

GM8136

# REAL TIME CLOCK

---

User Guide

Rev.: 1.0

Issue Date: August 2014





# REVISION HISTORY

## GM8136 RTC User Guide

Date	Rev.	From	To
Aug. 2014	1.0	-	Original

Copyright © 2014 Grain Media, Inc.

All Rights Reserved.

Printed in Taiwan 2014

Grain Media and the Grain Media Logo are trademarks of Grain Media, Inc. in Taiwan and/or other countries. Other company, product and service names may be trademarks or service marks of others.

All information contained in this document is subject to change without notice. The products described in this document are NOT intended for use in implantation or other life support application where malfunction may result in injury or death to persons. The information contained in this document does not affect or change Grain Media's product specification or warranties. Nothing in this document shall operate as an express or implied license or indemnity under the intellectual property rights of Grain Media or third parties. All information contained in this document was obtained in specific environments, and is presented as an illustration. The results obtained in other operating environments may vary.

THE INFORMATION CONTAINED IN THIS DOCUMENT IS PROVIDED ON AN "AS IS" BASIS. In no event will Grain Media be liable for damages arising directly or indirectly from any use of the information contained in this document.

Grain Media, Inc.  
5F, No. 5, Li-Hsin Road III, Hsinchu Science Park, Hsinchu City, Taiwan 300, R.O.C.

Grain Media's home page can be found at:  
<http://www.grain-media.com>



# TABLE OF CONTENTS

Chapter 1	RTC Overview .....	1
Chapter 2	Configuration of RTC in Linux .....	3
Chapter 3	RTC Related Files .....	9
Chapter 4	External RTC Driver .....	11

# LIST OF FIGURES

Figure 2-1. Device Driver Entry ..... 4

Figure 2-2. Real Time Clock Entry ..... 5

Figure 2-3. Real Time Clock Options ..... 6

Figure 2-4. Insert RTC Module ..... 7

Figure 2-5. Usage of hwclock ..... 7



# Chapter 1

## RTC Overview

---

Real Time Clock (RTC) is a hardware clock. This clock can be used for time keeping even when the device is powered off. A battery should be attached to the board to keep RTC alive.

Grain Media provides a RTC IP, which is built in GM8136 and constructs a functional RTC driver based on the Linux standard. With RTC, users can easily use the common utilities, such as `hwclock`, to obtain the correct time and the time setting.





# Chapter 2

## Configuration of RTC in Linux

---

Before using the RTC functions of GM8136, users should make sure that the following options in Linux kernel are all enabled:

### Device Drivers

- Real Time Clock
  - /sys/class/rtc/rtcN (sysfs)
  - /proc/driver/rtc (procfs for rtc0)
  - /dev/rtcN (character devices)

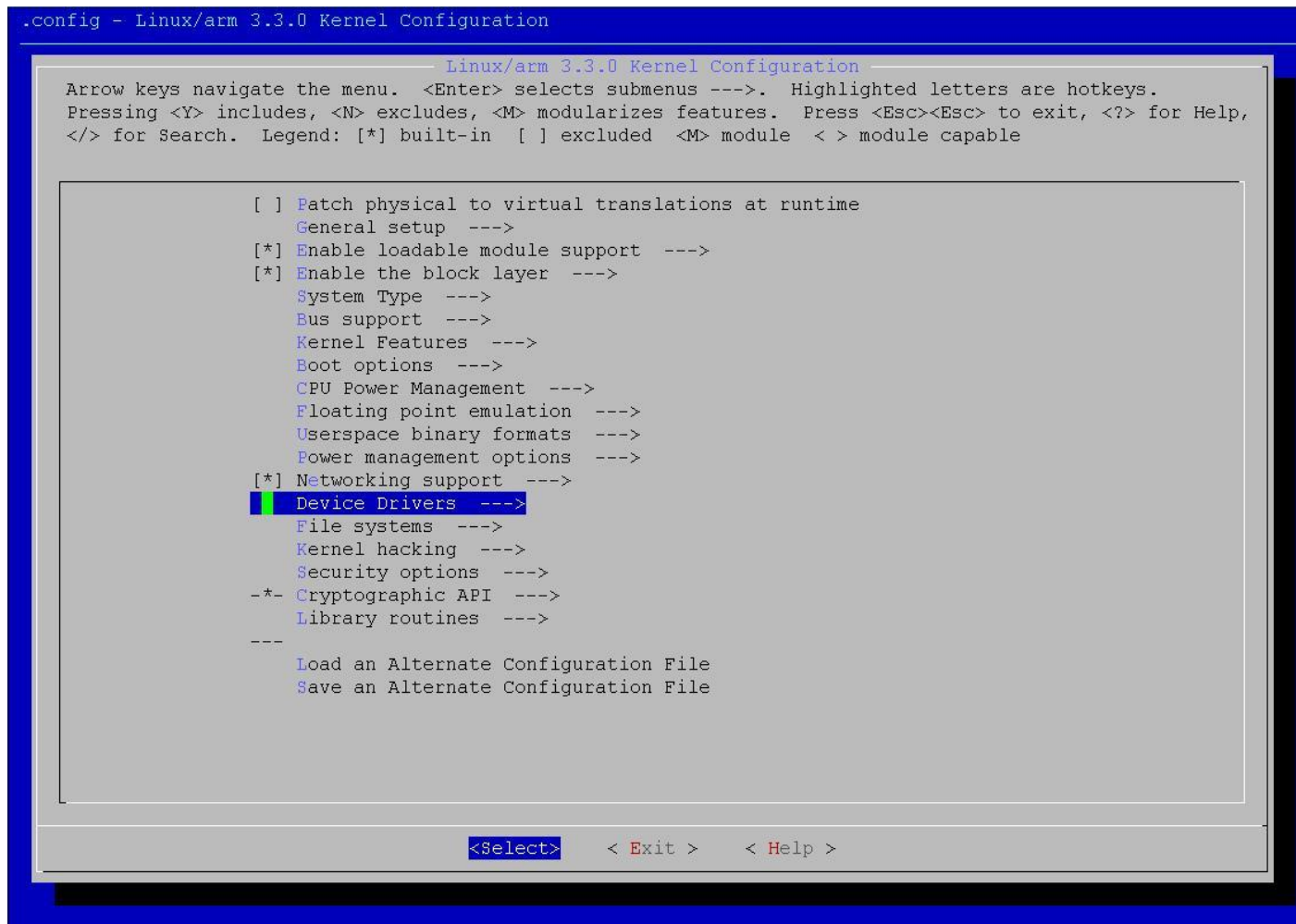


Figure 2-1. Device Driver Entry

```

.config - Linux/arm 3.3.0 Kernel Configuration

                                Device Drivers
Arrow keys navigate the menu.  <Enter> selects submenus --->.  Highlighted letters are hotkeys.
Pressing <Y> includes, <N> excludes, <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help,
</> for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < > module capable

[*] I2C support --->
[*] SPI support --->
    PPS support --->
    PTP clock support --->
--*-- GPIO Support --->
< > Dallas's 1-wire support --->
< > Power supply class support --->
< > Hardware Monitoring support --->
< > Generic Thermal sysfs driver --->
[ ] Watchdog Timer Support --->
    Sonics Silicon Backplane --->
    Broadcom specific AMBA --->
    Multifunction device drivers --->
[ ] Voltage and Current Regulator Support --->
< > Multimedia support --->
    Graphics support --->
< > Sound card support --->
[ ] HID Devices --->
[ ] USB support --->
< > MMC/SD/SDIO card support --->
< > Sony MemoryStick card support (EXPERIMENTAL) --->
[ ] LED Support --->
[ ] Accessibility support --->
[Y] Real Time Clock --->
[*] DMA Engine support --->
[ ] Auxiliary Display support --->

                                <Select>  < Exit >  < Help >

```

Figure 2-2. Real Time Clock Entry

```
.config - Linux/arm 3.3.0 Kernel Configuration

                                Real Time Clock
Arrow keys navigate the menu. <Enter> selects submenus --->. Highlighted letters are hotkeys.
Pressing <Y> includes, <N> excludes, <M> modularizes features. Press <Esc><Esc> to exit, <?> for Help,
</> for Search. Legend: [*] built-in [ ] excluded <M> module < > module capable

--- Real Time Clock
[ ] Set system time from RTC on startup and resume
[ ] RTC debug support
*** RTC interfaces ***
[*] /sys/class/rtc/rtcN (sysfs)
[*] /proc/driver/rtc (procfs for rtc0)
[*] /dev/rtcN (character devices)
[ ] RTC UIE emulation on dev interface
< > Test driver/device
*** I2C RTC drivers ***
< > Dallas/Maxim DS1307/37/38/39/40, ST M41T00, EPSON RX-8025
< > Dallas/Maxim DS1374
< > Dallas/Maxim DS1672
< > Dallas/Maxim DS3232
< > Maxim MAX6900
< > Ricoh R2025S/D, RS5C372A/B, RV5C386, RV5C387A
< > Intersil ISL1208
< > Intersil ISL12022
< > Xicor/Intersil X1205
< > Philips PCF8563/Epson RTC8564
< > Philips PCF8583
< > ST M41T62/65/M41T80/81/82/83/84/85/87
< > TI BQ32000
< > Seiko Instruments S-35390A
< > Ramtron FM3130
< > Epson RX-8581

<Select> < Exit > < Help >
```

Figure 2-3. Real Time Clock Options

After completing the configuration, users should switch the current directory to arm-linux-3.3/module/RTC/FTRTC011 and make a copy of the RTC kernel module, rtc-ftrtc011.ko. Please use "insmod" to insert this module into kernel and use "mdev -s" to generate a RTC device node as shown in Figure 2-4.

The module parameter, `clk_src`, is used to control the RTC clock source. Users can apply different RTC clock sources when inserting the `rtc-ftrtc011.ko`. The `clk_src` definition is shown in the below table.

Name	Default Value	Description
<code>clk_src</code>	0	RTC Clock Source Selection 0: External OSC 32.768KHz 1: Internal PLL3 (540MHz) -> 32.768KHz

```
/lib/modules # insmod rtc-ftrtc011.ko
ftrtc011 ftrtc011: rtc core: registered ftrtc011 as rtc0
/lib/modules # mdev -s
/lib/modules # ls -lh /dev/rtc0
crw-rw---- 1 root root 254, 0 Jan 1 00:35 /dev/rtc0
/lib/modules #
```

Figure 2-4. Insert RTC Module

The GM8136 RTC can then be operating normally. Users can use “`hwclock`” for free.

```
/lib/modules # date -s 2010.12.06-11:40
Mon Dec 6 11:40:00 UTC 2010
/lib/modules # hwclock --help
BusyBox v1.13.4 (2010-12-06 10:32:54 CST) multi-call binary

Usage: hwclock [-r|--show] [-s|--hctosys] [-w|--systohc] [-l|--localtime]
[-u|--utc] [-f FILE]

Query and set hardware clock (RTC)

Options:
-r      Show hardware clock time
-s      Set system time from hardware clock
-w      Set hardware clock to system time
-u      Hardware clock is in UTC
-l      Hardware clock is in local time
-f FILE Use specified device (e.g. /dev/rtc2)

/lib/modules # hwclock -w
/lib/modules # hwclock
Thu Nov 31 11:40:43 2013 0.000000 seconds
/lib/modules #
```

Figure 2-5. Usage of `hwclock`



# Chapter 3

## RTC Related Files

---

By using the RTC related files, users may understand the underneath operations. All paths are related to arm-linux-3.3/.

This article goes with the Linux kernel. It describes RTC in details in Linux.

- `Linux-3.3-fa/Documentation/rtc.txt`

This implements the GM8136 RTC provided by Grain Media.

- `module/RTC/FTRTC011/ftrtc011.c`



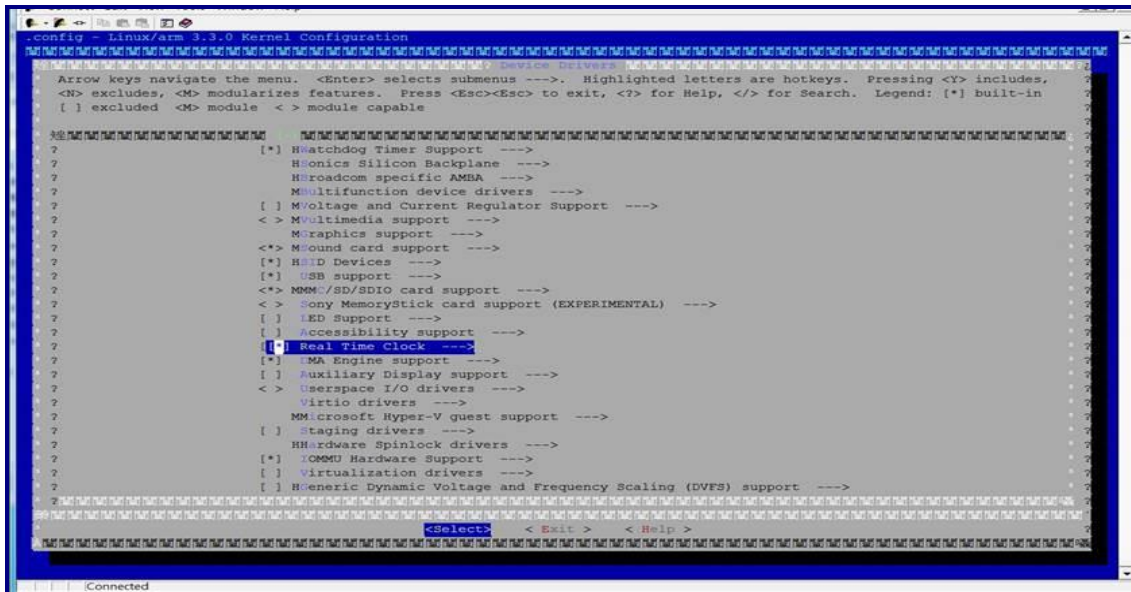


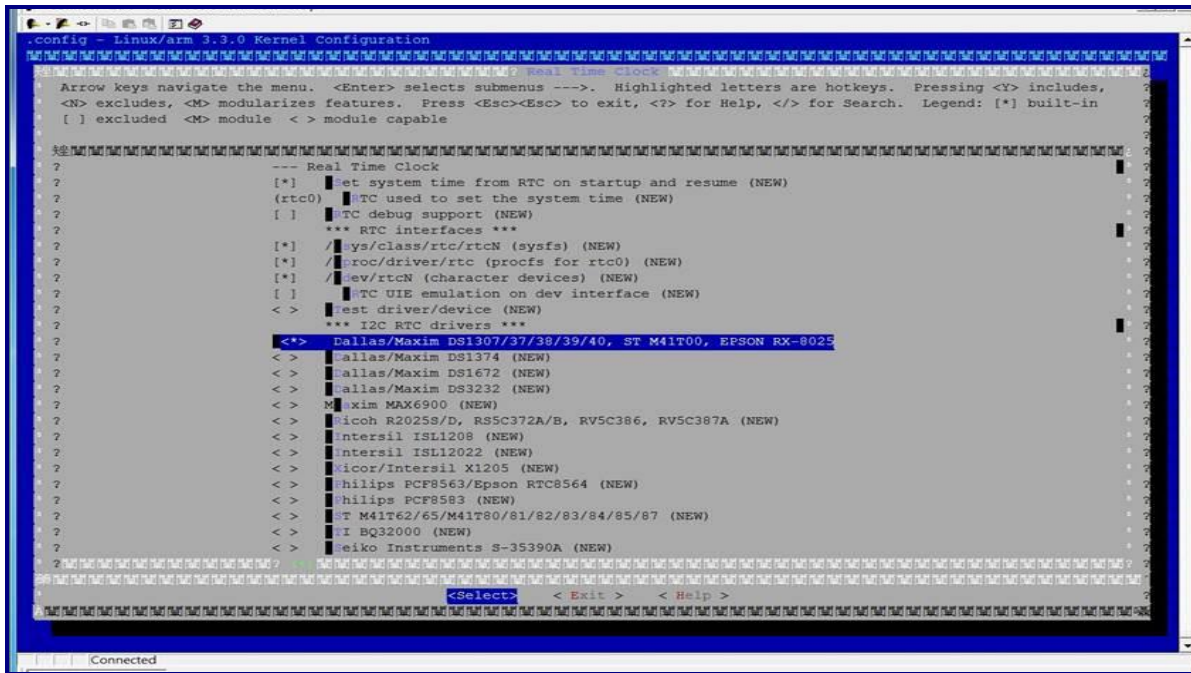
# Chapter 4

## External RTC Driver

Linux kernel 3.3 has built-in various RTC device drivers. Users can open the RTC driver device through the kernel configuration. Below is an example of enabling the DS1307 RTC support in kernel and user space.

Open Kernel Configuration to support DS1307 RTC and RTC subsystem





New DS1307 RTC device with I<sup>2</sup>C address 0x68 in user space

```
#> echo ds1307 0x68 > /sys/bus/i2c/devices/i2c-0/new_device
#> mdev -s
```

Setup the system time

```
#> date "2014-08-05 10:46:20"
```

Setup the RTC time from the system time

```
#> hwclock -w
```

Setup the system from the RTC time

```
#> hwclock -s
```

## Display the RTC time

```
#> hwclock -r
#> cat /proc/driver/rtc
rtc_time      : 10:49:15
rtc_date      : 2014-08-05
alarm_time     : 00:00:00
alarm_date    : 1970-01-01
alarm_IRQ     : no
alarm_pending  : no
update IRQ enabled : no
periodic IRQ enabled : no
periodic IRQ frequency : 1
max user IRQ frequency : 64
```