

HS-BIO Smart Lockbox Learning Kit assembly instructions



This product must be used with (U+ PROGRAM CARD)
U+ PROGRAM CARD SUPPORT ARDUINO IDE, PROGRAMMING SOFTWARE SUCH AS MIXLY, ARDUBLOCK, SCRATCH, ETC



Warning: Persons under the age of 14 must be under the guidance of a professional teacher or knowledgeable adult!

The assembly and debugging of the product require the use of relevant tools, please take safety precautions when assembling to avoid injury!

Product Introduction

The intelligent password box is a combination of rotary encoder, collision sensor, four digit LED Nixie tube, steering gear and other accessories.

This kit can set passwords, unlock, store items, and other functions.

You can also modify sample programs or write new programs yourself through programming software such as Arduino IDE and Mixly to control the smart password box.

Preparation of tools and assembly precautions

Self provided assembly tools: 3mm diameter cross screwdriver, scissors.

Self provided debugging tools: 1 computer with Windows 7, 8, 10, and 11 operating systems, 1 U+program card, 1 data cable, and 1 pair of 18650 lithium batteries.

If you want to easily assemble the kit, you need to read the assembly instructions carefully and assemble it step by step.

Safety warning

1. This product is a teaching and experimental product. Please do not use its function as a daily routine item, as it may be unstable.
2. When you are not using this product, please turn off the power switch on the battery box and remove the battery to keep it safe.

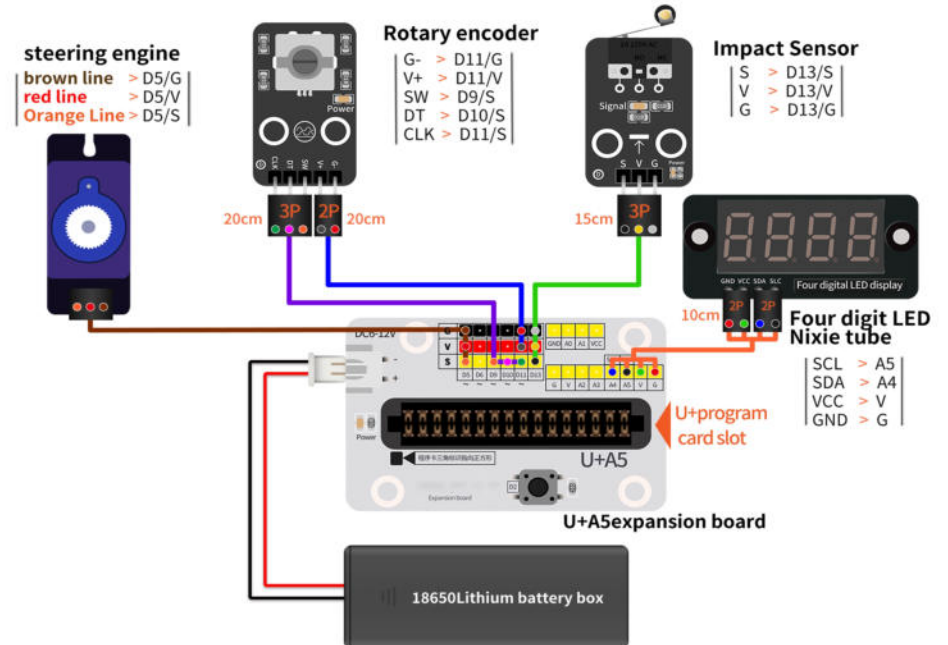
List of experimental materials

Self provided materials are not included in this product kit and must be provided by oneself

	name		picture		name		picture		name		picture
1	micro usb (self-provide) + U+program card (self-provide)	1*		2	18650 lithium battery (self-provide)	2*		3	hinge + Velcro adhesive backing + ribbon	2*	
4	18650 Lithium battery box	1*		5	Button press cap + 4mm screw + 7mm screw	1* 18* 19*		6	9g steering gear + Steering wheel	1* 1*	
7	Rotating cap + Rotary encoder	1* 1*		8	Impact Sensor	1*		9	Four digit LED Nixie tube	1*	
10	Main structural plate	1*		11	U+A5 expansion board	1*		12	3PDupont Line (15cm/20cm) + 2PDupont Line (20cm) + 2PDupont Line (10cm)	1* 1* 2*	

Circuit wiring diagram

DuPont line colors are randomly distributed, please refer to the identification information corresponding to the access port for line connection!

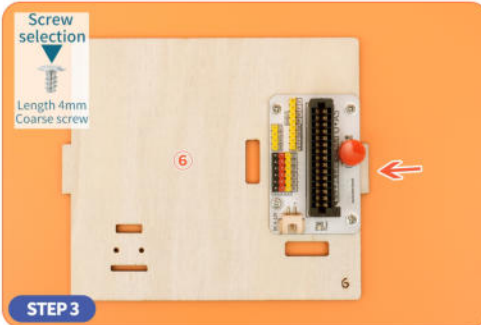


Start assembly



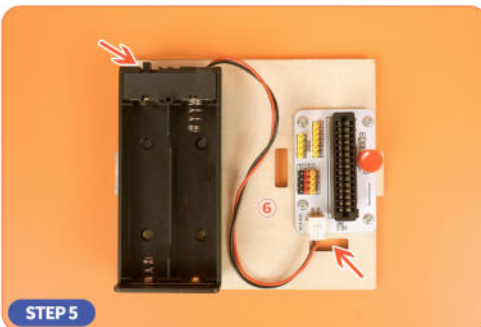
STEP 1

- Prepare all accessories and wooden board materials, and carefully check the number on the materials when assembling them.
(The wooden board has a number on the front side and no number on the back side)



STEP 3

- Install the U+A5 expansion board onto board ⑥ using 4mm thick grain screws. (Pay attention to installation orientation)



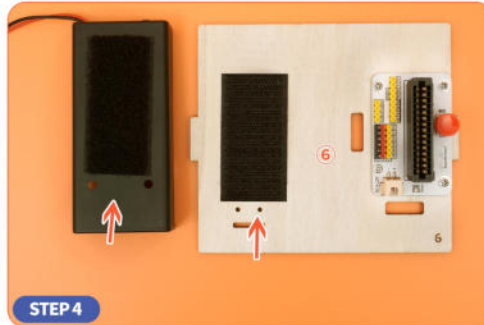
STEP 5

- Flip the battery box over and stick it on the front edge of board ⑥ (note that the battery box opening key is facing back). Refer to the [Circuit Wiring Diagram] and insert the battery box wire port into the [DC 6-12V] power interface on the expansion board.



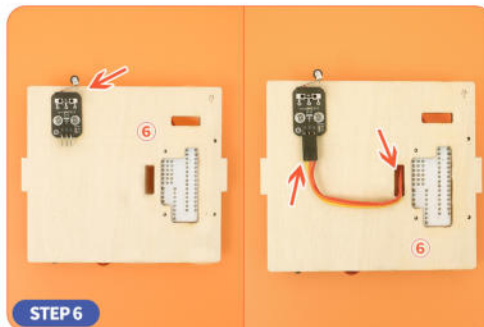
STEP 2

- Install the red button cap on the U+A5 expansion board.



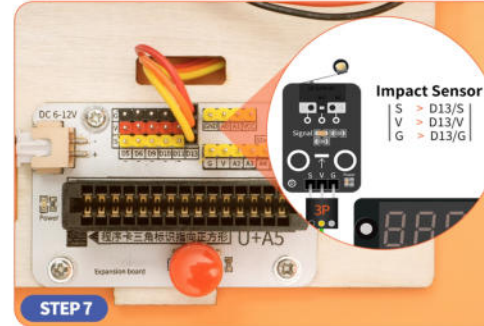
STEP 4

- Attach the curled surface of the Velcro to the back of the battery case, and the curled surface of the Velcro to the left of board ⑥. Pay attention to sticking it as close as possible to the front of board ⑥



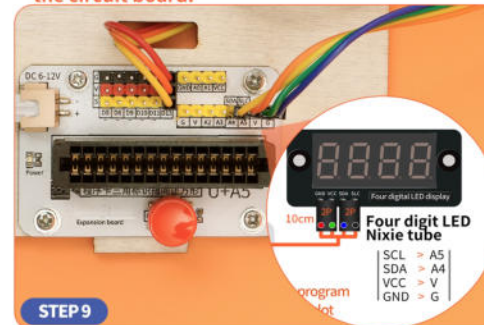
STEP 6

- Flip board ⑥ over to the back, install the collision sensor onto the back of board ⑥, and fix it with 4mm coarse grain screws (pay attention to the installation direction). Insert a 15cm 3P DuPont cable port into the collision sensor and pass it through the ⑥ board cable hole.



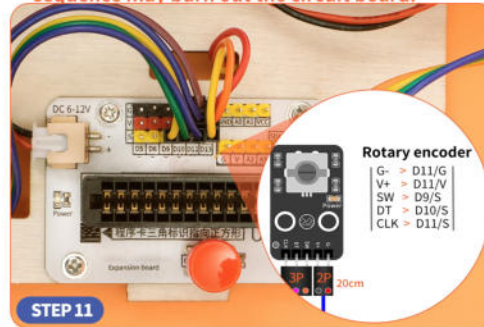
STEP 7

- Refer to the [Circuit Wiring Diagram] and STEP6 to plug the DuPont wire port of the collision sensor into the [D13] interface on the expansion board. Please check the port wire sequence before inserting it. Inserting the wrong wire sequence may burn out the circuit board.



STEP 9

- Insert the four digit LED Nixie tube DuPont line port into the [A5, A4, V, G] interface on the expansion board according to the [Circuit Wiring Diagram] and STEP8. Please check the port wire sequence before inserting it. Inserting the wrong wire sequence may burn out the circuit board.



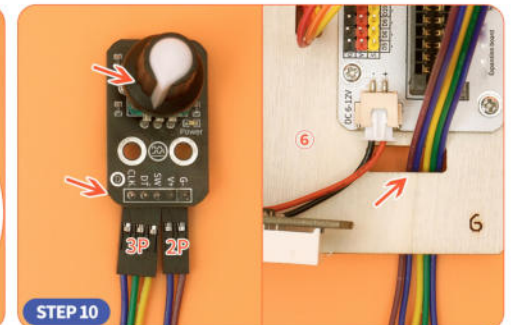
STEP 11

- Refer to the [Circuit Wiring Diagram] and STEP10 to plug the 2P DuPont wire port of the rotary encoder into the [D11/G, D11/V] interface on the expansion board, and then plug the 3P DuPont wire port into the [D9/S, D10/S, D11/S] interface on the expansion board. Please check the port wire sequence before inserting it. Inserting the wrong wire sequence may burn out the circuit board.



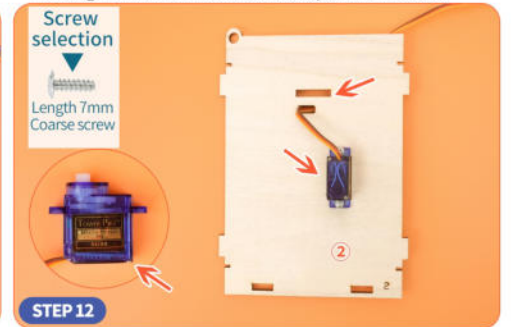
STEP 8

- Plug two 10cm 2P DuPont cable ports into the four digit LED Nixie tube ports [SLC, SDA] and [VCC, GND] respectively.



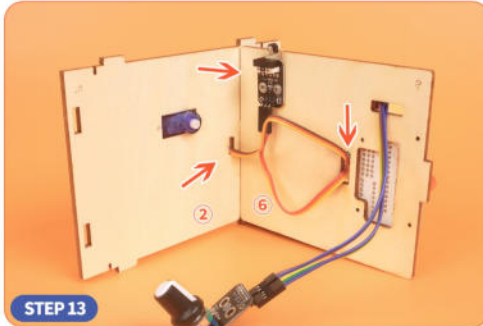
STEP 10

- Firstly, install the rotary cap on the rotary encoder, then plug one 20cm 3P DuPont cable port into the rotary encoder ports [SW, DT, CLK], and then plug one 20cm 2P DuPont cable port into [G -, V+]. Finally, pass the two DuPont cables from the back of board ⑥ through the cable hole to the expansion board.



STEP 12

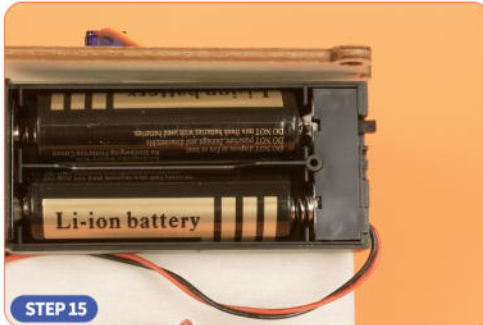
- Install the steering gear with the bottom facing upwards on the front of board ②, with the steering gear wire facing upwards passing through the wire hole of board ②, and fix it with a 7mm thick thread screw. (Pay attention to the orientation of the steering gear wire)



- Combine the gear side of the steering gear on board ② with board ⑥ (pay attention to the installation direction) and thread the steering gear wire through the wire hole on board ⑥.



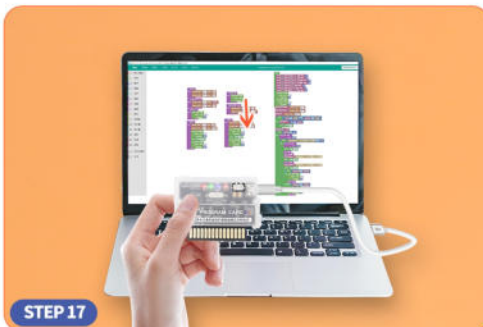
- Refer to the [Circuit Wiring Diagram] and STEP13 to plug the servo wire port into the [D5] interface on the expansion board. **Please check the port wire sequence before inserting it. Inserting the wrong wire sequence may burn out the circuit board.**



- Install the 18650 battery into the battery box.



- Install the battery cover and turn on the power supply. The power switch is on the side with the wire, and [ON] indicates power on, OFF indicates power off. (This step is to turn the steering gear shaft back to normal when powered on)



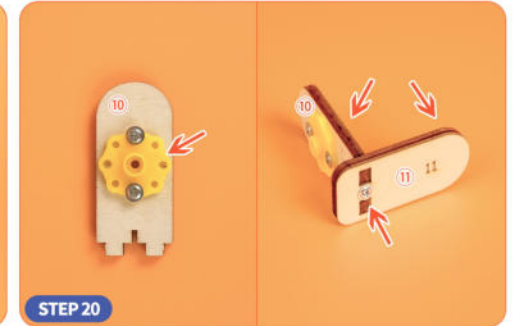
- Upload the first sample program of the suite to the U+program card using the Missy Mixly software.



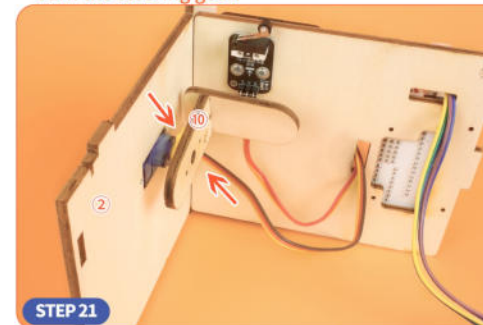
- Insert the program card into the card slot on the expansion board. **Pay attention to the insertion direction of the program card, with the triangular identification of the program card pointing towards the square identification of the expansion board slot.**



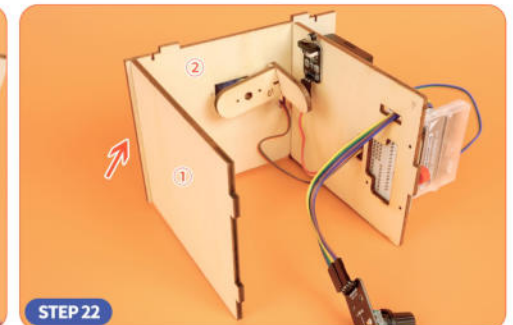
- Turn the switch to the OFF direction and turn off the power. **Attention: Please install the steering gear disc when the power is off. When the steering gear is powered on, there should be no mechanical resistance (such as screwing or breaking). Resistance greater than the torque of the steering gear will burn the steering gear.**



- Install the protrusion of the steering gear plate facing upwards on board 10 and secure it with 4mm coarse grained screws. Then, install board 11 in the opposite direction of the steering gear plate on board 10 and secure it with 7mm coarse grained screws.



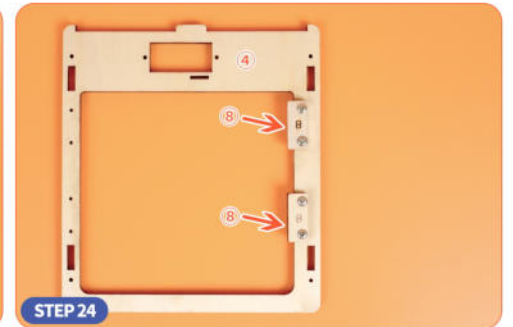
- Install the steering gear plate of board 10 on the steering gear and secure it with 7mm coarse grained screws. **(Note that during installation, plate 10 should be kept perpendicular to plate 2 and the steering gear should not be rotated.)**



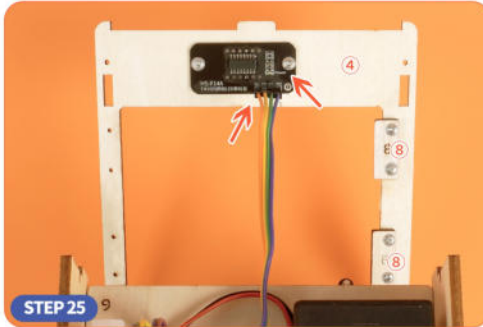
- Insert board ① onto board ②.



- Insert boards ① and ⑥ onto board ③ respectively. **(Note that the circular hole of plate ③ faces back)**

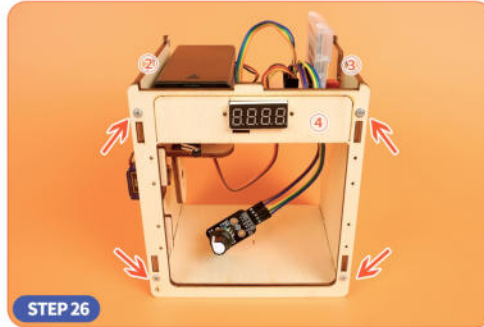


- Install two ⑧ boards on the wide side of the back of ④ board, and fix them with 7mm thick grain screws.



STEP 25

- Install the four digit LED Nixie tube on the back of board ④, and fix it with 4mm coarse screw. (Pay attention to installation orientation)



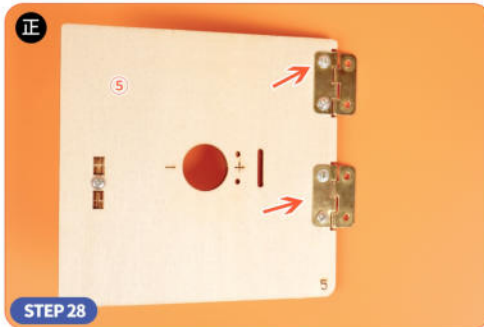
STEP 26

- Install the front of board ④ onto boards ② and ③, and secure with 7mm thick grain screws. (Pay attention to installation orientation)



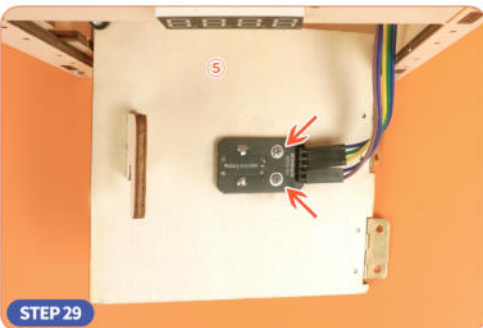
STEP 27

- Install the length section of board ⑦ facing upwards on the back of board ⑤, and fix it with a 7mm thick grain screw on the front.



STEP 28

- Install the two hinges with the shaft facing downwards onto the edge of the front of board ⑤ and secure with 4mm coarse grain screws.



STEP 29

- Install the rotary encoder horizontally onto the back of board ⑤ and secure it with 7mm thick grain screws. (Pay attention to installation orientation)



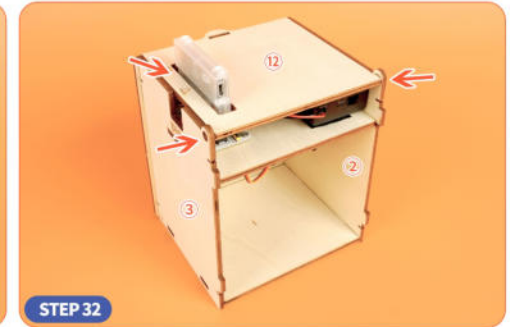
STEP 30

- Install the front of board ⑤ on the front of board ④, and then fix the other end of the two hinges on board ④ with 4mm coarse grain screws.



STEP 31

- Sort out all the wires and tie them with tie straps, then use scissors to trim off any excess tie straps. (Attention: Pay attention to safety when using scissors to avoid injury)



STEP 32

- Clip the No.17 board into the circular holes of the ② and ③ boards.



STEP 33

- Align board ⑨ and install it on boards ② and ③ (note that the opening and closing of board ⑨ align with the battery box opening key), and fix it with a 7mm thick grain screw. This step completes the installation of the smart password box!



STEP 34

- Turn on the power button.



STEP 35

- Function 1: The initial password of the smart password box is 1234. When entering the password, the encoder advances by 1 digit every time you press it. When you rotate, you select a number. Once the password is entered, press the rotary encoder again.



STEP 36

- If the password is correct, the rudder will emit an unlocking sound to open the smart password box.



STEP 37



STEP 38

- Function 2: Resetting the password requires the password box door to be opened before it can be set. Secondly, the password reset button needs to be held down until the password setting is completed before it can be released. Press and rotate to select the password number. (Note that the password for 0000 cannot be set)

- You can modify the code of the sample program yourself to change the execution results of the smart password box, and you can also rewrite the program yourself to control the smart password box. In short, the Hello STEM suite will make your learning more enjoyable:

After assembly, you also need to check if the installation is correct to avoid danger during debugging!



1. Carefully check the entire kit for any incorrect accessories. If any accessories are installed incorrectly, it may cause the entire kit to malfunction.
2. Carefully refer to the circuit wiring diagram to check if the wire connections are correct. Incorrect wire connections can cause circuit shorts, burn out electronic components, and in severe cases, lead to dangerous situations such as fire and explosion.
3. Carefully check if the pins at the bottom of the circuit board accessories are in contact with other metals. If there is contact, please check if any accessories are not installed, causing the circuit board to not be isolated from other metals.
4. Please check the power supply type and battery model used in this kit. Incorrect use of the power supply or battery can lead to dangerous situations such as fire and explosion.
5. If you encounter any questions that you do not understand, please contact the online customer service on the official service website or consult relevant professionals during working hours from 9:00 to 18:00 on Monday to Saturday. Do not operate blindly, otherwise there may be danger.

Refer to the process below to debug and experiment with the kit

Download and install the U+ program card driver and install the programming software.

Download the sample program to the U+ program card with a data cable.

Insert the program card into the U+ program card slot of the kit.

Turn on the kit power switch and the kit starts working.

During the debugging process, you may encounter the following issues.
Please refer to the prompts below to see if you can troubleshoot!

The smart password box cannot function properly after installation.

1. Check for loose and incorrect wiring, please refer to the circuit diagram for details.
2. Check if the battery is already low, and it is recommended to replace it with a new one.
3. Check if the DuPont wires of the sensor and expansion board are connected correctly, please refer to the circuit wiring diagram.
4. Check if the U+program card has downloaded the program.
5. Check if the U+program card is inserted backwards. If the program card indicator light is not on or dims, please immediately remove it. Inserting it backwards can cause a short circuit. Please refer to the card insertion method of STEP 18 for card insertion.

