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 2
 3                  ;* ------------------------------------------------------------------------ *
 4                  ;* Name   : GAWGETIM
 5                  ;* Author : Gerard Wassink
 6                  ;* Date   : December 25, 2021
 7                  ;* Purpose: Get RTC time on the RC2014 CP/M computer
 8                  ;* Versions:
 9                  ;*   0.1  : Initial code base, and 1st ASM program on CP/M
10                  ;*   0.2  : Code cleanup and optimisation
11                  ;*   0.3  : Return to CP/M using Warm Reboot
12                  ;*   0.4  : Check return code from RTC
13                  ;*
14                  ;* ------------------------------------------------------------------------ *
15                  ;
16                  ;* ------------------------------------------------------------------------ *
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35                  ;* ------------------------------------------------------------------------ *
36                  ;
37  0100            START       ORG     0100H
38                  ;
39                  ; BDOS and BIOS addresses and functions
40                  ;
41  0000 =          WARMBOOT    EQU     0000H           ; Warm Reboot
42  0005 =          BDOS        EQU     0005H           ; BDOS address
43  0009 =          PRTSCR      EQU     009H            ; Print $ terminated string function
44                  ;
45  0020 =          RTCGTTM     EQU     020H            ; Get HBIOS time
46                  ;
47                  ;* ------------------------------------------------------------------------ *
48                  ;*                                                                MAIN LINE *
49                  ;* ------------------------------------------------------------------------ *
50  0100 C5         GAWGETIM    PUSH    B               ; Save
51  0101 D5                     PUSH    D               ;  registers
52  0102 E5                     PUSH    H               ;   on the stack
53                              ;
54                              ;       Display starter message
55                              ;
56  0103 0E09                   MVI     C,PRTSCR        ; Print string function in reg C
57  0105 116A01                 LXI     D,MSG000        ; Data address in DE
58  0108 CD0500                 CALL    BDOS            ; Call BDOS for print string function
59                              ;
60                              ;       Get time from RTC (Real Time Clock)
61                              ;
62  010B 0620                   MVI     B,RTCGTTM       ; BIOS RTCGETTIM function
63  010D 216401                 LXI     H,TIMBUF        ; HL points to buffer for BIOS time
64  0110 CF                     RST     1               ; Call BIOS function 08H (8 times
    specified value)
65                              ;
66                              ;       Check return code
```

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                                ;
0111 CA1F01                     JZ      RTC$OK          ; A=0: OKAY, else error
                                ;
                                ;       Display error message
                                ;
0114 0E09                       MVI     C,PRTSCR        ; Print string function in reg C
0116 118101                     LXI     D,MSG001        ; Data address in DE
0119 CD0500                     CALL    BDOS            ; Call BDOS for print string function
                                ;
011C C33901                     JMP     ENDMAIN         ; Go back to CP/M
                                ;
                                ;       Convert date from BCD to Ascii
                                ;
011F =          RTC$OK          EQU $
011F 016401                     LXI     B,BCDDATE       ; BC points to value to convert
0122 11C901                     LXI     D,DSPDATE       ; DE points to receiving buffer
0125 CD3F01                     CALL    BCD2ASCII       ; Convert BCD to displayable
                                ;
                                ;       Convert time from BCD to Ascii
                                ;
0128 016701                     LXI     B,BCDTIME       ; BC points to value to convert
012B 11D301                     LXI     D,DSPTIME       ; DE points to receiving buffer
012E CD3F01                     CALL    BCD2ASCII       ; Convert BCD to displayable
                                ;
                                ;       Print result string
                                ;
0131 0E09                       MVI     C,PRTSCR        ; Print string function in reg C
0133 11A701                     LXI     D,DISPLTIM      ; Data address in DE
0136 CD0500                     CALL    BDOS            ; Call BDOS for print string function
                                ;
                                ;       Program end, restore registers and return
                                ;
0139 =          ENDMAIN         EQU $
0139 E1                         POP     H               ; Restore registers
013A D1                         POP     D               ;  from the
013B C1                         POP     B               ;   stack
                                ;
013C C30000                     JMP     WARMBOOT        ; Back to CP/M
                                ;
                                ;* ------------------------------------------------------------------------ *
                                ;*                 Convert BCD values to ascii bytes for display (BCD2ASCII) *
                                ;* ------------------------------------------------------------------------ *
013F =          BCD2ASCII        EQU     $
                                ;
                                ;       Initialize counter
                                ;
013F 3E03                       MVI     A,03H           ; load counter for 3 times
0141 326301                     STA     COUNT           ;  and store it
                                ;
                                ;       Loop start
                                ;
0144 0A         BCDAGAIN:       LDAX    B               ; load BCD value
0145 E6F0                       ANI     0F0H            ;  Isolate first nibble
0147 0F                         RRC                     ;   Rotate
0148 0F                         RRC                     ;    register
0149 0F                         RRC                     ;     A for
014A 0F                         RRC                     ;     four times
014B F630                       ORI     030H            ;      make Ascii number
014D 12                         STAX    D               ; Store printable value 1st part
                                ;
014E 13                         INX     D               ; Increment DE for next store
                                ;
014F 0A                         LDAX    B               ; load value again
0150 E60F                       ANI     00FH            ;  Isolate second nibble
0152 F630                       ORI     030H            ;   Make Ascii number
0154 12                         STAX    D               ; Store printable value 2nd part
                                ;
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                                ;       Increment pointers to next values
                                ;
0155 03                         INX     B               ; Point to next BCD byte
0156 13                         INX     D               ; Point to
0157 13                         INX     D               ;   next Ascii value
                                ;
                                ;       Check for loop end, go around if not
                                ;
0158 3A6301                     LDA     COUNT           ; Get counter value,
015B 3D                         DCR     A               ;  decrement it
015C 326301                     STA     COUNT           ;   store counter back
                                ;
015F C24401                     JNZ     BCDAGAIN        ; Not done? Again
                                ;
0162 C9                         RET
                                ;
                        ;* ------------------------------------------------------------------------ *
                        ;*                                                                DATA STORAGE *
                        ;* ------------------------------------------------------------------------ *
0163 03                 COUNT   DB      03H             ; Counter storage
                                ;
0164 =                  TIMBUF  EQU     $               ; Reserve room for date / time buffer
0164 000000             BCDDATE DB      00H, 00H, 00H
0167 000000             BCDTIME DB      00H, 00H, 00H
                        ;
016A 4741574745         MSG000  DB      'GAWGETIM version 0.4', 0DH, 0AH, '$'
0181 4572726F72         MSG001  DB      'Error retrieving time, RTC present?', 0DH, 0AH, '$'
                        ;
01A7 =                  DISPLTIM EQU    $               ; Reserve room for displayable time
01A7 4375727265                 DB      'Current date and time from RTC: 20'
01C9 30302D3030         DSPDATE DB      '00-00-00, '    ; YEAR, MONTH,DAY
01D3 30303A3030         DSPTIME DB      '00:00:00'      ; HOURS, MINUTES,SECONDS
01DB 0D0A                       DB      0DH, 0AH        ; CR/LF
01DD 24                         DB      '$'             ; End of string character
                        ;
01DE                    ENDPROG END
```