Labotronics

Tissue Slide Stainer

LB-20TSS

Index

1. Safety Measures

1) The user should read this user manual carefully before first installation and operating the machine, and put this manual beside the instrument to refer to it when meeting problems.
2) Before operation, read carefully the operation instruction first to know the operation steps and process.
3) Only staff who are familiar with basic regulations on safety at work and accident prevention and are trained in the use and operation of this instrument should be allowed to handle this instrument.
4) The instrument may only be transported or moved in an upright position, always, the tilt angle should not exceed 45°C.
5) After installation, the fixed feet have to be adjusted off the ground before transporting or movement.
6) The input voltage has been preset at the factory, please check this setting complies with your local power requirement before connecting the instrument to the mains power.
7) Use the power cord provided. If changing the power cord, ensure the power cord has an earth wire.
8) The instrument must be installed in a ventilated environment, don't operate in rooms with an explosion hazard.
9) The protective parts on the instrument and accessories must neither be removed nor modified, to avoid injury to the instrument or the human body.

2. Introduction

Tissue Slide Stainer LB-20TSS is an automatic unit with high dyeing effect. Features electrical modular design with high-speed mechanical arm. With 10.4-inch color touch screen display and continuous upload loading capacity ensure fast, efficient and stable performance with optimum user experience.

3. Features

1. An automatic tissue slide stainer, easy-to-use
2. High dyeing effect and throughput ensure stability
3. Electrical modular design for better functioning
4. High-speed mechanical arm for fast operation
5. 10.4-inch color touch screen for user friendly interface
6. Real time display of operation interface
7. Can process both conventional and special dyeing

4. Specifications

Model No.	LB-20TSS
Slide capacity	30
Loading capacity	10
Total sites	36
Reagent sites	26
Washing sites	5
Uploading sites	2
Downloading sites	3
Tank volume	500 ml
Display	10.4-inch touch screen
Program storage	10 sets
Power supply	AC 220 V±10%, 50/60 Hz
Power	200 W
Packaging dimension (L×W×H)	1050×615×590 mm
Gross weight	150 kg

5. Applications

Tissue slide stainer is used to automate the staining of peripheral blood and other hematologic smears across cytology, histology, immunology, microbiology, biotechnology, fisheries, research & medical institutes, pharmaceuticals, etc.

6. Instrument Introduction

6.1 Instrument Structure

1) The stainer will be used for normal and special dyeing of the biopsy in the pathology laboratory.
2) Both normal dyeing and special dyeing can simultaneously or independently process and achieve a qualified dyeing effect.
3) It mainly consists of rack transfer system, reagent management system and washing system, etc.

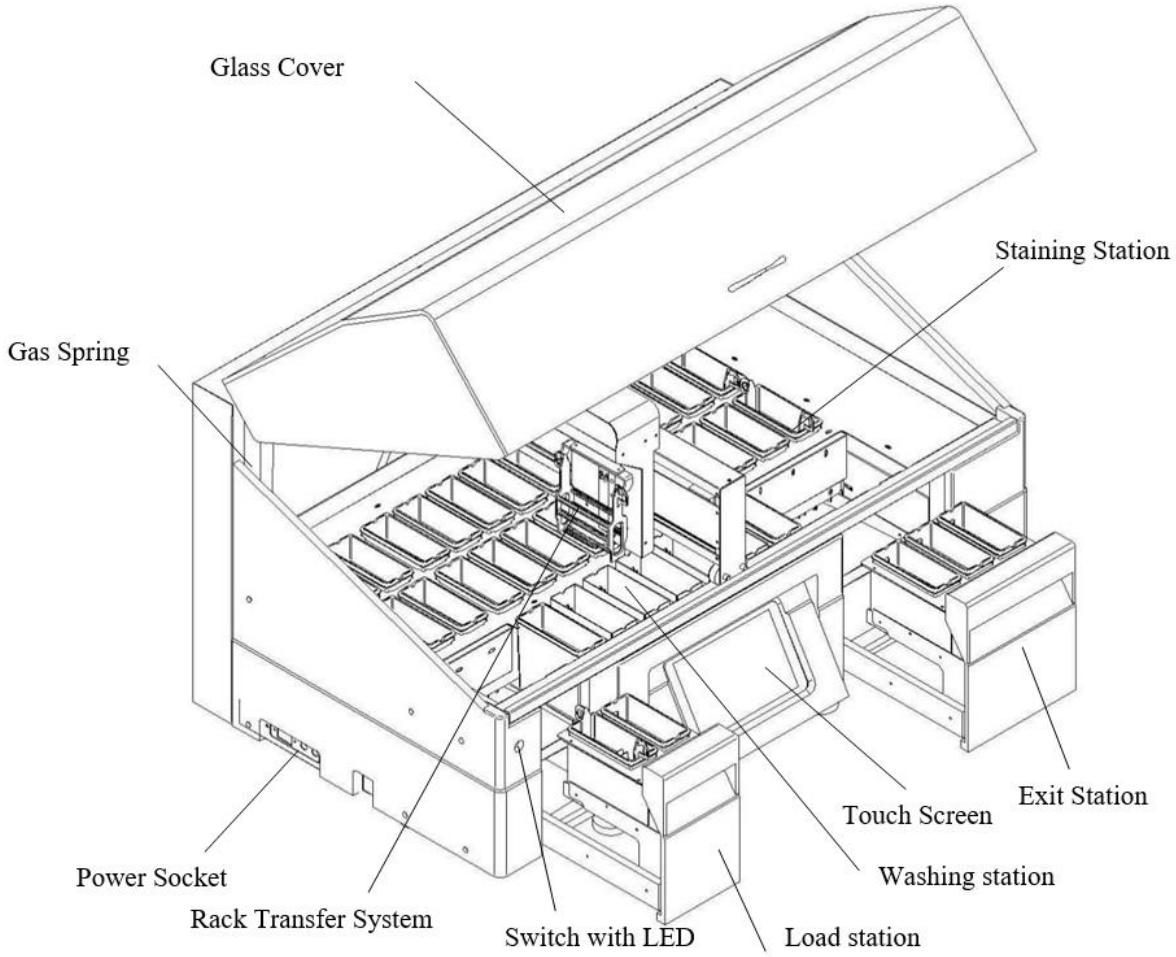


Figure-1

4) **Staining Racks transfer system:** Put the staining racks with slides into the dye of the corresponding station as the program set by the user.
5) **Solution Management System:** Solution management and its placement position and its setting of corresponding staining priority.
6) **Washing system:** To meet the automatic water washing function when multiple staining racks are running at the same time, there are five water washing stations in total.

7) **Heating of staining station:** The self-locking switch with lamp is used to control the heating of 1, 2, 13, and 14 stations. Press this control button, the light is on, and the heating is on. After about 1 hour, the station temperature can reach 30-35 ℃.
8) Press the button again, the button pops up, the light goes out, and the heating is off. The temperature of the reagent gradually returned to room temperature.

6.2 Back Panel Cover Plate

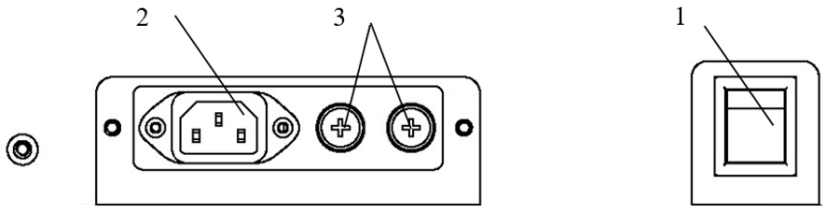


Figure-2

1— **Power switch:** AC220V power switch
2— **Power Socket:** AC220V socket (with Fuse 10A)
3— **Fuse:** Equipped with 2 fuses bgdp-5a (Φ 5 × 20)

6.3 Heat Button

1) Stain Heat
The switch is used to control the heating of the staining tank numbers 2, 3, 14, and 15. Press this switch button, the light will be on, and the heating will start. The reagent temperature will reach 30-35 ℃ in about 1 hour. Press the switch button again, the button pops up and the light goes off, and the heating is off. The reagent temperature gradually returns to room temperature.

2) Oven Heat
The switch is used to control the heating of the oven tank no: 1 and 13. If the user needs to oven heat, turn on the oven heating switch 10 minutes in advance. Turn off the control switch when you don't need the oven heat.

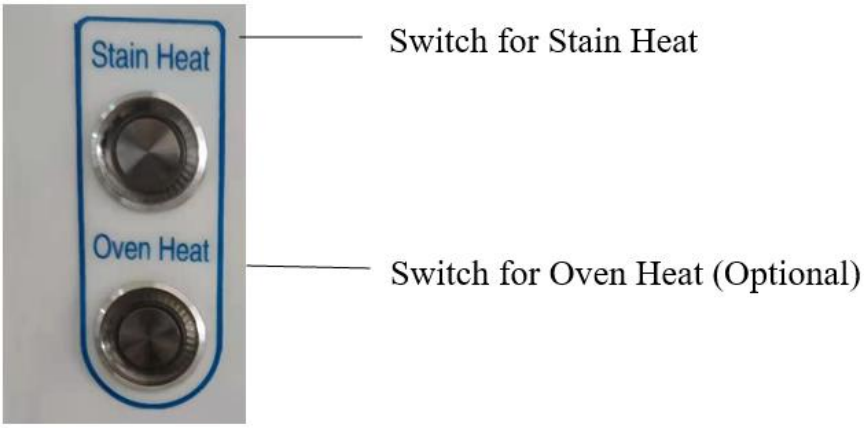


Figure-3

7. Installation

7.1 Unpacking

To unpack, pry open the steel buckle fixing the wooden box by slotted screwdriver, and open the top cover of the wooden box, take out the box of LCD touch screen and bracket, the waste bottle, the spare bottles, the tray, the instruction materials, etc., and then remove the side plates around. The machine is too heavy. It needs 4 people to lift the equipment out of the wooden box, and put it on a stable ground, and gently push it to the working area.

7.2 Preparation

1) Put the instrument on a flat and solid working platform, and connect the tap to the water supply network with the connector accessories attached to the instrument according to the situation of the water pipeline on site.

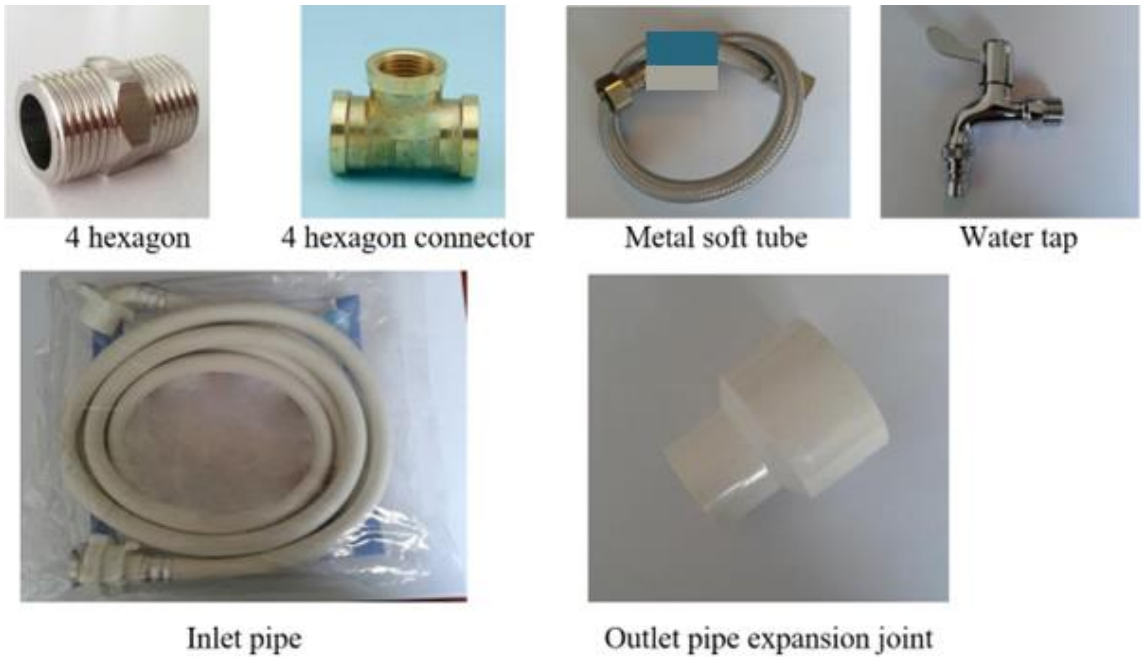


Figure-4

2) First turn off the water tap, insert one end of the water inlet pipe into the water tap, and connect the other end to the water inlet on the right side of the stainer.
3) Turn on the water tap and check whether there is water seepage at each connection of the water inlet pipe.

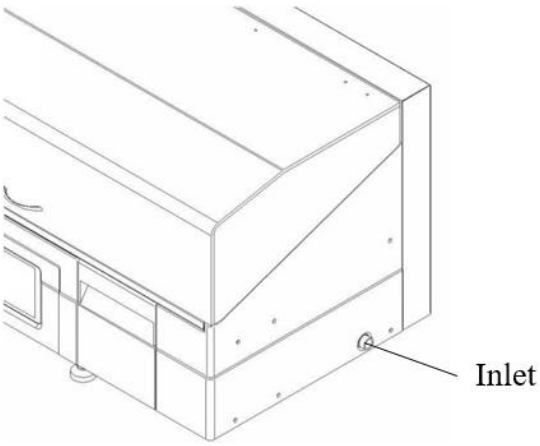


Figure-5

4) Place the drain at the sewer.
Note: Combined with the use characteristics of the instrument, the working site needs to have a water pipe, and be equipped with a water pipe. It is recommended that the user configure a special ventilation cabinet for the dyeing machine. To facilitate the placement of the drain pipe, the attached outlet pipe expansion joint can be placed at the outlet of the drain pipe.

7.3 Installation Guide

Open the box and put the machine on a flat and tight working platform. (The machine is heavy and needs 3-4 people to lift it out of the box)

7.3.1 Installation of water inlet and outlet pipes

1) Installation of water inlet

Check the situation of the faucet on site, the tap is connected to the water pipe by using the connector accessories provided by the instrument.

Figure-6

First turn off the tap and connect one end of the water pipe to the tap and the other end to the water inlet on the right side of the machine.

Figure-7

Turn on the faucet and check whether there is water leakage at each joint of the pipe. If there is water leakage, find out the cause and deal with it until there is no water leakage.

2) Installation of water outlet pipes

Install one end of the drainage pipe accessories of the machine, and fasten it with hoops, and place the other end at the sewer pipe.

Figure-8

Do not bend and bend the sewer pipe to ensure the smooth launching.

7.3.2 Important Notes

1) Do not tilt to ensure its stability.

Figure-9

The rack should be placed in the drawer straight, and do not tilt, and the drawers load and unload site should be in place.

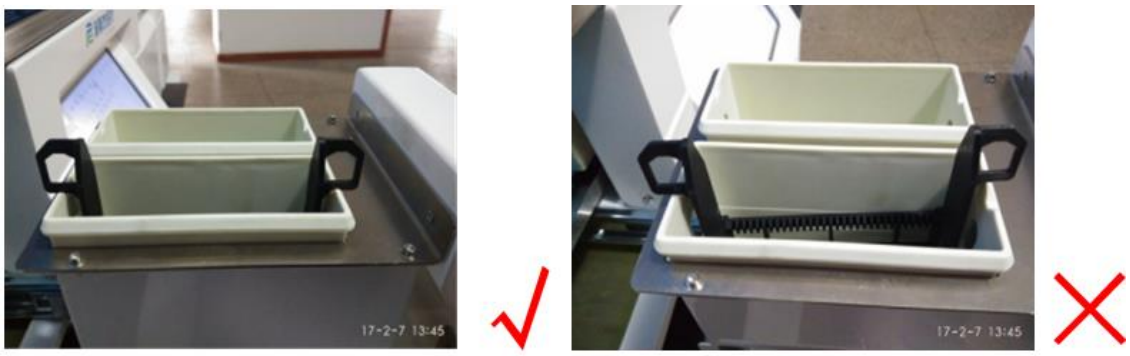


Figure-10

It is forbidden to HAND into the machine when it is running. If there is any special situation, please pause first. When the hood is opened, you can operate by hand without hearing the buzzer.

7.4 Storage Conditions

1) Without the crash of the direct rain or snow, the products after packing can adapt to different kinds of transportation modes.
2) The products after packing can be stored under (0～40) ℃. Under the condition of no acid, alkali, and no corrosive gas, the products can be stored.

8. Software Operations

Preparation: According to different dyeing methods, the user configures the required dyes and places them into the tanks, and marks them.
Note: The tank with BROWN color with special material that is better to use for: Xylene, hydrochloric ethanol, alcohol, haematoxylin. The White color is better used for alcohol.

8.1 Setting up of the Instrument

Reliable power connection, and then turn on the instrument, the LCD touch screen will display the main menu after program initialization several minutes as shown in the figure.

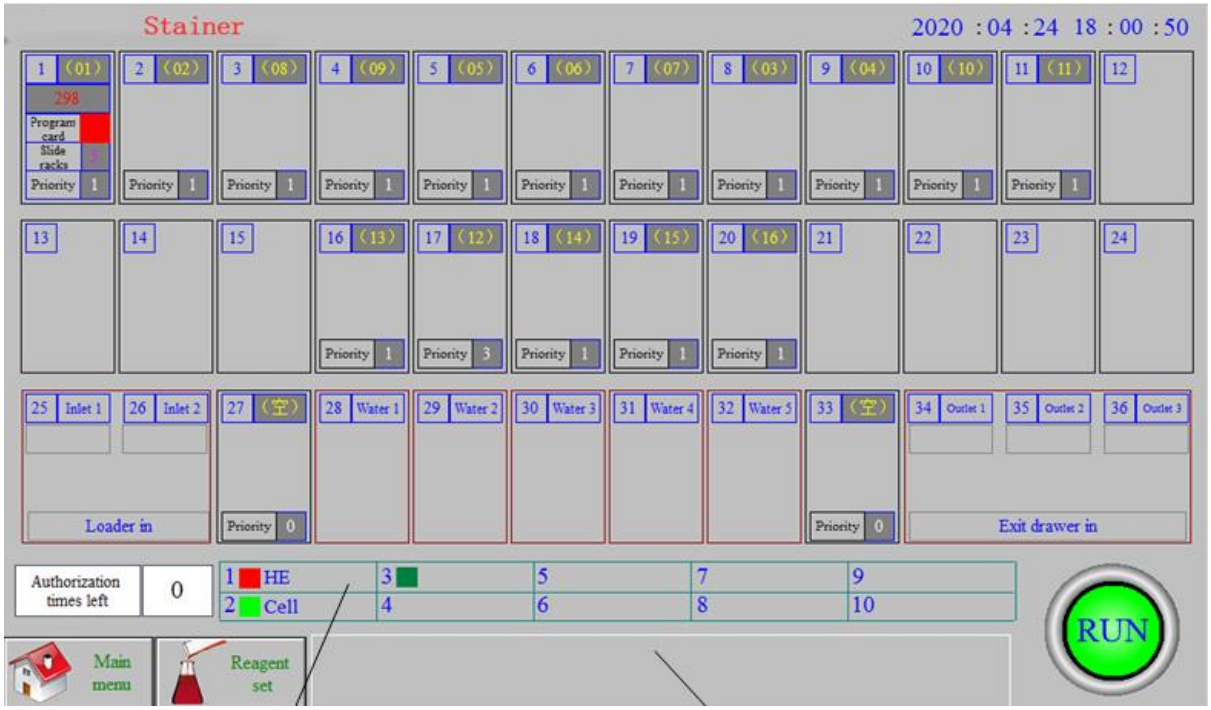


Figure-11

Note: If the buzzer sounds, check the prompt information of the alarm & notes toolbar.
The Buzzer sounds possibility caused by:

1. The glass cover doesn't close in a good situation.
2. The drawer of the exit is not closed in a good situation.
3. The stations of exit are all occupied by staining racks.

8.2 Menu

Click "**Main Menu**" and go into the interface which includes 8 management buttons.

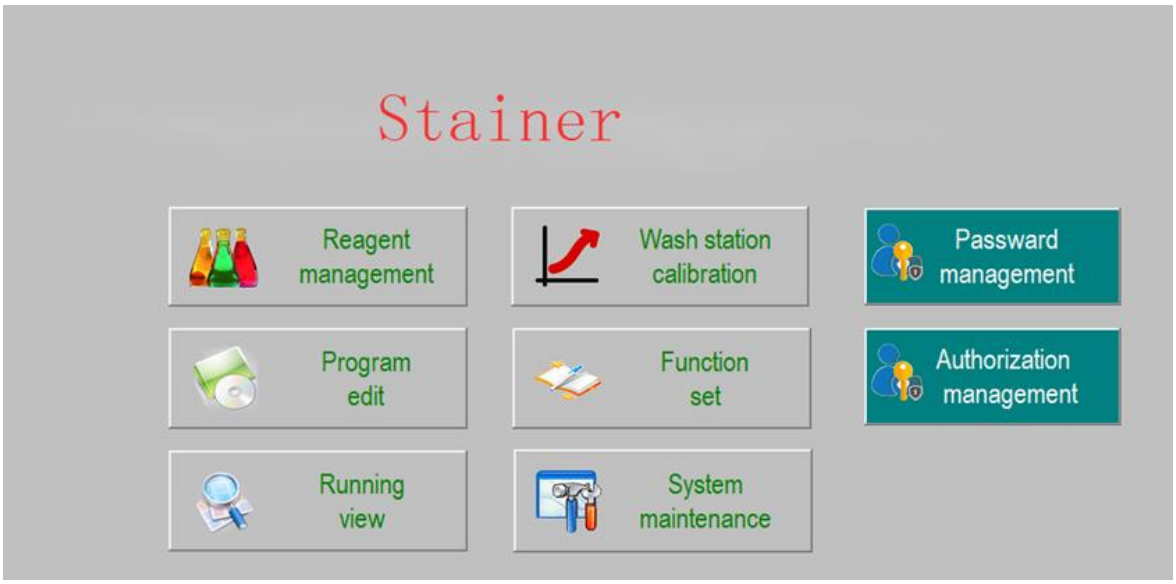
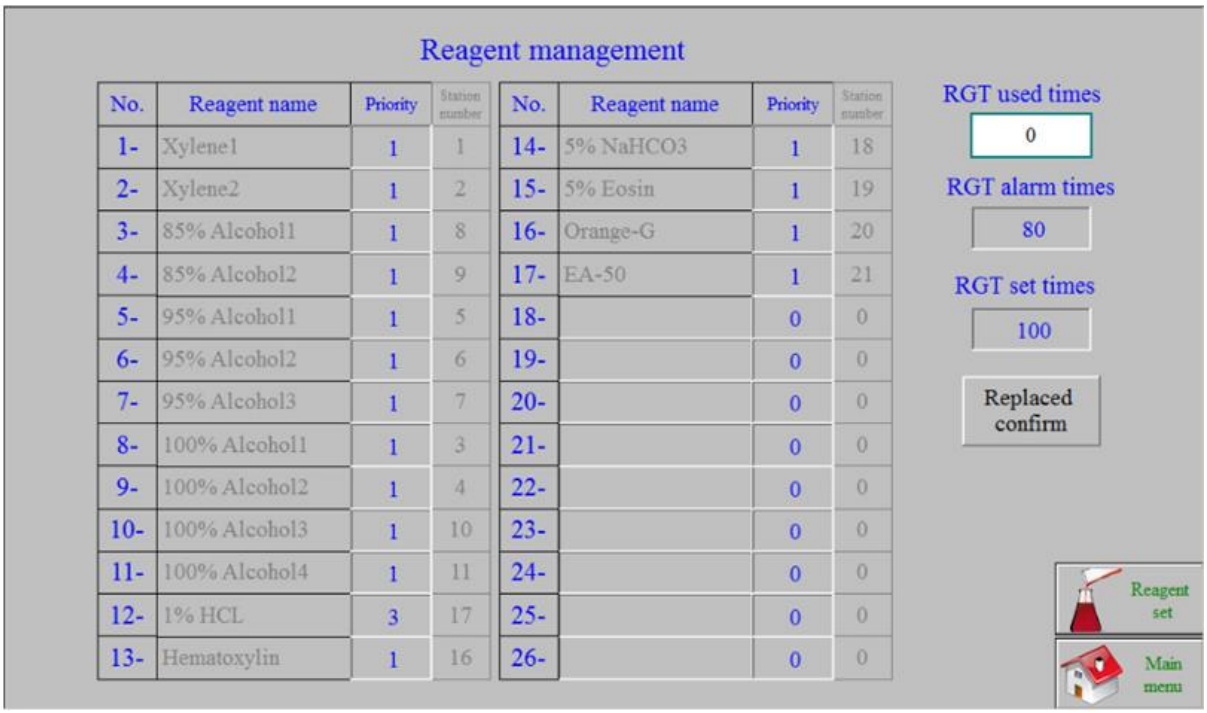


Figure-12

8.3 Reagent Management

Click "**Reagent Management**" and go into this window. In the figure, the designated site is displayed in gray font, and its station number is displayed in the table. The unspecified site is displayed in blue font, and its number is 0.



No.	Reagent name	Priority	Station number	No.	Reagent name	Priority	Station number
1-	Xylene1	1	1	14-	5% NaHCO3	1	18
2-	Xylene2	1	2	15-	5% Eosin	1	19
3-	85% Alcohol1	1	8	16-	Orange-G	1	20
4-	85% Alcohol2	1	9	17-	EA-50	1	21
5-	95% Alcohol1	1	5	18-		0	0
6-	95% Alcohol2	1	6	19-		0	0
7-	95% Alcohol3	1	7	20-		0	0
8-	100% Alcohol1	1	3	21-		0	0
9-	100% Alcohol2	1	4	22-		0	0
10-	100% Alcohol3	1	10	23-		0	0
11-	100% Alcohol4	1	11	24-		0	0
12-	1% HCL	3	17	25-		0	0
13-	Hematoxylin	1	16	26-		0	0

Figure-13

8.3.1 Reagent name and its priority

1) Edit the Reagent name as the figure shows.

Figure-14

2) **Normal Reagent Name:** Xylene I, II, III, VI, V, 95% alcohol I, II, III, IV, 100% alcohol I, II, III, IV, 80% alcohol I, II, 70% alcohol, distilled water, Haematoxylin, 1% Hydrochloric alcohol(1% ammonia water), 0.5% eosin, etc.
   Note: The reagent name cannot be repeated (The same kind of reagent can be distinguished by I, II, and III)
3) **To modify or clear the reagent name:** Press the backspace or clear keys. The reagent name of designated station position cannot be modified (gray character). If it needs to be modified, you can enter the reagent management interface, find its position to click, and delete the reagent(i.e., remove the reagent name in the station position), and return to the Reagent management interface with the blue character at this time
4) **Reagent priority setting:** The Reagent has 1-3 priorities, which are mainly determined according to the soaking time of the tissue in stains. The shorter time and its priority is high. The highest level is 3. For example, 1% Hydrochloric alcohol is generally set as level 3.
   Note: When more staining racks are running at the same time, the high priority will be executed automatically.
5) **Early warning of reagent used times:** When the used number of racks reaches the set number, users can be reminded to change the reagent in time. After the reagent is renewed, press the confirmation key, and the number of times in the used times column will return to zero. (The number of reagent early warning times and setting times can be set according to the usage of dye)

8.3.2 Regent replacement (Assign the station position to reagent)

1) Click the Reagent Station number in the figure-14 and go into this figure.

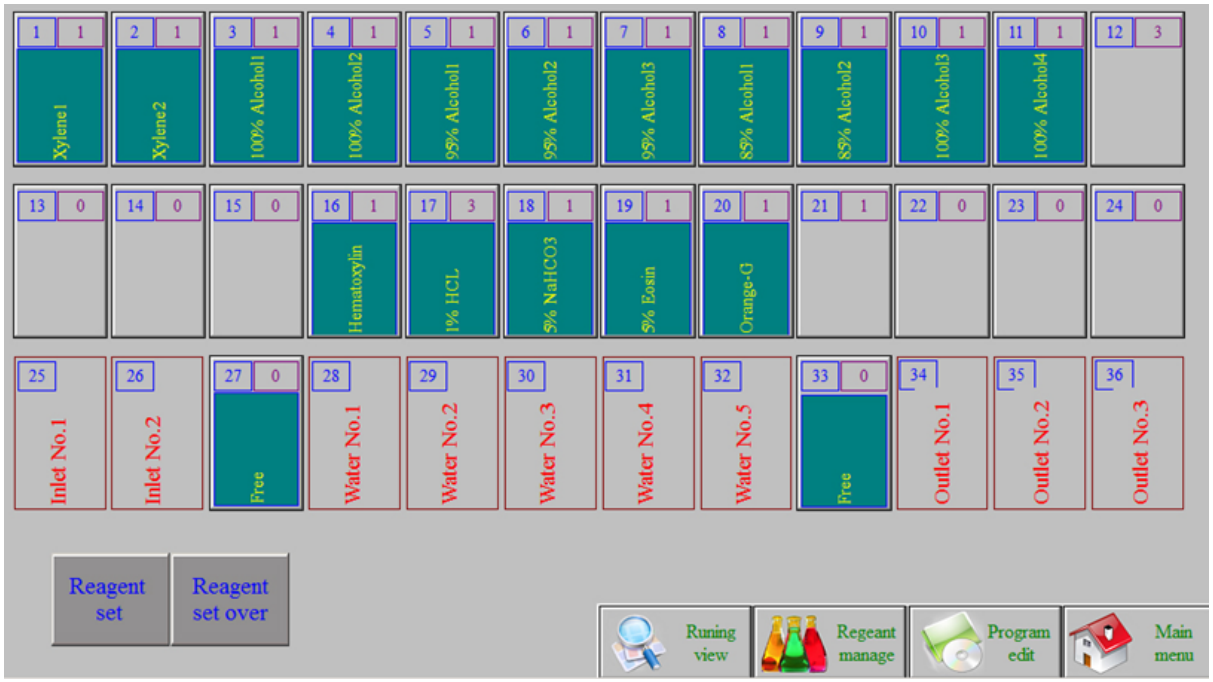
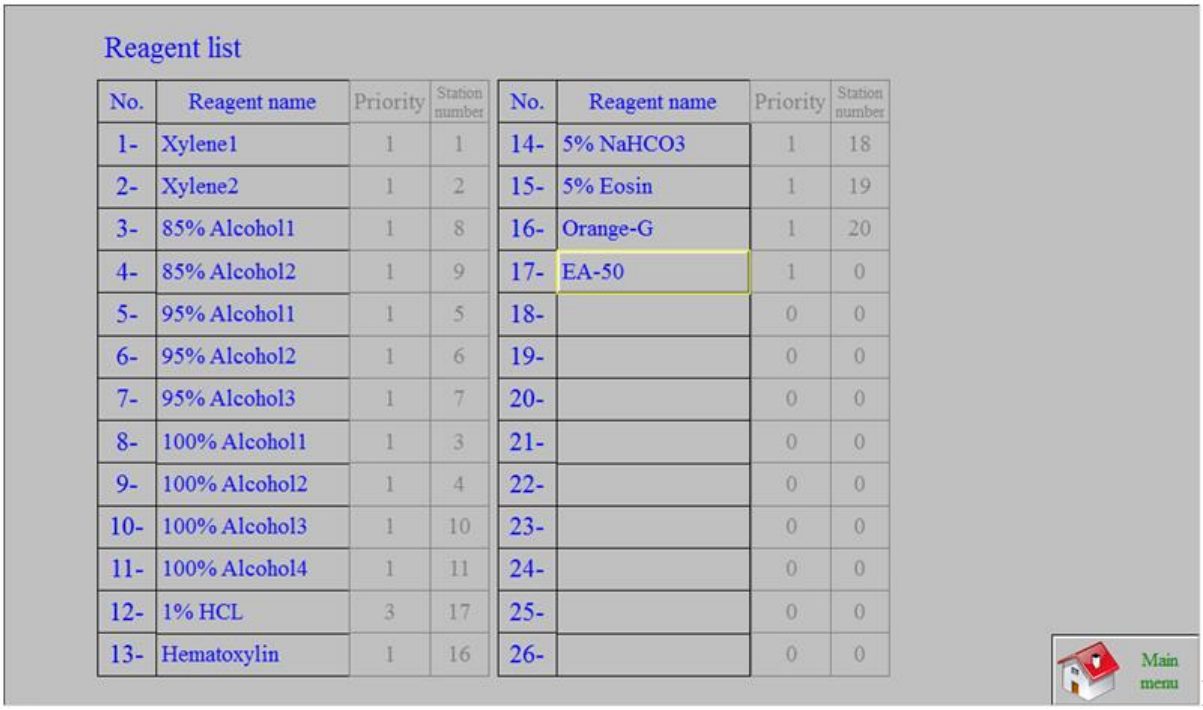


Figure-15

2) The user put the corresponding reagent to the station firstly, and then places it on the corresponding position in the instrument. Click the corresponding position icon in the interface of figure to enter the reagent management interface. At this time, the reagent name in the reagent management interface is blue highlighted, as shown in the figure.



No.	Reagent name	Priority	Station number	No.	Reagent name	Priority	Station number
1-	Xylene1	1	1	14-	5% NaHCO3	1	18
2-	Xylene2	1	2	15-	5% Eosin	1	19
3-	85% Alcohol1	1	8	16-	Orange-G	1	20
4-	85% Alcohol2	1	9	17-	EA-50	1	0
5-	95% Alcohol1	1	5	18-		0	0
6-	95% Alcohol2	1	6	19-		0	0
7-	95% Alcohol3	1	7	20-		0	0
8-	100% Alcohol1	1	3	21-		0	0
9-	100% Alcohol2	1	4	22-		0	0
10-	100% Alcohol3	1	10	23-		0	0
11-	100% Alcohol4	1	11	24-		0	0
12-	1% HCL	3	17	25-		0	0
13-	Hematoxylin	1	16	26-		0	0

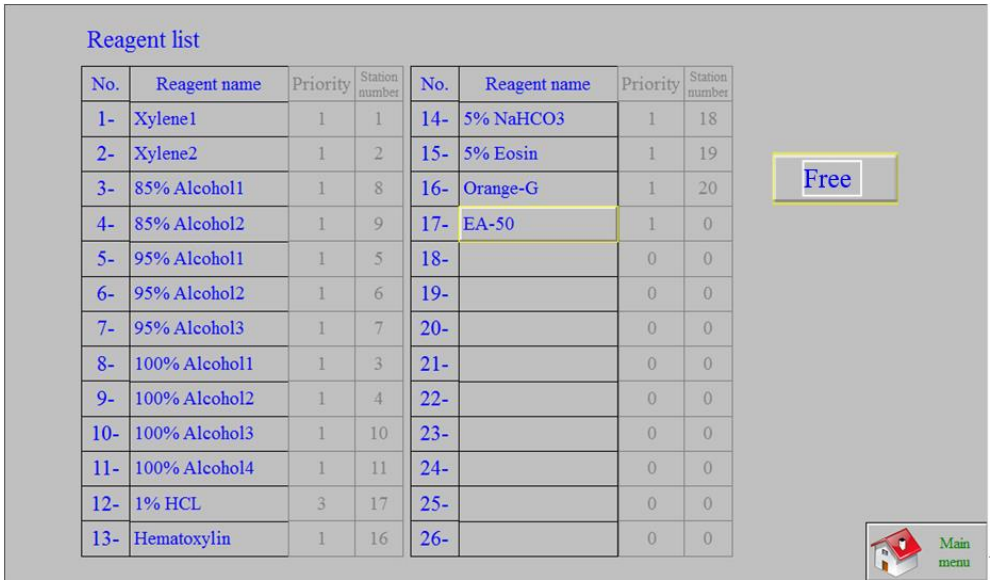
Figure-16

3) Click the raised button of the corresponding reagent, and the interface will return to the interface in the figure. The corresponding station has been added with reagent. Repeat the above operations, the required reagent will be designated station.
   Note: While adding the reagent into the instrument, it suggests that the user can record the reagent name on each station in a form. After setting the data in the interface, check it in the interface with a form to prevent the reagent misplacement.
4) When a reagent does not need or needs to change a station, the user can directly delete the reagent in the interface of the figure, and then reset its position.

Figure-17

8.3.3 Setting of empty station

1) When it is necessary to set the 27 and 33 positions as empty, locate, click the 27 or 33 position icon in the reagent placement interface, and enter the reagent management interface as shown in the figure, and click the set as empty icon.



No.	Reagent name	Priority	Station number	No.	Reagent name	Priority	Station number
1-	Xylene1	1	1	14-	5% NaHCO3	1	18
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3-	85% Alcohol1	1	8	16-	Orange-G	1	20
4-	85% Alcohol2	1	9	17-	EA-50	1	0
5-	95% Alcohol1	1	5	18-		0	0
6-	95% Alcohol2	1	6	19-		0	0
7-	95% Alcohol3	1	7	20-		0	0
8-	100% Alcohol1	1	3	21-		0	0
9-	100% Alcohol2	1	4	22-		0	0
10-	100% Alcohol3	1	10	23-		0	0
11-	100% Alcohol4	1	11	24-		0	0
12-	1% HCL	3	17	25-		0	0
13-	Hematoxylin	1	16	26-		0	0

Figure-18

Note: Other stations cannot be set up as empty. No empty icon is set in the reagent management interface when clicking other stations.

2) Quickly access the set in each interface of reagent management.

8.4 Program Editing

Click "**Program edit**" into the editing. There are 10 sets procedures in the program List.

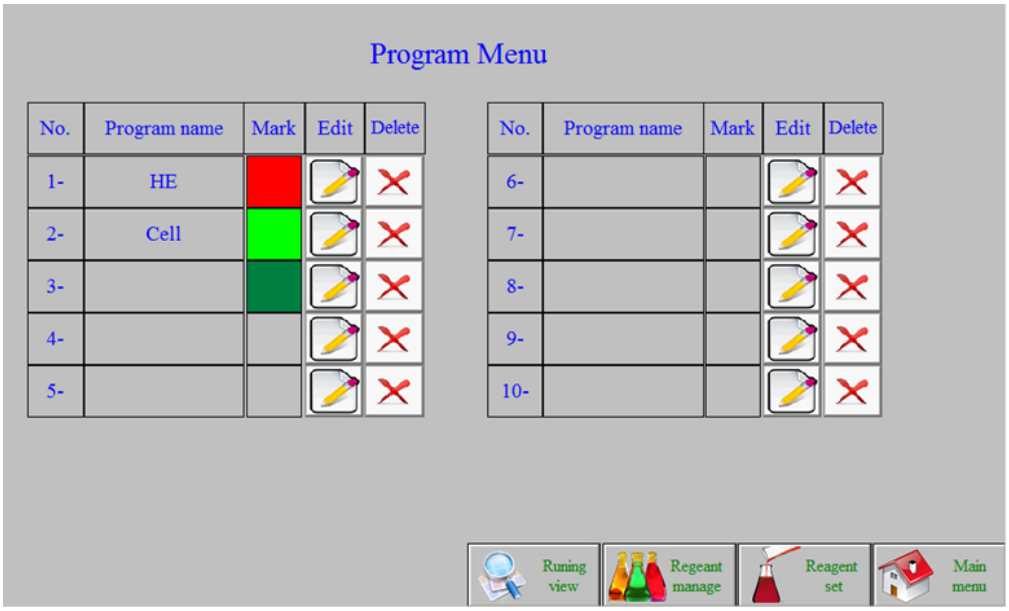

Figure-19

8.4.1 Editing Procedure

1) Click the edit icon to enter the program editing, as shown in the figure.

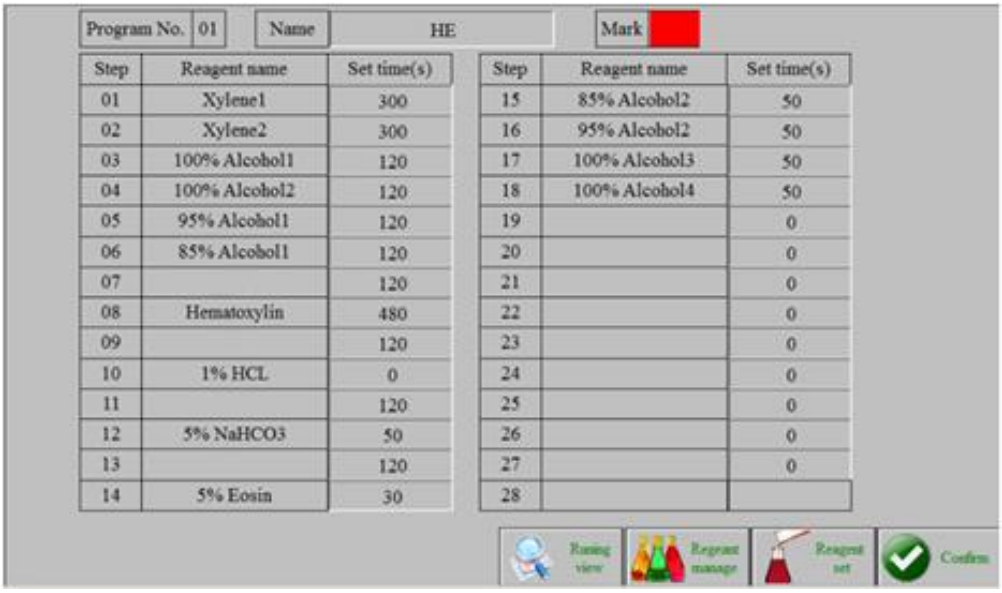

Figure-20

2) Enter the procedure name.

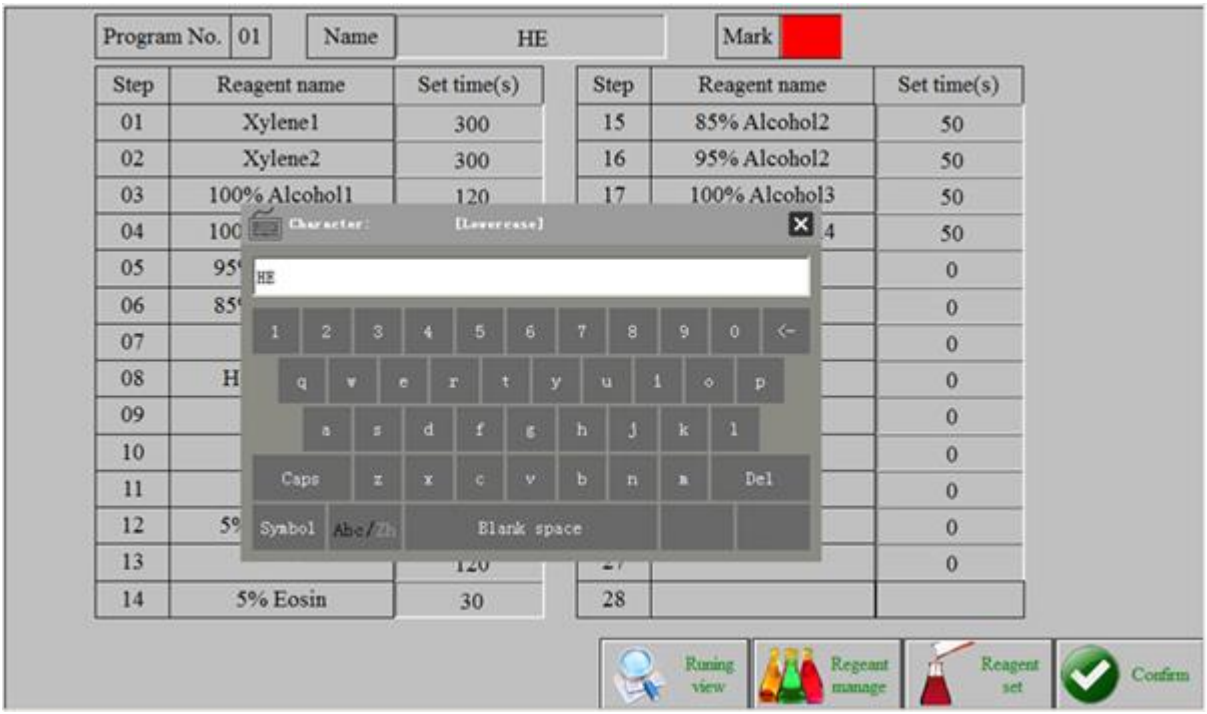

Figure-21

3) Click the color code to enter the color code setting, as shown in the figure.

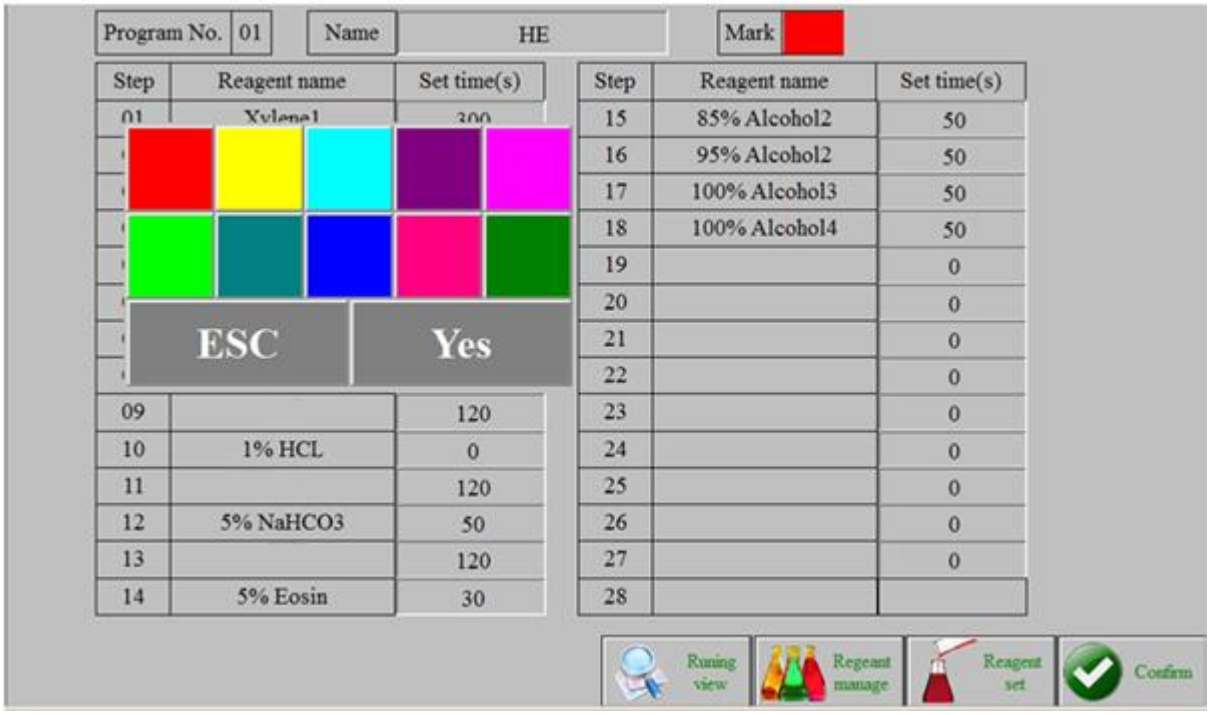

Figure-22

4) Select the corresponding color code and press confirm. Click the corresponding icon under the reagent name to select the reagent needed for each step.

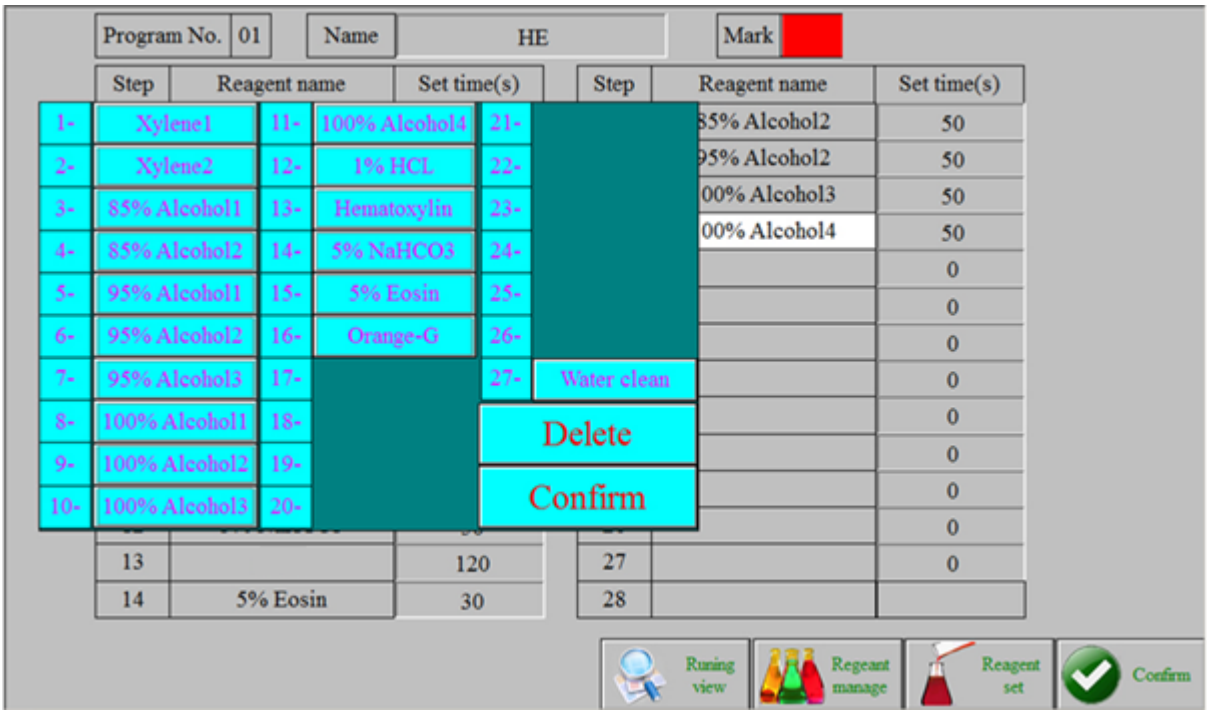

Figure-23

Note: The reagent of the defined station is displayed in the blue box. Select the reagent want and press Confirm. Or press the clear key to clear the reagent in the current column and select the reagent again.

5) Click the corresponding icon under the setting time column to set the time for each step of staining.
Note: The program can edit up to 28 steps. When a certain step doesn't set the reagent, the staining will not be performed. When two steps don't set the reagent, the staining program is finished. The staining steps that exist in this later step will not be performed.
6) After the program is edited, press the confirm key to save the program. If you need to modify the program, press the confirm key to save the program after modification.

8.4.2 Program Delete

Click "**Program Delete**" to delete.

8.5 Running View (Monitoring interface)

Click the Reagent Check to quickly view the current reagent distribution. Click the corresponding program in the program directory to quickly view the program content. Click the station icon, the box displays the current reagent name, the program name, the remaining time of the current staining, and other information. Long press the "**slide delete**" key for 5 seconds more to disappear, the remaining staining steps are forcibly interrupted and will not be executed. Click in the blank space of the monitoring interface and the pop-up box disappears.

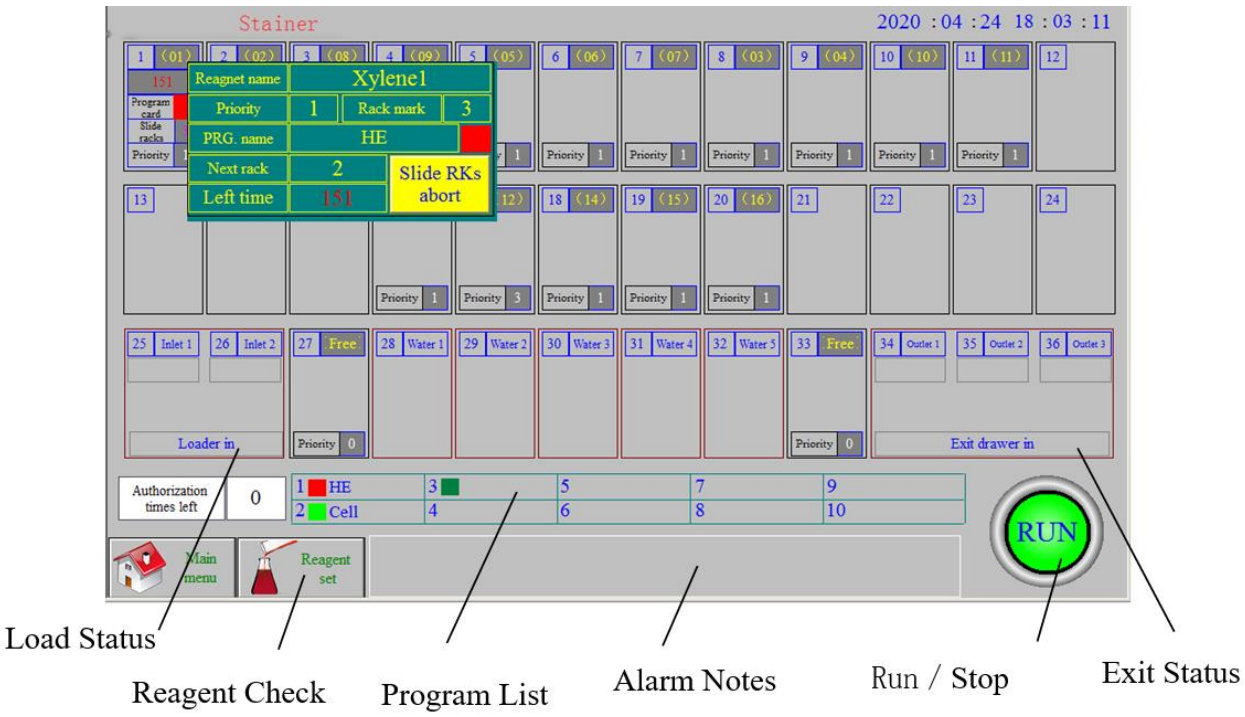

Figure-24

8.6 Wash Station Calibration

The station calibration management key is mainly used for the initial station coordinate debugging and setting of the equipment. The system maintenance management key is mainly used for the setting of some variable position parameters and the indication of sensor status (including the indication of output status). Both management functions are provided with password management.

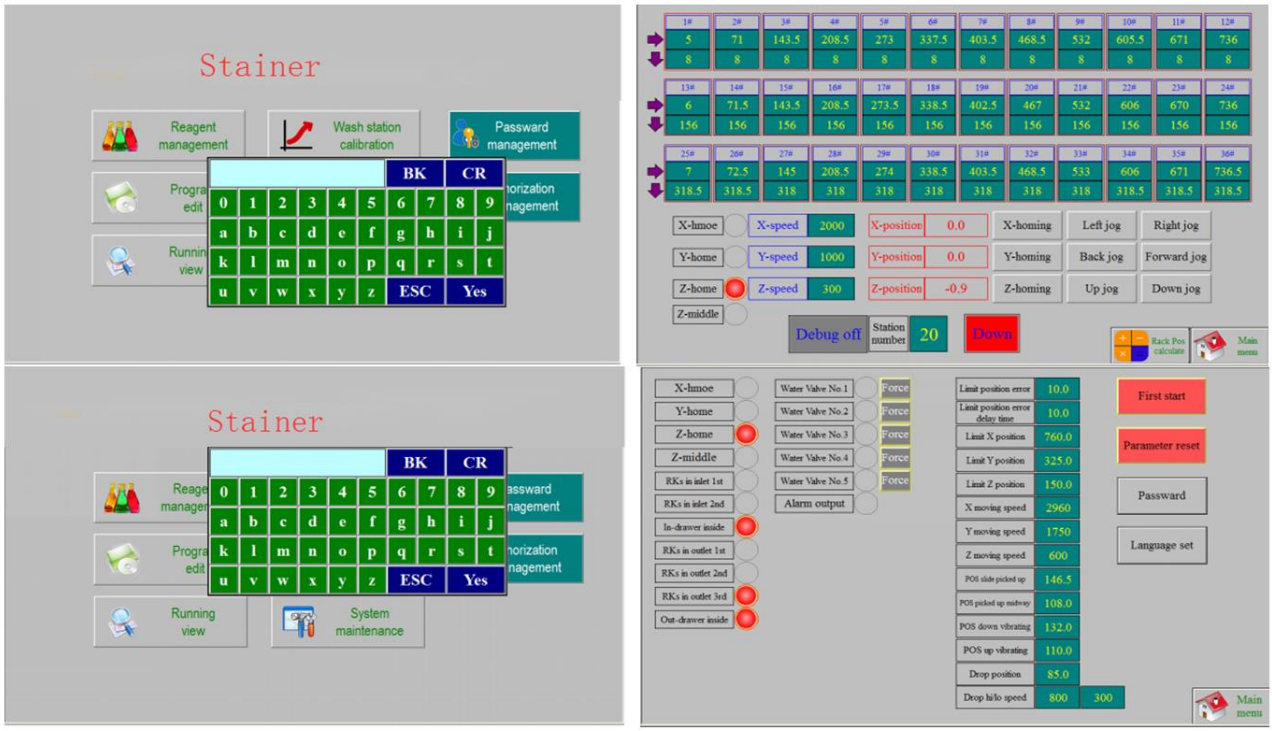

Figure-25

The system maintenance interface can be used for system password management and language setting.

Figure-26

Note: These two functions generally do not need to be used.

8.7 Function Setting

1) Click **"Function set"** in Main Menu. It is mainly to set the critical time of the instrument.

Figure-27

2) **Load waiting time:** Refers to the time (30-60s) reserved for changing the program after the rack is placed in the Loading drawer.
3) **Priority waiting time:** Time between different priority intervals of reagent (3-5s).
4) **Moving preparation time:** The moving time (4-6s) in advance when the actuator is ready for the position of the dye holder to be extracted.
5) **Staining rack waiting time:** The waiting time (3-6s) at the current staining stations after rack extraction.
6) **Alarm reset:** In case of fault alarm, the alarm signal will reset after troubleshooting.
7) **Alarm sound off:** Eliminate the alarm sound in case of beep and accident alarm.
8) **Cover opening operation/shutdown mode:** Control the operation/suspension of the mechanical arm when the cover is opened.
9) **Water flow detection off/on:** It is an optional function. When the water flow detection function is configured, the water flow detection is on (default: off).

8.8 Authorization Management

1) **Authority management:** It's divided into administrator level and experimenter level. Administrator level users can add and delete experimenter level users. After administrator level users add experimenter level users, experimenter level users can use all functions of the device, such as program editing, Reagent management function, selecting existing programs for staining operation, etc. Password is required for login. The password is set and managed by the user. There is no password at the factory.

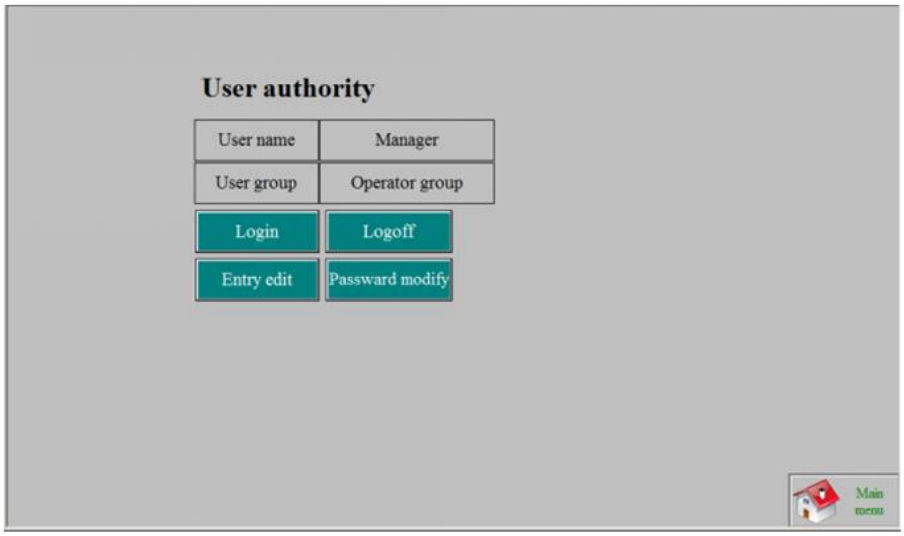

Figure-28

2) **Authorization management:** The password is required for login of authorization management. The password user is set in the password management interface. Enter the correct password and enter the figure interface. There is no password when leaving the factory. The password is set and managed by the user.

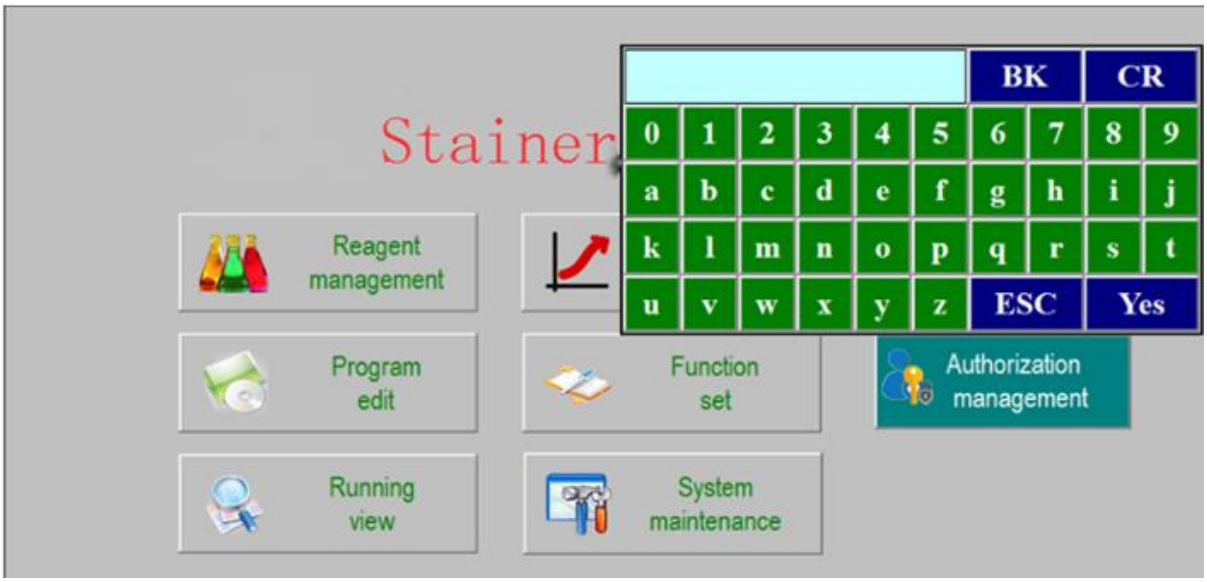

Figure-29

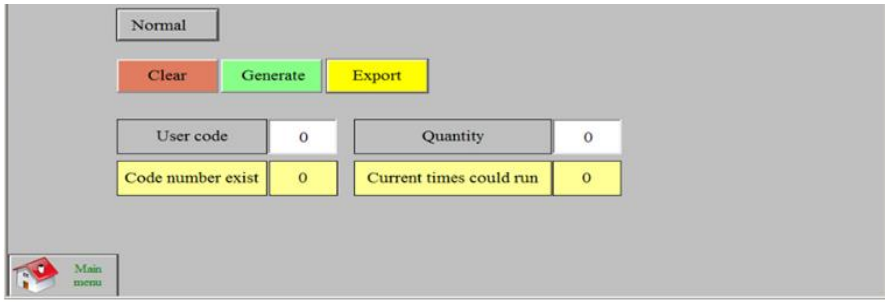

Figure-30

There are two ways to choose (default: Standard) and authorization. The authorization way is optional. It is used for users who have strict management requirements for staining. Barcode scanning gun needs to be configured. The standard configuration is conventional.

8.9 Staining Operation

8.9.1 Preparation

1) According to different staining methods, the user configures each reagent (500ml), adds it to the station attached to the instrument, and marks it.

Figure-31

Description: The brown VAT contains xylene, hydrochloric acid alcohol, haematoxylin dye, and the white VAT contains gradient alcohol.

2) The station is placed on each position in the instrument after optimization according to the staining process, and all the required stations are designated through the reagent management interface.
3) Edit each staining program through the program editing interface (10 sets of programs can be edited in total)
4) Set each time required for normal operation of the instrument through the parameter setting interface.

8.9.2 Upload of staining rack

1) Insert the slides into the racks as follows.

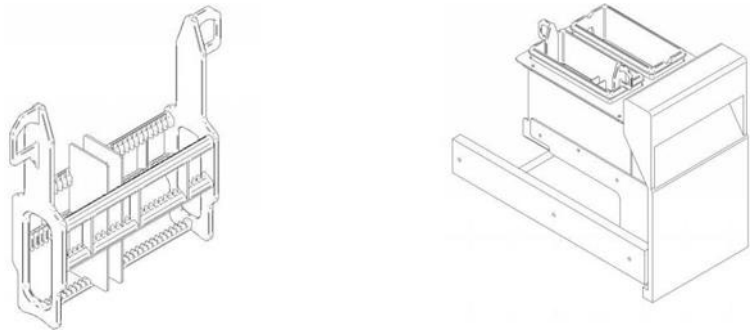

Figure-32

2) Open the upload drawer, and place the rack on the load stations at the upload drawer.
   Note: The rack should be aligned with the V-notch on the stations. There are 2 upload sites in the upload drawer.
3) Close the upload drawer, and the user selects the program (1-10). If the program does not need to be changed, the last running program will be executed after the waiting time.

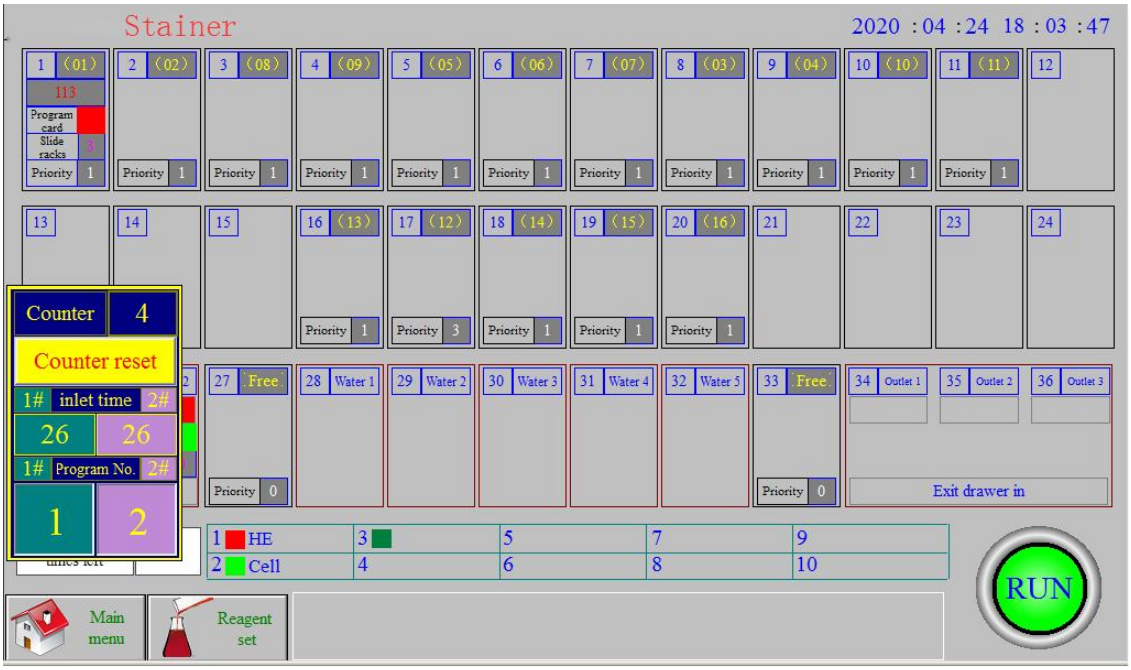

Figure-33

4) Press the run key in the monitoring interface to start the staining, and the rack will enter the corresponding tank according to the selected program, and enter the next step of the tank after the time is up. The status displayed at the key is the current status of the device. For example, if it is displayed as running, it means that the current device is staining.

5) When the rack in the upload drawer enters the station in the first step, it can be put into the next rack again, to realize the continuous upload of the rack.

8.9.3 Exit the racks

After staining, the rack will automatically move to the exit drawer, and the buzzer will beep for 60 seconds. When all three exit sites are full, the buzzer will beep for a long time to remind the user to take out the rack in time, so as not to affect the subsequent rack to take out the chips. After the slides are completed, the slides can be covered.

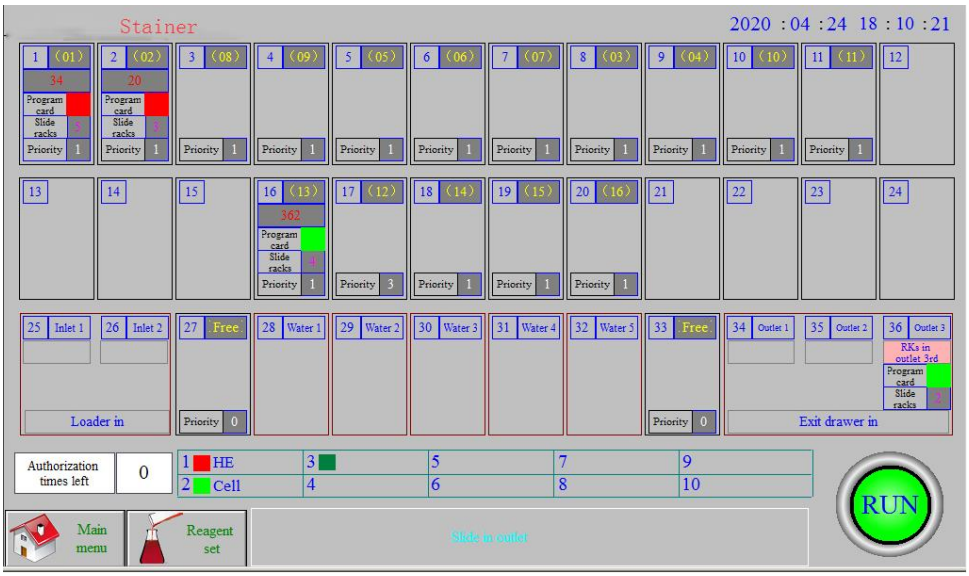

Figure-34

8.9.4 Turn Off

When the instrument is not used for a long time, turn off the power switch. When the current staining program is running, there is a short-time power failure (or press the pause key manually). After the power is called or the pause is cancelled, the instrument will continue to run the current program, but the staining time will be extended appropriately, which may affect the stain effect.

9. Troubleshooting

Trouble	Reason	Solving Method
No display after power on	The power cord is not plugged in, or the socket is damaged after power on.	Plug in the power cord or replace the socket.
	5A fuse is an open circuit.	Replace fuse.
	24V switch power supply has no output.	Replace switch power supply.
		Open the left cover plate to check whether the power module works normally and whether the main control PLC power wiring is loose.
The startup display is normal, but the hook and the mechanical arm do not move	48V switch power supply has no output; motor driver has no power.	Replace 48V switch power supply.
	The PLC reports " error" and the" error" indicator flashes.	Open the right cover plate to check whether the PLC status is in good situation.
The startup display is normal, the hook moves to the top, but the mechanical arm does not move	The engagement clearance of the gear in the carrier lifting mechanism is too large, and the Z axis (up and down) does not return to the zero position. At this time, the zero position indicator light is in the gray state.	Adjust the gear engagement clearance.
	The motor and driver that control for moving left and right or forward and backward are broken or driver is dead.	Open the right cover plate to check whether the motor driver's status is in good condition.
After the staining rack is lifted, the hook stops at the top end, and mechanical arm does not move	The reason is the same as above.	
During staining procedure, the arm without a rack stops at the lower end and the mechanical arm does not move	The z-axis center detection switch is broken, and the center indicator light is in gray state.	Replace the detection switch.
The mechanical arm moves in one direction only , left and right or forward/backward	The motor and driver in a certain direction that control the forward/backward or left and right movement are broken or the driver is dead.	Open the right cover plate to check whether the motor driver's status is in good situation.

The mechanical arm moves normally, and the forward /backward or left/right positions of the interface display are out of tolerance	Check whether the coding wiring is loose.	Fixed it again.
	Encoder is broken.	Replace a new one.
No water in the water washing station	The tap doesn't turn on or the water volume is too small.	Turn it on to the large volume.
	The filter at the water inlet is blocked.	Clean the filter.
	The water valve is broken.	Replace a new one.
The rack fails to lift	There is deviation in the cylinder position coordinate in X/Y direction.	Check the cylinder again and place it in a good situation.
	The cylinder is not placed flat and tilted.	
The machine doesn't identify the rack position after the drawer is situated in place	The sensor of the drawer inlet is damaged, or the wiring is loose.	Open the right cover plate, check whether the wiring is loose or replace the sensor.
	The sensor of the rack in the cylinder is damaged or the wiring is loose.	
The program is completed, the rack fails to enter the exit position correctly	Detection switch of the exit drawer is broken, or wiring is loose.	Check it to fix or replace it with a new one.
There is one rack already in the exit position, but the other one continues to go into it	The sensor of the Exit position is damaged, or the wiring is loose.	Open the right cover plate, check whether the wiring is loose or replace the sensor.
Waste water tank overflows	The drain hose bends and bends, straightens the drain hose.	Ensures that the drain pipe is unobstructed.