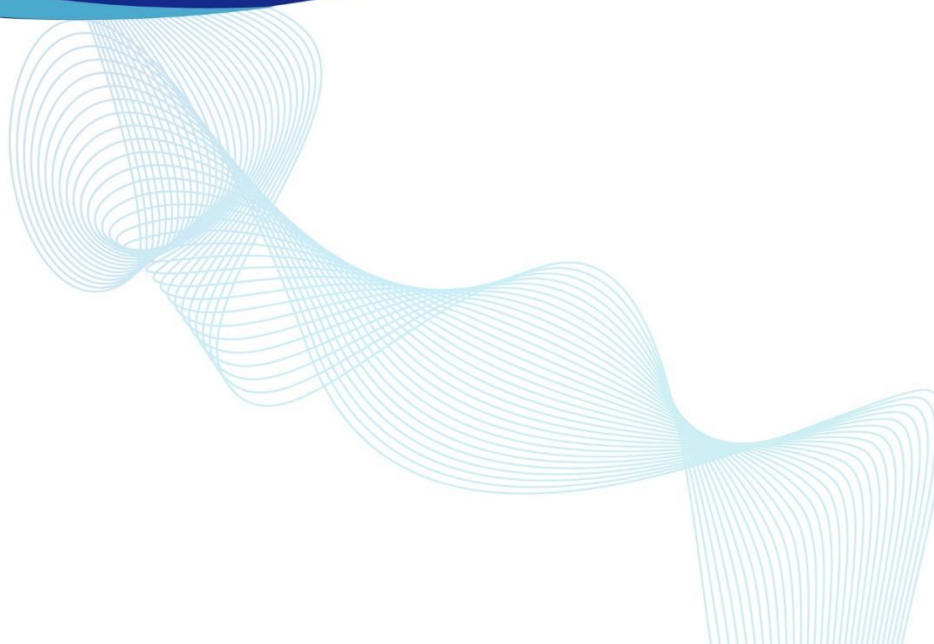




BP511 High Precision Filling Peristaltic Pump User Manual



Safety Information!

To prevent fire, electric shock or personal injury when using this product, please follow the following safety precautions:

1. Please turn off the power of the driver before installing (or removing) the pump head and tube, otherwise your fingers or clothes may be entangled in the driver;
2. Please turn off the power before connecting the external control device, otherwise the equipment may be damaged;
3. This product should be installed on a stable surface, otherwise the product may collapse and be damaged due to vibration;
4. This product should be installed in a protected place to prevent people from stepping on or tripping over the connecting wires, which may damage the connecting wires or cause personal injury.
5. Before cleaning this product, please unplug the power plug from the socket;
6. Do not disassemble, modify or repair this product without permission. If necessary, please contact Duoning/Prefluid.


Note:

1. Before using this product, please read carefully and fully understand the contents of this user manual;
2. Before using this product, please read and follow the instructions in the safety information carefully;
3. The tube is a consumable. Long-term use may cause rupture due to fatigue, resulting in liquid leakage. Please check and replace the tube in time.
4. Please keep this manual in a safe place.



Warning!

- This product may be interfered by electromagnetic fields and cause malfunction in some special industrial environments or near radio transmitters.
- Non-professionals are not allowed to open the casing of this product,



otherwise they will not receive normal after-sales service from Duoning/Prefluid.

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1. Overview

BP511 peristaltic pump is an industrial high-precision filling peristaltic pump. The product uses a large-screen LCD display to display the working parameters and working status of the equipment; The chassis adopts a streamlined metal molded enclosure with IP54 high protection level; the surface of the enclosure is treated with imported baking varnish, which is beautiful, easy to clean and anti-corrosion.

This series of products uses brushless DC motor as the drive, with low noise, low heat generation, maintenance-free, stable and reliable operation, high flowrate accuracy and stable pulse. It is very suitable for fluid transportation and filling in many fields such as beverages, health products, pharmaceuticals, fine chemicals and printing.

Product pictures as follows:



This series of products mainly consists of two parts:

- **Pump head:** YZ35 Pump head.
- **Drive:** The main body (power source) of the peristaltic pump.

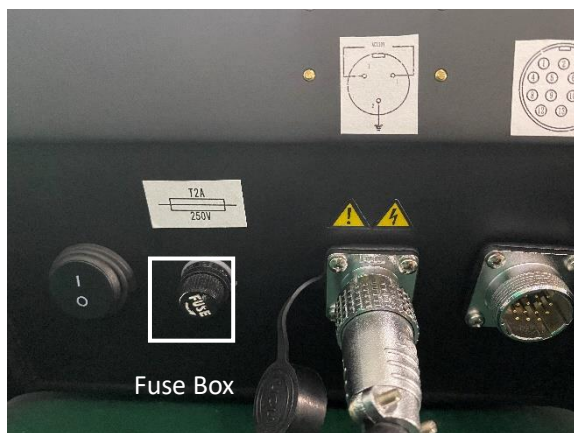
Fuse

This product contains a 2A standard fuse. If you need to replace it, please unscrew the fuse box and replace with another fuse of the same standard.

Note: Fuse specifications: rated 250V, 2A, size 5*20mm, slow blow.

 **Warning!**

Please turn off the power and unplug the power plug before replacing the fuse!



2. Product Introduction

2.1. Product Functions

- The large LCD window displays the working parameters and working status of the peristaltic pump, which is intuitive and clear.
- The operation interface is user-friendly and has simple prompts, making it easy to learn and understand.
- Two working modes are available, which can be used for quantitative filling or for ordinary continuous working, ensuring high flexibility, suitable for different occasions.
- There is a key tone and buzzer prompt sound when the key is pressed. The buzzer sound indicates that the key is effective. The sound can be turned on or off as needed.
- Available to use external signals to control the speed, direction, start and stop of the pump.
- Available to communicate via RS485 interface, Modbus RTU protocol to control pump speed, direction, start and stop, etc.
- Brushless DC motor, servo drive, runs quietly, generates little heat and is maintenance-free.
- Provides power-off memory function, the startup display will be the working interface before the last shutdown.
- 16 groups of file parameters can be stored for quick recall and improved work efficiency.

2.2. Technical Specifications

The detailed technical parameters of the product are shown in the following table:

Model	BP511
Drive	Brushless DC motor, servo drive, silent operation, low heat generation, maintenance-free
Speed range	0.1 - 600.0 rpm
Speed resolution	0.1 rpm

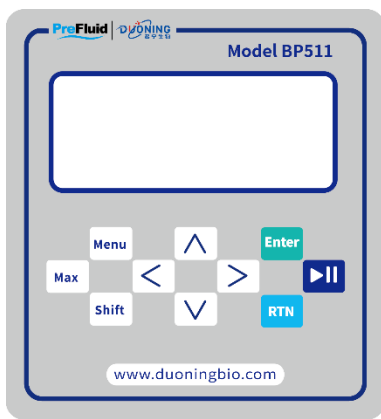
Model	BP511
Adjustment method	The panel keys adjust the parameters, and the buzzer sounds a prompt
Display mode	Large LCD screen displays working parameters and working status, with Chinese and English menus available
External control interface	Dry contact signal controls start, stop and direction; analog signal (current 4-20 mA, voltage 0-10 V) controls speed; RS485 interface, Modbus RTU communication protocol controls start, stop, direction and speed; provides state output function
Applicable power supply	220 VAC ($\pm 10\%$), 50 Hz/60 Hz
Power consumption	≤ 150 W
Work environment	Temperature 0 – 40 °C, relative humidity $\leq 80\%$
Applicable pump head	YZ35 pump head
Protection level	IP54
Flow range	For details, please refer to the Pump Head Manual.
Enclosure	Die-cast chassis with special spraying
Dimensions	265 mm (W) × 211 mm (H) × 300 mm (D)

Note 1: For the reference flow of the product, please refer to the Pump Head Manual.

3. Control Panel and Rear Panel Description

3.1. Control Panel Description








The control panel consists of a large LCD display screen and ten touch keys, as shown in the figure below.



Component Description:

LCD display screen: Display the working parameters and working status of the peristaltic pump.

The key functions are as follows:

-  - Start/Stop key: Control the start or stop of the pump
-  - Enter key: Confirmation of setting parameters
-  - Back key: Go back one level and exit
-  - Up key: Adjust parameters
-  - Down key: Adjust parameters
-  - Left key: Adjust parameters
-  - Right key: Adjust parameters

Max - Drain key: works with the direction to fill or drain the tube

Menu - Menu key: switch between the system settings interface and file settings interface

Shift - Function key: Use the key combination in a certain interface to:

① **Shift + Max**

In the "Quantitative dispensing" working interface, press this key combination to reset the "dispensing times" to zero; in the "Continuous Working" working interface, press this key combination to reset the "total amount" to zero.

② **Shift + Enter**

Press this key combination in the "Quantitative Filling" and "Continuous Working" interfaces to enter the calibration menu interface.

③ **Shift + ^**

In the two working interfaces, press this key combination to lock and release the control panel keys. In the "System Settings" and "File Settings" interfaces, press this key combination to quickly turn screens upward.

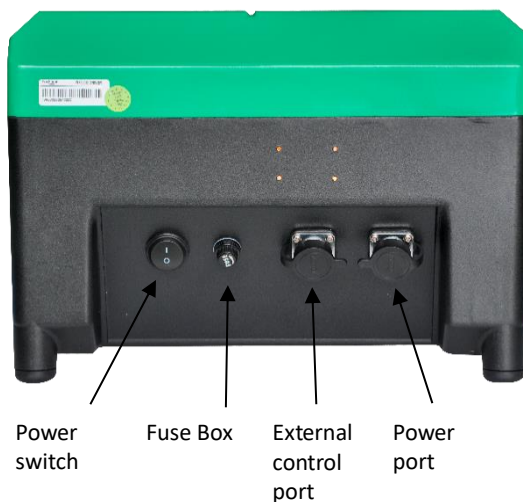
④ **Shift + v**

In the "Continuous Working" interface, press this key combination to switch the speed and flow position. The values displayed in bold can be modified. In the "System Settings" and "File Settings" interfaces, press this key combination to quickly turn screens downward.


⑤ **Shift + < , Shift + >**

Both working interfaces are available. Press this key combination to set the rotation direction.

3.2. Description of the Rear Part of the Chassis



- **External control port:** 14-pin external control interface for communication, current/voltage signals, direction, start/stop control signals, etc.
- **Power port:** 110V/220V AC power input socket.
- **Fuse box:** Built-in fuse.
- **Power switch:** Turn to "I" for ON, turn to "O" for OFF.

 **Notice:** Fuse specifications: 250V, 2A, 5mm*20mm, slow blow fuse.

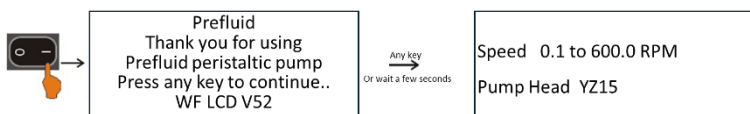
4. Operation

4.1. Installation of Pump Head and Tube

Before the following operations, the pump head and tube must be installed. For installation methods, please refer to the relevant pump head instruction manual.

4.2. Power-on

Insert the power plug into the power socket and turn on the power switch. The process of starting up the machine for the first time (new machine) or after restoring the factory settings is as follows:



After selecting "Chinese" and pressing the enter key, you will enter the file setting interface, as shown below.



⚠ Note: Make sure that the input power voltage is consistent with the power supply voltage required by the machine.

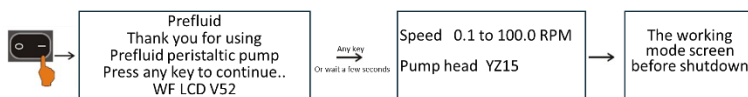
- **Power switch:** Turn to "I" for on, turn to "O" for off.
- **First time power on** or after restoring the factory settings, you need to select the operating language when you turn on the machine. This machine provides two operating languages, namely [Chinese] and [ENGLISH]. After booting up, the welcome interface will be displayed first. You can press any key or wait for three seconds to enter the language selection interface. Here, we will introduce the selection of Chinese. After selecting and confirming, you can enter the file setting

interface.

- **Method to enter the "File Settings" interface:**

- Press the **RTN** key to enter;
- In the system settings interface, press **Menu** key to enter.

The following is the process for each subsequent startup:



That is, enter the working interface before shutdown from the welcome interface, speed and pump head prompt interface.

4.2.1. Introduction to File Numbers

File No.: There are 00#-12# options, three types: current file parameters, 00# file parameters, 01#-12# file parameters.

- The current file parameters are the parameters that the pump is using after starting up, which can be modified and saved. The file number is displayed as 00#-12# in the file setting interface.
- 00# file is the default parameter and cannot be modified. After reselecting (press **^** , **v** to select and press **Enter** to confirm), display the default parameter. When the parameter is modified, it is automatically saved as the current file parameter and can also be saved as 01#-12 file.
- 01#-12 files, these 12 groups of parameters are the file parameters that have been stored before, reselect (press **^** , **v** to select and press **Enter** to confirm) to use. When the parameters are modified, they are automatically saved as the current file parameters. To call the 01# file again, press **^** , **v** key to reselect file 01#.

4.2.2. Introduction to Working Mode

- **Quantitative filling:** It is a common method to perform filling operations according to the set target filling volume, filling time and running speed.
- **Continuous working,** Work according to the set speed and flow rate.

4.2.3. Introduction to Pump Status

- **▶||** , The pump stops and waits for a trigger (press the **▶|** key or external signal trigger) to work.
- **▶••**, The pump is running and waiting for a trigger (press the **▶|** key or external signal trigger) to stop.
- **▶•|**, During the pump stop, the pump will automatically run again after the stop time.
- **▶▶**, While the pump is emptying and filling, press and hold **Max** key to display.
- **PC▶||**, The pump stops and waits for a trigger (communication to start the pump).
- **PC▶••**, The pump is running, waiting for a trigger (communication to stop the pump) to stop.
- **PC▶•|**, During the pump stop, after the stop time is over, the pump automatically starts running again. The initial start and stop are triggered by communication.
- **RC▶||**, The pump stops, and the 2nd and 11th pins of the external control interface are short-circuited, waiting for triggering (external signal triggering) to work, and the analog signal controls the speed. The "continuous working" mode is used.
- **RC▶••**, The pump is running, and the 2nd and 11th pins of the external control interface are short-circuited, waiting for the trigger (external signal trigger) to stop, and the analog signal controls the speed. The "continuous working" mode is used.

4.3. System Settings

In the file settings interface, press **Menu** key to enter system settings interface. As shown below:

File number: 01#
Working mode: Quantitative filling
Target volume: 1.000 mL
Tube selection: 1.6mm-1

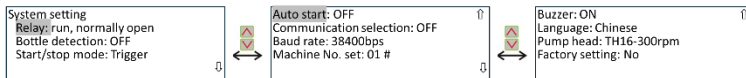


System setting
Relay: run, normally open
Bottle detection: OFF
Start/stop mode: Trigger

The system has multiple settings. Press the ∇ key and \wedge key to select the setting item (displayed as highlighted), and then press **Enter**, the following parameters will be highlighted. For regular parameters, use ∇ , \wedge and **Enter** to set. For multi-digit numerical parameters, you can use $<$, $>$ keys to select the bit (a bit will be highlighted), use \wedge , ∇ keys to adjust the value, and press **Enter** to confirm the setting. Press **shift** + \wedge or **shift** + ∇ to quickly scroll up or down.

Note: When the system settings interface is on the first screen, the right side will display " ∇ " mark, the last screen will show " \wedge " mark, the middle screen will also display " \wedge " and " ∇ " mark. It means "next screen presents" or "previous screen presents" or "both the previous and next screens present".

As shown in the following figure:



The parameters are described as follows:

Relay: "Run, normally open", "Run, normally closed" are optional. If "Run, normally open" is selected, when the pump is running, external control PIN13 and PIN14 are open, and when the pump stops, external control PIN13 and PIN14 are normally closed.

Bottle detection: ON and OFF are optional. When "ON", the pump operation is controlled by the bottle signal, that is, the pump operates when there is a bottle, and does not operate when there is no bottle; When "OFF", the operation of the pump is not controlled by the bottle signal, that is, the pump will start when it receives the external control signal.

Note: This item is used for “Quantitative filling” working interface, start the pump in external control mode (see V. External Control Description “Wiring method 1”).

Start-stop mode: There are two optional modes: trigger and switch. When “triggered”, the pump will operate after receiving a pulse signal. When “level”, the pump receives a high or low level, it will operate.

Auto-start: ON and OFF are optional. When “ON”, the powered pump starts according to the parameters before shutdown (when there is no communication or external control speed); when “OFF”, the powered pump is in a stopped state.

Note: The above two items are used for “Continuous Working” interface.

① The 2nd and 11th pins of the external control interface are open, the start and stop of the pump can be controlled by the 2nd and 11th pins, and the direction can be controlled by the 2nd and 3th pins. For details, see V. External Control Instructions “Wiring Method 2”. ② Short-circuit pins 2 and 11 of the external control interface. The start and stop of the pump can be controlled by pins 2 and 11, the direction can be controlled by pins 2 and 3, and the speed can be controlled by the analog signal of pins 5 or 14. For details, see V. External Control Instructions “Wiring Methods 3 and 4”.

Communication selection: ON and OFF are optional. When “ON”, the operation of the pump is controlled by communication; when “OFF”, the operation of the pump is controlled by the panel and external signals.

Baud rate: 9600bps, 19200bps and 38400bps are available.

Machine number setting: 01#-16# can be set, the default is 01#

Note: The above three items are used for communication control. “Communication Selection” =ON, the pump operation is mainly controlled by communication.

Buzzer: ON or OFF is optional.

Language selection: Chinese and English are available.

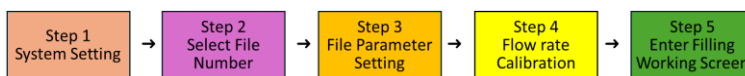
Pump head selection: YZ35 Optional. Use **shift** + **Enter** keys to select the pump head. The maximum speed is determined by the pump head.

Factory settings: Select YES or NO. Note! Once "YES" is selected, all the adjusted parameters will be restored to the factory settings. Please use with caution!!!

4.4. Quantitative Filling

4.4.1. Filling preparation

The flow chart is as follows:



Step 1: System setup

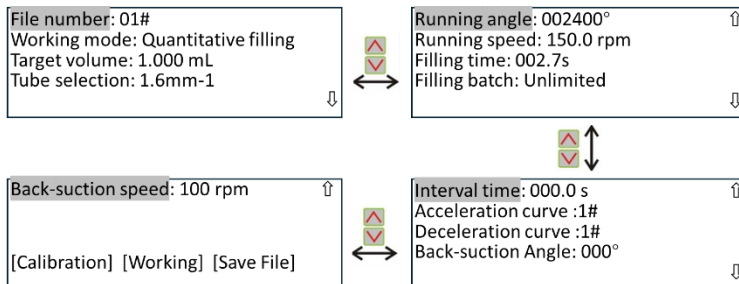
See **4.3. System Settings**, set "Communication Selection" to "OFF".

Step 2: Select the file number

Enter the file setting interface and select the file number to call the saved file parameters.

Step 3: File settings

Set the file parameters according to the previous method, as shown in the following figure (example):



File number: 00#-12#, select 01#.

Working mode: Two working modes are available: quantitative filling and continuous working. Select "quantitative filling".

Target loading: 0.010 mL-9.900 L, set to 1.000 mL.

Tube selection: Tube inner diameter 0.8 mm, 1.6 mm, 3.2 mm, 4.8 mm, 6.4 mm, 8.0 mm, 9.6 mm, 12.7mm are optional. -1, -2 means 1 channel, 2 channel tube. Set to 1.6mm-1. When reselecting the tube, the parameters represented by the tube are the default parameters.

Running angle: 30°-999999°, which is the angle of the pump head. Here, 002400° is determined by the "target filling volume" and the number of tubes and their channels and cannot be changed.

Running speed: 0.1-600.0 rpm, set to 150.0 rpm.

Filling time: 0.3-999.9 s, set to 2.7 s. "Running speed", "filling time" and "running angle" are related. If one of the speed and time changes, the other will change accordingly.

Filling batch: 0-999 can be set. When the set value is reached, the pump will stop filling and pop up a prompt interface. When it is set to 0, it will display "unlimited", indicating that the pump will continue to fill according to the set parameters. The usage is related to the "interval time".


Interval time: 0-999.9 s. ① When “interval time” = 0 s, the pump receives a trigger signal and dispenses once. ② When the “interval time” is greater than 0 s, the pump receives a start signal, dispenses once, stops once, and dispenses again, and the cycle repeats.



Acceleration curve: 1-9#, The larger the value, the longer the acceleration time. Select according to the impact of the liquid on the bottom of the bottle during filling.


Deceleration curve: 1-9#, The larger the value, the longer the deceleration time. Select the value based on the splashing of liquid on the bottom of the bottle at the end of filling.

Suction Angle: 0-360°, The angle at which the pump reverses after each normal operation. Used for dispensing high-viscosity liquids to prevent dripping.


Suction speed: 50-300 rpm.

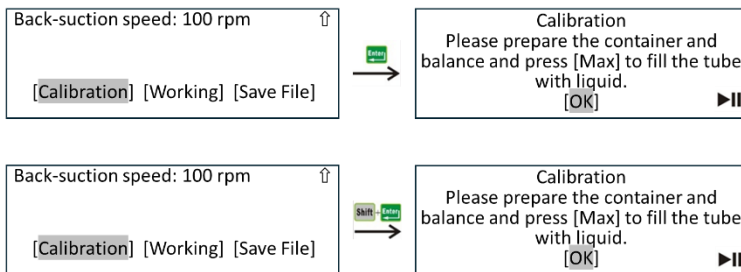
[Calibration]: When highlighted, press  key to enter the calibration interface.

[Work]: When highlighted, press  key, or press  key to enter the “Quantitative Filling” interface.

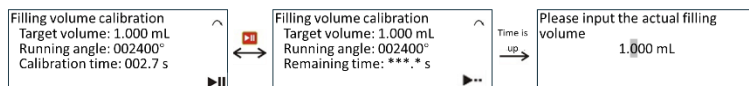
[Save the file]: When highlighted, press  key to enter the file parameter saving interface.

Step 4: Target loading calibration

In the file settings interface, press \wedge , \vee key to select [Calibration], then press  to confirm and enter the quantitative filling calibration interface (or in the file setting interface, press $\text{Shift} + \text{Enter}$), as shown below:



Follow the prompts to prepare a container that can hold the target amount and a balance that can weigh the target amount. Press **Max** key to fill the tube with liquid and make sure there are no bubbles in the tube. Then press **Enter** to enter the next menu. Press **▶** key in the calibration interface, the pump will be calibrated once as shown below. If the actual loading volume is known, press **Enter** key and directly input the actual loading value.



Target loading: 1.000 mL, the amount to be dispensed and calibrated.

Running angle: 002400°, the angle at which the pump needs to run based on the set target load and the number of tubes and their channels.

Calibration time: 002.7s, the time set for dispensing liquid, is also the calibration time.

After the calibration time is over, the input interface of the actual loading amount pops up. After inputting the actual amount according to the weighing on the balance, press **Enter** key, the running angle and time after this calibration will be generated as follows.

Please input the actual filling volume.
1.000 mL



Filling volume calibration
Target volume 1.000 mL
Running angle *****
Calibration time *.*.*s

If the set loading amount is too different from the actual calibration value, a warning interface may pop up: ①The running time is too long (>999.9 s). ②The running time is too short (<0.1 s). ③The running angle is too large (>999999°). ④The running angle is too small (<180°). See the figure below.

Warning
The running time is too long.
Please increase the speed or
replace the tube.
[OK]

Warning
The running time is too short.
Please decrease the speed or
replace the tube.
[OK]

Warning
Running angle is too large.
Please replace the tube.
[OK]

Warning
Running angle is too small.
Please replace the tube.
[OK]

Please follow the warning prompts to do the next step. Under normal circumstances, after several calibrations, you can enter the work interface to work.

Step 5: Enter the quantitative filling interface

After the calibration is completed, return to the file setting interface and press key or select [work] and press key to enter the quantitative filling interface.

Back-suction speed:100 rpm ↑
[Calibration] [Working] [Save File]



Quantitative filling: 1.000 mL ↑
002400° 002.7s
Σ ***** 150.0rpm ▶||


1.000mL: Target loading amount, the amount that needs to be dispensed

and calibrated.

002400°: The running angle of the pump calculated based on the target loading volume and the number of tubes and their channels can be fine-tuned as described below.

002.7s: The set filling time of the pump will be displayed as a countdown during running.

Σ***/******: The number of times of filling is increased by 1 for each filling, and the initial value is 0. If "Σ***/**" is displayed, it means batch filling. The value before "/" indicates the number of times filling has been completed, and the value after "/" indicates the set filling batch. The count is increased by 1 for each filling until the values before and after "/" are the same, and the filling completion prompt interface pops up. Press **Shift + Max** key to clear the number of filling times.

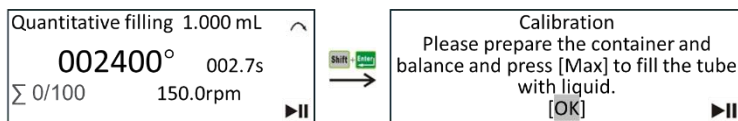
 : Indicates that the pump is running in the clockwise direction;


 : Indicates that the pump is running in the counterclockwise direction.

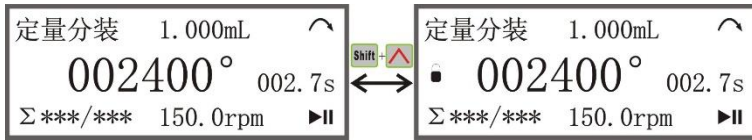
4.4.2. Key Combination

The usage of key combinations in the working interface.

- i. When the pump is stopped, press **Shift + <** or **Shift + >** key to change the running direction of the pump.
- ii. When the pump stops, press **Shift + Enter** , you can quickly enter the calibration interface. You can also select [Calibration] in the file setting interface, and press **Enter** key to enter.



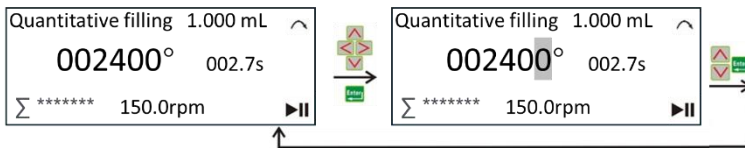
- iii. Press **Shift + ^** key to lock and unlock the keyboard. This operation can be performed when the pump is running or stopped. Only the stop function of the  key is available when keyboard is locked.



- iv. When the pump stops, press **Shift + Max** key to clear the number of filling times.

4.4.3. Fine Adjustment of the Running Angle



In working interface, after the tube has been working for a period of time, the liquid dispensed may change slightly. At this time, the running angle can be fine-tuned to adjust the liquid dispensing amount without re-calibration. Press **^**, **v**, **<**, **>** or **Enter**, a certain digit of the angle value will be highlighted to indicate that it can be modified. Press **^**, **v** to adjust the angle value, press **Enter** key to confirm. This operation can be performed both when the pump is running and when it is stopped. As shown below.

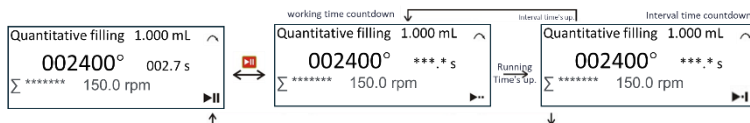



4.4.4. Manual Filling

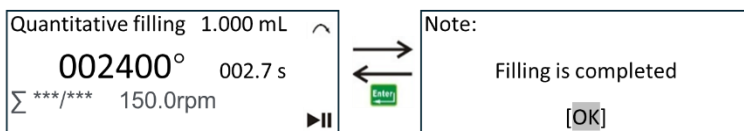
- i. When the batch size = "unlimited" and the interval time = 0. Press **▶|** key once, dispense once, and the count increases. When the count reaches 10000000, it returns to zero Σ0. The working interface is as follows.




- ii. When the filling batch size = "unlimited" and the interval time = n (n>0). Press  key once to dispense multiple times, the count will increase, and when the count reaches 10000000, it will return to zero Σ0, and the working interface is as follows. Press the  key to stop the pump.



- iii. When the filling batch size = N (N>0) and the interval time = 0. Press  key once to dispense once, the count will increase, and the count will be displayed as Σ***/***. When the filling is completed, the prompt interface will pop up.



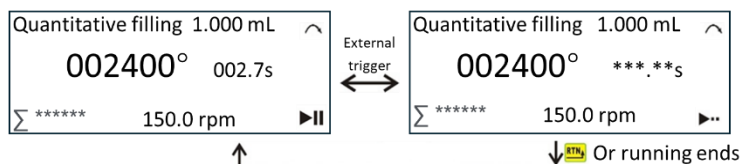
- iv. When the filling batch size = N (N>0), the interval time = n (n>0). Press  key once, and the filling will be divided into n times, and the count will increase, and the count will be Σ***/***.

4.4.5. External Control Filling

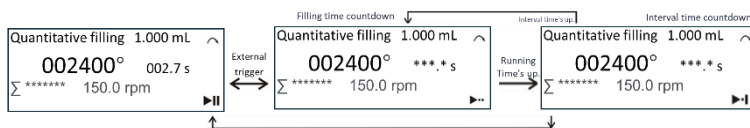
For external control filling, ① it is required to set "Bottle detection" in **4.3. System settings**, please set it to ON (the pump start is controlled by the bottle presence signal) or OFF (the pump start is not controlled by the bottle presence signal) as needed; the delay time can be set to 0 or n (n>0) as needed. ② it is required to connect external control signals and connect the bottle control signal and the filling start signal according to "**wiring method 1**" (see **V. External control instructions** for details).

- i. When "Filling batch size" = "Unlimited" and interval time = 0. External control starts the pump once, dispense once, the count increases, when

the count reaches 10000000, it returns to zero $\Sigma 0$, and the working interface is as follows.



- ii. When “filling batch size” = “unlimited”, interval time = n ($n > 0$). External control starts the pump once, dispense for multiple times, the count increases, when the count reaches 10000000, it returns to zero $\Sigma 0$, the working interface is as follows. Press again or using external control to stop the pump once.



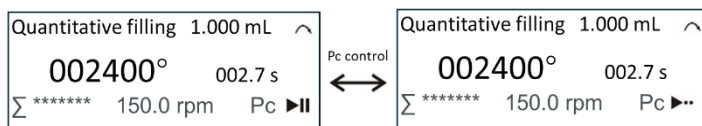
- iii. When “filling batch size” = N ($N > 0$), “interval time” = 0, the external control starts the pump once, the filling is done once, the count increases, and $\Sigma^{***}/^{***}$ is displayed.
- iv. When “filling batch size” = N ($N > 0$), and interval time = n ($n > 0$), the external control start the pump once, the filling is done N times, the count increases, and $\Sigma^{***}/^{***}$ is displayed.

Note: ① When “Bottle detection” = “ON”, when the external control starts and there is a bottle shortage, the interface prompts “Bottle shortage”. ② When the delay time = n ($n > 0$), the external control startup interface prompts “delay”. ③ Users usually use “Filling batch” = “Unlimited”, interval time = 0, bottle detection = “ON”, and “delay time” = 0. ④ After starting the pump in external control mode, press on the panel once to stop the pump urgently.


4.4.6. Communication Filling

For communication filling, ① it is required to set "Communication selection to ON in **4.3. System Settings** and set the baud rate as needed; set the machine number to any value between 01-16# as needed. ② If you need to access the communication control signal, follow "**Wiring Method 5**" to access the communication signal (see **V. External Control Instructions** for details).

- i. When "Filling batch size" = "Unlimited" and "interval time" = 0, the pump receives a start signal from the PC once, dispenses once, and the count increases, as shown in the figure below.



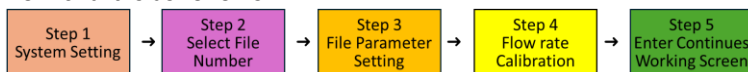
- ii. When "Filling batch" = "Unlimited" and "Interval Time" = n (n>0), the pump receives a start signal from the PC once and dispenses countless times, with the count increasing.
- iii. When "Filling batch size" = N (N>0), "interval time" = 0. The pump receives a start signal from PC, dispense once, and the count increases. The count is displayed as Σ***/**.*.
- iv. When "Filling batch size" = N (N>0), "interval time" = n (n>0), the pump receives a start signal from PC once, dispense N times, the count increases, and the count is displayed as Σ***/**.*.

Note: ① "PC" stands for "Personal Computer", which means it is controlled by a computer. ② After starting the pump by communication, press the  on the panel once to stop the pump urgently.

4.5. Continuous Working

4.5.1. Work Preparation

The flow chart is as follows:



Step 1: System setup

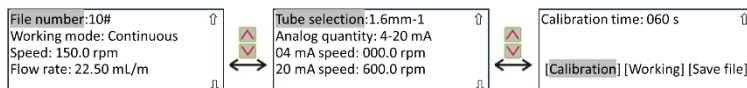
See **4.3. System settings**, set "Communication Selection" to OFF, "Auto start" is set to OFF.

Step 2: Select a file number

Enter the file setting interface and select the file number to call the saved file parameters.

Step 3: File parameter settings

Set the file parameters according to the previous method, as shown in the following figure (example):



File number: 00#-12#, the file number here is 10#.

Working mode: There are two working modes to choose from: quantitative filling and continuous working. Select "continuous working".

Speed: 0.1-600.0 rpm, set to 150.0 rpm.

Flow rate: 0.001-2.200 L/m, set to 22.50 mL/m.

Tube selection: Tube inner diameter 0.8 mm, 1.6 mm, 3.2 mm, 4.8 mm, 6.4 mm, 8.0 mm, 9.6 mm, 12.7mm as optional. -1, -2 means 1, 2 tubes. Set to 1.6 mm-1. When the tube is determined, the speed and flow are interrelated.

Analog: 4-20 mA, 0-10 V optional.

When "4-20 mA" is selected,

04mA speed: 0.0-600.0 rpm, set to 0.0 rpm. It is the speed corresponding to the external analog 4 mA.


20mA speed: 0.0-600.0 rpm, set to 600.0 rpm, which is the speed corresponding to the external analog quantity 20mA.



When "0-10 V" is selected,

0V speed: 0.0-600.0 rpm, set to 0.0 rpm. It is the speed corresponding to the external analog quantity 0 V.

10V Speed: 0.0-600.0 rpm, set to 600.0 rpm, which is the speed corresponding to the external analog quantity 10 V.

Calibration time: 15s, 30s, 60s, 90s, 120s, 150s, 180s, 240s is optional. Set to 60 s.






[Calibration]: When highlighted, press  key to enter the calibration interface.

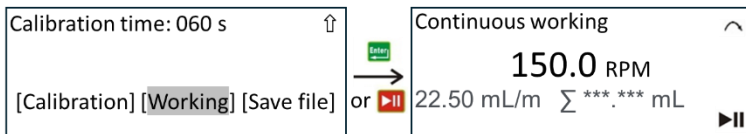
[Working]: When highlighted, press  key, or press  key to enter the "Continuous working" interface.

[Save file]: When highlighted, press  key to enter the file parameter saving interface.

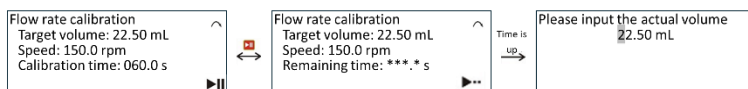
Note: When the analog quantity is set to any speed within the range of 0.0-600.0 rpm, the speed corresponding to other analog quantities is converted according to the ratio.

Step 4: Flow calibration

In the file settings interface, press  ,  keys to select [Calibration], then press  to confirm and enter the flow calibration interface (or in the working interface, press  + ), as shown below:



Follow the prompts to prepare a container that can hold the target amount and a balance that can weigh the target amount. Press **Max** to fill the tube with liquid and make sure there are no bubbles in the tube. Then press **Enter** to enter the next menu. Press **▶** key in the calibration interface, the pump will be calibrated once as shown below. If the actual loading volume is known, press **Enter** key and directly input the actual loading value.

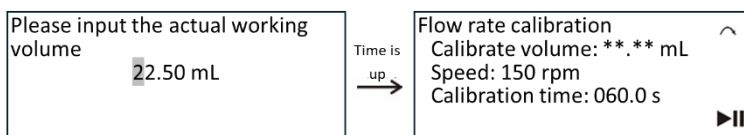


Calibrate the loading amount: 22.50 mL, the volume to be calibrated calculated based on the calibration time.

Speed: 150.0 rpm, set speed.

Calibration time: 060.0 s, the set flow calibration time.

After the calibration time is over, the input interface of the actual loading amount pops up. After inputting the actual amount according to the weighing on the balance, press **Enter** key. As follows.





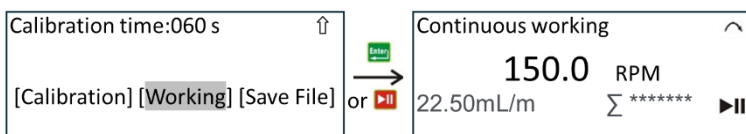
Note: If the calibration time is too long or too short, a warning may appear when entering the calibration interface. Please operate according to the prompts (as shown below).

Warning
The calibration volume is too high.
Please decrease the calibration time.
[OK]

Warning
The calibration volume is too low.
Please increase the calibration time.
[OK]

Step 5: Enter the flow metering interface

After the calibration is completed, return to the file setting interface and press  key or select [Working], press  key to enter the continuous working interface.




150.0RPM: The speed at which the pump needs to run, or the set speed, is generated based on the set flow rate and the number of tubes and tube channels.

25.50mL: The set flow rate or the corresponding flow rate generated by the set speed, that is, the delivery volume of the tube per minute.

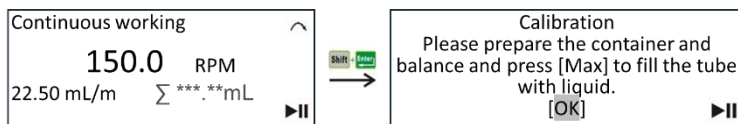
Σ *.**mL:** When the pump is working, the total amount (accumulated amount) of fluid output at the set speed/flow rate. The following units automatically change to mL, L, and kL. You can press **Shift + Max** to tare, after taring to 0, the unit will automatically return to mL.

4.5.2. Key Combination

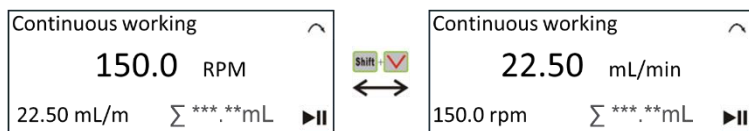
Here is the the usage of key combinations in the working interface.

- When the pump is stopped, press **Shift + <** or **Shift + >** keys, the rotation direction of the pump can be changed. The rotation direction can also be modified in the "System Settings" interface.
- When the pump stops, press **Shift + **, you can quickly enter the

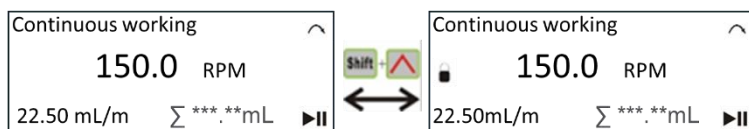
calibration interface, you can also select [Calibration] and press **Enter** in the file setting interface to enter the calibration interface.



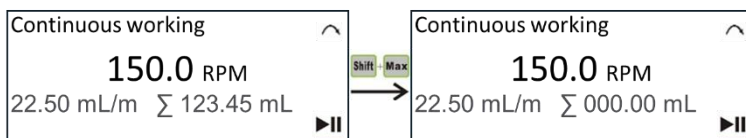
iii. Press **Shift + √** keys, the speed and flow rate can be set.



iv. Press **Shift + ⏏** keys, you can lock and unlock the keyboard. When the keyboard is locked, only the stop function of **▶||** key is available.



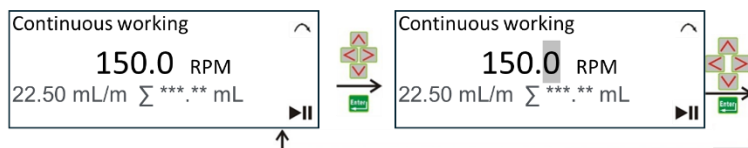
v. When the pump stops, press **Shift + Max** keys, the total amount value is reset to zero.



4.5.3. Speed and Flow Fine-Tuning

After the tube has been working for a period of time, the flow rate of the liquid squeezed out of the tube may change slightly. At this time, the speed can be fine-tuned to keep the actual flow rate consistent with the set flow rate. Therefore, the flow rate display value remains unchanged

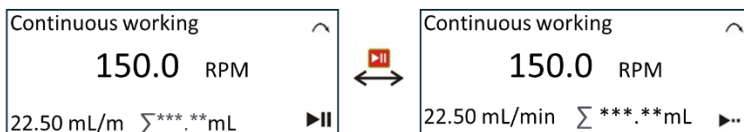
when the speed is adjusted. If the set flow rate is adjusted, the speed will be adjusted along with the flow rate according to the corresponding relationship between the flow rate and the tube. Method: Press \wedge , \vee , $<$, $>$ or **Enter** keys, a highlighted bit of speed (flow) indicates that the bit can be modified. Use $<$, $>$ keys to select the bit to be adjusted. Use \wedge , \vee keys to adjust the bit value, Press **Enter** key to confirm (when flow is adjustable, the method is the same). See the figure below.



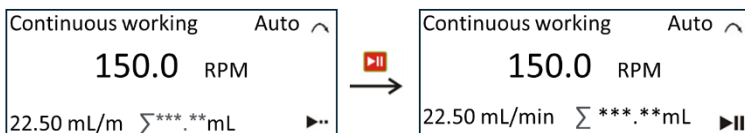
Note: ① If the flow range is determined, the speed calculated according to the tube specifications is also determined. It is possible that the adjustment is invalid during adjustment. ②The "speed" and "flow rate" can be adjusted regardless of whether the pump is in operation or not. ③When the machine stops running, you can press **Max** key to fill or drain the tube (in conjunction with the running direction).

4.5.4. Manual Work

Press **▶|** key once to start the pump working, and press it again to stop the pump working. See the figure below.



When "Auto Start" is set to ON, the pump will start running as soon as it is turned on. Press **▶|** key once to stop the pump.



4.5.5. External Control Work

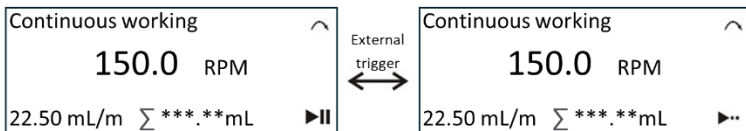
Working in external control mode ① it is required to set “communication select” to OFF in **4.3. System Settings**. ② Set “Start/Stop Mode” to “Trigger” or “Switch” as required. ③ If external control signals need to be connected, connect the direction signal and start/stop signal (pins 2, 3, and 12 of the external control interface) according to "**wiring method 2**", or connect the direction signal, analog input signal, analog control speed signal, and start/stop signal (pins 2, 3, 5/15, 11, and 12 of the external control interface) according to "**wiring method 3**" (see **V. External Control Instructions** for details).

- i. External control signal controls direction and start/stop. There are two control modes as follows. The external control interface is wired according to "**Wiring Mode 2**".

① When "Start/Stop Mode" = "Trigger", the pump starts working when it receives a pulse signal and stops working when it receives another pulse signal. When a low-level direction signal is received, the pump direction changes. If the pump is running in the current state, it needs to be started again to be effective. (See **V. External Control Instructions** for details)

② When "Start/Stop Mode" = "Switch", the pump starts working when it receives a low-level signal and stops working when it receives a high-level signal. When a low-level direction signal is received, the pump direction changes. If the pump is running in the current state, it needs to be started again to be effective. (See **V. External Control Instructions** for details)

The working interface is as shown below.




- ii. External control signals control direction, start and stop, and analog signals control speed. There are two control methods as follows. The external control interface is wired according to "[wiring method 3, 4](#)". First, short-circuit pins 2 and 11 of the external control interface.

① When "Start/Stop Mode" = "Trigger", the pump starts working when it receives a pulse signal and stops working when it receives another pulse signal. When a low-level direction signal is received, the pump direction is forward, and when a high level is received, the pump direction is reverse. The speed (flow) is calculated in inverse proportion to the received analog value (see [V. External Control Instructions](#) for details).

② When "Start/Stop Mode" = "Switch", the pump starts working when it receives a low-level signal and stops working when it receives a high-level signal. When a low-level direction signal is received, the pump direction is forward, and a high-level signal is reverse. The speed is calculated in inverse proportion to the received analog value (see [V. External Control Instructions](#) for details).

The working interface is as shown below.



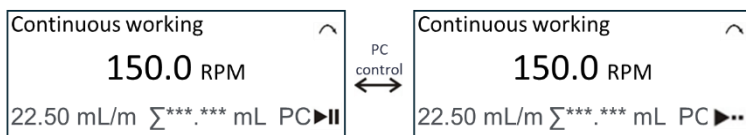
Note: After starting the pump in external control mode, press  on the panel once to stop the pump urgently.

4.5.6. Communication Working

For communication working, ① it is required to set "Communication

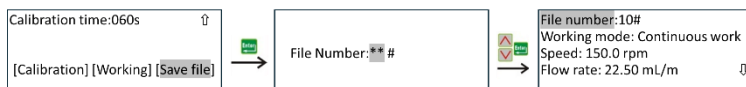
selection" to ON in **4.3. System Settings**; set the baud rate as needed; set the machine number to any value between 01-16# as needed. ② it is necessary to access the communication control signal and connect the bottle control signal and the filling start signal according to "**wiring method 5**" (see **V. External Control Instructions** for details).

When the start/stop command is received, the working interface is as shown below.



4.6. File Saving

In the file setting interface, select [Save File] and press **Enter** key to confirm and enter the file saving interface, as shown below.



4.7. Filling and draining

Before the peristaltic pump is used, the tube must be filled with liquid. In any working mode, press and hold **Max** key until the tube is full of liquid.

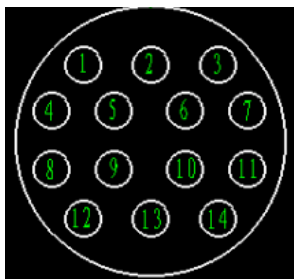
After the pump is finished working, the liquid in the tube must be drained. At this time, first change the running direction of the pump (opposite to when it is filled), then press and hold **Max** key until the liquid in the tube is drained.

5. External Control Instructions

This series of peristaltic pumps can be operated and controlled by the keys on the panel and can also be controlled by external current to control the speed (flow) and level to start and stop the pump. In addition, all pump parameters can be controlled by communication. All external controls are connected through the external control port.

5.1. External Control Interface

The external control interface is on the rear panel, a 14-pin aviation socket, and its internal pin sequence is as follows:



The pins of the external control interface are defined as follows (with external control cable colors):

Pins	Color	Definition
1-pin	Brown	+5V, use by external devices, the current is less than 100 mA.
2-pin	Red	GND, common ground wire.
3-pin	Orange	F/R, rotation direction control signal.
4-pin	Yellow	+12V, use by external devices, the current is less than 100 mA.
5-pin	Green	lin, current input (4-20mA), control speed (flow).
6-pin	Brown, dotted	A, RS485 communication terminal A.
7-pin	Red,	B, RS485 communication terminal B.

	dotted	
8-pin	Orange, dotted	A , RS485 communication terminal A.
9-pin	Blue	B , RS485 communication terminal B.
10-pin	Purple	REM , analog enable port/bottle signal port.
11-pin	Grey	S/S , trigger and switch control signal input port.
12-pin	White	COM , relay output common terminal.
13-pin	Black	NO , relay output normally open terminal.
14-pin	Yellow, dotted	Vin , voltage input (0~10V), for controlling the speed.

Note: This machine is equipped with a 14-pin external control cable as standard.

5.2. Wiring Method

This series of peristaltic pumps has 6 wiring methods for external control and communication control. The requirements for the added control level and impressed current have been explained above.

The 6 wiring methods are described as follows:

Wiring method 1: Connect pins 2, 10, and 11 of the external control interface to the external control device.

Wiring method 2: Connect pins 2, 3, and 11 of the external control interface to the external control device.

Wiring method 3: Connect pins 2, 3, 5, 10, and 11 of the external control interface to the external control device.

Wiring method 4: Connect pins 2, 3, 5, 10, and 11 of the external control interface to the external control device.

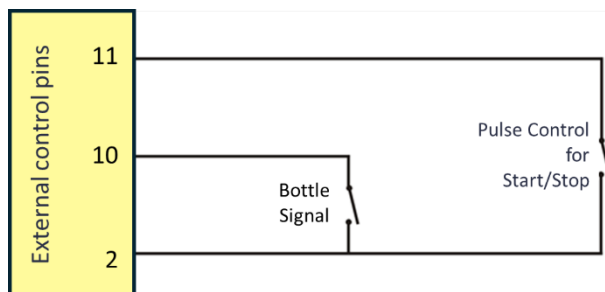
Wiring method 5: Connect pins 8 and 9 of the external control interface to the external control device.

Wiring method 6: Connect pins 12 and 13 of the external control interface to the external control device.

The typical wiring diagram is shown below:

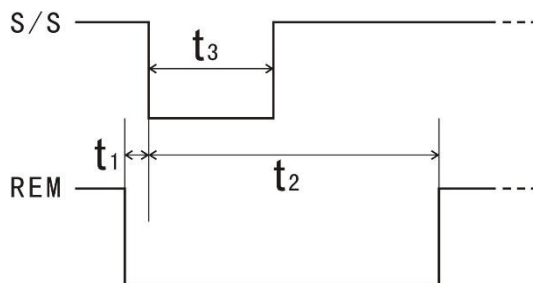
Wiring method 1: Connect pins 2, 10, and 11 of the external control

interface to the external control device.



Description:

- ① Short-circuiting pin 1 and 10 indicates that there is a bottle, and opening indicates no bottle. Pin 2 and 10 short circuited once indicates that a start/stop signal has been received.
- ② The timing sequence requirements of "start signal" and "bottle signal" are shown in the figure below:



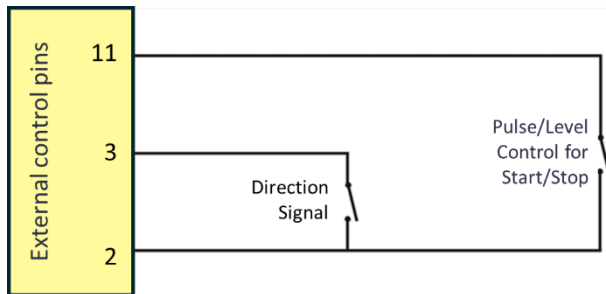
S/S—Start signal; **REM**—Bottle signal; **t₁**—Bottle signal advance placement time; **t₂**—Bottle signal holding time; **t₃**—Start signal holding time.

The requirements for each time period are shown in the following table:



Characteristic Time period	Shortest (ms)	Recommended (ms)	Maximum (ms)
t_1	0	10	100
t_2	150	200	Before next startup
t_3	100	150	Before next startup

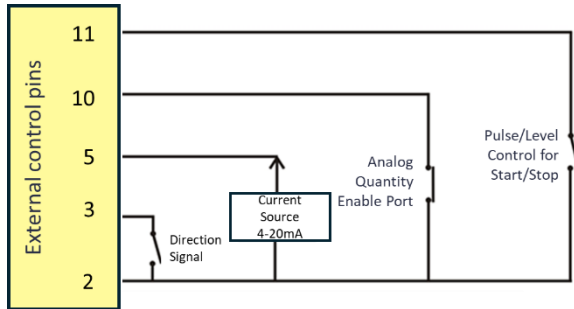
Wiring method 2: Connect pins 2, 3, and 11 of the external control interface to the external control device.



Description:

- ① When "Start-Stop Mode" = "Trigger", PIN11 starts working after receiving a pulse signal, and stops working after receiving another pulse signal.
- ② When "Start/Stop Mode" = "Switch", PIN11 works when it receives a low-level signal and stops working when it receives a high-level signal.
- ③ When PIN3 receives a low-level direction signal, the pump direction changes.

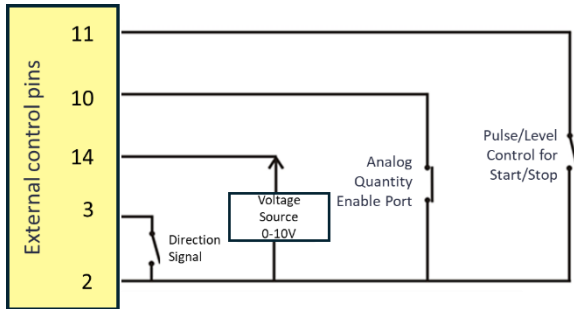
Wiring method 3: Connect pins 2, 3, 5, 10, and 11 of the external control interface to the external control device.



Description: External control signal controls direction, start and stop, analog signal controls speed. First, short-circuit pins 2 and 10 of the external control interface to select the speed to be controlled by external analog quantity.

- ① When "Start-Stop Mode" = "Trigger", PIN11 starts working after receiving a pulse signal, and stops working after receiving another pulse signal.
- ② When "Start/Stop Mode" = "Switch", PIN11 receives a low-level signal to start working, and receives a high-level signal to stop working.
- ③ When PIN3 receives a low-level direction signal, the pump direction is reverse, and high level is forward.
- ④ The speed (flow rate) is calculated based on the analog value received by PIN5 and the speed corresponding to the high and low values of the analog value (i.e. "4mA speed", "20mA speed").

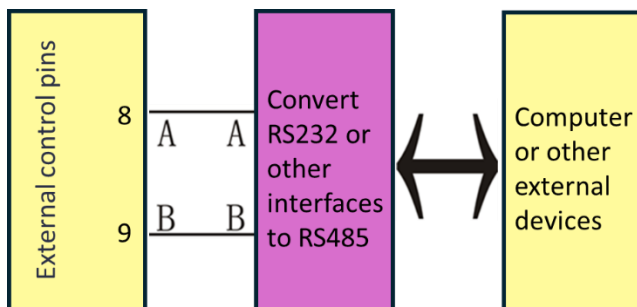
Wiring method 4: Connect pins 2, 3, 14, 10, and 11 of the external control interface to the external control device.



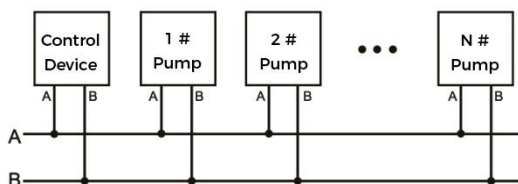
Description: External control signal controls direction, start and stop, analog signal controls speed. First, short-circuit pins 2 and 10 of the external control interface to select the speed to be controlled by external analog quantity.

- ① When "Start-Stop Mode" = "Trigger", PIN11 starts working after receiving a pulse signal, and stops working after receiving another pulse signal.
- ② When "Start/Stop Mode" = "Switch", PIN11 receives a low-level signal to start working, and receives a high-level signal to stop working.
- ③ When PIN3 receives a low-level direction signal, the pump direction is reverse, and high level is forward.
- ④ The speed (flow rate) is calculated based on the analog value received by PIN14 and the speed corresponding to the high and low values of the analog value (i.e. "0V speed" and "10V speed").

Wiring method 5: Connect pins 6/8 and 7/9 of the external control interface to the external control device. Mainly used for communication control.



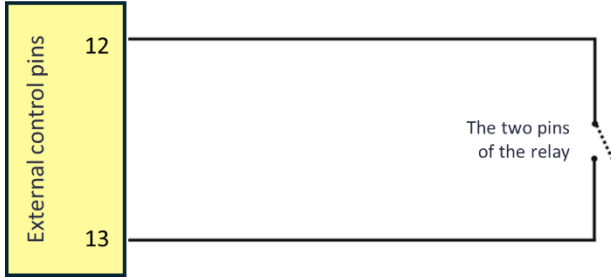
Some applications require remote communication control of multiple peristaltic pumps. Following "**Wiring method 4**" to connect the 6/8 pin (A) and 7/9 pin (B) of the external control interface to form a control system as shown in the following figure:



Note 1: $1 \leq N \leq 16$.

Note 2: Before performing communication control, please refer to "System Settings" to set a machine number for each pump.

Wiring method 6: Connect pins 12 and 13 of the external control interface to the external control device. When the "Relay" is set to "Run, Normally Open"/"Run, Normally Closed", the two pins are normally open/normally closed when the pump is running, and the two pins are normally closed/normally open when the pump is stopped.



6. Maintenance and Repair

6.1. Product Maintenance

- If the peristaltic pump will not be used for a long time, the tube should be removed.
- The enclosure of the product should be kept clean and can be wiped with a soft cloth dipped in clean water.

Note: Please do not use alcohol to clean the mask.

6.2. Product Repair

Be familiar with and master the correct operation of the product, external connection methods and various working conditions to eliminate faults caused by human factors. Common fault and troubleshooting methods are shown in the table below:

Fault	Cause	Troubleshooting	Remark
After powering on, there is no display on the LCD screen.	Check if there is electricity in the power socket, and if the power plug is loose, or the fuse loose or blown?	Re-plug the plug; reinstall or replace the fuse; note that the fuse must be selected according to the requirements in the specification sheet.	Be sure to check and determine what caused the fuse to blow.
After powering on, the LCD screen displays correctly, but the pump roller does not rotate.	Check whether the hold block on the pump head is pressed too tight so that the shaft is stuck; check whether the connecting wires of the motor are properly plugged in; whether the external control signal is connected and meets the requirements.	Reinstall the hold block of the pump head as required; plug in the plug; connect the external control line and check whether the signal meets the requirements.	Otherwise, there is a problem inside the pump and it is best to contact the supplier to resolve it.
The pump roller rotates	Check whether the tube is pressed into place;	Adjust the tube clamps on both sides	

Fault	Cause	Troubleshooting	Remark
but no fluid is pumped.	check whether the tube is damaged or leaking.	of the pump head; replace with new tubes.	
During operation, the tube slides to one side along with the roller.	Check whether the pipe clamp is locked and secure.	Adjust the tube clamp and fasten it.	

7. After-Sales Service

1. If the product has quality problems within three months from the date of purchase, Duoning/Prefluid will be responsible for replacement;
 2. This product will be repaired free of charge within one year from the date of purchase;
 3. After the warranty period, if the user cannot handle the fault by himself/herself, please contact the dealer or our company to get preferential repair and service;
- a) Failures caused by the following reasons are not covered by warranty service: self-modification, overload operation, improper maintenance, operating environment not meeting product specifications, operation beyond the voltage range, and failure to properly connect the wires, etc.

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