

EC1515S Instructions for the Use of Electronic Clocks V1.02

Because this clock has many functions, please read this manual carefully. Thank you for your cooperation.

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I. Brief Introduction to the Principle of the Clock

The time read by MCU from the clock chip and the temperature collected by thermistor are displayed by digital tube, and the parameters displayed when setting parameters are displayed. Sixty light emitting diodes display the seconds of the clock. The parameters of time and clock are set by keys. The clock chip is powered by backup batteries so that the clock can still run normally after power off without setting the time every time it is powered on. The single chip computer collects the brightness of the environment through the photoresistor, and controls the time when the digital tube turns on and off, so as to realize the automatic brightness display. The MCU reads the internal music data, converts it into frequency signal and outputs it to the buzzer, so that music can be played.

II. Introduction of Functions

1. Digital tube display

There are red, green, blue and white digital tubes to choose from. Users can also switch to other color digital tubes by themselves.

Power-on defaults to the time, temperature, year, month, day, week display, through the button can be set only to show time or only show time and temperature (set in the "time display settings").

2. LED Display

There are three combinations of red green LED, red blue LED and blue white LED to choose from. Users can also switch to other color combinations of LED.

There are 13 kinds of display, which can be switched by keys. It can also be set as automatic switching display (set in "LED automatic switching display settings"). When the switching display parameter x is less than 60, the switching display time is $x*1$ minute, when it is more than 60, the switching display time is $(x-60)*60$ minute, and when $x=0$, the switching display is not automatically switched. For example, when set to 30, switch to the next display every 30 minutes. When set to 62 (greater than 60), switch to the next display every $(62-60) * 60$ minutes (that is, 2 hours).

3. Clock accuracy

Using DS1302 as clock chip, it can use clock auto-calibration function to improve travel time accuracy.

4. time setting

You can set the time by pressing the button. When the clock chip is properly equipped with backup batteries, even when the clock is powered off, it will go normally without resetting the time every time the power is turned on.

5. Automatic clock calibration

Because this clock is a suite, the clock will inevitably have errors after welding, in order to maximize the accuracy of the clock, so do this function. Clock error can be corrected by setting error time and error amount. For example, if the clock is 2 seconds faster every 24 hours, then the error time is set to 24, and the error amount is set to -2. If every 24 hours is 8 seconds slow, the error time can be set to 3, and the error is set to 1.

6. Voice output

Use a passive buzzer to output music.

7. ringtone download

There are 7 bells built-in when the kit leaves the factory. It can also download the bell to the clock by itself. It can be set as the alarm for the whole time and the alarm clock. See the bell download tutorial in Part 6 for details.

8. hourly chime

It can be turned on or off. When it is turned on, it can ring when the current time satisfies the whole time and the alarm time. It can set the alarm time (for example, it can be set from 8 a.m. to 22 p.m. and not at other times).

9.Alarm clock

There are four independent alarm clocks, which can be closed or opened separately. The alarm time, alarm tone and alarm mode can be set separately.

When the alarm clock is turned on and the current time satisfies the alarm clock's hour, minute and mode at the same time, the alarm will ring.

When the loud time exceeds the set loud time or when loud, press the MODE button to stop the loud.

Sleeping greedily function: Press PLUS key when the noise is loud, pause the noise, and then resound after five minutes.

Six alarm clock modes to meet various needs.

Alarm mode 0: Ordinary alarm clock will ring every day.

Alarm mode 1: Workday alarm clock 1, Monday to Friday ring, Saturday, the day does not ring.

Alarm mode 2: weekend alarm clock 1, on Saturdays and Sundays, Monday to Friday no alarm.

Alarm mode 3: Workday alarm 2, Monday to Saturday, Sunday no alarm.

Alarm mode 4: weekend alarm 2, Sunday alarm, Monday to Saturday no alarm.

Alarm mode 5: A single alarm clock will automatically turn off the alarm clock after one alarm.

10.Temperature display

The ambient temperature is measured by a thermistor. Can be set to Celsius or Fahrenheit display, when the clock is showing temperature, press the MODE key to switch to Fahrenheit or Celsius display. Temperature calibration can be done when the temperature is not correct (set in "Temperature Calibration Settings") (for example, when the display temperature is 3 degrees higher than the actual temperature, set the temperature calibration value to - 3).

11.Brightness Adjustment Function

The ambient brightness is measured by a photoresistor. When the automatic brightness function is turned on, the brightness of the clock can be automatically changed with the brightness of the ambient light. When the automatic brightness function is turned off, the clock brightness can be manually adjusted. Whether manual or automatic brightness, there are 100 levels of brightness.

12.12/24 hours system

The default is 24-hour system, which can be set to 12-hour system by keystrokes (set in 12/24 setting mode).

13.Sunday display

It's incorrect to show Sunday as Wednesday 7. The correct display should be '日', but it increases in order to take care of some people's habits and foreigners may not know Sunday. When the clock is showing Sunday, press the MODE key to set Sunday to Sunday or Sunday 7.

14.Restore Factory Defaults

Turn off the clock and remove the memory battery. Wait for about two minutes, then turn on the clock.

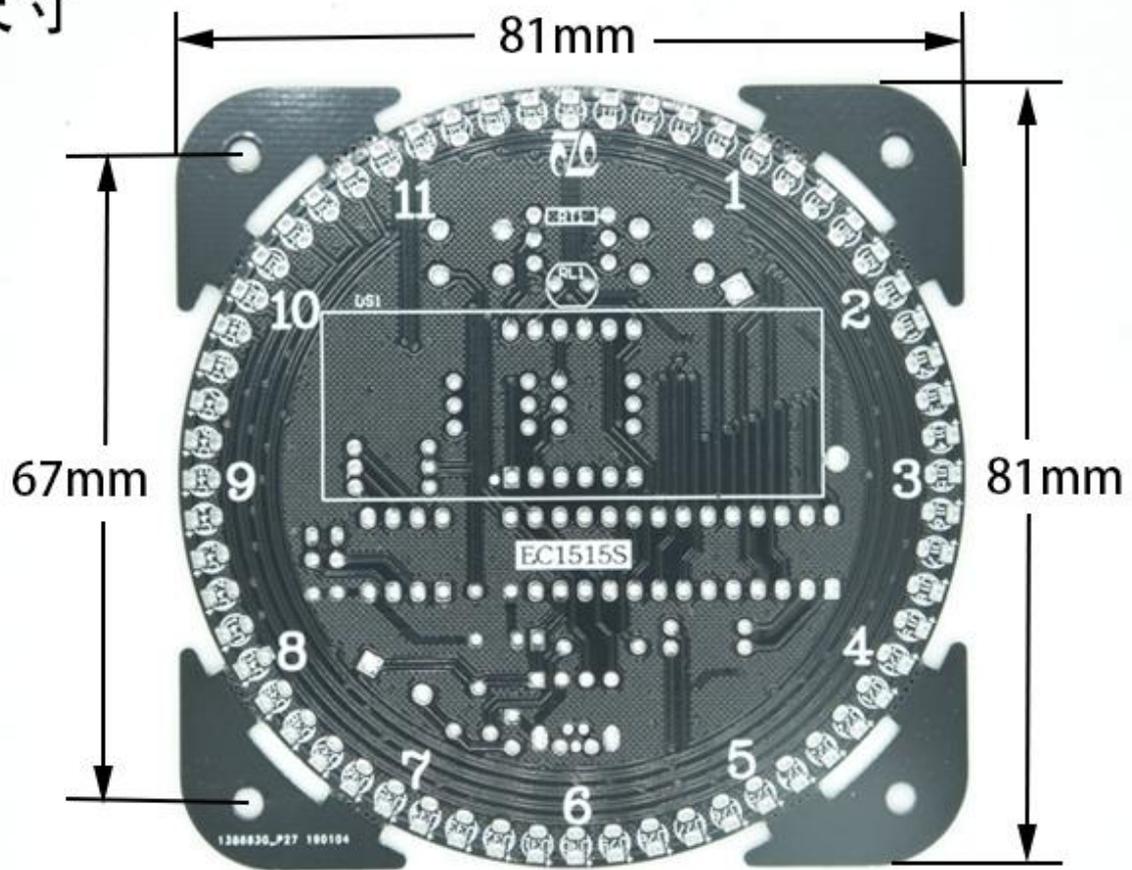
15.Some possible errors

- 1.Display "Err1". The clock module is not welded properly or incorrectly.
- 2.Display "Err2". Thermistor (temperature measuring circuit) is not well welded or wrong welded.
- 3.Display "Err3". Photoresistor (photoelectric circuit) has not been welded well or has been welded incorrectly.

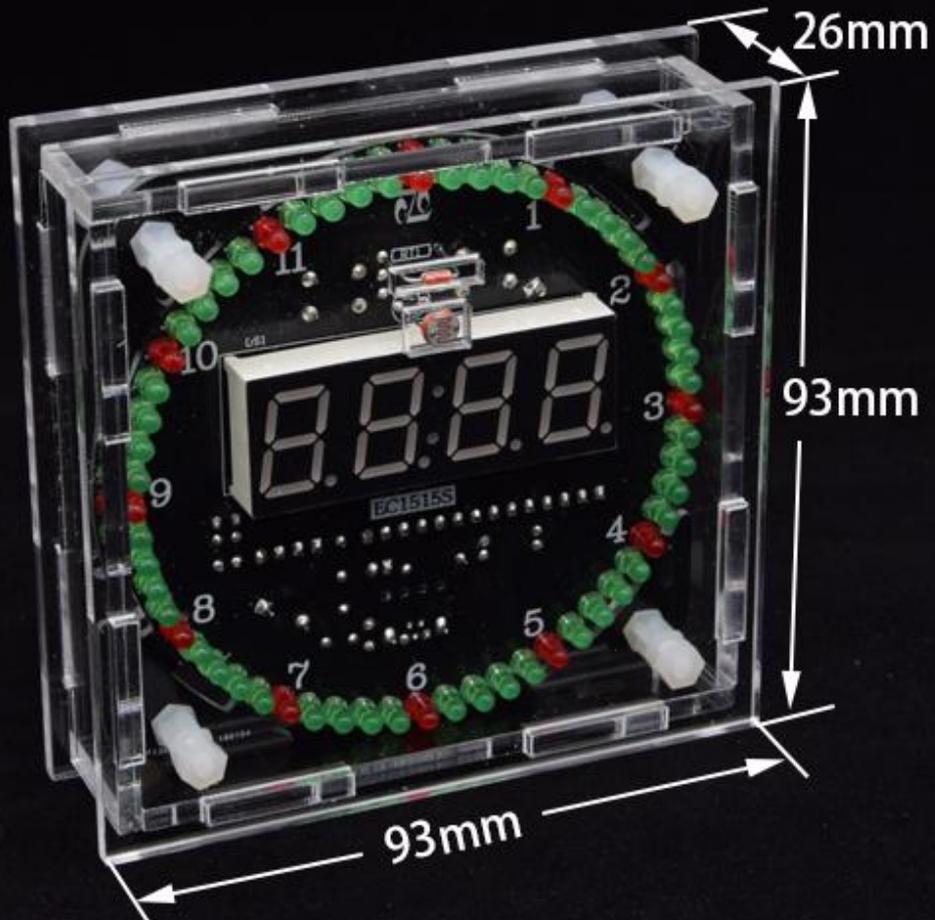
III.Introduction of Hardware

Size:

PCB尺寸



尺寸



Weight:

The finished product does not contain shell:47g

The finished product contains a housing:128g

IV. Electrical Performance

Power supply:DC5V

Working current:<50MA

Noise current:<100mA

Working temperature:0~40℃

V. Electronic clock display and key function

1. Time Display

	Display description	MODE Key Function	PLUS Key Function
Time display mode (power-on default mode)	There are three display modes: 1. Time, temperature, year, month, day and week. 2. Wheel display of time and temperature. 3. Display time only.	<ol style="list-style-type: none"> 1. Press 1 second for a long time to enter the time setting mode. 2. Press 3 seconds long to set the alarm clock and alarm clock. 3. Press 5 seconds to enter the function settings. 4. When displaying Sunday, the displaying mode of Sunday can be changed. 5. When displaying temperature, it can be switched to Celsius or Fahrenheit. 	<ol style="list-style-type: none"> 1. Lunar temperature, year, month, day and week. 2. Hold down the MODE key and press the PLUS key to switch the LED display mode. 3. When the alarm rings, enter the sleepy mode (the alarm clock is suspended and will ring again in 5 minutes).

2. Time Settings

This setting can modify the time of the clock. If there is no button to press for 10 seconds under each setting, the time display will be automatically returned and the time before it will be restored.

Mode	Display description	MODE Key Function	PLUS Key Function
Time display mode			Long press 1 second into Year Setting
Year Setting	Four digital tube flashing shows "Year"	Set "Year", long press can quickly set	Into Month Setting
Month Setting	front two tube flashing shows "Month", after two tube always shows "Day"	Set "Month", long press can quickly set	Into Day Setting
Day Setting	Front two tube always shows "Month", after two tube flashing shows "Day"	Set "Day", long press can quickly set	Into Hour Setting
Hour Setting	Front two tube flashing shows "Hour", after two tube always shows "H" when 24 hour system, when 12 hour system shows "A" in am, shows "P" in pm.	Set "Hour", long press can quickly set	Into Minute Setting
Minute Setting	Front two tube always shows "Hour", after two tube flashing shows "Minute"	Set "Minute", long press can quickly set	Into Second Setting
Second Setting	Front two tube always shows "--", after two tube flashing shows "Second"	Set "Second", long press can quickly set	If there is a time to adjust, save the settings, otherwise not save the settings, and return time display mode.

For example, we should set the clock to 12:00 minutes and 00 seconds on January 1, 2019, the value of "year" to 2029, the value of "month" to 1, the value of "day" to 1, the value of "time" to 12, the value of "minute" to 0, and the value of "second" to 0.

3. Integral alarm and alarm clock setting

每种设置模式下长按 MODE 键 3 秒或 10 秒内无任何按键按下，则自动返回时间显示模式并保存设置。

Mode	Display description	MODE Key Function	PLUS Key Function
Time display mode			Long press 3 second into hourly chime switch setting
hourly chime switch setting	Front two tube always shows "01", after two tube flashing shows "On" or "OF" to express open or close the hourly chime	Open or close the hourly chime	When hourly chime is turned on, into Hourly Chime Star Time Setting When hourly chime is turned off, enter alarm clock 1 switch setting.
Hourly Chime Star Time Setting	Front two tube always shows "02", after two tube flashing shows hourly chime star time	Set star time(for example: the start time is set to 8, the end time is set to 22, hourly chime will happen from 8 o'clock to 22 o'clock every day)	Into Hourly Chime End Time Setting
Hourly Chime End Time Setting	Front 2 bits of digital tube always shows "03", after two tube flashing shows ending time.	Set ending time(for example: the start time is set to 8, the end time is set to 22, hourly chime will happen from 8 o'clock to 22 o'clock every day)	Enter the hourly chime bell setting
Hourly chime bell setting	Front 2 bits of digital tube always shows "04", after two tube flashing shows The name of the bell.	Set the bell of Hourly chime	Enter alarm clock 1 switch setting
Alarm clock 1 switch setting	Front 2 bits of digital tube always shows "10", after two tube flashing shows "ON" or "OF" indicates Turn on or off the alarm clock 1.	Turn on or off the alarm clock 1	When the alarm clock 1 is turned on, enter Alarm clock 1's hour setting. When the alarm clock 1 is turned off, enter the alarm clock 2 switch setting.
Alarm clock 1's hour setting	Front 2 bits of digital tube always shows "11", after two tube flashing display shows Alarm clock 1's hour.	Set Alarm clock 1's hour, Long press can be set quickly.	Enter the alarm clock 1's minute setting
Alarm clock 1's minute setting	Front 2 bits of digital tube always shows "12", after two tube flashing display shows Alarm clock 1's minute	Set alarm clock 1's minute, Long press can be set quickly.	Enter the alarm clock 1's bell rings time length setting
Alarm clock 1's bell rings time length setting	Front 2 bits of digital tube always shows "13", after two tube flashing display shows alarm clock 1's bell rings time length	Set the alarm clock 1's bell rings time length, Set the range from 1 to 20 minute.	Enter the alarm clock 1's bell setting
Alarm clock 1's bell setting	Front 2 bits of digital tube always shows "14", after two tube flashing display shows alarm clock 1's bell name.	Set the alarm clock 1's bell	Enter the alarm clock 1's mode setting

Alarm clock 1's mode setting	Front 2 bits of digital tube always shows"15",after two tube flashing display shows alarm clock 1's mode	Set the alarm clock 1's mode。	Enter alarm clock 2 switch setting
Alarm clock 2 switch setting	Front 2 bits of digital tube always shows"20",after two tube flashing display shows "ON"or"OF", indicates Turn on or off the alarm clock 2.	Turn on or off the alarm clock 2	When the alarm clock 2 is turned on , enter the alarm clock 2 setting. When the alarm clock 2 is turned off , enter the alarm clock 3 setting
Alarm clock 2's hour setting	Front 2 bits of digital tube always shows"21",after two tube flashing display shows Alarm clock 2's hour.	Set Alarm clock 2's hour , Long press can be set quickly.	Enter the alarm clock 2's minute setting
Alarm clock 2's minute setting	Front 2 bits of digital tube always shows"22",after two tube flashing display shows Alarm clock 2's minute	Set alarm clock 2's minute , Long press can be set quickly.	Enter the alarm clock 2's bell rings time length setting
Alarm clock 2's bell rings time length setting	Front 2 bits of digital tube always shows"23",after two tube flashing display shows alarm clock 2's bell rings time length	Set the alarm clock 2's bell rings time length ,Set the range from 1 to 20 minute.	Enter the alarm clock 2's bell setting
Alarm clock 2's bell setting	Front 2 bits of digital tube always shows"24",after two tube flashing display shows alarm clock 2's bell name .	Set the alarm clock 2's bell	Enter the alarm clock 2's mode setting
Alarm clock 2's mode setting	Front 2 bits of digital tube always shows"25",after two tube flashing display shows alarm clock 2's mode	Set the alarm clock 2's mode。	Enter alarm clock 3 switch setting
Alarm clock 3switch setting	Front 2 bits of digital tube always shows"30",after two tube flashing shows"ON"or "OF"indicates Turn on or off the alarm clock 3.	Turn on or off the alarm clock 3	When the alarm clock 3 is turned on , enter the alarm clock 3 setting. When the alarm clock 3 is turned off , enter the alarm clock 4 setting.
Alarm clock 3's hour setting	Front 2 bits of digital tube always shows"31",after two tube flashing display shows Alarm clock 3's hour.	Set Alarm clock 3's hour , Long press can be set quickly.	Enter the alarm clock 3's minute setting
Alarm clock 3's minute setting	Front 2 bits of digital tube always shows"32",after two tube flashing display shows Alarm clock 3's minute	Set alarm clock 3's minute , Long press can be set quickly.	Enter the alarm clock 3's bell rings time length setting
Alarm clock 3's bell rings time length setting	Front 2 bits of digital tube always shows"33",after two tube flashing display shows alarm clock 3's bell rings time length	Set the alarm clock 3's bell rings time length ,Set the range from 1 to 20 minute.	Enter the alarm clock 3's bell setting

Alarm clock 3's bell setting	Front 2 bits of digital tube always shows"34",after two tube flashing display shows alarm clock 3's bell name .	Set the alarm clock 3's bell	Enter the alarm clock 3's mode setting
Alarm clock 3's mode setting	Front 2 bits of digital tube always shows"35",after two tube flashing display shows alarm clock 3's mode	Set the alarm clock 3's mode。	Enter alarm clock 4 switch setting
Alarm clock 4 switch setting	Front 2 bits of digital tube always shows"40",after two tube flashing shows"ON"or "OF"indicates Turn on or off the alarm clock 4.	Turn on or off the alarm clock 4	When the alarm clock 4 is turned on , enter the alarm clock 4 setting. When the alarm clock 4 is turned off,Return time display mode.
Alarm clock 4's hour setting	Front 2 bits of digital tube always shows"41",after two tube flashing display shows Alarm clock 4's hour.	Set Alarm clock 4's hour , Long press can be set quickly.	Enter the alarm clock 4's minute setting
Alarm clock 4's minute setting	Front 2 bits of digital tube always shows"42",after two tube flashing display shows Alarm clock 4's minute	Set alarm clock 3's minute , Long press can be set quickly.	Enter the alarm clock 4's bell rings time length setting
Alarm clock 4's bell rings time length setting	Front 2 bits of digital tube always shows"43",after two tube flashing display shows alarm clock 4's bell rings time length	Set the alarm clock 4's bell rings time length ,Set the range from 1 to 20 minute.	Enter the alarm clock 4's bell setting
Alarm clock 4's bell setting	Front 4 bits of digital tube always shows"44",after two tube flashing display shows alarm clock 4's bell name .	Set the alarm clock 4's bel	Enter the alarm clock 4's mode setting
Alarm clock 4's mode setting	Front 2 bits of digital tube always shows"45",after two tube flashing display shows alarm clock 4's mode。	Set the alarm clock 4's mode。	Return to time display mode and save settings

4. Function Settings

In each setting mode, if the MODE key is pressed for 3 seconds or 10 seconds without any buttons, the time display mode will be returned automatically and the settings will be saved.

Mode	Display description	MODE Key Function	PLUS Key Function
Time display mode			Press the MODE for 5 seconds to Enter automatic brightness switch settings .
Automatic brightness switch setting	Front 2 bits of digital tube always shows"1-",after two tube flashing display shows "ON" or "OF" to express turn on or off Automatic brightness function.	Turn on or off Automatic brightness function.	When Automatic brightness function is turned off, Enter brightness settings. When Automatic brightness function is turned on, Enter temperature calibration settings.

<p>Brightness setting</p>	<p>Front 2 bits of digital tube always shows "2-", after two tube flashing display shows Optical control class parameters.</p>	<p>Brightness setting (Range from 01 to 100 and when 100 is shown to be 00). This feature is not effective until the automatic brightness function is turned off.</p>	<p>temperature calibration settings.</p>
<p>Temperature calibration setting</p>	<p>Front 2 bits of digital tube always shows "4-", after two tube flashing display shows Temperature calibration value</p>	<p>Setting temperature calibration values , The range is -9 ~ 10. For example, when the display temperature is 3 degrees higher than the actual temperature, , Set the calibration value to -3.</p>	<p>Enter 12/24 hour Display setting</p>
<p>12/24 hour Switch setting</p>	<p>Front 2 bits of digital tube always shows "6-", after two tube flashing display shows "ON" or "OF" to express 12 hour or 24 hour display.</p>	<p>12/24 hours display setting</p>	<p>Enter time display mode setting</p>
<p>Time display mode setting</p>	<p>Front 2 bits of digital tube always shows "7-", after two tube flashing display shows time display mode</p>	<p>Set display mode(3 kinds in total)0: Display time only.1:Time, temperature, year, month, day, week display in turn.2: Time, temperature in turn.</p>	<p>Enter LED auto switch display mode settings</p>
<p>LED auto switch display mode settings</p>	<p>Front 2 bits of digital tube always shows "8-", after two tube flashing display shows LED Variation time parameter</p>	<p>Setting time parameters for LED display modes changes (0 is fixed display) .For example, when set to 30, Switch to the next display every 30 minutes. When set to 62 (More than 60) , every (62-60) *60minute (That is 2 hours) Switch to the next display。 (Range: 0~84).</p>	<p>Enter error time setting</p>
<p>Error time setting</p>	<p>Front 2 bits of digital tube always shows "C-" , after two tube flashing shows Clock's error time.</p>	<p>Set error time (range:0~96).for example: The clock speeds up to 2 seconds every 24 hours, Then the error time is set to 24, The error amount is set to -2.</p>	<p>Enter error amount setting.</p>
<p>Error amount setting</p>	<p>Front 2 bits of digital tube always shows "d-" , after two tube flashing shows Clock's error amount</p>	<p>Set error amount (range:-6~6).for example: The clock speeds up to 2 seconds every 24 hours, Then the error time is set to 24, The error amount is set to -2.</p>	<p>Return time display mode and save settings</p>

3. Writing Music

Because the ringtone is placed in the internal storage of MCU, it is impossible to download a music file directly, so we need to write music and send it to MCU. Write music?! Isn't it necessary to be musical proficient? You can rest assured that you don't need to be very proficient in music, as long as you follow the simple score to write it.

Because I don't know anything about music, I don't teach you how to read the short music. I need to consult professionals who know the short music. Now let's tell you how to write music according to the music sheet.

- All characters must be entered in English.
- Numbers on the chart are written directly.
- The underscore below the number on the spectrum represents half-beat, and the underscore “_” is added after the number when compiling.
- The point above the number on the spectrum indicates an increase of a tone, and a single quotation mark "" is added in front of the number when it is written.
- The point below the number on the spectrum represents a tone reduction, and a point "." is added after the number when it is written.
- There is a “#” sign in front of the number on the notation to indicate the rising half tone, and a “#” sign is added before the number when it is written.
- There is a "-" sign at the back of the number on the spectrum, which means that the sound is prolonged by a beat, and "-" is added after the number when it is written.
- There is a dot "." after the number on the simplified spectrum, which means that the sound is extended by half beat, and it is written with "*".
- Add a space at the end of each note to indicate the end of a note.
- Add "R+" to the front of the music and tell the MCU that it is a bell.
- Write the playing time of each note, for example, 500 milliseconds for each note. Add "25" after "R+" (1 means 20MS, ending with a space).

With these rules, you can basically write a song that is not very complicated. Because there are only 510 bytes of storage space used to store music in MCU, it can't store too long music. But don't underestimate the 510 bytes. Each note takes 2 bytes and can store 255 notes. If each note plays 500 milliseconds, it can play for 2 minutes, which is also longer.

Let's practice the following:

月亮代表我的心

孙 仪词
翁清溪曲

1=D $\frac{4}{4}$

(5 - 5 3 2 1 | 3 - - - | 6 - 6 4 2 1 | 7 - -) 0 5 | 1̣. 3̣ 5̣. 1̣ |
你 问 我 爱 你

7̣. 3̣ 5̣ 0 5̣ | 6̣. 7̣ ị. 6̣ | 6̣ 5̣ 5̣ - 3 2 | 1. 1 1 3 2 | 1. 1 1 2 3 |
有 多 深 我 爱 你 有 几 分 我 的 情 也 真 我 的 爱 也 真 月 亮

2. 1 6 2 3 | 2 - - 0 5 | 1. 3 5. 1 | 7. 3 5 0 5 | 6. 7 i. 6 |
代 表 我 的 心 你 问 我 爱 你 有 多 深 我 爱 你 有 几

6 5 5 - 3 2 | 1. 1 1 3 2 | 1. 1 1 2 3 | 2. 6 7 1 2 | 1 - - 3 5 |
分 我 的 情 不 移 我 的 爱 不 变 月 亮 代 表 我 的 心 轻

3. 2 1 5 | 7 - - 6 7 | 6. 7 6 5 | 3 - - 5 | 3. 2 1 5 | 7 - - 6 7 |
轻 的 一 个 吻 已 经 打 动 我 的 心 深 深 的 一 段 情 叫 我

1. 1 1 2 3 | 2 - - 0 5 | 1. 3 5. 1 | 7. 3 5 0 5 | 6. 7 i. 6 |
思 念 到 如 今 你 问 我 爱 你 有 多 深 我 爱 你 有 几

6 5 5 - 3 2 | 1. 1 1 3 2 | 1. 1 1 2 3 | 2. 6 7 1 2 | 1 - - (5 |
分 你 去 想 一 想 你 去 看 一 看 月 亮 代 表 我 的 心

1. 3 5. 1 | 7. 3 5. 5 | 6. 7 i. 6 | 5 - - 3 2 | 1. 1 1 3 2 | 1. 1 1 2 3 |
2. 6 7 1 2 | 1 - -) 3 5 :|| 1 - - 3 2 :|| 1 - - - | (6 7 6 6 - |
轻 心 你 去 心

5 - - -) ||

The above spectra are compiled according to the rules as follows:

R+25

5-5_3_2_1_3---6-6_4_2_1_7--0_5_1*3_5*1_
7.*3_50_5_6*7_'1*6_6_5_5-3_2_1*1_13_2_1*1_12_3_
2*1_6.2_3_2--0_5_1*3_5*1_7.*3_50_5_6*7_'1*6_
6_5_5-3_2_1*1_13_2_1*1_12_3_2*6_.7.1_2_1--3_5_
3*2_157.--6_.7_.6.*7_.6.5.3--53*2_157.--6_.7_.
1*1_12_3_2--0_5_1*3_5*1_7.*3_50_5_6*7_'1*6_
6_5_5-3_2_1*1_13_2_1*1_12_3_2*6_.7.1_2_1--5.
1*3_5*1_7.*3_5*5_6*7_'1*6_5--3_2_1*1_13_2_1*1_12_3_
2*6_.7.1_2_1--3_5_1--3_2_1---6.7_.6_.6.-
5---

Send the above music to the single-chip computer, and let's teach you how to send it. In addition, some people may ask, there are other symbols on Jane Pop, why not write them? These symbols have little effect on the integrity of the whole song, so you don't need to write them in, just write a few basic parameters.

4.Download Music

Firstly, the RXD line from USB to TTL is connected to the position of P31 on the clock, the TXD line is connected to the position of P30 on the clock, and the GND is connected to the position of GND on the clock. If the clock needs to be powered by USB to TTL, the 5V on the TTL is connected to the 5V position on the clock. It can also be powered by power lines.

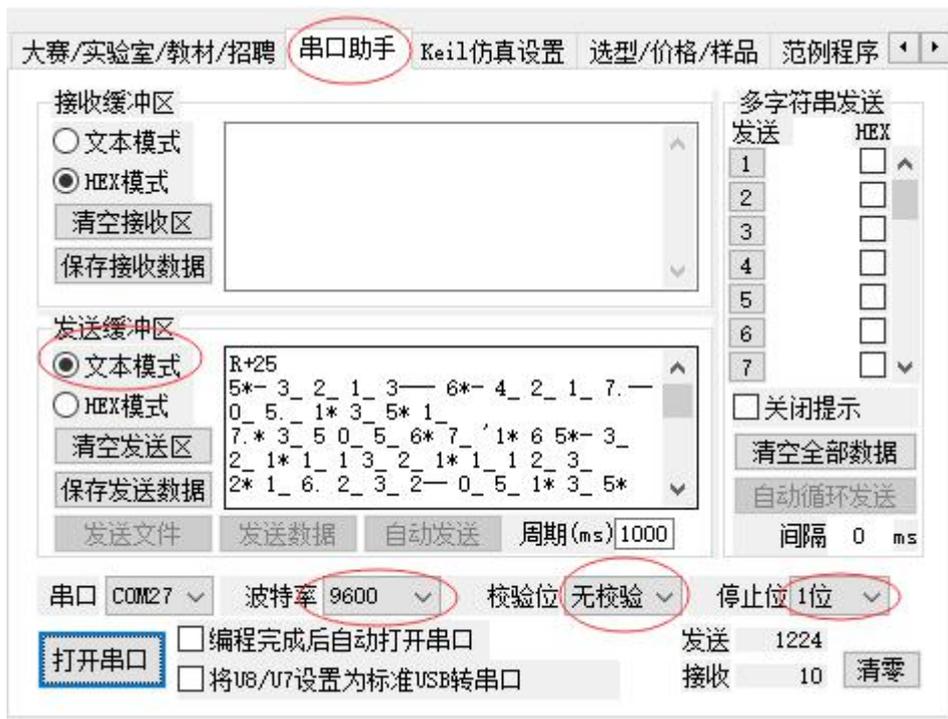
Hold down the MODE key and power on the clock. The digital tube shows "A001", indicating that the clock has entered the bell download mode.



Press the PLUS key again, and the digital tube will display "A002", indicating that the clock is ready to receive the ringtone.



Open the serial communication software, as follows:



Configure the serial port according to the parameters on the diagram, find the serial port to connect the clock, and open the serial port. Then the compiled music is copied to the sending buffer, and the point sending is OK. After the MCU receives the data, it will play the received music. If you feel that the music is unsatisfactory, you can press the PLUS key (showing "A002") and download the music again.

When the download is completed, the clock will be re-energized, and the clock will enter the normal display state. Choosing the music numbered 7 in the whole time or the alarm bell is the music just downloaded.