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'SUNCLOCK - 24 DEC 92 rev. 28 JUN 94
'by George Murphy VE3ERP
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'Orillia, ON L3V 6A6, CANADA
'From QRZ Disk 1996

BEGIN:
    CLS : KEY OFF: SCREEN 9: PI = 3.14159
FOR y = 0 TO 349: PSET (0, y): PSET (639, y): NEXT y
FOR x = 0 TO 639: PSET (x, 0): PSET (x, 349): NEXT x
    'load day name variables.
20  DATA "Sun ", "Mon ", "Tue ", "Wed ", "Thu ", "Fri ", "Sat "

30  FOR Z = 1 TO 7: READ J$(Z): NEXT Z

    'Dimension and load month name variables.
40  DATA "JAN ", "FEB ", "MAR ", "APR ", "MAY ", "JUN "
50  DATA "JUL ", "AUG ", "SEP ", "OCT ", "NOV ", "DEC "

60  DIM MO$(12): FOR Z = 1 TO 12: READ MO$(Z): NEXT Z

    'Dimension and load month name and day count variables.
70  DATA JAN,31,FEB,0,MAR,31,APR,30,MAY,31,JUN,30
80  DATA JUL,31,AUG,31,SEP,30,OCT,31,NOV,30,DEC,31

90  DIM M$(12), D(12), D$(12): FOR Z = 1 TO 12: READ M$(Z), D$(Z): D(Z) =
VAL(D$(Z)): NEXT Z

    '.....load variables
100 OPEN "I", 1, "sunclock.fil"
110 IF EOF(1) THEN 170
120 INPUT #1, NA$
130 INPUT #1, SX$
140 INPUT #1, LX
150 INPUT #1, LO
160 GOTO 110
170 CLOSE

    '.....calculate variables
180 COLOR 7, 0: ' CLS
190
200 IF LX > 0 THEN LX$ = "N" ELSE LX$ = "S"
210 LX$ = STR$(ABS(LX)) + LX$
220 IF LO < 0 THEN LO$ = "W" ELSE LO$ = "E"

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230 LO$ = STR$(ABS(LO)) + LO$

    'lat.& long. of location
240 LC$ = LX$ + "," + LO$
250 LG = LEN(LC$)
260 H$ = "###.##"

    'to Riset program
270 GOSUB Riset

    'to format screen display
280 GOSUB FORMAT
290
300 '
310 '.....start
320 ASP = .735                'aspect ratio factor
330 CX = 311: CY = 106        'initial coordinates of dial centre
340 LIN = 8                   'initial line for text
350 RD = 131                  'length of dial radial
360 RN = 98                   'length of 5 minute markers radial
370 RS = 98                   'length of seconds radial
380 RM = 86                   'length of minutes radial
390 RH = 65                   'length of hours radial
400 '
410 '.....start one minute cycle
420 IF VAL(TIME$) < LAST THEN CLEAR : GOTO BEGIN 'midnight
430 LAST = VAL(TIME$)
440 C1 = 11                   'color 1 (cyan)
450 C2 = 10                   'color 2 (green)
460 C3 = 1                     'color 3 (blue)
470 '
480 '.....draw clock face
490 LIN = LIN + 1              'shift display one line down
500 IF LIN = 15 THEN 310
510 CY = CY + 14              'shift Y coordinate one line down
520 RO = RD + 16              'radius of outer ring
530 RI = RD - 10              'radius of inner ring
540 RP = RO / COS(PI / 6)      'radius to corner of hexagon
550 HX = TAN(PI / 6) * RO      '1/2 length of hexagon side

560 '.....draw hexagon
570 COLOR C2, C3
580 LINE (CX - HX, CY - RO * ASP)-(CX + HX, CY - RO * ASP)
590 LINE -(CX + RP, CY)
600 LINE -(CX + HX, CY + RO * ASP)

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610 LINE -(CX - HX, CY + RO * ASP)
620 LINE -(CX - RP, CY)
630 LINE -(CX - HX, CY - RO * ASP)
640 LOCATE LIN + 9, (80 - LEN(SX$)) / 2: PRINT SX$
650 CIRCLE (CX, CY), RI 'draw inner ring
660 '
670 L = PI / 6 '5 minute marker angle in radians
680 COLOR C2, C3
690 FOR Z = 1 TO 12 'draw 5 minute markers
700 DX = SIN(L * Z) * RN / ASP
710 DY = COS(L * Z) * RN
720 CIRCLE (CX + DX, CY + DY), 7
730 CIRCLE (CX + DX, CY + DY), 8
740 NEXT Z
750 '
760 HRS = VAL(LEFT$(TIME$, 2)) 'hour
770 MIN = VAL(MID$(TIME$, 4, 2)) 'minute
780 IF HRS > 12 THEN HRS = HRS - 12 'convert 24 hr. clock to 12 hr. clock
790 HS = HRS * 30 + MIN / 2 + 180 'hours angle in degrees
800 HS = -HS * PI / 180 'hours angle in radians, clockwise rotation
810 HX = SIN(HS) * RH 'X coordinate of hour hand
820 HX = HX / ASP 'aspect ratio correction
830 HY = COS(HS) * RH 'Y coordinate of hour hand
840 '
850 '.....start seconds counter
860 IF INKEY$ <> "" THEN GOTO OPTIONS
870 T = INT(TIMER) 'current time to nearest second
880 IF T = INT(TIMER) THEN 880 'delay until next second
890 SEC = VAL(RIGHT$(TIME$, 2)) 'get seconds
900 '
910 '.....seconds
920 COLOR C3, C3 'background color
930 CIRCLE (CX + SX, CY + SY), 4 'subdue seconds indicator
940 '
950 S = SEC * 6 + 180 'seconds angle in degrees
960 LS = -S * PI / 180 'angle in radians, clockwise rotation
970 SX = SIN(LS) * RS 'X coordinate of second hand
980 SX = SX / ASP 'aspect ratio correction
990 SY = COS(LS) * RS 'Y coordinate of second hand
1000 '
1010 COLOR C1, C3
1020 CIRCLE (CX + SX, CY + SY), 4 'print new seconds indicator
1030 '
1040 GOSUB 1490 'get day of week and date J$ & D$
1050 JD$ = J$ + D$ 'day & date

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1060 COLOR C2, 1
1070 LOCATE LIN - 5, 33: PRINT "?????????????"
1080 LOCATE LIN - 4, 33: PRINT "?"
1090 LOCATE LIN - 3, 33: PRINT "?????????????"
1100 LOCATE LIN - 4, (80 - LEN(JD$)) / 2: 'centre day and date printout
1110 PRINT JD$ 'print day & date
1120 LOCATE LIN - 2, 29: PRINT USING "##.##"; HD;
1130 PRINT " hrs. of daylight"
1140 LOCATE LIN - 1, 37: PRINT "to-day"
1150 LOCATE LIN, 29: PRINT "("; SU$; " am" 'sunrise
1160 IF SD < 12 THEN MM$ = " pm" ELSE MM$ = " am"
1170 LOCATE LIN, 39: PRINT "--"
1180 LOCATE LIN, 41: PRINT SD$; MM$; " )" 'sunset
1190 LOCATE LIN + 1, 39: PRINT "at"
1200 LOCATE LIN + 2, (80 - LEN(NA$)) / 2: 'centre name of cummunity
1210 PRINT NA$
1220 LOCATE LIN + 3, 33: PRINT "?????????????"
1230 LOCATE LIN + 4, 33: PRINT "?"
1240 LOCATE LIN + 5, 33: PRINT "?????????????"
1250 LOCATE LIN + 4, 36: 'centre digital time printout
1260 PRINT TIME$ 'print digital time
1270 COLOR C1, C3
1280 CIRCLE (CX, CY), 3: 'draw dial centre
1290 PAINT (CX, CY + 1): 'fill dial centre
1300 LINE (CX, CY)-(CX + HX, CY + HY): 'print hour hand
1310 GOSUB 9000:
1320 '.....minutes
1330 COLOR C3, C3: 'color blank
1340 LINE (CX, CY)-(CX + MX, CY + MY): 'blank current minute hand
1350 M = MIN * 6 + SEC / 10 + 180: 'minutes angle in degrees
1360 IF SEC = 0 THEN M = M + 6
1370 MS = -M * PI / 180: 'angle in radians, clockwise rotation
1380 MX = SIN(MS) * RM: 'X coordinate of minute hand
1390 MX = MX / ASP: 'aspect ratio correction
1400 MY = COS(MS) * RM: 'Y coordinate of minute hand
1410 '
1420 COLOR C1, C3: 'color blank
1430 LINE (CX, CY)-(CX + MX, CY + MY): 'print new minute hand
1440 '
1450 IF SEC = 0 THEN CLS : GOTO 410: 'end of 1 minute cycle
1460 GOTO 850: 'end of 1 second cycle
1470 '
1480 '*****
1490 '.....day of week subroutine
1500 MO = VAL(LEFT$(DATE$, 2)): 'month no.

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1510 M$ = MO$(MO) 'month name
1520 DA = VAL(MID$(DATE$, 4, 2)) 'day no.
1530 D$ = RIGHT$(STR$(DA), 2) 'day name
1540 IF LEN(D$) = 2 THEN 1560 'insert leading space to single digit day
1550 GOTO 1540
1560 D$ = M$ + D$ 'month & day e.g. Nov. 9
1570 '
1580 '.....calculate day of week
1590 YR = VAL(RIGHT$(DATE$, 4)) 'year
1600 K = INT(.6 + 1 / MO)
1610 L = YR - K
1620 O = MO + 12 * K
1630 P = L / 100
1640 Z1 = INT(P / 4)
1650 Z2 = INT(P)
1660 Z3 = INT(5 * L / 4)
1670 Z4 = INT(13 * (O + 1) / 5)
1680 Z = Z4 + Z3 - Z2 + Z1 + DA - 1
1690 ZZ = Z - (7 * INT(Z / 7)) + 1
1700 J$ = J$(ZZ) 'name of day e.g. Friday
1710 RETURN
1720 '
1730 '***** END of SUNCLOCK *****

FORMAT: '
1890 '.....format sunup/sundown display
1900 SUR = INT((INT((SU - INT(SU)) * 1000) + 5) / 10)
1910 SUX$ = STR$(SUR)
1920 SUX$ = RIGHT$(SUX$, LEN(SUX$) - 1)
addsulz: IF LEN(SUX$) < 2 THEN SUX$ = "0" + SUX$: GOTO addsulz
1940 SU$ = STR$(INT(SU)) + ":" + SUX$
1950 '
1960 IF SD < 1 THEN SD = SD + 12
1970 SDR = INT((INT((SD - INT(SD)) * 1000) + 5) / 10)
1980 SDX$ = STR$(SDR)
1990 SDX$ = RIGHT$(SDX$, LEN(SDX$) - 1)
addsd1z: IF LEN(SDX$) < 2 THEN SDX$ = "0" + SDX$: GOTO addsd1z
2010 SD$ = STR$(INT(SD)) + ":" + SDX$
2020 RETURN 'return to start of SUNRISET
2030 END

RISET: ' - 29 MAR 87.....adapted from SUNFIND by Smith Harris
'published in 80 MICRO magazine October 1983 edition, and slightly
'modified by George Murphy after consultation by mail with Smitty.

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'Degree to Radian
DR = PI / 180
'Radian to Degree
RD = 180 / PI
2100 :
2110 LA = LX * DR 'Latitude in Radians
2120 SX = INT(LO / 15) * 15 'SX = standard meridian
2130 MX = LO - SX 'Deg. correction for std. meridian
2140 MC = MX / 15 'Hrs. correction for std. meridian
2150 MR = MX * DR 'Rad equiv. of meridian correction
2160 YR = VAL(RIGHT$(DATE$, 2)) 'year - last 2 digits
2170 OO = 1900 + YR: GOSUB 2790
2180 Z = YR / 10: y = INT(Z): x = (Z - y) * 10: W = (y + x) / 4: W = INT(W * 100000!
+ .5) / 100000!
2190 IF INT(W) = W THEN Q1 = 29: DA = 366 ELSE Q1 = 28: DA = 365.2423
2200 D(2) = Q1
2210 K = 360 / DA 'Days to degrees
2220 N1 = 0: N2 = 0: N3 = 0: N4 = 0: YZ = 1
2230 M1 = VAL(LEFT$(DATE$, 2)) 'month #
2240 D1 = VAL(MID$(DATE$, 4, 2)) 'day #
2250 GOSUB 2760
2260 N = NQ

2280 '.....SUNRISE / SUNSET
      GOSUB EQUATE
2300 CC = PI / 2 '90 degrees at sunrise, sunset
2310 IF LA - Z < 0 THEN T = INT(ED - MG + MX + .5) ELSE T = INT(180 - ED - MG - MX -
.5)
2320 IF T < 0 THEN T = 360 + T
2330 AA = CC - Z
2340 BB = CC - LA
2350 SS = (AA + BB + CC) / 2
2360 TT = (SIN(SS - AA) * SIN(SS - BB) * SIN(SS - CC)) / SIN(SS)
2370 IF TT < 0 THEN TT = 0
2380 TR = SQR(TT)
2390 C1 = TR / SIN(SS - CC)
2400 C = 2 * ATN(C1) * RD 'Angle in degrees
2410 AZ = 2 * RD * ATN(TR / SIN(SS - AA)) 'Azimuth in degrees
2420 CH = C / 15 'Hours vs. C
2430 SU = 12 - .056 + ET + MC - CH: H1 = SU 'Sunrise
2440 UP = INT(SU) 'Hour part
2450 MU = (SU - UP) * 60 'Minutes
2460 MU = INT(MU + .5) / 100 'Nearest whole minute
2470 IF MU = .6 THEN MU = 0: UP = UP + 1
2480 SU = UP + MU 'Hours and minutes

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2490 SD = 12 + .056 + ET + MC + CH: H2 = SD'Sunset - 24 hr.time
2500 HR = H2 - H1 'Hours of sun
2510 HD = INT(HR * 100 + .5) / 100'Hours of daylight
2520 DN = INT(SD)
2530 MD = (SD - DN) * 60
2540 MD = INT(MD + .5) / 100
2550 IF MD = .6 THEN MD = 0: DN = DN + 1
2560 SD = DN + MD - 12
2570 IF LA - Z < 0 THEN AL = FIX(90 - (Z - LA) * RD - .5) ELSE AL = INT(90 - (LA -
Z) * RD - .5)
2580 IF SX$ = "STANDARD TIME" THEN 2600
2590 SU = SU + 1: SD = SD + 1: SX$ = "DAYLIGHT SAVING TIME"'daylight saving time
2600 RETURN

EQUATE:
2620 '.....COMPUTE LONG. of GP SUN & EQ TIME
2630 NN = N
      IF N > 365 THEN NN = N - 365
2640 L1 = (279.575 + (K * NN)) * DR
2650 G1 = (356.967 + (K * NN)) * DR
2660 LD = L1 + (1.916 * SIN(G1) + .02 * SIN(2 * G1)) * DR
2670 DL = .39782 * SIN(LD)
2680 Z = ATN(DL / SQR(-DL * DL + 1))
2690 EL = -104.7 * SIN(L1) + 596.2 * SIN(2 * L1) + 4.3 * SIN(3 * L1) - 12.7
2700 EL = EL * SIN(4 * L1) - 429.3 * COS(L1) - 2 * COS(2 * L1) + 19.3 * COS(3 * L1)
2710 ET = -EL / 3600
2720 ED = ET * 15
2730 ER = ED * DR
2740 RETURN
2750 '
2760 '.....CONVERT DATE TO DAY OF YEAR
2770 Q1 = 0
      FOR Q = 1 TO M1: Q2 = Q1: Q1 = Q1 + D(Q): NEXT Q
      NQ = Q2 + D1
      RETURN
2780 '
2790 '.....SUBSEQUENT YEARS
2800 y$(1) = STR$(YR): y$(2) = STR$(YR + 1)
2810 FOR Q = 1 TO 2: YR$(Q) = RIGHT$(y$(Q), 2): NEXT Q
2820 RETURN

'.....exit/change parameters
OPTIONS:
      SCREEN 0

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CLS
LOCATE 11, 16
PRINT "Press any key to change variable paramaters...."

LOCATE 13, 16
PRINT "otherwise this note will vanish in 7 seconds..."

T1 = TIMER

SCAN:
IF INKEY$ <> "" THEN GOTO PARAMETERS

T2 = TIMER
IF INT(T2 - T1) = 7 THEN CLS : RUN EX$
GOTO SCAN

PARAMETERS:
'.....change parameters

CLS
PRINT
PRINT "The notations 'STANDARD TIME' and 'DAYLIGHT SAVING TIME' ";
PRINT "refer only to the sunup and sundown times."

PRINT
PRINT "You can change settings at any time."

PRINT
COLOR 0, 7
PRINT "'"; SX$; "'"; " is the current setting."

COLOR 7, 0
PRINT "Do you want to switch the setting now? (y/n)"

SCANKEY:
Z$ = INKEY$
IF Z$ = "n" OR Z$ = "N" THEN GOTO NOCHANGE
IF Z$ = "y" OR Z$ = "Y" THEN GOTO CHANGE
GOTO SCANKEY

CHANGE:
IF SX$ = "" OR SX$ = "DAYLIGHT SAVING TIME" THEN SX$ = "STANDARD TIME": GOTO
NOCHANGE
IF SX$ = "STANDARD TIME" THEN SX$ = "DAYLIGHT SAVING TIME"

NOCHANGE:
COLOR 0, 7

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PRINT ""; SX$; ""; " is now the current setting."
COLOR 7, 0
PRINT
PRINT "The time shown by the clock hands and in the digital display is ";
PRINT "the time you have set on your computer's internal clock.";

PRINT ""
PRINT STRING$(80, 205);

PRINT "Current location is ";
COLOR 0, 7
PRINT " "; NA$; " "

COLOR 7, 0
PRINT ".....Press <ENTER> if OK or....."
LINE INPUT "ENTER name of some other location? "; Z$
IF Z$ <> "" THEN NA$ = Z$

PRINT
PRINT "Current latitude used in calculations is ";
COLOR 0, 7
PRINT LX; " "

COLOR 7, 0
PRINT ".....Press <ENTER> if OK or....."
PRINT "ENTER latitude in decimal degrees (minus if South) of "; NA$;
INPUT Z$
IF Z$ = "" THEN GOTO LXOK ELSE LX = VAL(Z$)
LXOK:
PRINT
PRINT "Current longitude used in calculations is ";
COLOR 0, 7
PRINT LO; " "

COLOR 7, 0
PRINT ".....Press <ENTER> if OK or....."
PRINT "ENTER longitude in decimal degrees (minus if East) of "; NA$;
INPUT Z$
IF Z$ = "" THEN GOTO LOOK ELSE LO = VAL(Z$)
LOOK:
'.....save data
OPEN "0", 1, "sunclock.fil"
WRITE #1, NA$
WRITE #1, SX$
PRINT #1, LX

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PRINT #1, LO
CLOSE
CLEAR : GOTO BEGIN
END
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9000 OUT (1020), 1: SUNRISE$ = "0" + RIGHT$(SU$, 4)
9010 SUNSET$ = RIGHT$(STR$(VAL(SD$) + 12), 2) + RIGHT$(SD$, 3)
9020 IF LEFT$(TIME$, 5) > SUNRISE$ THEN OUT (1020), 0
9030 IF SUNSET$ < LEFT$(TIME$, 5) THEN OUT (1020), 1
9900 RETURN
```