

- **Ping trig...echo...unit:** This block is inside the sonar package we added. We can use this block to get the time, distance in cm and distance in inches detected from the ultrasonic ranging sensor. In this experiment, we set the trig pin and echo pin of the sensor are P13 and P15 port of micro:bit. And the data we want to get is the distance in cm.

```

on start
  set distance to 0

forever
  set distance to ping trig P13
  echo P15
  unit cm
  if distance < 20 then
    servo write pin P1 to 180
    show string "Welcome!"
    pause (ms) 2000
    start melody power down repeating once
  else
    servo write pin P1 to 0
    pause (ms) 1000
  
```

- **Start melody repeating:** We use the **Start Melody Repeat** block to play a melody to remind the door is about to close, please be careful! When the melody ends, the door begins to close.
- **Download the program to micro:bit to see what happens.**

Result

When the distance detected by the ultrasonic sensor is less than 20 cm, open the door (the servo's shaft rotates 180 degrees), and the matrix LEDs of the micro:bit will display "Welcome". After 2 seconds, the buzzer will play a melody to warn that the door is about to close. Then, when the distance detected by the ultrasonic sensor more than 20 cm, the door start closing (the servo's shaft rotates 0 degrees).



How to apply ultrasonic ranging sensors to the car to make the car have an obstacle avoidance function?

Experiment 14 – Make an accurate clock

Instruction

Have you ever been late for school because you forgot to set the alarm clock? This is really embarrassing! Let's make an alarm clock with a RTC module together today, and say goodbye to being late!

Target

- Learn how RTC work and use it to make a clock with buzzer.
- Learn how to set time for RTC.

Required Parts

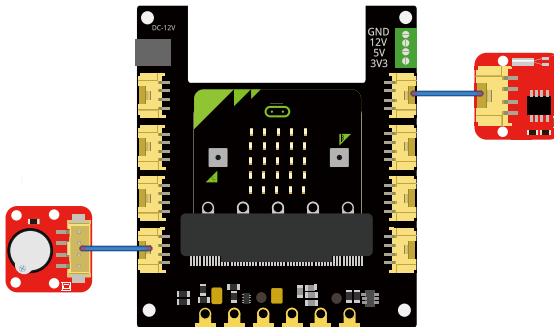
- Micro:bit x1
- Crowtail-Base shield for Micro:bit x1
- Crowtail-RTC x1
- Crowtail-Buzzer x1
- Crowtail-Cable x2
- USB cable x1

Hardware learning and connection

This tiny RTC module is based on the clock chip DS1307 which communicates with microcontrollers with I2C protocol. The clock/calendar provides seconds, minutes, hours, day, date, month and year information. The end of the month date is automatically adjusted for months with fewer than 31 days, including corrections for leap year. Besides, this module is really low power consumption, it can serve you more than a month with a CR1220 battery.



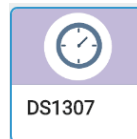
Connect Crowtail-RTC and Crowtail-Buzzer to I2C and P0 port of Crowtail-Base shield for Micro:bit. The hardware connections are as follows:



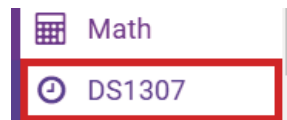
Programming and note

Before we using the RTC, we need to add an extension package for RTC(DS1307). Follow the steps below to add an extension package of RTC.

- **Step1:** Click on the Extensions, then search “ds1307” in the search bar.



- **Step2:** Add the DS1307 package to your Makecode and you can see it.



```

on start
  set year 2020
  month 2
  day 20
  weekday 3
  hour 7
  minute 0
  second 0

```

```

forever
  if hour = 7 and minute < 2 then
    start melody power up repeating once
    pause (ms) 1000

```

- **Set date and time:** We use this block to set the current date and time. In this case, we start the time from the beginning of the program, so the time needs to be set exactly the same as your local time, or you can set it faster because you need time to upload the program, otherwise the clock may be inaccurate.
- **And:** It is a logic **and** block. This combines two logical statements into one statement that returns true when both of the other statements are true and only true. In this experiment, when hour equal to 7 and minute less than 2, then if run the code inside if statement. Otherwise, the code inside if statement will not run.
- **Download the program to micro:bit to see what happens.**

Result

After uploading the program, the buzzer will start playing music for 2 minutes. Then, if you don't stop powering the micro: bit, the buzzer will play the "alarm" for 2 minutes every day starting from 7 am.



Can you display the time on the micro: bit's matrix LEDs in the format we see every day?

Experiment 15 – Distance display

Instruction

It takes too much time to scroll the messages on the micro: bit's matrix LEDs, which makes viewing very inconvenient. But don't worry, you will learn a better way to display messages or data from this experiment. It does not require you to spend time waiting for the information to scroll. You can see all the messages and data at a glance. This method is to use OLED for display.