



Z-100 Real Time Clocks

This is the third article in our Clock series.

In it, we will show a fix to the PC-DOS version of ZCLK, and provide an update on Charles Hett's article on replacing the battery in the Smart-Watch. We may provide future information, as well.

ZCLK Y2K Software Patch

ZCLK is not year 2000 compliant! Any attempt to change the year to anything after January 1, 2000, will result in an error "Could not set the system DATE". The problem was located in the FMTDAT routine of ZCLK.COM, which simply added 1900 to the two digits you enter for the year. In DOS, dates earlier than 1980 are invalid, therefore causing the error.

If you never intend to use a 1900 date again, a simple fix is to use DEBUG to change the 1900 to 2000 in ZCLK.COM. Search for the 1900 byte sequence with the command:

```
S0100 0600 81 C1 6C 07{RETURN}
```

and change to **81 C1 D0 07** (hex for 2000) using normal DEBUG procedures.

If you might need to still use 1900 dates, and since the source code is available, make the following changes to the FMTDAT: routine using EDLIN or other favorite editor. The routine is located at or around line 644 in EDLIN.

```
FMTDAT: CALL FIXL      ;DO DAY
        MOV DL,AL
;
        CALL FIX      ;DO MONTH
        MOV DH,AL
;
        CALL FIX      ;DO YEAR
        MOV CL,AL
        MOV CH,AH      ;CX = 2 digit year.
        mov BX,80      ;Valid years began
        cmp CX,BX      ; in 1980.
        jb FMTDAT1     ;If below 80, skip
        ADD CX,1900    ; the add 1900.
        jmp FMTDAT2
FMTDAT1: add CX,2000    ; Else add 2000.
FMTDAT2: RET          ;Good until 2079.
```

Reassemble your new ZCLK.COM. The DEBUG fix is only good until the year 2079 - but still long after I'm gone. Someone else can work up a new fix by then!

Note: I have modified ZCLK (different ports for PC-DOS) to work in PC-DOS and it works fine with the EasyPC system. However, it will NOT work with the Gemini board, which uses the same PC ports. If someone has it working with Gemini's PC-DOS, please let me know. I'll have more info by next time.

ZCLK PC-DOS Software Patch

This time I wish to pass on the fix for PC-DOS. Yes, it works great for EasyPC, but the Gemini PC-emulator does not recognize the clock, even though it supposedly uses the same PC ports.

So, first lets cover the code changes to a PC version of ZCLK and call it ZCLK-PC.COM.

The ZCLK distribution disk includes the source code as ZCLK.ASM. Open this in your favorite editor. I personally use a PC-clone for all my assembly work because of the ability to open many windows at the same time, but doing the work on a Z-100 will work also. It's just a bit harder.

First search for the variable ZPIA. Or toward the top of the file in the definitions look for:

```
ZPIA EQU 0E0h
ADATA EQU ZPIA+0
ACTL EQU ZPIA+1
BDATA EQU ZPIA+2
BCTL EQU ZPIA+3
```

These are the four IO ports to the 68A21 Peripheral Interface Adaptor (PIA) IC (U114) on the Z-100 motherboard, where the ZCLK is located.

In PC-DOS the base port to the PIA is 378h (a word value) rather than the 0E0h (a byte value) listed. Ordinarily, and after the following code changes, the ZPIA equate would be the only number to change. But, if this were all we did and tried to assemble the code, we would get 23 severe errors; specifically, error A2050: value out of range.

Let us see what is happening:

The first instance of problems is in the ACCESS routine:

```
ACCESS: IN  AL,ADATA
        OR  AL,00000011b
        OUT ADATA,AL
```

See the error?

ADATA is now 378h, which is a word value, rather than a byte (0E0h) and will not fit in AL! Hence the out of range error.

We must correct the error by using something similar to:

```
ACCESS: PUSH DX      ; Save any DX value
        MOV DX,ADATA ; Get the port#
        IN  AL,DX
        OR  AL,00000011b
        OUT DX,AL
        POP DX      ; Set previous DX
```

And we need to do this for each use of the new port number. Let's do another, in the same ACCESS routine:

```
MOV  AL,11111110b
OUT  BDATA,AL
```

Change this to:

```
PUSH DX
MOV  DX,BDATA
MOV  AL,11111110b
OUT  DX,AL
POP  DX
```

Yes, you can probably get by using less PUSH DX and POP DX lines, but with a CALL routine in between uses, things could get ugly unless you either save DX each time, or ensure the CALL routine does not use DX for something. I did not bother looking.

So, I leave it as an exercise for you to do the rest. You have to search for each use of ADATA, ACTL, BDATA, and BCTL to find them all.

Reassemble your new ZCLK-PC.COM. Change the name back to ZCLK when you copy the file to your PC-DOS disk. Remember, I have not gotten this to work with the Gemini PC-emulator, but it works great with EasyPC.

New ZCLK2 Real Time Clock

While we are on the subject of ZCLK, I have found a source for all the parts of the original ZCLK except the variable capacitor, but I did find a close match.

I have created a new circuit board, with silk screen and solder mask, that I'll call ZCLK2, using the same ZCLK circuitry and have been testing three boards for weeks. It uses a ribbon cable to stay clear of any EasyPC or Gemini installation.

Of important note, the battery is a single external CR2032 3v lithium cell, so it is easily replaceable. (I also tried a similar 3v cell, the CR2025, but it was slightly thinner and slightly smaller in diameter. It would not make a reliable contact in the battery holders that I bought.)

The cost for the new ZCLK2 is \$55.00, which includes shipping in the States. If you are interested, please let me know.

SmartWatch Battery Mod Update

As you may recall, back in issue #124 of the "Z-100 LifeLine" Charles Hett wrote the article: "Substitute Backup Battery for Dallas Semiconductor DS1216E Smartwatch".

I tried Charles' fix on a dead SmartWatch I had removed from an EasyPC Z-100 installation when I needed another EasyPC system to play with. I wrote about the EasyPC system in a separate LifeLine.

The battery was completely dead and the SmartWatch would not allow my testbed (just a set of spread-out circuit boards without a case) Z-100 to power up to the hand prompt.

So, I completed Charles' mod, but the SmartWatch would still not allow me to power up to a hand prompt (no beeps).

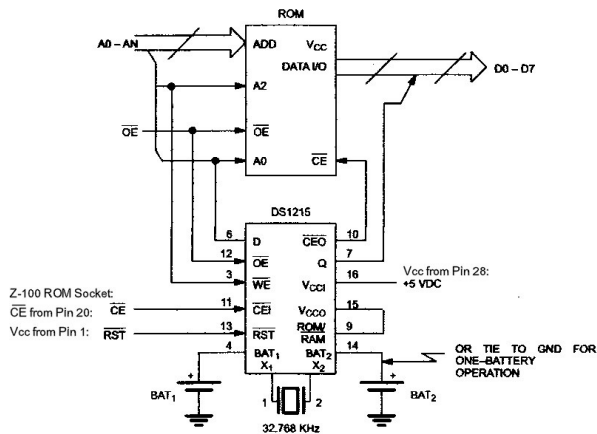
So, in the event you were experiencing a similar issue with your SmartWatch, I did some additional research:

The DS1216E SmartWatch module uses the DS1215 clock chip on a circuit board that is installed under the Monitor ROM at U190 on the motherboard in the Z-100. All the pins are connected directly from the ROM IC through the SmartWatch module to the Z-100 socket at U190, except Pin 20. Pin 20 is the Chip Enable (CE) line.

In simple terms, the SmartWatch module intercepts any Chip Enable (CE) signal from the Z-100, reads the data to see if the clock is needed or if the data is meant for the ROM chip, then issues its own Chip Enable (CE) signal to the ROM if the clock was not being addressed.

It appears that this communication was not happening in my SmartWatch, in spite of the fresh battery.

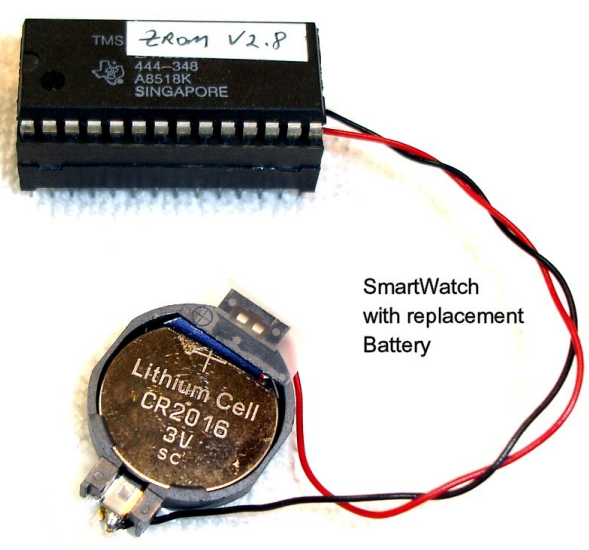
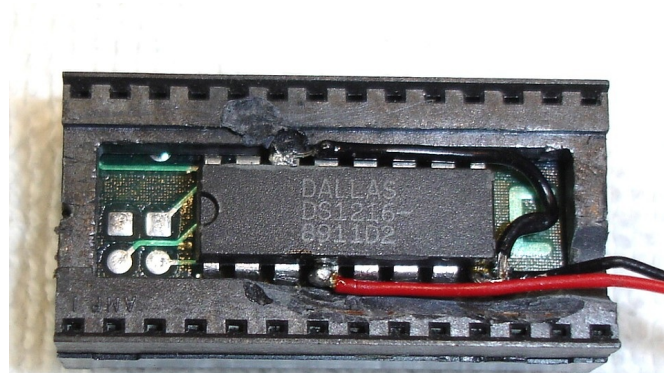
ROM/TIME CHIP INTERFACE Figure 4



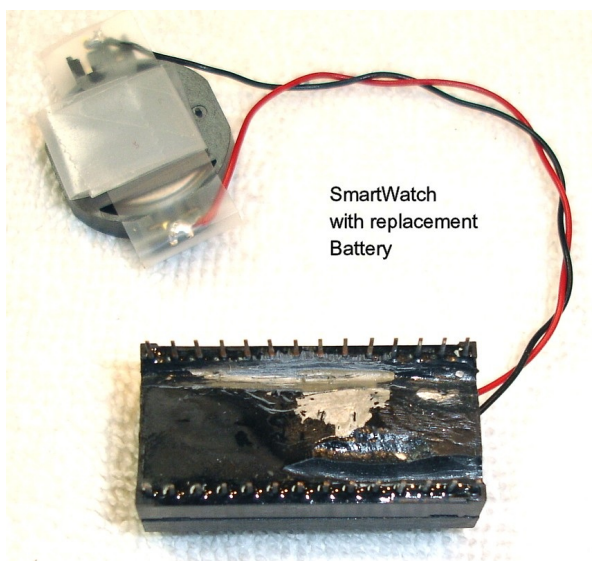
Looking at the circuitry above, my resistance reading all checked out except at Pin 14 of the DS1215 chip. The note for Pin 14 reads "or tie to gnd for one-battery operation". Well, on my SmartWatch, Pin 14 was NOT tied to ground. Apparently, there was a second battery (also dead) installed in this SmartWatch module.

Note: Since then, I have found a second Smart-Watch module, and it did indeed have the image of a second battery in the epoxy back.

Again studying the circuitry, if I just tied Pin 14 to ground, that would also disconnect the second battery from any possibility of charging current (grounded at both ends), so I soldered another wire from Pin 14 to Pin 8 (ground) on the DS1215 SmartWatch.



SmartWatch with replacement Battery



SmartWatch with replacement Battery

The SmartWatch now allowed me to power up and the clock was now operational. I hope you find this helpful.

I hope you enjoyed this Clock series. If you have any questions or comments, please contact me by email at:

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Cheers,
Steven Vagts

