SYMple Clock

A. M. MacKay
Owen Sound, Ontario

There are lots of clock programs around, but this one is a little different, and a lot more useful than most. It is written for a SYM-1 with 4K memory, but will work with a bare board. It is similar in some ways to the one in Issue 1 of Compute II, but doesn't require Basic or a CRT.

While most clock programs using the LED readouts won't do anything else while the clock is running, this one sits at the top of your memory, out of the way of most programs, and quietly ticks away while you and your SYM do other and better things. But when you want the time, either visually or for use by a program, just call it and there it is.

Since a program such as this will likely be stored on tape and loaded when required over the years, no page zero slots are used so you don't have to remember or keep track of them.

The clock runs in 24 hour format. If you prefer 12, change location 0FAB to 12. Then to start the clock, enter the hours, minutes and seconds, with fifteen or twenty seconds lead time, into locations 0FFD, 0FFE and 0FFF respectively. Then enter "GO F3F" and at the exact second hit "CR" and presto! Nothing happens! Ah, but it does. Your clock is running, quietly minding it's own business, eagerly awaiting your summons. Now, to see the time, all you do is hit "SHIFT CALC CR" or "SHIFT 0 CR" or any other "UNRECOGNIZED" command. The time will be displayed for a few seconds, then the readouts will be blanked except for a row of dots. As soon as you see the dots, you can go back to whatever you were doing with your SYM. If you want the time displayed during, and as part of, a program, just use "JSR B9 0F" and there it is.

Most importantly, though, if you want the time for controlling purposes, just call it at 0FFD, 0FFE and 0FFF with your program. It can, at the proper time, sound an alarm, turn off the lights, turn on your lights, and/or whatever makes you happy.

If you don't want clock time, but just the time since your SYM was turned on (actually since the clock started), don't enter anything in 0FFD-F. Just hit "GO F3F CR" and the clock will automatically start at 00 hours 00 minutes 00 seconds.

If your SYM is new, this is a good chance to experiment, changing things to suit your purposes. For example, try moving "DLY" from line 1090 to line 1010 (change "EB" to "D4" at location 0FEA). Your SYM now looks like a cheap digital clock. Now try changing "0A" at location 0FD2 to "1A", then move lines 1070 and 1080 to a new location between lines 1000 and 1010. Do you prefer the display this way?

The theory of operation is similar to that given for my clock article in Compute II no. 1, which required Basic and a CRT. However, the program is somewhat different because the clock in that article kept time in hex, while this one keeps time in decimal. To work in decimal with "SED" you must use ADC or SBC. "INC" just doesn't work.

Your SYM-1 is very powerful by itself, and is the basis for an extremely complex and powerful system. To get the most from it, I urge you to join the SYM-1 Users' Group, P.O. Box 315, Chico, CA 95927. And, of course, subscribe to and keep reading COMPUTE!

```
0005              .OS
0010 ;   ***************************************
0020 ;   ***************************************
0030 ;   ***                               ***
0040 ;   ***   > > > SYMPLE   CLOCK < < <   ***
0050 ;   ***                               ***
0060 ;   ***   BY A. M. MACKAY             ***
0070 ;   ***   CO-ORDINATOR, SURVEY DEPT.  ***
0080 ;   ***   GEORGIAN COLLEGE A.A.T.     ***
0090 ;   ***   1150 EIGHTH STREET EAST     ***
0100 ;   ***   OWEN SOUND, ONTARIO CANADA  ***
0110 ;   ***   N4K 5R4      JUNE 18, 1980  ***
0120 ;   ***                               ***
0130 ;   ***************************************
0140 ;   ***************************************
0150 ;
0160 ;
0170              .BA $0F3F
0180 ;
0190 ;   * * * DEFINITION OF LABELS * * *
0200 ;
0210 OUTBYT       .DE $82FA
0220 SCAND        .DE $8906
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```
                   0230 ACCESS      .DE $8B86
                   0240 IFR2        .DE $A405      ;FLAG FOR DISPLAY TIMER
                   0250 DISBUF      .DE $A640
                   0260 URCVEC      .DE $A66D
                   0270 IRQVEC      .DE $A67E
                   0280 CLRINT      .DE $AC04
                   0290 T1CH        .DE $AC05
                   0300 T1LL        .DE $AC06
                   0310 ACR         .DE $AC0B
                   0320 IFR         .DE $AC0D
                   0330 IER         .DE $AC0E
                   0340 ;
                   0350 ;     * * * INITIATE TIMER * * *
                   0360 ;
0F3F- 20 86 8B     0370 START       JSR ACCESS     ;UNWRITE PROTECT SYS RAM
0F42- A9 71        0380             LDA #L,CLOCK    ;SET IRQ
0F44- 8D 7E A6     0390             STA IRQVEC      ;  VECTOR
0F47- A9 0F        0400             LDA #H,CLOCK    ;    TO
0F49- 8D 7F A6     0410             STA IRQVEC+1    ;      "CLOCK"
0F4C- A9 B9        0420             LDA #L,TIME     ;SET UNRECOGNIZED
0F4E- 8D 6D A6     0430             STA URCVEC      ;  COMMAND VECTOR
0F51- A9 0F        0440             LDA #H,TIME     ;    TO
0F53- 8D 6E A6     0450             STA URCVEC+1    ;      "TIME"
0F56- A9 C0        0460             LDA #$C0        ;SET BITS 6 & 7
0F58- 8D 0B AC     0470             STA ACR         ;  FOR FREE RUNNING MODE
0F5B- 8D 0E AC     0480             STA IER         ;    AND T1 INTERRUPT ENABLE
0F5E- AD 0D AC     0490             LDA IFR         ;CLEAR T1 FLAG BIT 6 BUT
0F61- 29 BF        0500             AND #$BF        ;  DON'T DISTURB OTHER
0F63- 8D 0D AC     0510             STA IFR         ;    IFR BITS
0F66- A9 50        0520             LDA #$50        ;SET
0F68- 8D 06 AC     0530             STA T1LL        ;  TIMER
0F6B- A9 C3        0540             LDA #$C3        ;    FOR 1/20 SEC AND
0F6D- 8D 05 AC     0550             STA T1CH        ;      START TIMER
0F70- 60           0560             RTS
                   0570 ;
                   0580 ;     * * * INTERRUPT SERVICE ROUTINE * * *
                   0590 ;
0F71- 48           0600 CLOCK       PHA  ;          ;SAVE ACCUMULATOR
0F72- F8           0610             SED  ;          ;TIME IS IN DECIMAL MODE
0F73- CE FC 0F     0620             DEC COUNT       ;SEE IF 1 SEC HAS PASSED
0F76- D0 3B        0630             BNE EXIT        ;IF NO, EXIT
0F78- A9 14        0640             LDA #20         ;IF YES,
0F7A- 8D FC 0F     0650             STA COUNT       ;  RESTORE COUNT
0F7D- 18           0660             CLC  ;          ;    AND
0F7E- A9 01        0670             LDA #01         ;      ADD 1
0F80- 6D FF 0F     0680             ADC SECS        ;        TO
0F83- 8D FF 0F     0690             STA SECS        ;          SECS
0F86- C9 60        0700             CMP #$60        ;SEE IF 60 SECS HAS PASSED
0F88- D0 29        0710             BNE EXIT        ;IF NO, EXIT
0F8A- A9 00        0720             LDA #00         ;IF YES, RESET
0F8C- 8D FF 0F     0730             STA SECS        ;  SECS TO ZERO
0F8F- 18           0740             CLC  ;          ;    AND
0F90- A9 01        0750             LDA #01         ;      ADD
0F92- 6D FE 0F     0760             ADC MINS        ;        ONE TO
0F95- 8D FE 0F     0770             STA MINS        ;          MINS
0F98- C9 60        0780             CMP #$60        ;SEE IF 60 MINS HAS PASSED
0F9A- D0 17        0790             BNE EXIT        ;IF NO, EXIT
0F9C- A9 00        0800             LDA #00         ;IF YES, RESET
0F9E- 8D FE 0F     0810             STA MINS        ;  MINS TO ZERO
0FA1- 18           0820             CLC  ;          ;    AND
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0FA2- A9 01      0830              LDA #01        ;        ADD
0FA4- 6D FD 0F   0840              ADC HOUR       ;          ONE TO
0FA7- 8D FD 0F   0850              STA HOUR       ;            HOUR
0FAA- C9 24      0860              CMP #$24       ;SEE IF 24 HOURS HAS PASSED
0FAC- D0 05      0870              BNE EXIT       ;IF NO, EXIT
0FAE- A9 00      0880              LDA #00        ;IF YES, RESET
0FB0- 8D FD 0F   0890              STA HOUR       ;  HOUR TO ZERO
0FB3- AD 04 AC   0900 EXIT         LDA CLRINT     ;ENABLE TIMER INTERRUPT
0FB6- D8         0910              CLD  ;         ;BACK TO HEX
0FB7- 68         0920              PLA  ;         ;RESTORE ACCUMULATOR
0FB8- 40         0930              RTI
                 0940 ;
                 0950 ;          * * * DISPLAY ROUTINE * * *
                 0960 ;
0FB9- 20 86 8B   0970 TIME         JSR ACCESS     ;UNWRITE PROTECT SYS RAM
0FBC- 48         0980              PHA  ;         ;SAVE ACCUMULATOR
0FBD- 8A         0990              TXA  ;         ;  AND
0FBE- 48         1000              PHA  ;         ;    X-REGISTER
0FBF- AD FD 0F   1010              LDA HOUR       ;PUT
0FC2- 20 FA 82   1020              JSR OUTBYT
0FC5- AD FE 0F   1030              LDA MINS       ;  TIME ON
0FC8- 20 FA 82   1040              JSR OUTBYT
0FCB- AD FF 0F   1050              LDA SECS
0FCE- 20 FA 82   1060              JSR OUTBYT     ;    DISPLAY
0FD1- A9 0A      1070              LDA #$0A       ;SET NUMBER OF
0FD3- 8D FB 0F   1080              STA CNT1       ;  TIMEOUTS FOR DISPLAY
0FD6- A9 FF      1090 DLY          LDA #$FF       ;SET LENGTH OF
0FD8- 8D 1F A4   1100              STA $A41F      ;  TIMEOUT
0FDB- 20 06 89   1110 DISPL        JSR SCAND      ;LIGHT LEDS
0FDE- AD FA 0F   1120              LDA MASK       ;CHECK TIMER
0FE1- 2C 05 A4   1130              BIT IFR2       ;  IRQ
0FE4- 10 F5      1140              BPL DISPL      ;IF NO IRQ REPEAT
0FE6- CE FB 0F   1150              DEC CNT1       ;ELSE START AGAIN
0FE9- 10 EB      1160              BPL DLY        ;FINISHED?
0FEB- A2 05      1170              LDX #$05       ;CLEAR
0FED- AD FA 0F   1180 CLR          LDA MASK
0FF0- 9D 40 A6   1190              STA DISBUF,X   ;  DISPLAY
0FF3- CA         1200              DEX
0FF4- 10 F7      1210              BPL CLR
0FF6- 68         1220              PLA  ;         ;RESTORE
0FF7- AA         1230              TAX  ;         ;  X-REGISTER AND
0FF8- 68         1240              PLA  ;         ;    ACCUMULATOR
0FF9- 60         1250              RTS
                 1260 ;
                 1270 ;          * * * STORAGE DEFINITIONS * * *
                 1280 ;
0FFA- 80         1290 MASK         .BY %10000000          ;BIT 7 ONLY
0FFB-            1300 CNT1          .DS 1                  ;PROVIDE SPACE FOR CNT1
0FFC- 14         1310 COUNT         .BY 20                 ;SET COUNT TO 20
0FFD- 00         1320 HOUR          .BY 00                 ;START TIME AT 00 HOURS
0FFE- 00         1330 MINS          .BY 00                 ;               00 MINUTES
0FFF- 00         1340 SECS          .BY 00                 ;               00 SECONDS
                 1350              .EN
```

LABEL FILE: [/ = EXTERNAL]

```
/OUTBYT=82FA    /SCAND=8906    /ACCESS=8B86
/IFR2=A405      /DISBUF=A640   /URCVEC=A66D
/IRQVEC=A67E    /CLRINT=AC04   /T1CH=AC05
/TILL=AC06      /ACR=AC0B      /IFR=AC0D
/IER=AC0E       START=0F3F     CLOCK=0F71
EXIT=0FB3       TIME=0FB9      DLY=0FD6
DISPL=0FDB      CLR=0FED       MASK=0FFA
CNT1=0FFB       COUNT=0FFC     HOUR=0FFD
MINS=0FFE       SECS=0FFF
//0000,1000,1000
>
```