How to add an extremely accurate real-time clock?

I bought a RTC-module with DS3231 from Maxim and add to my Raspberry Shake.
It cost just 1,51€ at AMAZON and is better than the normal available RTC.

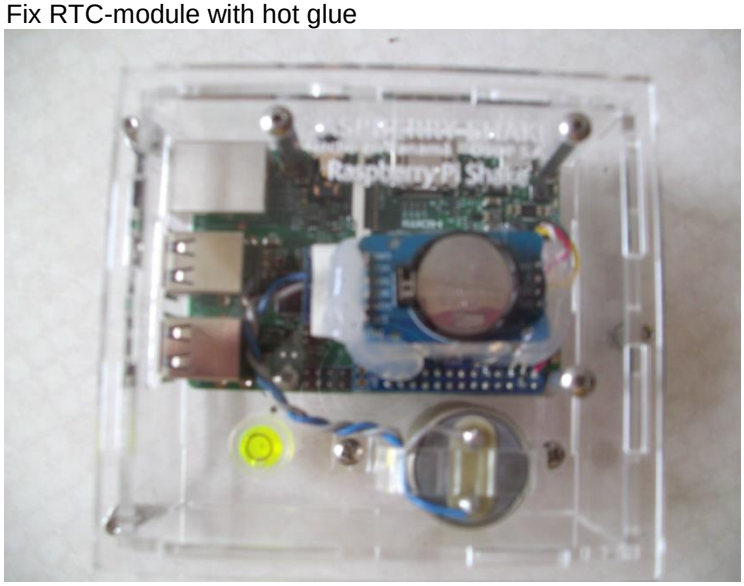
See my step to step guide:

HW-Installation:

1.

RTC	Raspberry Shake PCB
solder GND	PIN 9 (GPIO) = GND
solder VCC	PIN 1 (GPIO) = 3,3V
solder SDA	PIN 3 (GPIO) = SDA
solder SCL	PIN 5 (GPIO) = SCL

2. Put an isolation tape on Shake PCB
3. Fix RTC-module with hot glue



SW-Installation:

1. Run sudo raspi-config and enable I2C and SPI

2. After reboot you see:

```
myshake@R10A1:/opt $ i2cdetect -y 1
     0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f
00:          -- -- -- -- -- -- -- -- -- -- -- -- --
10: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
20: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
30: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
40: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
50: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
60: -- -- -- -- -- -- -- -- 68 -- -- -- -- -- -- --
70: -- -- -- -- -- -- -- --
```

3. Edit config.txt
   Add a line with "**dtoverlay=i2c-rtc,ds3231**" at the end of the file
   sudo nano /etc/config.txt

4. Reboot again and check:

```
myshake@R10A1:/opt $ i2cdetect -y 1
     0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f
00:          -- -- -- -- -- -- -- -- -- -- -- -- --
10: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
20: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
30: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
40: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
50: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
60: -- -- -- -- -- -- -- -- UU -- -- -- -- -- -- --
70: -- -- -- -- -- -- -- --
```

5. Setup one time RTC-clock (NTP-Update and Internet connection required)
   sudo hwclock –w

6. Disable Fake-hwclock
   sudo systemctl stop fake-hwclock
   sudo systemctl disable fake-hwclock
   sudo apt-get purge fake-hwclock

7. Change setting in file hwclock-set
   Comment out with "#" the first IF statement
   sudo nano /lib/udev/hwclock-set

```
#!/bin/sh
# Reset the System Clock to UTC if the hardware clock from which it
# was copied by the kernel was in localtime.

dev=$1

# if [ -e /run/systemd/system ] ; then
#      exit 0
# fi
```

8. Enable NTP
   sudo timedatectl set-ntp true

9. Reboot

Check SW-Installation:

1. Check, if the system find correctly the rtc

```
myshake@R10A1:/opt $ dmesg | grep rtc
[    4.307900] rtc-ds1307 1-0068: rtc core: registered ds3231 as rtc0
```

2. myshake@R10A1:/opt $ cat /proc/driver/rtc

```
rtc_time        : 10:54:46
rtc_date        : 2017-07-11
alrm_time       : 00:00:00
alrm_date       : 1970-01-01
alarm_IRQ       : no
alrm_pending    : no
update IRQ enabled      : no
periodic IRQ enabled    : no
periodic IRQ frequency  : 1
max user IRQ frequency  : 64
24hr            : yes
```

3. myshake@R10A1:/opt $ sudo hwclock -r

```
Tue Jul 11 12:51:53 2017  -0.098483 seconds
```

4. myshake@ R10A1:/opt $ sudo hwclock -c

```
hw-time      system-time         freq-offset-ppm   tick
1499770395   1499770395.999382
1499770406   1499770406.999498               -2     -0
1499770417   1499770417.999641               -0     -0
1499770428   1499770428.999726                1      0
1499770439   1499770439.999388               -2     -0
1499770450   1499770450.999651               -0     -0
```

5. myshake@R10A1:/opt $ sudo timedatectl status

```
      Local time: Tue 2017-07-11 12:51:22 CEST
  Universal time: Tue 2017-07-11 10:51:22 UTC
        RTC time: Tue 2017-07-11 10:51:21
       Time zone: Europe/Berlin (CEST, +0200)
     NTP enabled: yes
NTP synchronized: yes
 RTC in local TZ: no
      DST active: yes
 Last DST change: DST began at
                  Sun 2017-03-26 01:59:59 CET
                  Sun 2017-03-26 03:00:00 CEST
 Next DST change: DST ends (the clock jumps one hour backwards) at
                  Sun 2017-10-29 02:59:59 CEST
                  Sun 2017-10-29 02:00:00 CET
```