S and U registers are 16 bit registers that contain Stack pointers.

Note: A stack is part of the memory reserved for the microprocessor. Information is placed on the stack by using the PUSH and PULL commands. The stack pointer tells the microprocessor where the information is located in memory. A stack works by pulling the last information placed on it out first. The last in is the first out. The hardware stack designated with an "S" is used by the microprocessor and the user stack designated with a "U" can generally be used by the programmer.

-Editor-

The S register is called the "hardware" stack and is used by the system to point to an area where we save the return address during subroutine calls. When-

ever a JSR or BSR is executed the location of the next instruction, which is held in the PC (Program Counter), is saved in the stack area of RAM pointed to by the S register. When a RTS (Return) instruction is executed, the address now located in the stack area is placed back into the PC which causes the computer to jump back to its location before the subroutine.

The second stack register U is not used to hold return addresses, but can be used by the programmer as another stack, indexing, or to hold a value. You can set up a U stack by loading the U register with the address that we wish to use as a stack area. Being a two stack processor is one of the advantages of the 6809. A stack area can also be used to save temporary data using the PSH (Push) and PUL (Pull) instructions. A PSH command "pushes" a one or two byte register onto the stack, while a PUL "pulls" one or two bytes of data off the stack and places it in a register. PSH and PUL are often

thought of as plates stacked in a pile. The last "plates" put on the stack are the first ones off. Our stack works the same way, the last data pushed on the stack is the first off. We can save one or all of the registers on the stack, except the stack register being used.

EXAMPLE:

```
PSHS A
PSHS A,B,X,Y,U,CC,PC
```

The PUL instruction works in the opposite way to pull the data back off the stack.

EXAMPLE:

```
PULS A
PULS A,B,X,Y,U,CC,PC
```

You can push or pull registers in any order you wish but, its important to remember to PUL whatever data you PSH. You don't have to use the same registers when pushing and pulling but, they should be registers of the save size.

EXAMPLE:

```
PSHS A,B,Y
PULS X,U
```

(A+B-X AND Y-U)

Since the stack can be used at anytime we often use it to pass parameters back and forth between subroutines. Using this method we write one all purpose routine and pass the data the routine needs and return an answer when the routine is finished. When writing a long routine you may run out of registers to use. This is when the stack can be used to store temporary data.

EXAMPLE:

```
START LDB #3
LDX #0
STX RES
```

```
LOOP PSHS B
LDB #10
LDA #10
MUL
ADDD RES
STD RES
PULS B
DECB
BNE LOOP
SWI
RES FDB 0
END
```

The preceeding routine will perform the math routine 10*10 three times, notice how I use the PSH and PUL commands. Use the Stack carefully and you will find it a big help when writing your programs. There are other more complex ways of using the stacks but, for now the above examples should get you started.

Now we will examine some of the instructions that we didn't cover before. The first are the TFR (Transfer) and EXG (Exchange) instructions. The TFR command allows you to transfer the contents of registers of the same size from one to another. A one byte register can only be transfered to a one byte register and a two byte register to a two byte register. The first register in the instruction contains the data you wish to transfer and the second register is the one to which you want to transfer the data. The contents of the register that you are transferring the data to is destroyed.

```
TFR REG,REG
```

```
REG - A,B,D,X,Y,U,CC,DP,PC
```

EXAMPLE:

```
TFR A,B
TRANSFER A TO B
```

```
TFR X,Y
TRANSFER X TO Y
```

The TFR is often used when we wish to perform a math operation on data held in a register other than the A or B register.

```
START  LDX  #10
        TFR  X,D
        SUBD #2
```

The EXG (Exchange) instruction allows you to exchange the contents of like size registers, destroying the old contents of each.

```
EXG  REG,REG
```

```
EXG  A,B
EXCHANGE A AND B
```

```
EXG  X,Y
EXCHANGE X AND Y
```

Another often used instruction is the CLR or Clear command. The CLR command places a zero in the A or B register or a memory location. It is the same as a LDA #0 but, it executes faster.

```
CLRA
CLRB
CLR  MEMORY
```

Other commands that we did not cover are called the "logical operations" the OR, AND and EOR.

These instructions operate on the "bit level" testing each bit at a time. The OR instruction works by taking an 8 bit value in the A, B or CC register and ORs it to a operand. A bit is set when either one OR the other bit OR both bits are set. Since a bit can only be 1 or 0 here is table of the possible results of an OR operation.

```
0 OR 0 = 0 RESET
0 OR 1 = 1 SET
1 OR 0 = 1 SET
1 OR 1 = 1 SET
```

The OR is often used to set bits within a byte. For example to set the third bit of a byte we would write ORA #4.

The AND instructions ANDs the contents of the A, B, CC registers with a operand. The result is only set when both one bit AND the other bit are set.

```
0 AND 0 = 0 RESET
0 AND 1 = 0 RESET
1 AND 0 = 0 RESET
1 AND 1 = 1 SET
```

The AND is most often used to mask bits in a byte. For example AND can be used to mask the the Most significant bit of a byte to see if it is set (1).

```
ANDA #128
```

The EOR (Exclusive Or) instruction is a variation of the OR but, works only on the A or B register and a operand. If either one or the other bit is set the result is set but not both.

```
0 EOR 0 = 0 RESET
0 EOR 1 = 1 SET
1 EOR 0 = 1 SET
1 EOR 1 = 0 RESET
```

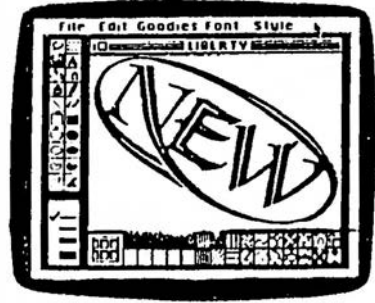
The EOR is used to check the sign of a result. If the result of an EOR is set then the number was negative. We will see more of this command when we examine multiple percision math in a later part of this series.

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.

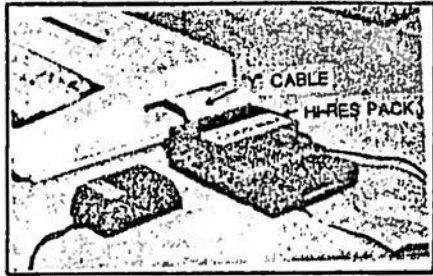
CoCo MaxTM II



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 menu



Zoom In I

Control Over Your Work

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

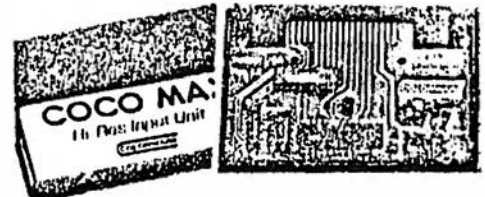
- You can move it around
- Copy it
- Shrink or enlarge it in both directions
- Save it on the electronic **Clipbook**
- Flip it vertically or horizontally
- Rotate it
- Invert it
- Clear it, etc. etc.

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 points! (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...

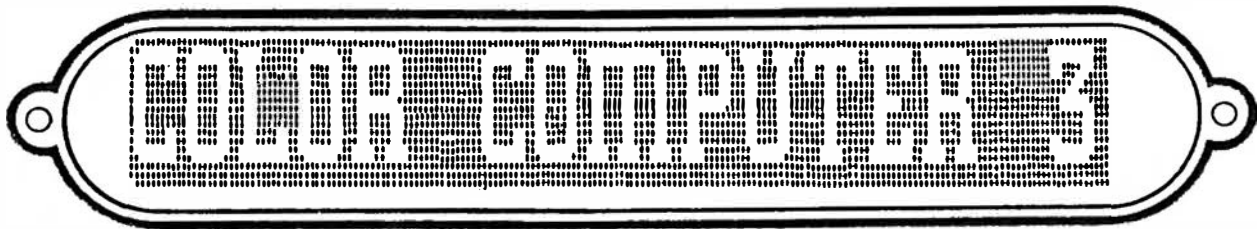
You'll be impressed with CoCo Max's capability. Text can be added and moved around anywhere on the picture. (You can also rotate, invert and flip it...) At a click, you can choose from 14 built in **fonts** each with 16 variations. That's over 200 typestyles!



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!



The Color Computer 3 has some features that are not present in the earlier models. Last month we looked at error trapping. With error trapping we can force the program to go to specified line numbers when an error occurs and print instructions depending upon the error type. Last month we gave a program for this purpose.

The 6809 family of microprocessor can only address 64K bits with its 16 address lines. Since the color computer 3 comes with 128K then there must be some unique method of addressing the extra 64K. The color computer 3 has a memory manager that moves 8K blocks of memory depending upon the values stored in a register. The registers occupy memory from 65440 to 65455.

MANAGING MEMORY

There are many ways of managing memory. One way is to create a ramdisk. Programs can be saved to or loaded from the ramdisk. This involves moving each byte of the program from one memory location to another.

A second method involves stacking programs in memory and selecting the program to run by changing the basic vectors. This is the technique we used in our Multiprogram Manager which we developed our first year.

The memory manager in the color computer 3 allows us to select 8K blocks of memory by changing a value in a register. For the 128K color computer 3 there will be a total of 16-8K memory blocks. The following are the registers for 128k.

Operating 64K Memory Block		Extra 64K Memory Block	
65440	1	65448	1
65441	2	65449	2
65442	3	65450	3
65443	4	65451	4
65444	5	65452	5
65445	6	65453	6
65446	7	65454	7
65447	8	65455	8

FIGURE 1

Let's look at 8K blocks of memory in the normal 64K. The first block contains pointers, the keyboard buffer, the 32 character screen ram, and PMODE 4 graphics. This block should not be moved by the memory manager.

The second block can contain 4 graphics pages. A PCLEAR 8 reserves memory in this block for graphics.

The third 8K block is not designated for anything. This is the block we will be moving. Notice from Figure 1 that the register containing this block is 65442. By poking different values into 65442, we can move different memory blocks into this area. Now if each 8K block contains a program, then we can move programs into this area by doing memory pokes into 65442.

A basic program can be loaded into any memory area that is not used in the normal 64K of memory. A zero must precede the first statement. The third 8K block starts at 16384. So it is necessary to poke a 0 into 16384 for the program to run. The values in memory locations 25 and 26 tell basic where to start. We will want our programs to start at 16385 so we will need a 64 in 25 and a 1 in 26.

When we load a program the values in 27 and 28 tell basic where the program ends. These values will have to be preserved as we switch banks if we want to edit the programs. We decided to save these values in the upper 2 bytes of each bank. These locations are 24574 and 24575.

To make it easy to switch banks we decided to write a control program and place it in the top part of the fourth 8K bank. A machine language subroutine allows us to go from our control program to the program in the third 8K memory bank. The two programs are exchanged by using the execute command. The machine language program resides in memory from 510 to 533 and the program vectors are in memory from 500 to 503.

DEVELOPING A PROGRAM

We wrote a memory manager development program to allow us to experiment with moving memory blocks. It allows us to look at the values in the registers, write data to memory, read data from memory, clear up the screen, and run the other program. The third 8K memory bank is in the register at 65442. By poking different values into this register, we can select a different 8K memory bank.

Before loading the program it is necessary to decide where in upper memory it is to be located. We placed ours at 28161. To do this we need to do the following before loading the program.

```
POKE 25,111:POKE 111*256,0:NEW
```

Now load the program. When the program is run the following appears:

- 1 LOOK AT REGISTERS
- 2 WRITE DATA TO MEMORY
- 3 READ DATA FROM MEMORY
- 4 CLEAR UP SCREEN
- 5 RUN PROGRAM

Selecting (4) will give reversed video and true lower case characters. To view and change the memory block select (1). The registers to the right are for the second 64K bank. For a 128K computers, we found that we could use values of 112-115. There may be other banks that are usable but these seemed to work without any problems. These appear to be the memory blocks that contain the high resolution graphics. All of our experimentation was done with the computer in the 32 column mode. This program may not work in the 40 or 80 column mode.

To change a bank press a number key. Then enter the number for the bank. The numbers are ORED with 64. If a 1 is entered then when the register is displayed, a 65 will be printed: To save confusion enter numbers from 64 to 111 for a 512K computer. This will use the extra memory. For the 128K computer values from 112 to 115 can be used. This is the high resolution screen.

After selecting a memory bank, exit the control program by selecting (5) from the menu. This calls the machine language linker and will run the program in the selected memory bank. If a program has not been loaded then an error message or the OK prompt will appear on the screen. If an error message appears then type "NEW". A program can then be loaded from a cassette or disk. When it is desirable to return to the control program just type "EXEC" and press "ENTER". The control program runs and gives the menu. Additional programs can be loaded by continuing the procedure.

Options (2) and (3) allow peeking and poking values into memory. These are not required for switching the banks. The machine language subroutine is automatically transferred to memory as the program is run.

COLOR COMPUTER 3

256K MEMORY

(NEW)

Add another 128K of memory to your color computer 3. Its like having two computers in one package. ME-31 \$49.95.

512K MEMORY

Upgrade your Color Computer 3 to 512K. Our plug in board is easy to install and will give you the maximum addressable memory. With 512K you can have two ramdisks with the included ramdisk disk software. Complete assembly ME-30 \$99.95

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512K RAMDISK

A ramdisk operates from memory just like a disk drive except it is many times faster. The 512K ramdisk allows drive 2 and 3 to be ramdisks. You can backup a disk to either ramdisk or select either ramdisk for quickly loading programs. Also included is a memory test program.

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MEMORY SAVER 2

(NEW)

Now you can save your computer's memory when power fails. Assembly consists of a small rechargeable battery that mounts under the keyboard and an enable switch. When power fails the electronic control circuit connects the battery to the memories saving all data or programs for at least 30 minutes.

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Hartselle, AL 35640

CC-3 MEMORY MANAGER PROGRAM

```
10 PRINT"COLOR COMPUTER 3 MEMORY
MANAGER
20 PRINT"COPYRIGHT (c) 1987
30 PRINT"DYNAMIC eLECTRONICS INC
.
35 PRINT
37 'CHECK FOR ML SUBROUTINE
40 IF PEEK(510)<>142 THEN GOSUB
350
45 'SAVE PROGRAM ENDING VECTORS
50 A=PEEK(502):B=PEEK(503):POKE
24574,A:POKE24575,B
60 PRINT"1 LOOK AT REGISTERS
70 PRINT"2 WRITE DATA TO MEMORY
80 PRINT"3 READ DATA FROM MEMORY
":PRINT"4 CLEAR UP SCREEN
90 PRINT"5 RUN PROGRAM
100 X$=INKEY$:IF X$=""THEN 100
110 X=VAL(X$)
120 ON X GOTO 130,220,270,320,34
0
130 FOR M=65440 TO 65448
140 A=PEEK(M):PRINTM;A,:B=PEEK(M
+8):PRINTM+8;B
150 NEXT M
180 PRINT"PRESS ENTER FOR MENU O
R ANY KEY
185 'WAIT FOR KEY TO BE PRESSED
190 R=65442:X$=INKEY$:IF X$="" T
HEN 190
200 X=VAL(X$):IF X=0 THEN RUN
210 INPUT"ENTER VALUE";V:POKER,V
:GOTO130
219 '
220 PRINT"THIS WRITES TO MEMORY
230 INPUT"ENTER MEMORY";M
240 A$=INKEY$:IF A$="" THEN 240
250 A=ASC(A$):POKE M,A:PRINTM;A$
260 M=M+1:GOTO240
269 '
270 PRINT"THIS PRINTS FROM MEMOR
Y
280 INPUT"MEMORY";M
290 A=PEEK(M):A$=CHR$(A)
300 PRINTM;A;A$:M=M+1:GOTO290
310 '
319 'THIS CLEANS UP THE SCREEN
320 POKE359,57:POKE85314,16:POKE
65468,63:POKE65469,0
330 RUN
339 '
340 POKE500,64:POKE501,1:POKE163
64,0:POKE 502,PEEK(24574):POK
E503,PEEK(24575):EXEC 510
349 '
350 FOR J=510 TO 533:READ A:POKE
J,A:NEXT J:RETURN
360 DATA 142,0,25,16,142,1,244,1
68,132,230,164,167,160
370 DATA 231,128,140,0,28,35,243
,126,174,117,57,0,
```

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.

MAGIGRAPH

MagiGraph is a graphic utility program for the TRS-80 color computer. It makes it easy to draw highly detailed graphic characters. MagiGraph has 9 animation buffers which allow various positions of an animated character to be tested and revised so that the animation blends together smoothly.

MagiGraph has two screens. The graphics screen contains the drawing and a movable box controlled by the arrow keys. The design screen allows drawing in the area designated by the box. The arrow keys allow moving the box across the screen without affecting the pixels. Pressing the enter key switches screens. With the design screen, the arrow keys move the cursor. Pressing a designated color key continuously draws a colored pixel on the screen in the direction of the last arrow pressed until the key is released.

The design window can be rotated, inverted, and the pixels shifted in many ways by pressing certain keys. If a particular design in the window is to be used again, it can be placed in one of the buffers and recalled by pressing the key for the buffer. This makes it easy to save critical parts of the drawing for later use.

TELEWRITER 64 WORD PROCESSOR

This excellent word processor will handle all of your writing requirements. With its full screen editor, any part of the text can be quickly accessed with the arrow keys. Phrases or paragraphs can be inserted, deleted, or copied to another part of the text. The completed writing can be saved to a cassette or disk or printed on any printer. Features include:

- 3 display formats of 51, 64, or 85 columns x 24 lines
- True lower case characters
- Friendly full screen editor
- Right justification
- Drives any printer
- Runs in 16K, 32K, or 64K computers or CC-3
- Menu driven disk and cassette I/O
- CoCo 3 Compatible with Poke for 32K mode. Add ULTRA-TELEPATCH below for total CoCo 3 compatibility.

Disk \$59.95, Tape \$49.95

ULTRA-TELEPATCH

Telewriter 64 enhancer that adds features such as block transfer, autokey repeat, overstrike, visible carriage return, in memory disk I/O module, typeahead buffer, fast disk I/O, search & replace control codes, user definable defaults, word delete, disk spooling, key beep, multiple print copies. Modify the boot program for your parameters. Print to disk with TSPool or make multiple copies with TPRINT. Makes the TW 64 completely compatible with the CoCo 3. \$19.95 disk

Add \$3 shipping

DYNAMIC ELECTRONICS
Box 896 (205) 773-2758
Hartselle, AL 35640

MagiGraph differs from other graphics programs in that the pixel of each color can be selected by pressing the key corresponding with the color. For example to draw a red line hold down the "R" key until the line is completed. Hold down the "Y" key to draw in yellow. A disadvantage is that circles and boxes can not be drawn by pressing a single key. The ability to draw in any color and place parts of the drawing into buffers is very useful.

Examples are given for writing a basic graphic or assembly program. These would be useful for developing special graphic programs with animation.

Graphic screens can be saved or loaded from a disk. As an experiment we backed up the disk to one of the ramdisks of our color computer 3. We wanted to see if a problem exists when working with a ramdisk. There were several example pictures on the disk and we quickly loaded them from the ramdisk. They were in color and looked very good. There were no problems in using the ramdisk.

MagiGraph is an excellent graphics program. It is very good for doing a drawing in color. The picture can not be printed to a printer, but any screen dump program can be used for this purpose. The information contained in the cursor box can be printed to a printer. It allows generation of very attractive pictures in color and is compatible with the color computer 3. The cost is \$39.95. For more information contact The Micro Works, P. O. Box 1110, Del Mar, CA 92014 (619) 942-2400.

CC3 DRAW

CC3 DRAW is a drawing program for the COCO III. It requires a joystick and allows a picture to be drawn on the high resolution screen and saved to a disk. The program is easy to use. Just type RUN "CC3DRAW". The fore-

ground and background colors can be changed by pressing numbers 0-9.

After selecting a suitable color combination, drawing can begin. The cursor is moved by the joystick and a small blinking cursor shows its position. The space bar or a second joystick button can be used to mark the starting point. To draw an object, move the cursor to the position where the object is to be drawn. Then press the appropriate key to do the drawing. For example press L for a line, B for a box, SHIFT B for a filled box, or C for a circle.

A menu is available that prints the available commands on the screen. This is accessed by pressing the ? key. Other commands include the "K" key which allows changing the palette values. Select the palette to change by entering a number from 0 to 15 and then entering the color value.

An interesting feature is the ability to label parts of the drawing. This is accomplished by pressing "T" and then writing the text desired at the cursor location. Press ENTER to return from this section.

Drawings can be saved to or loaded from a disk. Sections of the screen can be marked and moved to a new location. There are other functions that allow painting the screen to a selected background and selecting various palettes.

We found CC3 DRAW easy to use after a little practice. CC3 DRAW sells for \$19.95 +\$3 shipping. Spectrum Projects, P. O. Box 264, Howard Beach, NY 11414.

RENEWAL TIME?

The date beside your name on the address label indicates 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 5/87.

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.

Radio Shack, a division of Tandy Corporation, has released DeskMate 3(TM), an integrated software package designed exclusively for the powerful new Color Computer 3 (tm).

DeskMate 3 includes seven commonly used personal productivity applications on one disk: TEXT, a text entry and editing program that preforms search, replace, file merge, block select, copy and delete; LEDGER, a simple spreadsheet which includes menu and automatic column formatting; PAINT, a sixteen-color picture editor to create graphics screens; TELECOM, a communication program to access national information services and transmit and receive ASCII files from other computers by phone; INDEX CARDS, a personal filing system perfect for tracking names and addresses; CALENDAR, a monthly calendar to organize each day; and CALCULATOR, a four-function calculator available within any application.

DeskMate 3 also features a 40/80-column switchable display for TEXT, LEDGER and TELECOM. Suggested Retail price is \$99.5 at all Radio Shack Stores.

Sunrise Software has announced the release of BUSINESS BANKBOOK +3 for the color computer market. This system is designed to replace manual check register systems for small business applications.

Systems requirements are a 32K or greater color computer, one, or two disk drives, and a printer. SYSTEM I is available for one disk drive operation, SYSTEM II for two disk drives. 23

The program is shipped on disk only, with software for the original CoCo and CoCo II on side one, and special programming for the CoCo3 on side two. All data is compatable with both versions of the program.

The BUSINESS BANKBOOK +3 system features up to four user assignable account number per transaction, checks or deposits. Monthly, or year to date, check register, summary of accounts, listing of individual account numbers, and a current listing of checks outstanding. The system also prints checks, and updates the check register. Files are maintained for regular payees, and one time only checks may be printed. Additional forms are required to print checks.

The program is not copy protected. However, it is run protected. A code plug is supplied to operate the program. Backup copies may be made as required. A complete manual is also supplied with each program.

BUSINESS BANKBOOK +3 cost \$49.95, plus \$2.00 shipping. Florida residents must also add \$2.50 sales tax. Orders may be placed by mail, or by calling 1-800628-2828, extension 552, VISA and MasterCard accepted.

It's finally here! Spectrum Projects has announced an 80 COLUMN version of Telewriter 64 for the CoCo III with Telepatch features plus much, much more!!! Use the F1 & F2 keys to access the main menu or editor, ALT key for special characters & now you can use the CTRL key instead of Clear! Reg. TW-64 DISK & 128K CoCo 111 \$39.95 +\$3 S/H. Spectrum Projects, P. O. Box 264, Howard Beach, NY 11414.

Dynamic Electronics Inc. has announced the release of CC-THERM which is a digital thermometer for Radio Shack Color Computers. It consists of a thermistor wired to the end of a flat cable. The other end of the cable is wired to a joystick plug. The thermistor can be mounted on a wall, inside equipment, or outside a building for temperature measurements. It can be used to monitor the temperature inside a computer or other equipment where a remote temperature measurement is desired. The computer could be used to control a relay to turn on a heater or air conditioner

for regulating temperature. A dual version is available for measuring temperature in two locations or for measuring both inside and outside temperatures. The outside temperature can be read from your screen for HAM RADIO use. Basic software on tape or disk continuously prints the temperature in both Fahrenheit and Centigrade. The software could be merged with other programs to expand its usefulness.

CC-THERM \$12.95, CC-THERM 2 \$19.95 Specify tape or disk. Add \$3 shipping. Dynamic Electronics Inc., Box 896, Hartselle, AL 35640.

HAM RADIO & COMPUTERS

by

Bill Chapple W4GQC

In this series we are looking at methods of utilizing a computer for ham radio use. We have given some software programs and hardware projects since we started this section last August. There is much that can be covered and we will cover at least one subject each month. We have been covering measuring temperature using the joystick ports. These can be used to measure the outside temperature from within your shack. If you are interested in this then I suggest you read the material.

The recent FCC expansion of the novice privileges allows very good operating privileges with a license that takes a minimum of effort. The novice license requires passing a 5 word per minute Morse code test plus a test on operating rules. Voice, repeater, and digital communications are allowed along with the traditional Morse code.

Morse code communications is perhaps the most effective of all of the modes for long distance communications. During and before world war II Morse code was extensively used for communications. You can communicate over long distances with relatively low power. As an example I have contacted stations in Europe, South America, South Africa, and Japan from my car using Morse code. Now with computers, you can type your messages with the keyboard and have it sent out on the air using Morse code. Also the computer can be used to decode the Morse code and display the received message on the screen. We have covered the transmitting part and are now looking at receiving and decoding Morse code.

It appears that some of the commercial Morse code interfaces do not work very well except for strong signals. Static and in-

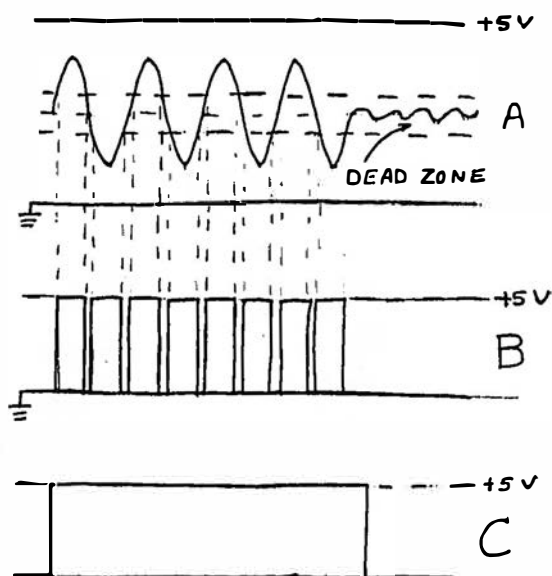
terference (QRM) will cause errors and the wrong character to be decoded. Interference can be reduced by using a good audio filter. If you have a commercial interface and interference is a problem then you might want to consider adding a filter. Building a filter is covered in the last part of this article.

IMPROVED TONE DECODER

An interface that converted audio tones into a voltage level was presented a couple of months ago. This was successfully used with a bench test setup between two color computers. However there may be a speed problem for fast speed operation with that tone decoder. The speed can be improved by using a circuit that gives a voltage output for both half cycles of the audio. This allows an increase in speed because a much smaller filter capacitor can be used. Also a dead zone is desired to prevent low level noise or interference from causing an output.

Figure 1 shows a graphic representation of the processing results. The audio applied to a speaker or headset is shown at A. The dotted lines represent the dead zone. The amplitude has to exceed the dotted lines to cause an output in both the positive and negative directions. Positive is the portion above the center line and negative is the portion below the center line. In B the output goes to +5 whenever the audio exceeds the dead zone for both positive and negative variations. C represents the desired output to the computer. This output gives 5 volts when an audio signal is present.

Designing electronic circuits requires the same procedure as writing programs. The first step is to decide what is required and the second step is to determine the details for accomplishing the objective. We will again use the LM-339 quad comparator that was discussed in our March issue. With a few simple changes we can meet our objective.



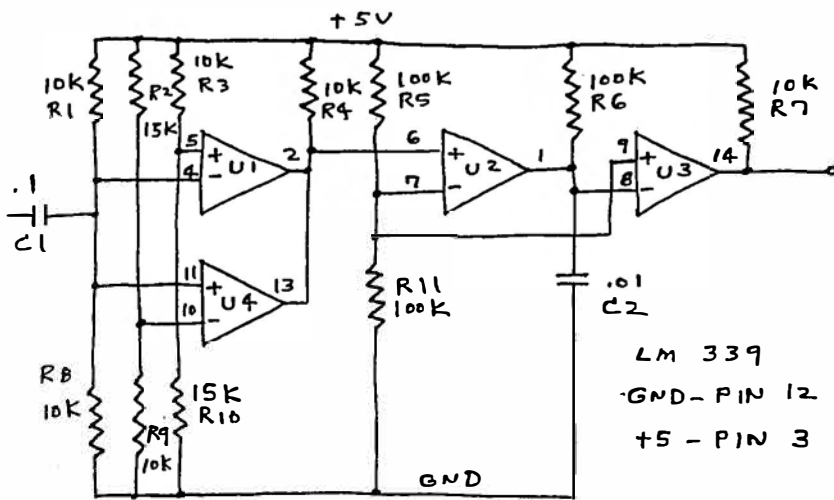
SIGNAL PROCESSING

Figure 1

Since the operation of a comparator was discussed in detail, we will not cover it again. There was an unused comparator in the LM-339. We used it to provide an output on the negative portion of the audio. The outputs of the comparators are open collector types. This means that we can tie two outputs together.

A schematic diagram of the improved tone decoder is shown in Figure 2. The circuitry associated with U2 and U3 is identical to what we previously had except capacitor C2 is reduced from a .1 to a .01. This increases the response 10 times. Notice that the outputs of U1 and U4 are connected together. These outputs go low whenever the audio exceeds the dead zones between the dotted lines in Figure 1. Also notice that the inverting (-) input of U1 is connected to the noninverting (+) input of U2. The output of U1 goes low for + audio and the output of U2 goes low for - audio.

The dead zone is generated by the voltage dividers R2 and R9 and R3 and R10. Resistors R1 and R8 divide the 5 volts down to 2.5 volts. Notice the placements of the 10K and 15K resistors. Resistors R3 and R10 bias



IMPROVED TONE DECODER

Figure 2

or set the voltage reference for the + input of U1 above the 2.5 volts established by R1 and R2. Resistors R2 and R9 set the reference for the - input of U4 below the 2.5 volt reference. This creates the dead zone.

CW FILTER

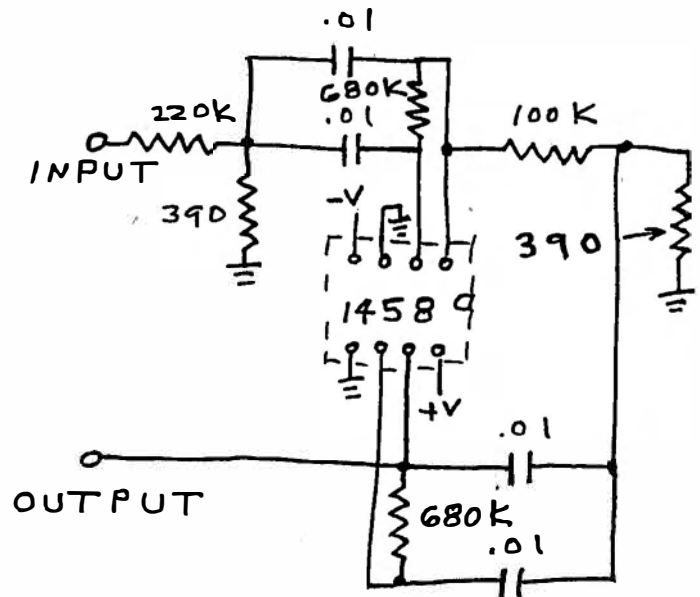
A CW filter is a bandpass audio filter. A filter can be constructed by using an LM1458 dual operational amplifier. The LM1458 is in an 8 pin dual in-line package. It requires a positive and negative voltage of at least 5 volts. Higher voltages of 9 to 12 volts work much better. A schematic diagram of the CW filter is shown in Figure 3. There are no special precautions that must be taken since this is an audio circuit. The filter can be built on the interface circuit used for previous projects.

After the filter is constructed, it will be necessary to supply audio to it from your transceiver or receiver. Sticking a connector into the phone jack disables the speaker in most applications. However an external speaker can be used with an adapter to provide audio to the filter from the transceiver. The filter is resonate around 800 hertz. The output of the filter could be connected to

the tone decoder circuit input and to the input of an audio power amplifier for speaker use. This will allow you to hear what comes out of the filter and make it easier to tune stations.

NEXT MONTH

I have the CW decoder working with my Swan transceiver. Next month we will present the software. I had some trouble with software but now it is working very well. We are looking at selling ham radio hardware. If you are interested in this let me know. It takes time and money to develop hardware so if we know there is a demand, then it helps. We used to sell filters, speech compressors, antennas, and Morse code copiers. In the future we will cover other subjects such as teletype, slow scan television and packet radio.



CW FILTER

Figure 3

BASIC PROGRAMMING

In this series we are showing how to write basic programs. For the past few months we have been looking at a large address file for use with a disk or ramdisk. We wrote an address file program that will handle 100 addresses with each address requiring 100 bytes for a total of 10000 bytes. This program allowed us to sort on names, zip codes, and telephone numbers.

We are now looking at a disk file program that will handle 15 of these files for a total of 1500 addresses. This month we are presenting material that will be used for our disk file program. Our objectives are as follows:

1. Have 15 address files on a disk with names of X1 to X15.
2. Let the program automatically load and sort the files.
3. Print the files.

IMPROVED SORTER

If we are to sort 1500 items then there must be a quicker method than the one we previously used. Let's consider a deck of cards with 4 suits which are clubs, diamonds, hearts, and spades. Let's assume that the cards are numbered from 1 to 13 for the clubs, 14 to 26 for the diamonds, 17 to 39 for the hearts, and 40 to 52 for the spades. This is the order we want for the cards after our sorting. As an exercise, mix up or shuffle the cards and then look for the first one, then the second, and then the third until all of the cards are in order. This is similar to the bubble sort that we have been using. This method is not bad if there are only a few items to sort.

A second method would be to look through the deck and remove all clubs. We could set these aside and make another pass removing all diamonds. A third pass would remove all hearts. The remaining cards would be the spades.

Next we could place the cards in each suit in order and finally combine the groups of cards to complete the sorting. This is easier and faster. If you do not believe this then try it for yourself.

SORT PROCEDURE

Our procedure will be to divide the number of items by 2. We will place a marker at the middle and compare the first

CC TERM (new)

CC-THERM is a digital thermometer for Radio Shack Color Computers. It consists of a thermistor wired to the end of a flat cable. The other end of the cable is wired to a joystick plug. The thermistor can be mounted on a wall, inside equipment, or outside for temperature measurements. It can be used to monitor the temperature inside a computer or other equipment where a remote temperature measurement is desired. The computer could be used to control a relay to turn on a heater or air conditioner for regulating temperature. A dual version is available for measuring temperature in two locations or for measuring both inside and outside temperatures. The outside temperature can be read from your screen for Ham Radio use. Basic software on tape or disk continuously prints the temperature in both Fahrenheit and Centigrade. The software could be merged with other programs to expand its usefulness.

CC-THERM \$12.95, CC-THERM 2 \$19.95
Specify tape or disk. Add \$3 shipping.

DYNAMIC ELECTRONICS Inc.

Box 096 (205) 773-2750

Hartselle, AL 35640

item with the first item past the marker. We will exchange as necessary so that the smaller is in the lower memory and the larger is in the upper memory. This will continue until no items are exchanged.

We will again divide the number of items by 2 and let this be our marker. We will then compare the first item with the first one past the marker and exchange as required. This will continue until we do not make any swaps.

We will again divide the number of items by two and establish a new marker. We will continue until the marker is on the second item. If we compare all of the items and no exchanges are made, then the sorting is completed.

Let's take a numerical example with 10 numbers.

	1	2	3
1	25	* 25	25
2	58	58	22
3	13	13	8
4	87	87	17
5	92	92	77
6	35	* 35	35
7	22	22	58
8	8	8	13
9	17	17	87
10	77	77	92

Figure 1

In Figure 1 the first column shows the numbers. The second shows the first two comparisons, and the third shows the results after the first pass.

	1	2	3	4
1	* 25	* 8	* 8	* 8
2	22	17	17	13
3	* 8	* 77	* 25	* 25
4	17	22	13	17
5	77	25	58	58
6	35	13	22	22
7	58	58	77	77
8	13	35	35	35
9	87	87	87	87
10	92	92	92	92

Figure 2

INTRODUCING DYPRINT

BANNER

Now you can print **LARGE** signs for special occasions such as birthdays, parties, or yard sales. Even make your own **FOR SALE** signs when you need to sell that old car or lawnmower. Banner uses standard print characters and is compatible with any printer. The characters are formed by a 21 x 27 dot pattern and are printed sideways across the paper. The basic character can be expanded up to 4 times for making large characters up to a full page.

The printer parameters can be used to expand the size and quality of the signs. For example high density signs can be printed with printers that use compressed characters. Darker signs can be printed by using double strike.

MAXPRINT

MAXPRINT allows graphics to be blown up and printed on a standard printer. Any PMODE 4 picture generated by COCOMAX, MAGIGRAPH, VIDEO DIGITIZERS, or BASIC can be printed. This allows a large picture or poster to be made. The program supports all 8 graphics pages for a total of 12288 bytes. MAXPRINT prints 8 characters per byte for a total of 98304 characters.

The graphics picture is 256 characters wide and is printed with 2 passes for the 128 character per line mode or 8 passes for the 32 character per line mode using large characters. The results from each pass can be trimmed and taped together to form a large blown up picture.

Use MAXPRINT to blow up pictures of friends and family and make posters announcing sales or special events.

The DYPRINT package contains both BANNER and MAXPRINT. The cost is only \$19.95 plus \$3 shipping for tape or disk.

DEALER INQUIRIES INVITED

Checks, VISA or MC Cards

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Next we compare every other one as shown in Figure 2. It takes 3 passes before we do not have to make a change as shown in the columns.

	1	2	3
1	* 8	* 8	* 8
2	* 13	* 13	* 13
3	25	17	17
4	17	25	22
5	58	22	25
6	22	58	35
7	77	35	58
8	35	77	77
9	87	87	87
10	92	92	92

Figure 3

Notice that the numbers are finally sorted in two passes when adjacent values are compared and switched.

BASIC SORT ROUTINE

We modified our address file program with the following sort routine using the method discussed. We compared this method to the previous method on a file of 50 names. It was over two times faster. The speed difference greatly increases as the number of names increases.

```

5800 'SORT ROUTINE
5805 X=NF-1:Y=X
5808 Y=INT(Y/2):V=X-Y
5809 AA=0
5810 FOR J=0 TO V:P=S+100*J+OS:Q
      =S+100*(Y+J)+OS
5815 PRINTJ;J+Y
5820 FOR L=0 TO 8
5830 M1=P+L:M2=Q+L:A=PEEK(M1):B=
      PEEK(M2)
5840 IF A<B THEN GOTO 5870
5850 IF A=B THEN 5865
5860 GO SUB 5900:AA=AA+1:GOTO 58
      70
5865 NEXT L
5870 NEXT J:IF AA>0 THEN GOTO 58
      09
5880 IF Y>1 THEN 5808
5885 RETURN
5900 PRINT"EX "J" AND "(J+Y)

```

```

5910 P1=P-OS:Q1=Q-OS
5950 XX=P1:GOSUB 5990:POKE500,MS
      :POKE501,LS:XX=P1+99:GOSUB 59
      90:POKE 502,MS:POKE503,LS:XX=
      Q1:GOSUB 5990:POKE 504,MS:POK
      E505,LS
5960 EXEC 510:RETURN
5990 MS=INT(XX/256):LS=XX-256*MS
      :RETURN
5999 '

```

LOADING DISK FILES

How can we easily load our disk files with designations X1 to X15? For sorting we will use two FOR-NEXT loops. Suppose if J=1 we want to load X1 and if J=5 load X5. Look at the following routine.

```

5060 FOR J=1 TO LF
5070 FOR K=J+1 TO LF
5080 J$=RIGHT$(STR$(J),1):K$=RIG
      HT$(STR$(K),1)
5090 J1$="X"+J$:K1$="X"+K$
5100 PRINTJ1$,K1$
5109 'LOAD FIRST FILE
5110 PRINT"LOADING "J1$:LOADMJ1$

```

The key is line 5080. J\$ and K\$ are string equivalents of J and K. In line 5090 "X" is combined with J\$ and K\$ to give the strings J1\$ and K1\$. These strings can be used to load the files from the disk as shown in 5110.

Next month we will continue and hopefully finish the program. We are very excited about this program as we have had many requests for it.

ATTENTION DEALERS

Are you taking advantage of our free services? We will list your new products and review them free. Also our ad rates are the lowest.

QUESTIONS & ANSWERS

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

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.

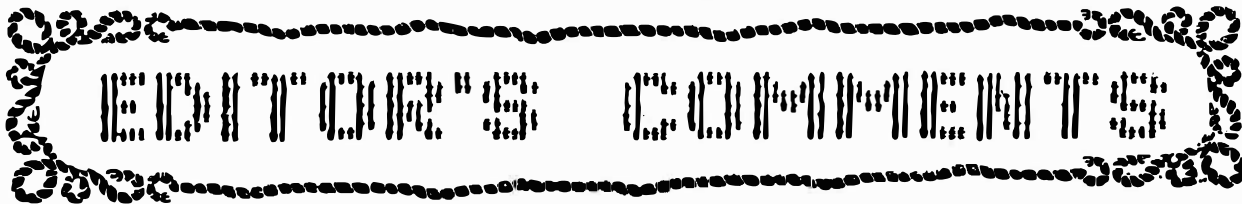
QUESTION: Several months ago I upgraded by system from a COCO II to a COCO III and a CM-8 monitor. I also have two disk drives and a multi-pak interface (I have changed the PAL chip). I am not able to get VIP WRITER to work on the COCO III. When I load the program I will get the title page, then memory sense and then the working screen with the command line, the cursor in the command line, but the computer locks up. Pressing the keys have no effect. Do you know how I could get VIP WRITER to work on the COCO III?

ANSWER: We are not familiar with VIP WRITER and can not answer your question. We suggest contacting the writer of the program or dealer handling the program. If any of our readers have a patch let us know and we will print your answer and give you credit.

QUESTION: Enclosed is a money order for a 1 year subscription to Dynamic Color News. I am also interested in your 128K memory upgrades but don't know if it will properly connect to my COCO-2. I am very satisfied with my COCO-2 and have no plans to buy a COCO-3 at this time but I am very interested in improving my COCO-2. I will provide as much information as I can with hopes that my COCO-2 qualifies for your Banker RAMS and/or Memory Saver hardware package. The SAM chip is socketed and the memory chips are soldered in. The numbers are 8040665-KQD8430.

ANSWER: The COCO-2 has as much computing power as the COCO-3 since both use the 6809 family of microprocessors. We have one COCO-3 and can not tell much difference in its performance except for the special features and the easy expandability to 512K of memory. Your computer can not be upgraded unless the memory chips are unsoldered and replaced with sockets. Your memory chips are 4164 equivalents. Memory upgrades usually

require removing memory chips and installing other memories or assemblies. The Banker RAMS are produced by J & R Electronics and require removing the SAM chip and installing a circuit board in the socket. The SAM chip fits into the socket on the circuit board. 256K memory chips fit in the sockets used to house 64K chips. Our Memory Saver 2 will work with all color computers and provide power to memories during power failures or brown outs.



The nice weather we have been having has made me a little lazy. Dean and I like to go camping and there are a lot of nice State Parks here in North Alabama and Southern Tennessee. We generally do not stay over one night because of our work load. I always carry a computer and ham radios are installed in my car. Sometimes on these excursions new ideas for computers are exposed. As soon as I get an idea, I get out my model 100 and start writing.

As I have stated many times Radio Shack Color Computers are very expandable. We are showing how to make accessories and write programs. The joystick ports have tremendous potential for many applications. We are showing how to use these ports for making various measurements. This month we completed the temperature measuring article. Next month we will have a new subject.

Basic and machine language programs can be placed in EPROMS. We are discussing this in our EPROM series. This is especially useful for those who do not have a disk drive or for applications where the computer is required to do a single job. An example of this would be using a computer for controlling a production process. To access a program in an EPROM just do a

memory poke and run the program I would like to put an EPROM under the keyboard and put my word processor, terminal program, and assembler in it. This would save time trying to find the disk and load the program.

In our programming series we show a faster method of sorting data. We are developing a program that will handle 1500 addresses in 15 disk files. There is much interest in this program and with ramdisks becoming more popular for the older computers and the 512K CC3 there should be more demand for this type of program.

There is increased interest in our Ham Radio section. Even if you are not interested in ham radio, these articles should be of interest to you since they contain both hardware and software applications. As an example this month we show a diagram for an improved tone decoder. You could use any sound source to give a 5 volt logic output. This could be used to turn a device on or off with a relay or electronic switch. An audio filter could be added to allow a device to turn on if a certain frequency is on the audio line.

I want to thank each of you for your support. We are always open to suggestions and would like to hear from you.

CLASSIFIED ADS

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5. No X-Rated ads.

We have very, very LOW PRICES on paper, ribbons, disks, and other supplies. Send \$1 for our FULL-COLOR catalog and receive a \$2 credit. Marty's, 44 S. Front, Saint Clair, PA 17970

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 warranty and will be replaced should they become defective. DSK-1 SSDD for CoCo \$6.95 /box, DSK-2 DSDD for MSDOS \$7.95 /box. Prime 41256 150 nanosecond memory chips only \$2.25 each. 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 preceding 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. We can do your ad at a nominal cost. Rates are per page or fraction per month. Enclose payment with ad copy. No X-Rated ads.

ADVERTISER'S INDEX

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

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Dynamic Electronics Inc.	
3, 16, 17, 20, 21, 27, 28, 30	
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Rococo Software	back
Spectrogram Magazine	8
T & D Subscription Software	8

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

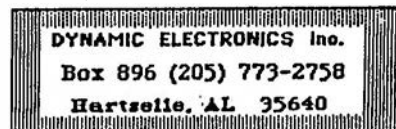
DCN-3

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

Programs are \$7.95 each tape or disk. Add \$2 shipping. Checks, VISA & MC.



DYNAMIC COLOR NEWS SUBJECT INDEX

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NEW for the CoCo 3

....'File-It'....

"File-It" is a Database/File system written just for your new CoCo 3. It allows full customizing of file parameters, screen displays and printer formatting. Enter, edit, save, find, etc. your data in seconds. Takes advantage of the 3's new features. Very easy to use! No need to study a manual for hours to set up your first file. Be using "FILE-IT" in just minutes after receiving it. And best of all it can be yours for the low introductory price of ONLY \$10.50, complete with documentation on disk. No extras for postage or handling. Just send check or money order for \$10.50 to:

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P.O. Box 690256
San Antonio, TX 78269

TX Res. add 6 3/4% Tax

This is only the first in a product line of CoCo programs to be marketed by DA-Comp Services. Watch for more "affordable" programs to be released soon.

*****SOFTWARE AUTHORS*****

Write for details of how you can benefit from our unique software marketing program. Don't let your hard work go to waste because no one wants to publish your program.

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 38 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.

\$17.95
TAPE



\$18.95
DISK

CROSSOVER

CROSSOVER is an original, exciting arcade game in which 1 or 2 players team up against the computer, trying to stop its never-ending onslaught. Can you conquer your CoCo? Make the game fast and furious or make it slow & sane, because you have complete control of the difficulty level. It's a great game for the whole family. See the reviews in the June CoCo-ADS & the Feb. '86 RAINBOW. It's 100% Machine Language for smooth graphics and joystick control!

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ROCOCO SOFTWARE
3019 SYLVESTER DRIVE
HARTLAND, WI 53029

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