

Arduino based underwater sensors

... for hydrological research in flooded cave systems ...

Using a \$2 DS3231 RTC & AT24

Posted on May 21, 2014

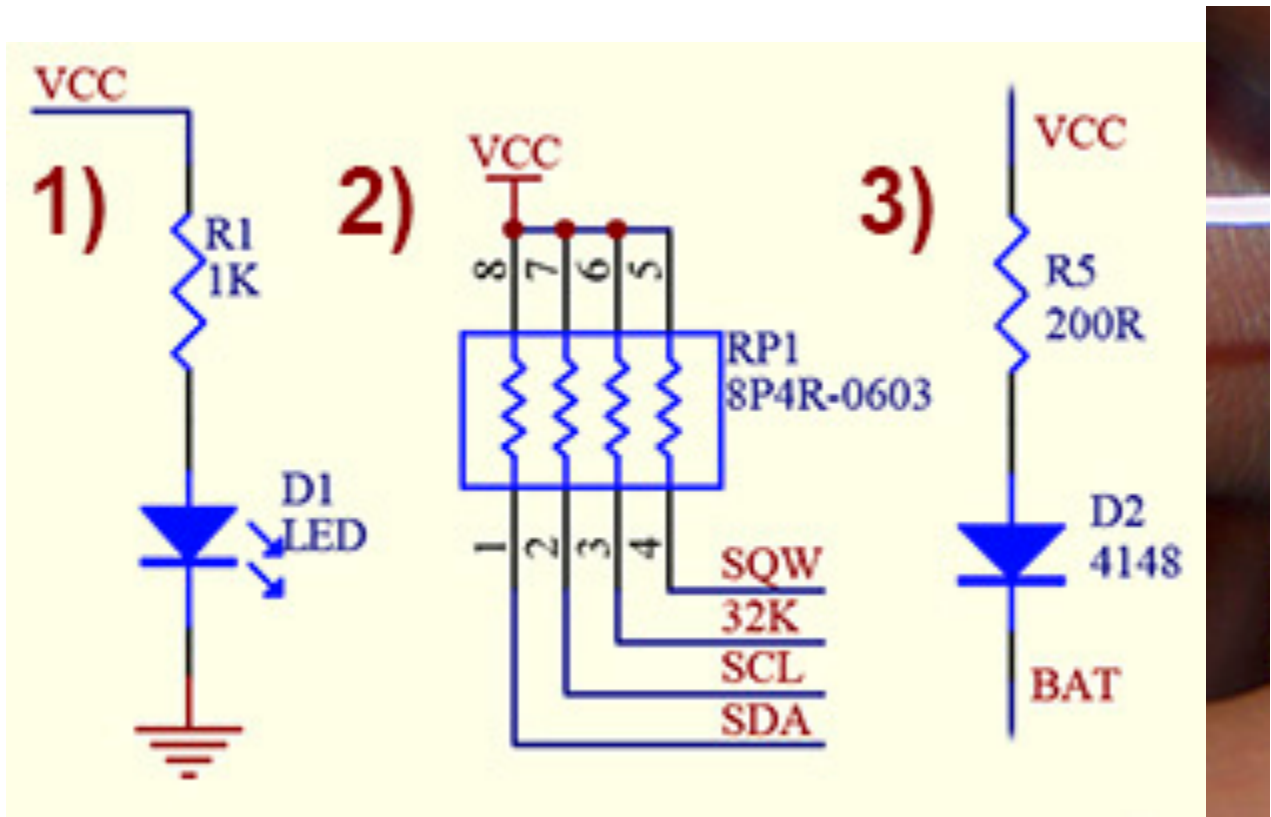
Since the Cave Pearl is a data logger I say that the most important sensor is a sleeping processor and begins the clock with a DS3231 Chronodot from Macetech ([eBay](#), [Amazon](#), [etc.](#) and I eventually I proverbial slow boat, I did some digging to find out if I bought them directly from the manufacturer.

So perhaps they are counterfeit chip compatible? I also found rumors about legitimate manufacturer plants/equipment produce extra parts. Or legitimate products go out defective (if 10% of a run's chips are defective in an entire run) but someone intercepts them and they are destroyed, and they resurface on the market. With these possibilities in mind, I still have to make it as inexpensive as possible if they are going to be used on the board for the same money, maybe even less (and you get temp to 0.25°, although

When the RTC's arrived they had an indicator above. I had a feeling that

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But thanks to the tutorial by msuzuk easily:



The power indicator (1) was pretty p
I2C lines, so they were not needed h
get rid of the pullups on SCL and SD,
concerned, as that alarm

Follow

weak internal processor pullups kee

```
digitalWrite(INTERRUPT_PIN, HIGH);
```

Fortunately the pin stays high in all s
fingers are crossed....again... 😊)

Then I looked at the resistor & diode
battery. The LiR2032 that these moc
you buy them, most provide 35ma to
charged battery would keep the unit
discharge, etc) But, it requires a 4.2V
4.3-ish volts. I don't anticipate my 3x
deployment (especially if I end up po
reason to keep the charge

Follow

240mAh) as a replacement which sh

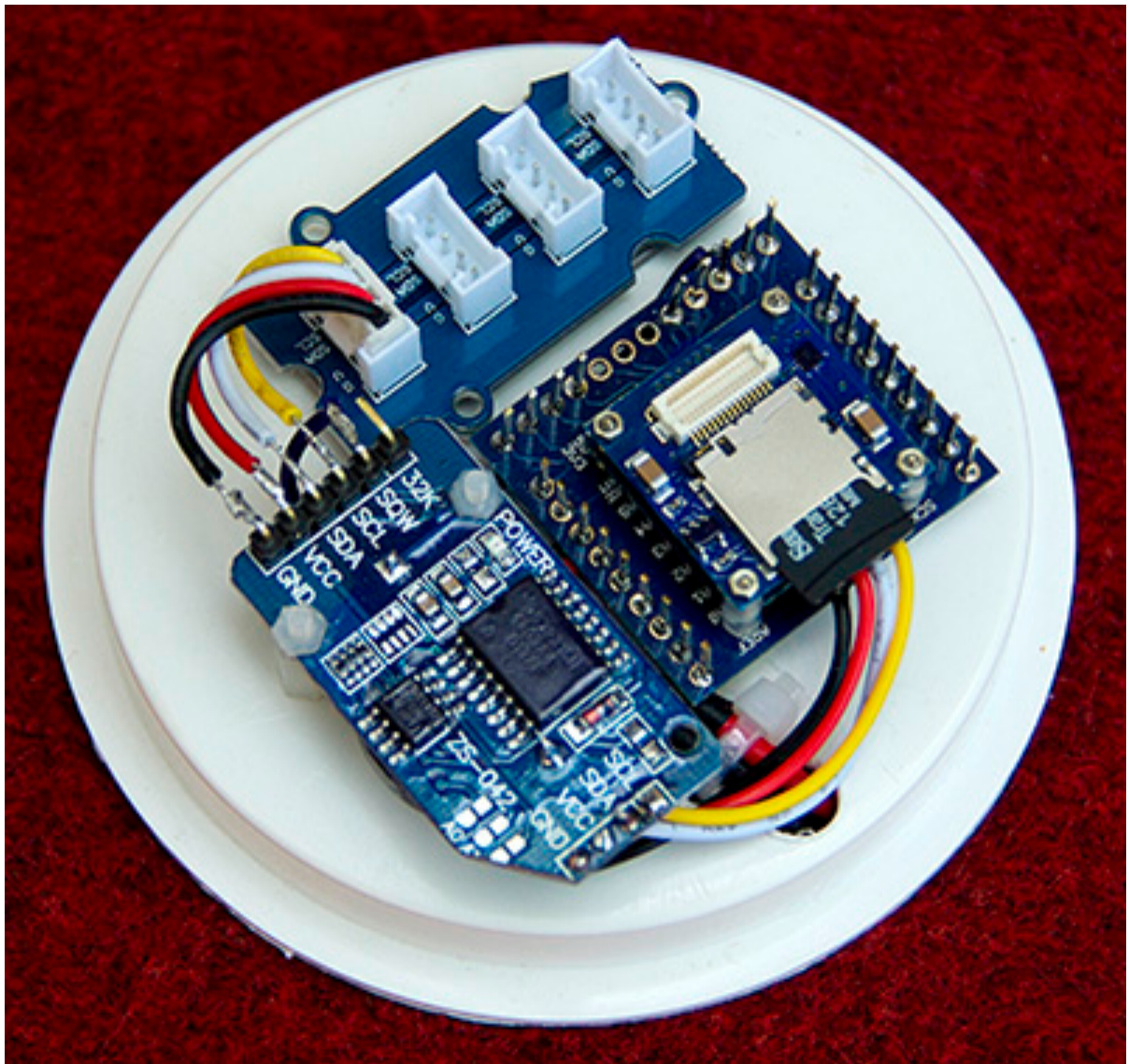
Libraries for that RTC?

I am using the Date, Time and Alarm
which is based largely on Jean-Claud
And it's worth noting the clear alarm

Then we come to the AT24C32N (2.7
those 4 resistor bricks is lifting pins
being set to 0x57 on the I2C bus. The
address to something else. Although
hoped it might be (all that eeprom r
to the SD card in the first place) it's p
or characters that I want into a PSTR
routine. This flexibility a

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essentially the same code to handle
you want more information about the
I2C eeprom for the gory details.



The May 2014 build of the data log

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which used a hacked Tinyduino light sensor board to regulate & pull up the I2C bus. SQW is soldered to interrupt pin 2. **Later in 2014 I switched to Pro Mini style boards** with 3.3 v regulators, so I left that four resistor block (2 in the schematic above) in place to provide I2C and SQW pullup.

be releasing an RTC board, and that “trusted” clock signal provided that the same I2C bus address as this eB. I can run that test to spot clock drift, about 2 seconds per month, while the equipment, you can make the chip e

Addendum: 2014-05-21

I just realized something

Follow ak

the tiny light sensor shield, but I am voltage on the battery pack because out of sync with the voltage seen by (2014-10-28 : data sheet says its Ok

Addendum: 2014-07-01

I created a very inexpensive 3-comp card adapter. And you can see a pos a power shutdown feature. In those shown earlier in this post (2 in the pl in place, as I did when using the hac loggers now, and some of them have RTCs are proving to be pretty durabl

Addendum: 2014-10-28

Follow

I have noticed that when I power this
But according to the datasheet, the DS1307 is
powered from Vbat. (1 μ A baseline power
when the crystal is doing temperature compensation)
elegant way to power a DS1307 by connecting
high in output mode when the system is powered
When the Arduino pin is low, the DS1307 enters
low current timekeeping mode. But the DS1307
Square-Wave Enable) of control register 0
alarms to occur when running the Real Time Clock
is disabled (logic 0) when power is first applied
wake the Arduino, even if you have configured
tested this and it seems to work fine
by about 70 μ A. (or ~ 600 mAh per year)

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to see if this is stable as a direct jump limiter, which might give me a problem with a resistor as N.G. did.

And since my loggers are going in case of bumping the temp conversion time by reducing the battery drain to $< 1 \mu\text{A}$. DS3234 chips (?) but if it does this problem coin cell lifespan estimates are to be

And finally, doing this means that you can't rely on the amount of time, so you need to make sure that the packaging is no guarantee of good keep it cool. I can't not simply read a CR2032 coin cell with a multimeter. *stays above 3v even when*

Follow the

Ω resistor pulse load (for 2 seconds)
without a meter, check if the battery

I do wonder if its worth putting a 10
of the alarm events. But I don't know
think its a good idea in their applicat
than 3x the current draw of the DS32

NOTE: If you try powering the entire
onboard SDA & SCL resistors into pu
resistors on the 328 that get enablec
that problem, check out this post on
Also note that I had to go all the way
the twi library on my machine, but if
library edit does not cha

Follow

Addendum: 2014-11-04

This 32k AT24C256 is pin for pin com
tempting me to do one more little r
be quite handy to have two easily ac
storage of calibration & configuratio
eeprom will limit the I2C bus speed t
the I2C bus speed to 400 kHz.

Addendum: 2014-11-05

Testing confirms that the AT24C256 i
the eeprom on the RTC breakout wo
eeprom on the rtc breakout is 0x57 k
allows me to buffer 512 (

Follow p

card. And after some testing, I have go into standby mode at 1 μA when The only challenge is that this many several days worth of data...so I will kind of procedure for shutting down losing information. One solution wo flushes the entire eeprom to the SD way simply hitting the reset button v residual data in the buffer gets save batteries.

In some of my older loggers that we is not enough space to easily do this breakout, so I came up with some “i

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Of course, you could do this with *any* I2C device.

pronounced when I use different col
“syncing by hand” at the playground
reduces my inter-unit time offsets.

One solution would be a sketch that
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you could get the offsets down to a very small amount of communication. But I do not have an accurate time signature, or a dedicated hardware just to reproduce information. A logical approach would be to have two programs inside Arduino. Then both programs read a value from the serial line & set the clock.

In addition, I would like to have all my time in UTC before setting the clock.

** It looks like I might have been causing the clock to be updated properly. Makes me wonder if the clock was updated properly. Makes me wonder if the clock was updated properly.*

Addendum 2014-12-04

Follow

Someone at the allaboutcircuits.com boards and found the chip to be wel

<http://forum.allaboutcircuits.com/th>

This is good to know, although of co with cheep eBay knock-offs. For a d

“By comparing the rising edge of th unit with a good satellite lock, you ca

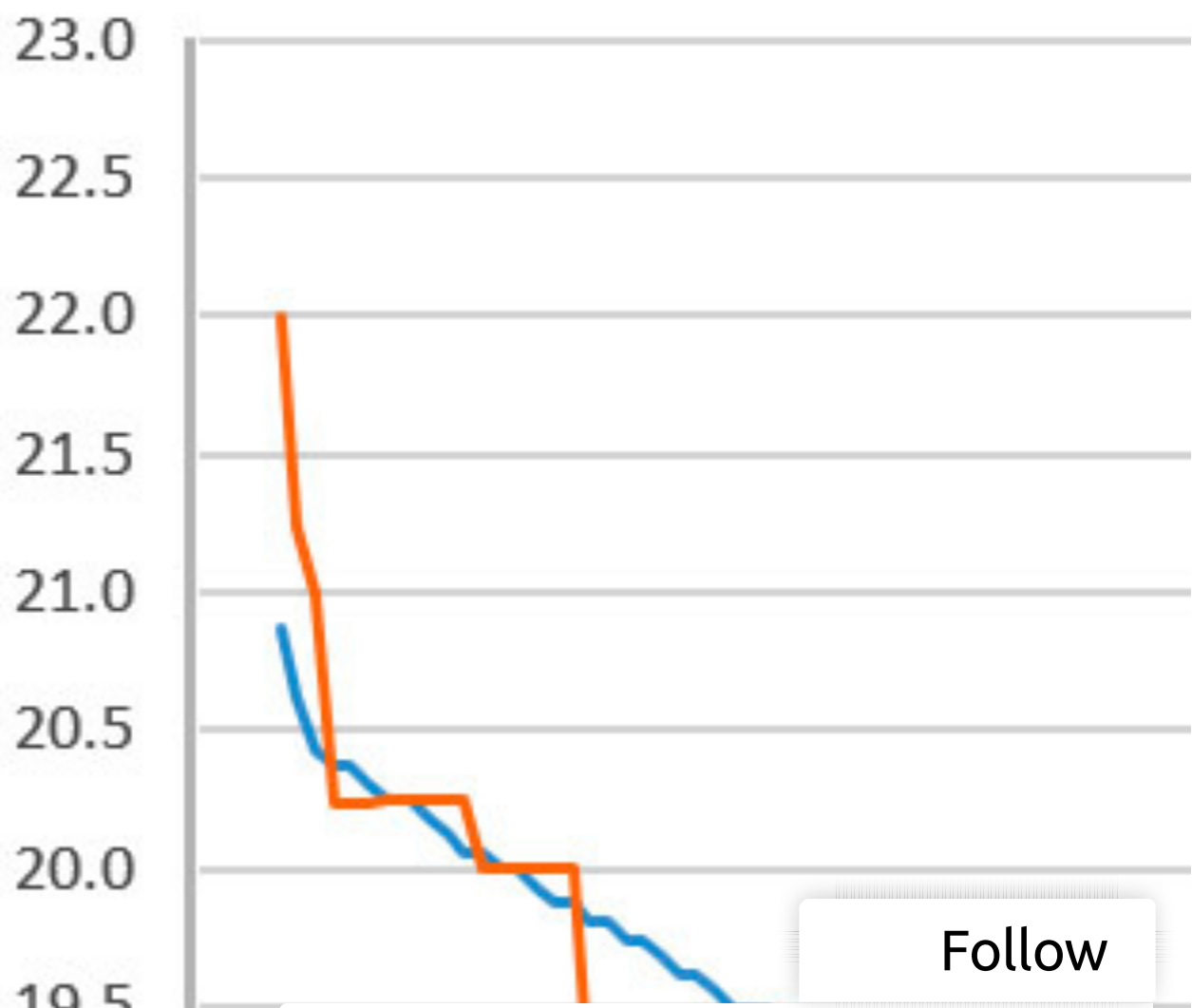
See <http://www.romanblack.com/or> (no need to use a PIC, though...)

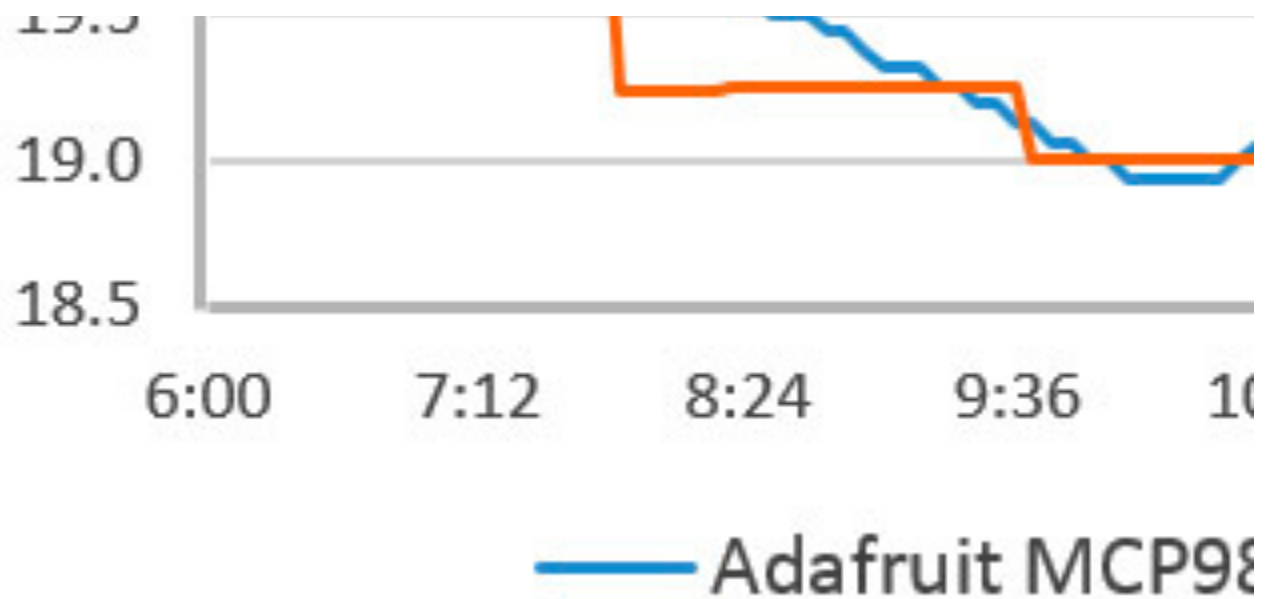
Addendum 2014-12-06

Follow

I have been noodling around with ne
would post a quick overnight compa
data from the Adafruit MCP9808 (\pm)

Degree Celsius vs Time: (5 min san





did not catch it when I posted this graph with:

$\text{TEMP_degC} = (((\text{short})\text{MSB} \ll 8) \mid (\text{short})\text{LSB}) / 4$
 from Coding Badly at the Arduino for Dummies book.
 0.25°C. But what I was actually getting was in whole degrees, and no temps that read xx.

So I tried this code to fix it: `TEMP_degC = ((short)MSB << 8) | ((short)LSB);`

```
Wire.beginTransmission(DS3231_A  
Wire.write(0x11); //location of Tem  
Wire.endTransmission();
```

```
Wire.requestFrom(DS3231_ADDRES  
bytebuffer1 = Wire.read(); // Here's  
bytebuffer2 = Wire.read(); bytebuf  
// the upper 2 bits of the LSB repre
```

```
TEMP_degC = float(bytebuffer1);
```

```
switch(bytebuffer2){
```

```
case 0:
```

```
TEMP_degC = TEMP_degC + 0.00;
```

```
break;
```

```
case 1 :
```

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```
TEMP_degC = TEMP_degC + 0.25;
break;
case 2:
TEMP_degC = TEMP_degC + 0.50;
break;
case 3:
TEMP_degC = TEMP_degC + 0.75;
break;
}
// see http://forum.arduino.cc/index.php?topic=111111.0
```

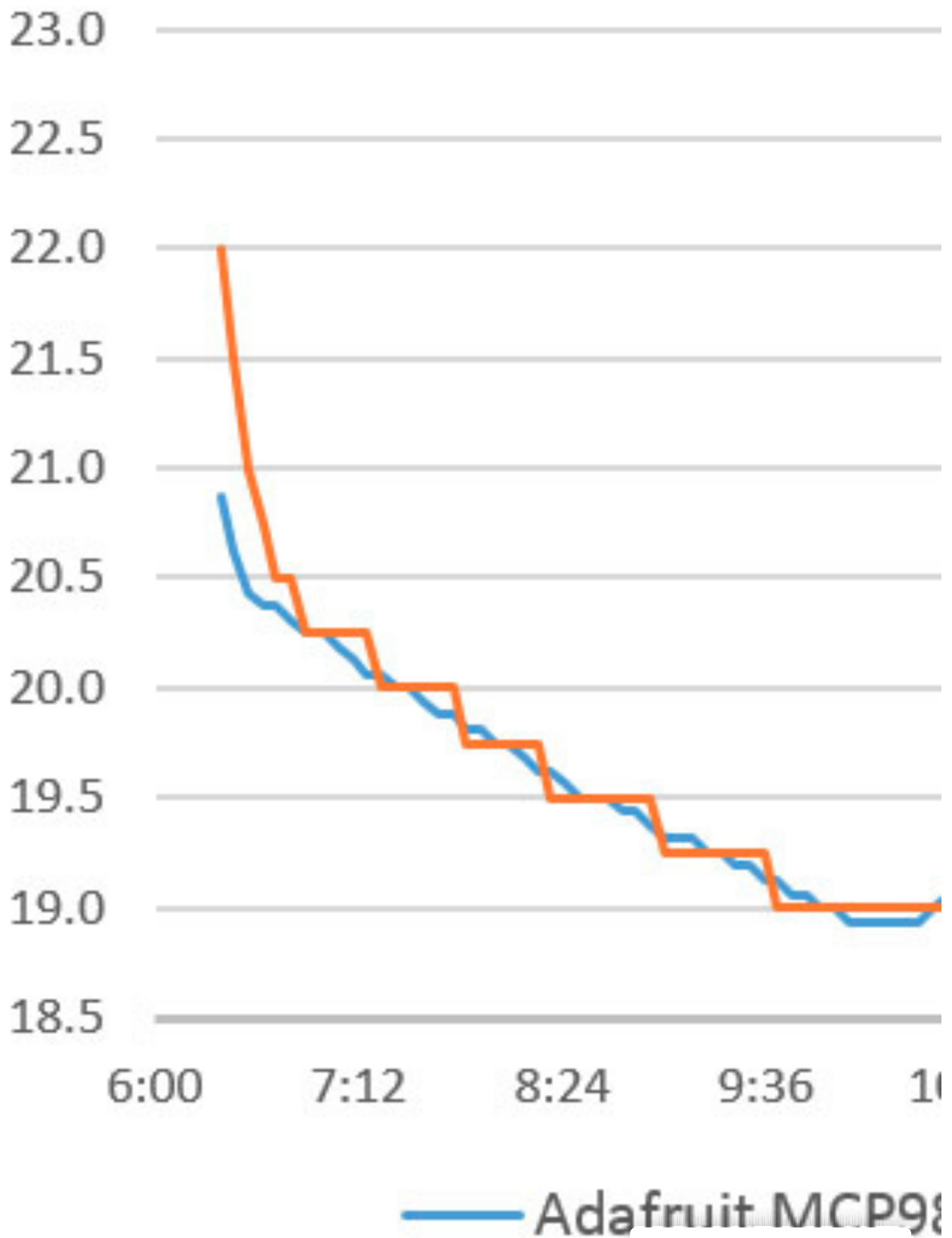
But I got the same result with that code. Are the temperatures coming from? Why do

Addendum Update Update:

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So it turns out that both examples of the decimal (so I could print them my other temperature sensors provided using `fracTemp=(TEMP_degC` work for the RTC fractional data. Check the decimal part of the RTC temperature showing me that you need determine integer before you do a conversion I changed `xx.05` into `xx.0244`, and `xx.7` that graph should have looked like:

A rectangular button with rounded corners and a subtle drop shadow, containing the word "Follow" in a bold, black, sans-serif font.



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Addendum 2014-12-20

Recent fieldwork gave me a chance to test the DS3231 RTCs. The RTCs were set at the end of August at 12:00 seconds. That puts these cheap units within a few seconds of "real" DS3231 breakouts like the ChronoDot. A pretty crude test. These modules are

Addendum 2015-01-11

I have been putting together some sketches for a pipe, and the tight curved profile of the pipe. As soon as I did this, I realized that I should make it *along*, as it makes it easy to replace the standoff bolts. And if I am

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change those coin cells regularly. It's a good idea to tuck everything under the RTC.

Addendum 2015-01-22

Steve Hicks over at envirodiy.org has a script that converts (seconds since January 1, 2000) into UTC. The formula is $[=CELL/(60*60*24)+"1/1/1970"]$ note the single 32-bit number (another conversion). The number of days in each month a script example using *long epoch = now*

P.S. The [RTC library](#) I'm currently using it is fairly [easy to calculate](#) an epoch. *your clocks set to UTC.*

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Addendum 2015-03-11

I have decided to pin power all of my including the long chains of DS18B20s I have been working on. But I still don't know if generating the interrupts will have a significant impact. I have added a voltage divider connected to the RTC board, with the center divider connected to the Arduino. I am hoping these 4.7 MΩ resistors will only 0.35μA draw to the ground line. Without the ADC input capacitor is being charged, the readings wobble a bit without a capacitor. I was afraid that leakage on a MLCC capacitor would draw sleep current so I left it out. I read th

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delay, throwing away the first reading to what I see on an external voltmeter *of load on the coin cell* to actually read conversion while the pin power is re
This approach would waste some energy the “load” to see if I can interpret the

Addendum 2015-03-13

There is another question about pin happens when I have Battery-Backed powered only by the backup battery. Presumably the alarm still gets generated the open-drain SQW pin, which should Arduino that bleeds away

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Addendum 2015-04-01

I just returned from another fieldwork drift checks on twelve data loggers that after three months of operation they all had the remarkable consistency across them. Looking at something other than my netbook I had on hand, and re-checking them was reading the current time - new loggers that I had prepared before were exactly nine seconds slow (my computer netbook I take into the field). When I checked every one of them became 24 seconds slow by the compile & upload of the RTC software.

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the offsets I reported back in Decem
have a drift somewhere between 0-5
This is well within the manufacturers
is the limiting factor, at least I can be
negative time offset before each dep

NOTE: With further testing I have fo
button, the resulting **RTC time offset**
system this reduced lag caused by th
see even more of a difference on my
removing the verify option as you up
errors to get to a faster upload time,
a “read time only” sketch to confirm

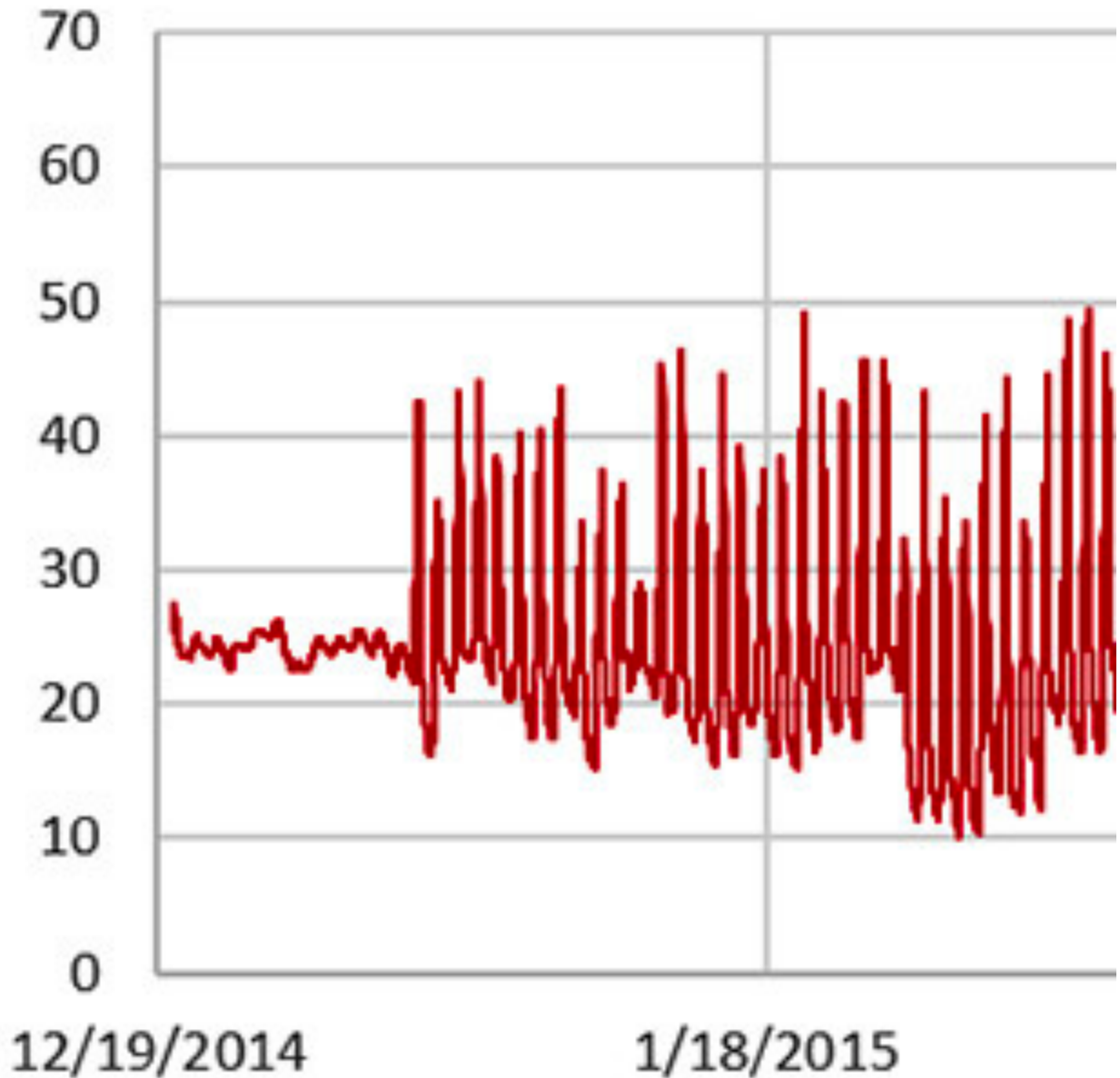
Addendum 2015-04-05

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Just digging into the recent data set,
act as a rain gauge) got baked as the

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RioS Surface DS024 R1



This is the record from the RTC and
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hitting 60°C. The good news is that
the same as the units that were left
tropical sun, as I am a firm believer i

Addendum 2015-04-07

That last deployment saw several log
post the little code snippet I use to d
my loggers to sleep

In setup: *(note brackets missing aro*

```
#include LowPower.h // https://gi  
#include RTCLib.h // https://git  
#define RTCPOWER_PIN 7 // this is  
Follow
```

So after the setting the next alarm ti

```
RTC.setA1Time(Alarmday, Alarmho  
//The variables ALRM1_SET bits and  
RTC.turnOnAlarm(1);
```

I use this function to de-power the R

```
void sleepNwait4RTC()  
{  
//  
#ifdef RTCPOWER_PIN    //if using  
pinMode (RTCPOWER_PIN, INPUT);  
digitalWrite(RTCPOWER_PIN, LOW)  
// driving pin LOW FORCES to the R
```

Follow

```
#endif
//
noInterrupts ();    // make sure we
attachInterrupt(0,clockTrigger, LOW
interrupts ();      // interrupts allow
LowPower.powerDown(SLEEP_FOR
detachInterrupt(0); //HERE AFTER
//
#ifdef RTCPOWER_PIN
digitalWrite(RTCPOWER_PIN, HIGH
pinMode (RTCPOWER_PIN, OUTPUT
#endif
//
}
```

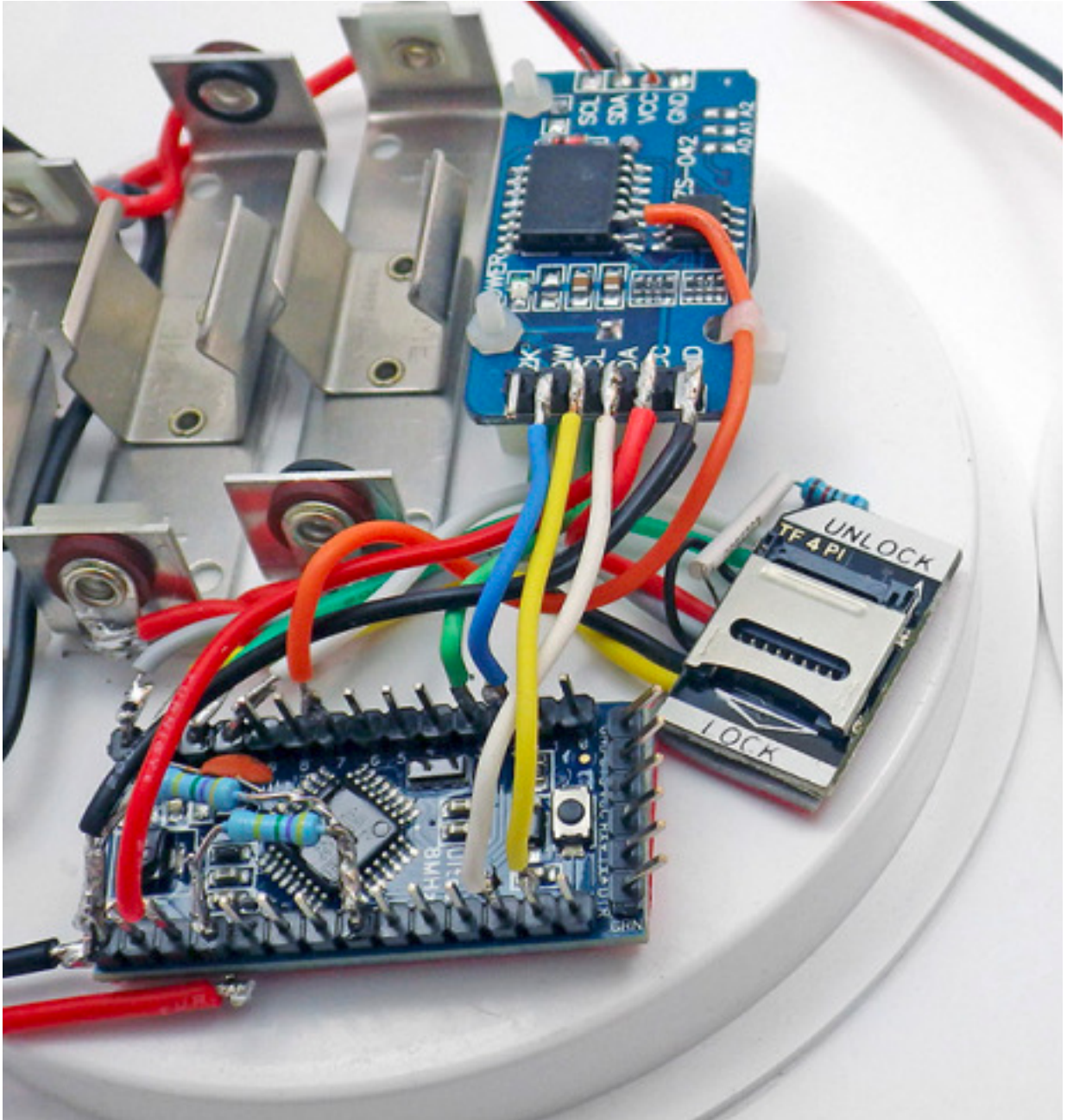
and clocktrigger is the ISR that upda

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```
void clockTrigger() {  
    clockInterrupt = true;  
}
```

So there you have it. After 3 months
calling this good code. BTW this is h

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For more information on these logger platf

Addendum 2015-06-10

Follow

After finding Rob Tillarts multispeed up on the higher speed scans. So I h the 8Mhz boards, and TBWR=12 on t The larger AT24C256 eeprom that I the smaller AT24c32 on the RTC boar rated to 100kHz. Since I had been u immediately see shortened operatin whether a humble 8Mhz Arduino can the capacitance on the lines, there's on that RTC breakout. But with quite my standard code build to shorten n

Addendum 2015-06-17

I have done a few more

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but as expected it also bleeds $0.32\mu A$ when the Arduino is powered & sleeping. If I remove the Arduino, the current drain from the battery rises to almost double that at $0.56\mu A$ when the Arduino is up and letting it go into timekeeping. When the Arduino sleeps (with the coin cell divider causing a 5-7mV drop per day on the battery), the minimum for the DS3232's vBatt cells will only provide about 4-5 months before the little cells need to be replaced. This is less than I thought I would get more time than the coin cells. I am suspecting there are other factors.

One trick I can try is to set the coin cell divider to 0V.

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the Arduino sleeps. This would raise also send $0.7\mu\text{A}$ from the analog pin it also pushes about $0.03\mu\text{A}$ *back to* connected. I don't know if that power CR2032's – but perhaps it would be c would shut down the divider power batteries. This is much lower than th a bit dodgy to flip flop between and

I will have to do more tests before I coin cells catch fire when their voltage small constant drain from one of the capacitor – which could be kept charged voltage. That way I'd never have to v

[Follow](#)

rolling...hmmmm...I wonder what tl

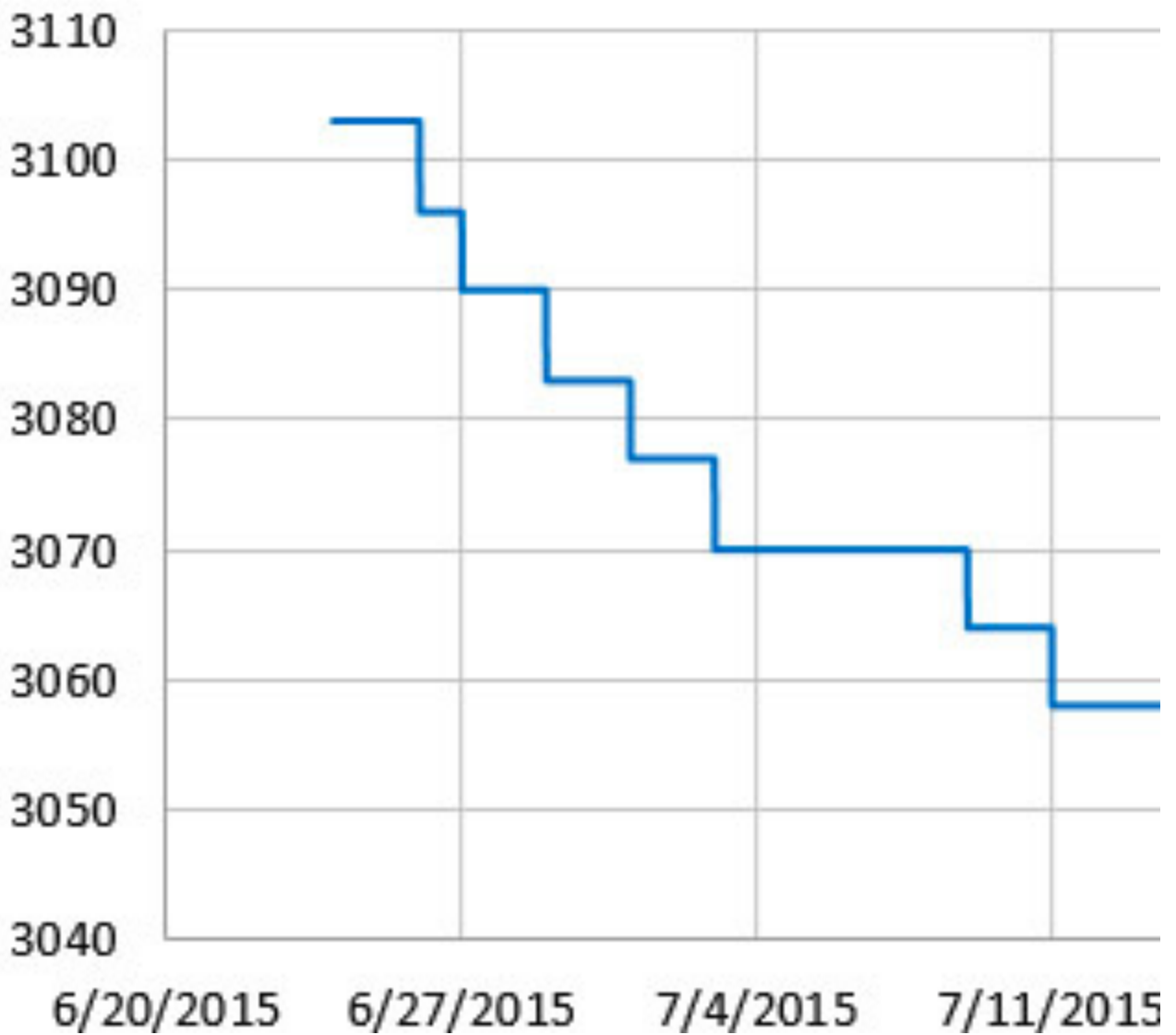
P.S. In my tests to date, the faster 40

Addendum 2015-07-23

Looks like my earlier concern about
were unfounded. Several of my bench
leveled out around a nominal 3.05 v.

Follow

053 PR&RH: Bench Test:



Most of the new batch have this 2 x 4
deploy those units, which likely will r

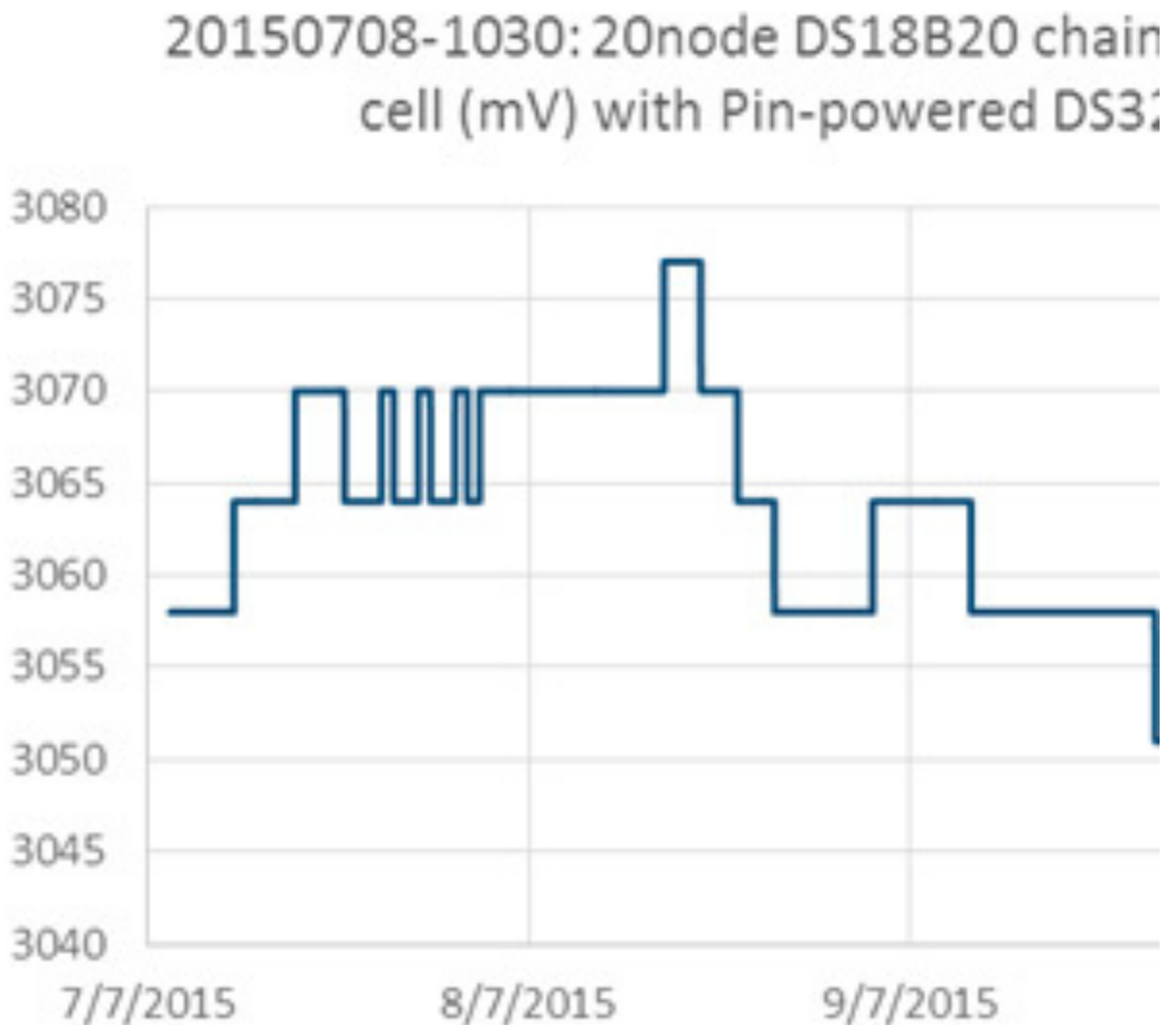
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over at ganssle.com testing the beha
Using Ultra-Low Power MCUs is worth
low power operation goes.

Addendum 2015-10-30

Just a quick update on that coin cell (and
sensors) and the coin cell voltage ro

Follow



cr2031 voltage on pin powerd ds3231 RTC r

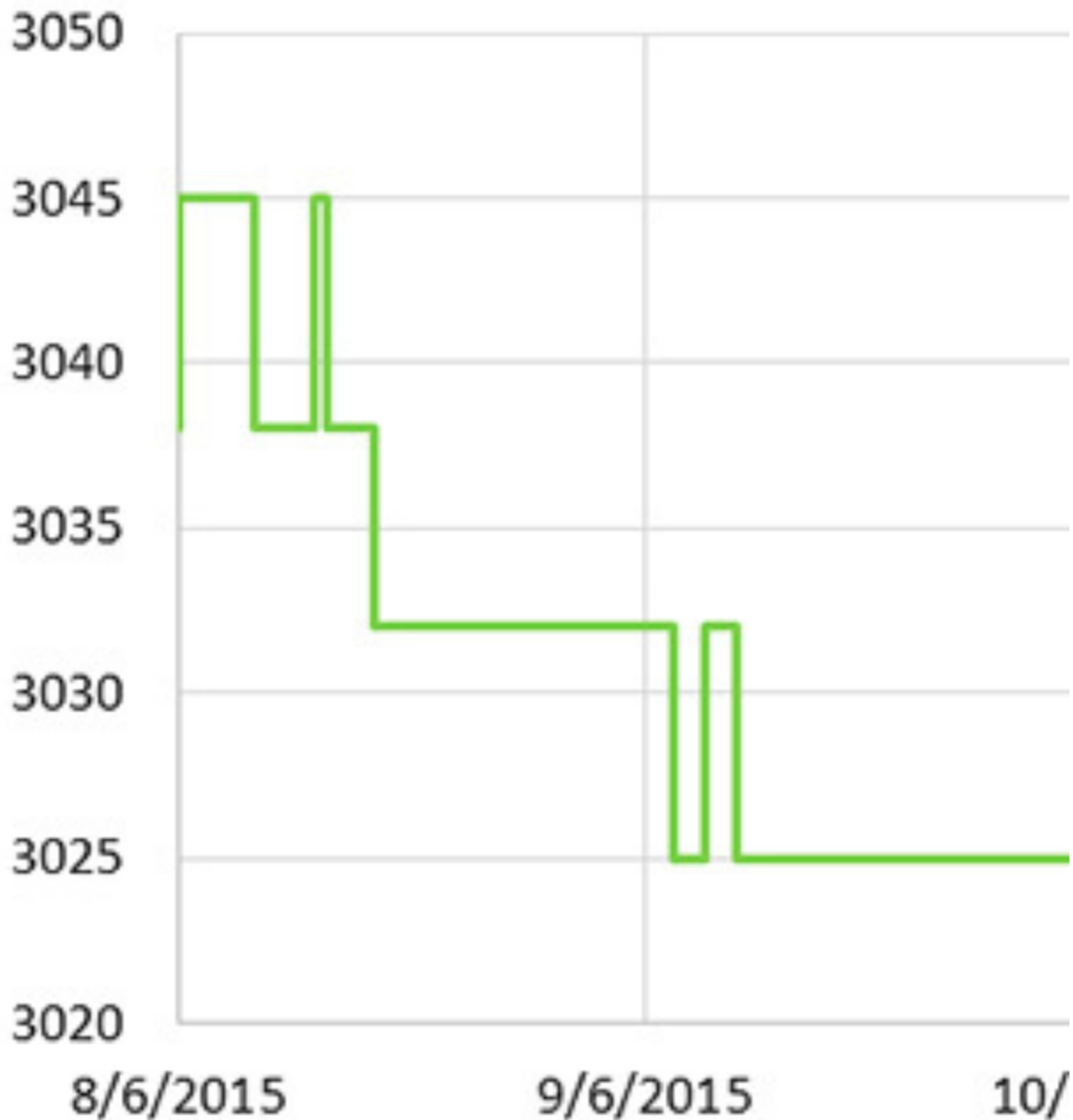
So at least I am not seeing a catastro
question of whether this

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mere 3 μ A when the RTC is in timekeeping mode, well below my 1 year target with the pin 100mAh /cell, there should be no problem.

Note: Data from the batch of logger results:

Follow



RTC coin cell (mV) record from a r

All the loggers using 2x4 [Follow](#) le

mV, and I attribute the differences to my new builds.

Addendum 2016-01-08

I prep these RTC's in runs of 10 to 20 ultrasonic bath. While I was de-soldering the circuit) I realized that the first part of teacher friends of mine bring Arduino these RTC's quickly. You can just pop time cleaning them up. You don't even that logger is about the simplest example sleeping Arduino.

Addendum 2016-01-16

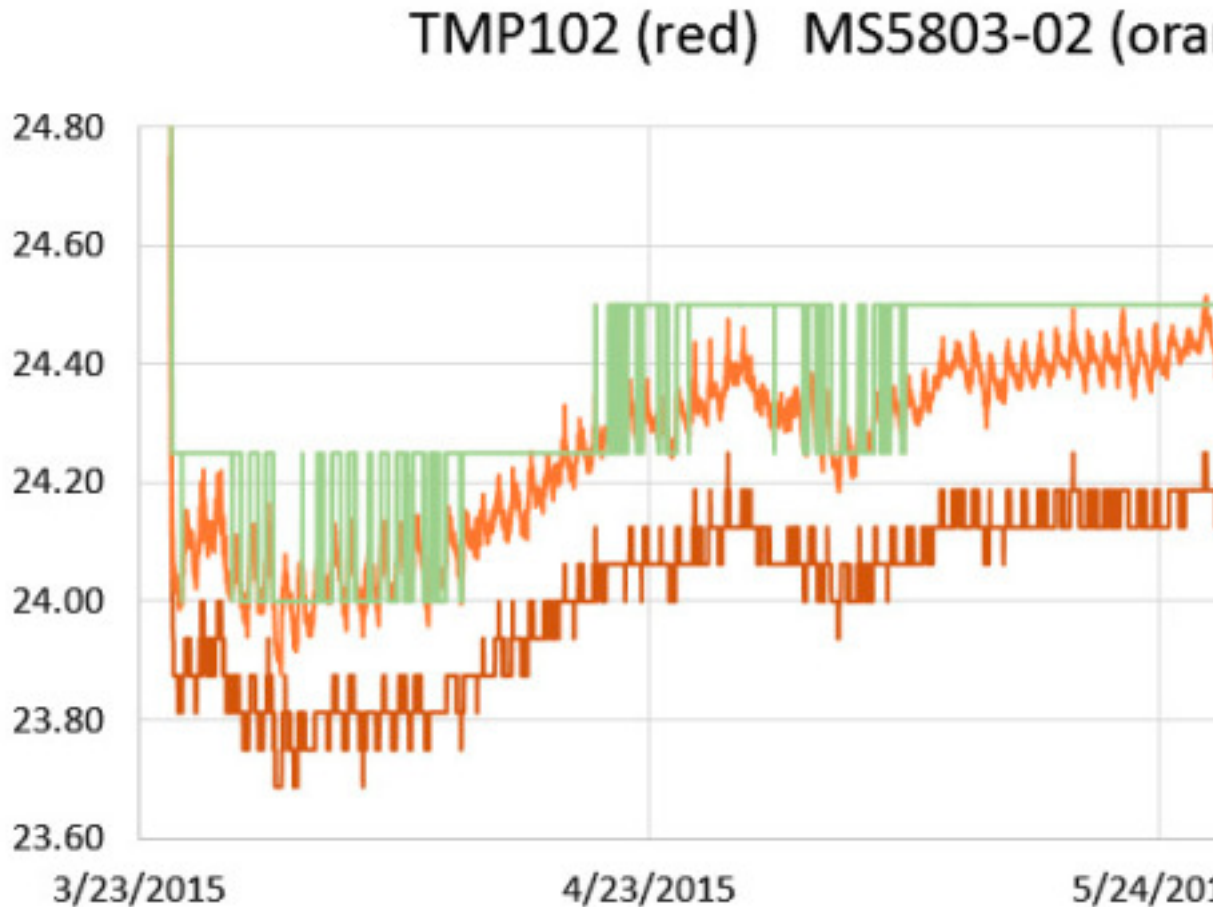
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Just stumbled across [a post at Arduino](#) combining day-month-year data into date-stamp file name. This could be based loggers, as opposed to the more every X minutes approach. I think this generating a max of 512 entries in the

Addendum 2016-01-21

Data from a cave deployment of one

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The MS5803 is a 24bit pressure sensor which has a m
sensor embedded under 3-4mm of epoxy, an

so I am impressed again with the ter
illustration of what gain when you a

Follow

Addendum 2016-02-13

Over at raspberrypi-geek.com they
the DS3231, and the MCP79400. The
is a result of the temperature compe
temp variation to see how this affect

Addendum 2016-02-26

Just stumbled across a playground fo
user Tominakasi tried replacing the l
He reached 24 hours of operation w
would need significantly more time t
application. If I play with some data
Super Capacitor Calculat

Follow

one farad cap. But folk's over at Spa
leakage current would be a serious p
tracking the coin cell voltage with a
these boards, I think I will pickup a 5
experiment to find out how long it a
RTC's 2.3v minimum. It would not ta
then top it up when necessary beca
Probably not worth doing for a regu
epoxy... hmmm...

Addendum 2016-03-04

There must be a million great clock p
like they would be fun to build. The i
legs, and I think it could

Follow or

am not alone in drooling over the Fe
drive batch of small electromagnets

Addendum 2016-04-07

Another coin cell curve (mV) from a l



8/8/15

9/8/15

This was from a $2 \times 4.7 \text{ M}\Omega$ set, so I a go a year even with the added drain switched over to 10 meg Ω resistors, whether the ADC can still get enough I've been dating the coin cells with a their lifespan.

Addendum 2016-04-21

Just had to post a link to the Arduinc DS3231 board with a pro-mini and o

[Follow](#)

Addendum 2016-05-21

There are a host of changes coming
the full-swing oscillator driver circuit
data loggers, it might spur a few mo
DS3231 for performance oriented bu

Addendum 2016-06-18

Just had to add a shout out here to L
great addition to his Open Wave Hei
on underwater logging, and his worl

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2 bloggers like this.

Related

[Buffering sensor data to an AT24C32
eeprom on I2C](#)

In "Lessons learned."

A
E
I

This entry was posted in [Experiments w other sensors](#) ar

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34 Responses to *Using a \$2 DS3*

Alex *says:*

November 16, 2014 at 5:43 am

hi, thanks for the article. A few que
still work (assuming it is pulled hig
We are trying to see if it is possible
while ds3231 is in timekeeping mo

thanks

edmallon *says:*

November 16, 2014 at 7:18 pm

Yes. I still use the interrupt
Follow

high to apply power to the
again, I pull that power pin
not yet done any longer
causes some other system

Alex *says:*

November 18, 2014 at 6:13 am

great, thanks. Have you seen this on
power on/off arduino : <http://elect>
first answer, he uses an ds1305, but

edmallon *says:*

November 20, 2014 at 12:39 am

Follow

I think a few people have taken to
<https://www.tindie.com/products/>

But my loggers have “always on”
need to do processing depending on
Scream Ultra board with a low quiescent
running, pin powering the RTC is
batteries. Fatlib16 brought his P
same regulator:

<http://forum.arduino.cc/index.p>

And the SD card is responsible for
around 0.03mA do you still need

Alex says:

November 24, 2014 at 5:33 am

Follow

Great thanks. I got my own DS3231
Result came in at about 60 uA with

thanks

[edmallon](#) says:

November 24, 2014 at 8:03 pm

Hmmm, so we *are* putting
current by making it gen
200 mAh available, we ar
there is not too much de
interrupt line?

I have also been trying to
power from the RTC batt
indicate that the switch-(

Follow

<http://www.forward.com>

“The I2C interface is acc
connected to the DS3231
controller and DS3231 I2
while reading data from
placed into a known stat
micro-controller should p

I still have to think about
not seen any weirdness i
other I2C devices, but *no*
during those events. Gue

Antoan *says:*

December 1, 2014 at 7:35 am

Follow

Really interesting stuff 😊 I want us
one? You wrote that you will but I c

[edmallon](#) says:

December 1, 2014 at 5:41 pm

A drift test against a “rea
are quite bad, the drift te
them to get reliable data
actually go into the field
experiment before I get
to verify clock accuracy.

(I should add that my fie
logger scripts that auton
for making sure the RTC'
wipes out any accumulatio

Follow

setup for the latest gene
drift mid-late next year.)

nonokunono *says:*

December 28, 2014 at 6:06 am

hi, I can confirm what you said: "I h
 μA " . I am also powering the modu
off, external interrupt on the SQW/
I have set the appropriate control r
Everything works very well except 1
thanks

edmallon *says:*

December 29, 2014 at 9:44 pm

Follow

My units continue to sen
That I how I wake up the
any I2C communications
drain the coin cell dry be

If your units are not senc
register setting that need
breakout boards I get fr
coin cell battery.

Jim Remington *says:*

January 25, 2015 at 2:51 am

When power to the module is off, S
signal, you will need a pullup from
pullups. Let us know if that was the

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Very useful blog article!

edmallon *says:*

January 25, 2015 at 5:01 pm

If you do not remove the
is soldered on rtc board.
the code, because my ea
sensor board. This requir
removing the SQW pullu
there, because I had forc
functionality as those ala
Arduino pullup on SQW a

Jim Remington *says:*

January 26, 2015 at 12:45 a

Follow

The pullup in the re:
off, it is not effective
Arduino input if you

The Arduino pullups
other pullups.

Jim Remington *says:*

February 3, 2015 at 9:34 pm

UPDATE and correction! I did some
output in the "battery backed squa
to 5V (3.9K or so) in order to see th
pulses but they are about 1V and th
genuine DS3231 modules from Jeel

Follow

Jim Remington *says:*

February 3, 2015 at 10:42 pm

Problem solved! I forgot about the
down the external pullup resistor.

edmallon *says:*

February 4, 2015 at 11:40 pm

Because I have other I2c sensors
pin powering the RTC's Vcc line
me away from a conflict with the

It sounds like you were powering
SQW, and ALSO applying the int
effect you had: internal pulldown

Follow

power pin low to de-power the F level.

I think the key to making it work you drive it low to force the RTC
`pinMode (RTCPOWER_PIN, INPUT)`
`digitalWrite(RTCPOWER_PIN, LOW)`

Input mode is equivalent to a sense interrupt pin a chance to win the even if you used the Vcc line on

When you re-powered the pin, you
`digitalWrite(RTCPOWER_PIN, HIGH)`
`pinMode (RTCPOWER_PIN, OUTPUT)`

At which point both pins are pulled
(One other thing to t

Peter *says:*

May 21, 2015 at 2:31 am

Hi Edward,

Very interesting project you have n
eeprom. I've also powered the mo
the SQW pin. Bit 6 (Battery-Backed
to occur when running the RTC fro
pull-up and a external pull resistor
does fire the SQW interrupt low. Ar

Thanks,
Peter

Follow

edmallon *says:*

May 21, 2015 at 11:17 am

The first thing I would do is check the I2C window to make sure the register is configured, but then next I would try and use about 15% of them as de-bounce breadboard loggers with pull-up resistors because I can be confident they will get from eBay. 2K is a pretty good value (I already have a pull-up resistor on the I2C lines)

Peter *says:*

May 21, 2015 at 2:09 pm

Follow

I did add the pull up
anymore. Maybe I'n
powered during bat
are set correctly of C

It's a good point to

[edmallon](#) says:

May 21, 2015 at 7:28 pr

Yes, you are quite
pull-up, although
enabling the inte
physically remove
Vcc line, so the al
On my current lo
powered all the ti

Follow

why I now solder
the pad on the br
Vcc line, keeping
these RTCs. The s

scrungy_doolittle *says:*

May 23, 2015 at 10:07 pm

So I have a real quandary. I am usin
have an LCD display running, as we
I have installed CR2032 batteries in
power to the rtc. When I plug it bac
programmed it.

So say I programmed it Thursday. I
with thursday as the current date, I
the 5v supply to the clock board. th

Follow

so that I can remove the clock, and clock in counting mode.

Is this a flaw in the 3231, or a screw

The whole point of this is that if po
an accurate clock when the power

This board is un-modified. I also ha

[edmallon](#) *says:*

May 24, 2015 at 5:15 pm

This is just a guess, but c
will automatically reset t
Arduino. In fact it will do
setting sketch that I four
the Arduino platform, wh
time was actually update

Follow

LED – it has no serial out
has no ability to set the c
removed the RTC setting
accidentally reset the clo

John Wells *says:*

December 1, 2015 at 12:36 pm

Thanks for the extremely! informat

[edmallon](#) *says:*

December 12, 2015 at 9:51 am

Keep in mind that the DS
battery when it is depow
depowered

Follow 0

usually better to put those
sensors that automatically
pressure sensors draw a
them for that behavior.

Tom *says:*

January 10, 2016 at 5:15 pm

Interesting project. I found your page
received is exactly like the one you
was glad to see the simple mod ne
supposed to be a rechargeable bat

[edmallon](#) *says:*

January 10, 2016 at 5:50 pm

Follow

Yes, that's happened to me
often on eBay's policy due to
sellers, rather than anything

Pingback: [Using a \\$2 DS3231 RTC & AT24C32 EEprom](#)

G8UJS *says:*

February 8, 2016 at 9:27 pm

Great project, I used the DS3231 with
chips using a 60Khz time signal so
attached battery the clocks were tested
a vast difference in temp. The DS3231
dec so the time set very accurately.
over to another blank chip allowing

Follow

dylanh5 says:

February 9, 2016 at 11:13 pm

Wow great information on DS3231 'as you can set the RTC in the serial story' I thought I'd post about it here <https://github.com/JChristensen/D>
You've even inspired me to start m

edmallon says:

February 10, 2016 at 12:29 am

I will have to look into the compile time method. I am sure the DS3231 RTCs slowly creep forward and this would let me get a better idea of the creep depending on the voltage at the 3.3v

Follow

changes to the battery v

Tomas *says:*

February 27, 2016 at 3:05 pm

I am doing just another temperatu
Rather than download sketch from
coding/developing. While I was sea
guess, it must be one of your entry
later during next visits, I realized, tl
take me while to read them backwa

edmallon *says:*

February 28, 2016 at 10:41 am

Glad to hel Follow

of variation in soldering
because the holes for the
where those contacts ba
port like I am. It's a bit so
to get picky about the via

Sunny *says:*

February 28, 2016 at 7:28 am

Hi Edward. Great article on the rtc :
arduino from its slumber using the

edmallon *says:*

February 28, 2016 at 10:46 am

I considere [5](#)

during cpu up-time, and
than to say using the ala
the DS3231. For a bare b
[UNO based data logger](#).

Arduino based underwater sensors

The Twenty Ten Them

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