BP501 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 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.

Table of Contents

1. Overview

BP501 peristaltic pump is an industrial high-precision filling peristaltic pump. This 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 shell with IP54 high protection level; the surface of the shell is treated with imported baking varnish, which is elegant, 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 filling 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.

➢**The product pictures are as follows:**

➢**This series of products mainly consists of two parts:**

- **Pump head:** PF246 pump head.

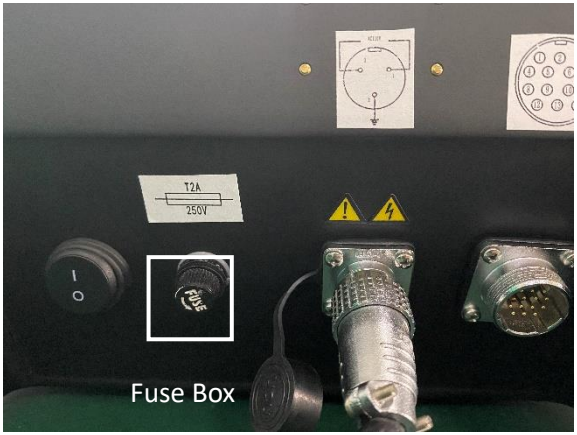
- **Drive:** The main body (power source) of the peristaltic pump.

➢Fuse

This product contains a 2A standard fuse. If you need to replace it, please unscrew the fuse box and replace it 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 screen displays the working parameters and working status of the peristaltic pump, which is intuitive and clear.

- The operation interface is friendly and has simple prompts, making it easy to learn and understand.
- Two working modes are optional. It can be used for quantitative filling or for ordinary continuous working. It is highly flexible and suitable for use in 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.
- The speed, direction, start and stop of the pump can be controlled by external signals.
- The pump speed, direction, start and stop can be controlled by RS485 interface and Modbus RTU communication protocol.
- Brushless DC motor, servo drive, low noise, low heat and maintenance-free operation.
- It has a power-off memory function, and 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 Specification

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

Model	BP501
Drive	Brushless DC motor, servo drive, no-noise operation,

Model	BP501
	low heat generation, maintenance-free
Speed range	0.1 - 350.0 rpm
Speed resolution	0.1 rpm
Adjustment method	The panel buttons 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 4-20ma, voltage 0-10v) controls speed; rs485 interface, Modbus RTU communication protocol controls start, stop, direction and speed; state output function
Applicable power supply	220vac (±10%), 50hz/60hz
Power consumption	⩽150w
Work environment	Temperature 0 - 40℃, relative humidity ≤80%
Applicable pump head	Yz35 pump head
Protection level	Ip54

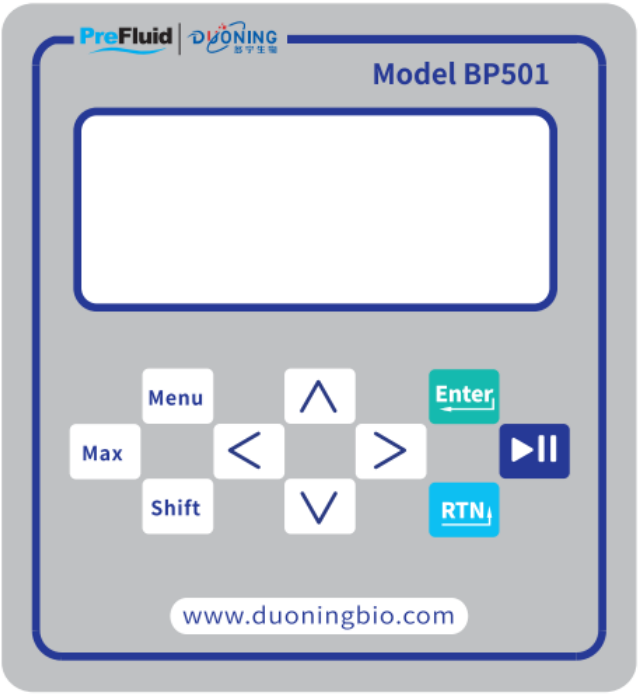
Model	BP501
Flow range	For details, please refer to the pump head manual.
Enclosure	Die-cast chassis with special spraying
Dimensions	265 mm (w) × 211 mm (h) × 300 mm (d)

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 buttons, as shown in the figure below.



Component Description:

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

➢**The button functions are as follows:**

▶II —— Start/Stop button controls the start or stop of the pump

Enter —— Confirmation of parameter settings with the Enter key

RTN —— Return key to return to the previous level and exit

∧ —— Up key to adjust parameters

∨ —— Down key to adjust parameters

< —— Left key to adjust parameters

> —— Right key to adjust parameters

Max —— Drain key cooperates with the direction to fill or drain the tube

Menu —— Menu key to switch between system settings interface and file settings interface

Shift —— Use the function key combination in a certain interface:

① Shift + Max

In the “Quantitative filling” working interface, press this key combination to reset the “filling times”; in the “Continuous working” interface, press this key combination to reset the “total amount”.

② Shift + Enter

In the "Quantitative Filling" and "Continuous working" interfaces, press this key combination to enter the calibration menu interface.

③ Shift + ∧

In the two working interfaces, press this key combination to lock and release the control panel buttons. In the "System Settings" and "File Settings" interfaces, press this key combination to quickly turn pages 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 pages downward.

⑤ Shift + < , Shift + >

Available in both working interfaces. Press this key combination to set the rotation direction.

3.2. Description of the Rear Part of the Chassis

Power switch | Fuse box | External control interface | Power port

- **External control interface:** 14-pin external control interface, interfaces for communication, current/voltage signals, direction, start/stop control signals, etc.
- **Power Outlet:** 110V/220V AC power input socket.

- **Fuse Box:** Built-in fuse.
- **Power switch:** Turn to "I" for ON, turn to "O" for OFF.

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

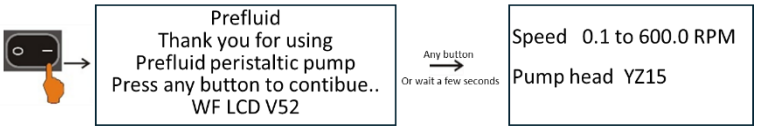
4. Operation Instructions

4.1. Installation of Pump Head and Tube

The pump head and tube must be installed before the following operations. For detailed installation methods, please refer to the relevant "Pump Head Manual".

4.2. Power-on Introduction

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 confirmation button, you will enter the file setting interface, as shown below.

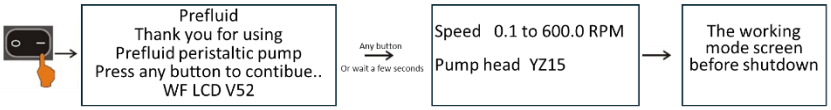
Note: Make sure that the input power voltage is consistent with the power supply voltage required by the machine.

- **Power switch:** Turn to "I" for on, turn to "0" for off.
- **First boot** 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 turning on the machine, 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, enter the file setting

interface.

- **How 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 Number 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 ∧ , ∨ to select, and press Enter to confirm), the default parameters will display, when the parameters are modified, they are automatically saved as the current file parameters and can also be saved as 01#-12 files.
- 01#-12 files, these 12 groups of parameters are the file parameters that have been stored before, reselect is available (press ∧ , ∨ to

select, press Enter to confirm). After the parameters are modified, they are automatically saved as the current file parameters. If you want to call the 01# file again, you need to press ∧ , ∨ 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.

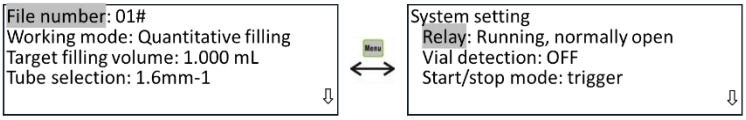
4.2.3. Introduction to Pump Status

- ▶II, The pump stops and waits for a trigger (press the ▶I key or external signal trigger) to work.
- ▶··, The pump is running and waiting for a trigger (press the ▶I key or external signal trigger) to stop.
- ▶·I, 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 ▶II, 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 ▶·I, 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▶II, The pump stops, and the 2 and 11 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 2 and 11 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

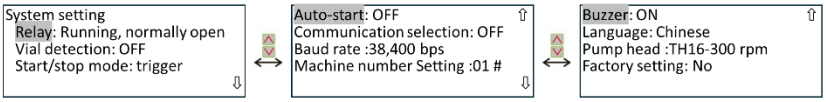
In the file settings interface, press Menu key to enter the system setting interface. As shown below:



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

***Note**: When the system settings interface is on the first page, the right side will display "⇩" mark, the last page will show "⇧" mark, the middle page will display both "⇧"and"⇩" marks. It means "the next page presents" or "the previous page presents" or "both the previous and next pages present".*

As shown in the following figure:



The parameters are described as follows:

Relay: "Run, normally open" and "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 pump operation is not controlled by the bottle signal, that is, the pump operates when it receives the external control drive signal.

Note: This item is used in the “Quantitative Filling” working interface to start the pump in external control mode (see **V. External Control Instructions “Wiring Mode 1”** for details).

Start-stop mode: There are two optional modes: trigger and switch. When "trigger", the pump will work when it receives a pulse signal; when "level", the pump will work when it receives a high or low level.

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 in the "Continuous Working" interface. ① The 2nd and 10th 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 10 of the external control interface, the pump start and stop 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 options: 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 operation of the pump is mainly controlled by communication.*

Buzzer: ON or OFF is optional.

Language Selection: Chinese and English are available.

Pump head selection: Only available for PF246. 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. Preparation for Filling

The flow chart is as follows:

Step 1: System Setup

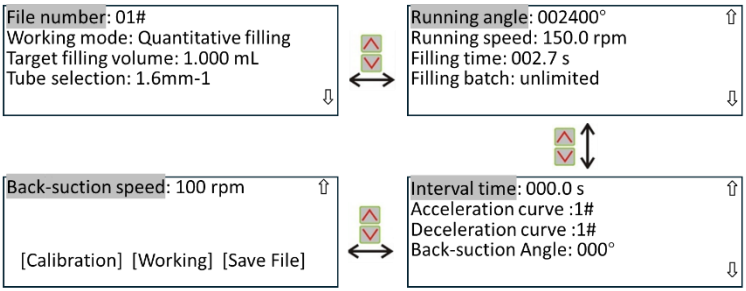
See **4.3 System Settings**, set “Communication Selection” to “OFF”.

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, 12.7 mm, oth are optional. -1, -2 means 1 channel, 2 channel tube. Set to 1.6 mm-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: 0.1-350.0 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 dispense according to the set parameters. The usage is related to the "interval time".

Stop time: 0-999.9s.①When “interval time” = 0s, the pump receives a trigger signal and dispenses once.② When the “interval time” is greater than 0s, 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 according to the splashing of liquid on the bottom of the bottle at the end of filling.

Suction angle: 0-360°, the angle of reversal after each normal operation of the pump. Used for filling high-viscosity liquids to prevent dripping.

Suction speed:50-300rpm.

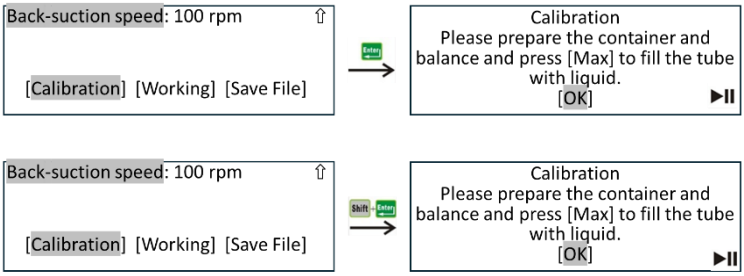
[Check]: When highlighted, press Enter key to enter the calibration interface.

[Work]: When highlighted, press Enter key, or press ▶I key to enter the "Quantitative Filling" interface.

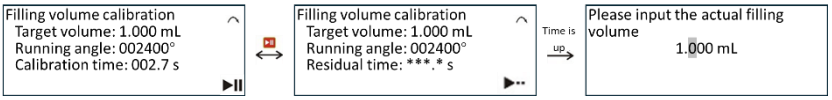
[Save File]: When highlighted, press Enter key to enter the file parameter saving interface.

Step 4: Target loading calibration

In the file settings interface, press ∧ , ∨ to select [Calibration] and press Enter to confirm and enter the quantitative filling calibration interface (or in the file setting interface, press Shift + 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 to fill the tube with liquid and make sure there are no bubbles in the tube. Then press Enter to enter the next menu. In the loading volume calibration interface, press ▶I key, 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.



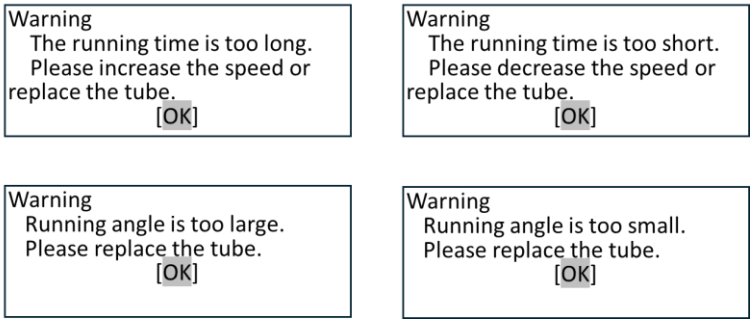
Target loading volume: 1.000 mL, the dispensing volume that needs to be filled and calibrated.

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

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

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

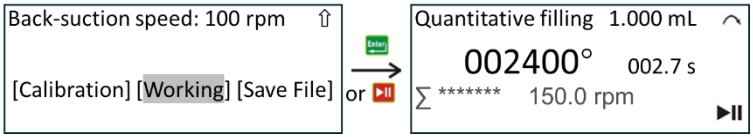
If the set loading amount is too different from the actual calibration value, a warning interface may pop up:①The running time is too long (> 999.9s).②The running time is too short (<0.1s).③The running angle is too large (> 999999°).④The running angle is too small (<180°). See the figure below.



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

Step 5: Enter the quantitative filling interface

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



1.000mL: Target loading quantity, the loading quantity 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 operation.

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 forward direction;

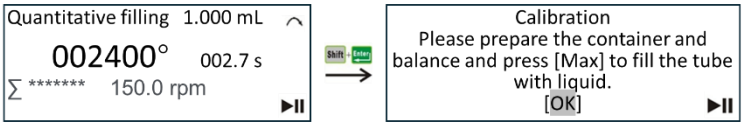
: Indicates that the pump is running in the reverse direction.

4.4.2. Key Combinations

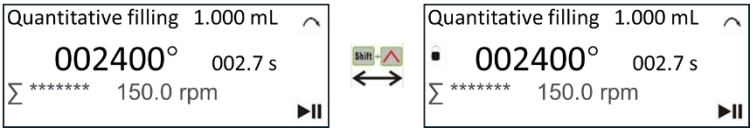
In working interface, you can use key combinations.

(i) When the pump is stopped, press Shift + < or Shift + > keys, you can change the pump rotation direction.

(ii) When the pump stops, press Shift + Enter, you can enter calibration interface, you can also select [Calibration] in the file setting interface and press Enter key to enter.



(iii) Press Shift + ∧ keys, the keyboard can be locked and unlocked. The operation can be performed when the pump is running or stopped. Only the stop function of ▶II key is available.



(iv) When the pump stops, press Shift + Max key to zero the number of filling times.

4.4.3. Fine-tuning 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 ∧ , ∨ , < , > or Enter, a certain digit of the angle value will be highlighted to indicate that it can be modified. Press ∧ , ∨ to adjust the angle, press Enter key to confirm. This operation can be performed when the pump is running or stopped. See the figure below.

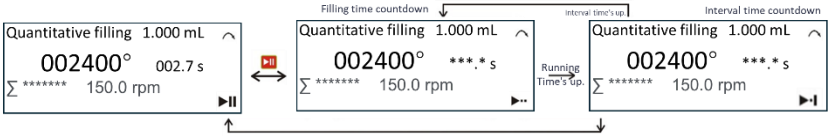
4.4.4. Manual Filling

(i) When the batch size = "unlimited" and the downtime = 0.

Press ▶I key once, dispense once, and the count increases. When the count reaches 10000000, it returns to zero Σ0. The working interface is as follows.

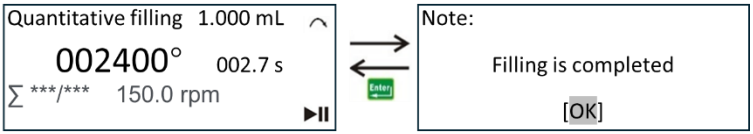
(ii) When the filling batch size = "unlimited" and the downtime = n (n>0).

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 ▶| key again to stop the pump.



(iii) When the filling batch size = N (N > 0) and the downtime = 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.



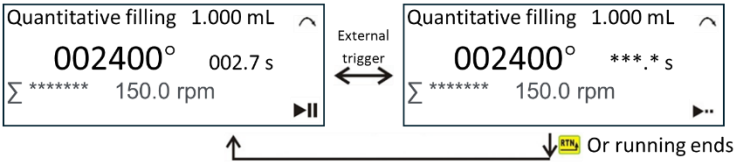
(iv) When the filling batch size = N (N>0), the downtime = n (n>0).

Press ▶| key once, and the filling will be divided into n times, and the count will increase, and the count will be Σ***/***.

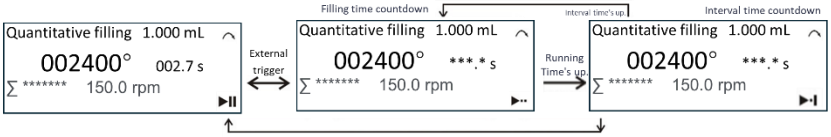
4.4.5. External Control Filling

External control filling ① It is necessary to set "Bottle Presence Detection" in the **4.3 System Settings** section. 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 necessary 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" = "Unlimited", and the downtime = 0. The external control starts once, the filling is done once, and the count increases. When the count reaches 10000000, it returns to zero Σ0, and the working interface is as follows.



(ii) When "Filling Batch" = "Unlimited", and the downtime = n (n>0). The external control starts once, the filling is repeated multiple times, and the count increases. When the count reaches 10000000, it returns to zero Σ0, and the working interface is as follows. The pump stops once by pressing the ▶I key or external control.



(iii) When “Filling Batch” = N (N > 0) and “Interval Time” = 0, the external control starts once, filling is performed once, the count increases, and

Σ***/*** is displayed.

(iv) When “Filling Batch” = N (N > 0), and the downtime = n (n > 0), the external control starts once, the filling is performed N times, the count increases, and Σ***/*** is displayed.

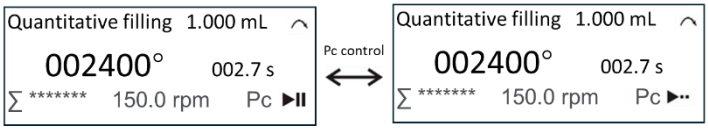
Note:①*When "Bottle detection" = "ON", when the external control starts and there is a bottle shortage, the interface prompts "Bottle shortage".* ②*When the delay time = n (n>0), the external control startup interface prompts "delay".* ③ *Users usually use "Filling batch" = "Unlimited", stop time = 0,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

4.4.6 Communication Filling

For communication filling ①You need to set "Communication Selection" to ON in the **4.3 System Settings** section; set the baud rate as needed; and set the machine number to any value between 01-16# as needed. ②If 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 “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), “stop time” = 0. The pump receives a start signal from PC, dispenses once, and the count increases. The count is displayed as Σ***/***.

(iv) When “Filling batch size” = N (N>0), “stop time” = n (n>0), the pump receives a start signal from PC once, dispenses 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*  *key 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

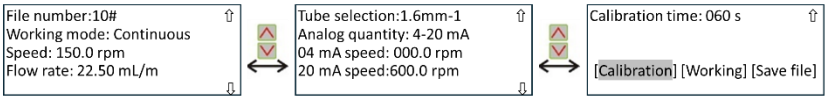
See **4.3 System Settings**, set “Communication Selection” to OFF, and “Auto Start” to OFF.

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: 0.1-350.0 rpm, set to 150.0 rpm.

Flow: 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, oth are 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 "4-20mA" is selected,

04mA speed: 0.0-350.0 rpm, set to 0.0 rpm. It is the speed corresponding to the external analog 4 mA.

20mA speed: 0.0-350.0 rpm, set to 350.0 rpm, which is the speed corresponding to the external analog quantity 20mA.

When "0-10 V" is selected,

0V speed: 0.0-350.0 rpm, set to 0.0 rpm. It is the speed corresponding to the external analog quantity 0 V.

10V speed: 0.0-350.0 rpm, set to 350.0 rpm, which is the speed corresponding to the external analog quantity 10 V.

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

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

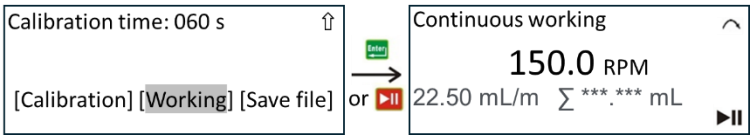
[Work]: When highlighted, press Enter key, or press ▶I key to enter the "Continuous Working" interface.

[Save File]: When highlighted, press Enter 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.*

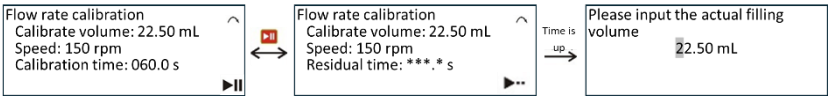
Step 4: Flow calibration

In the file settings interface, press ∧ , ∨ to select [Check] and press Enter to confirm and enter the flow calibration interface (or in the working interface, press Shift + 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 to fill the tube with liquid and make sure there are no bubbles in the tube. Then press Enter to enter the next menu. In Loading volume calibration interface, press ▶I, 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.

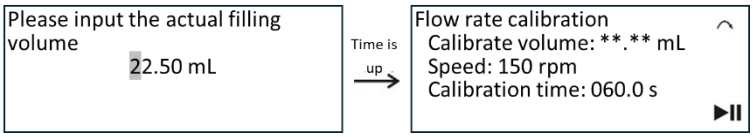


Loading volume calibration: 22.50mL, the volume to be calibrated based on the calibration time.

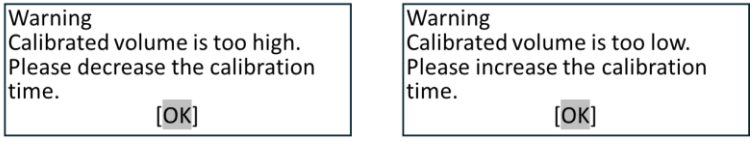
Speed:150.0rpm, the set speed.

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

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



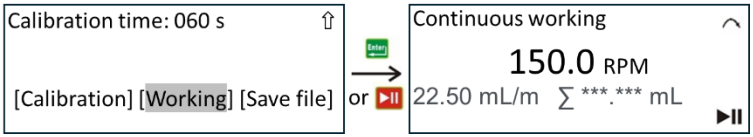
***Note**: If the calibration time is too long or too short, a warning may appear when entering the calibration interface. Please handle it according to the prompts (as shown below).*



Step 5: Enter the flow metering interface

After the calibration is completed, return to the file setting interface and

press ▶I key or select [Work], press Enter 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:** The total amount (accumulated amount) of fluid deliveried at the set speed/flow rate when the pump is working. The following units automatically change to mL, L, and kL. You can press Shift + Max to zero, the unit will automatically return to mL.

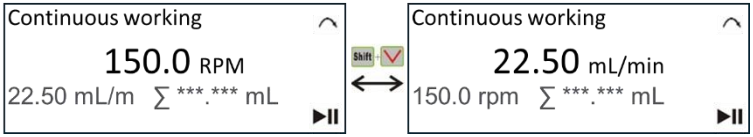
4.5.2. Key Combinations

In working interface, you can use key combinations.

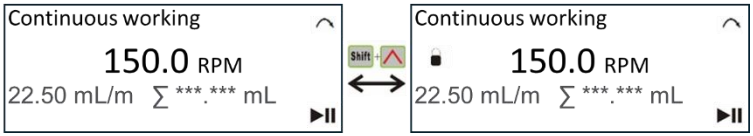
(i) When the pump is stopped, press Shift + < or Shift + >, the direction of rotation of the pump can be changed. The direction of rotation can also be changed in the "System Settings" interface.

(ii) When the pump stops, press Shift + Enter, you can quickly enter calibration interface, or you can also select [Calibration] in the file setting interface and press Enter key to enter.

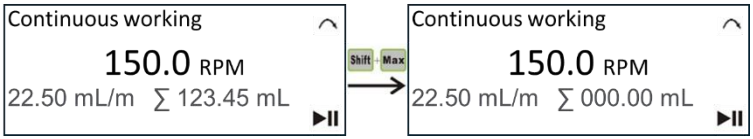
(iii) Press Shift + ∨ , The speed and flow rate can be set.



(iv) Press Shift + ∧ key, the keyboard can be locked and unlocked. When the keyboard is locked, only the stop function of ▶I key is available.



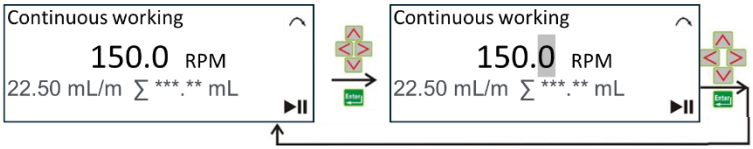
(v) When the pump stops, press Shift + Max key to zero the total value.



4.5.3. Fine-tuning of Speed and Flow Rate

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

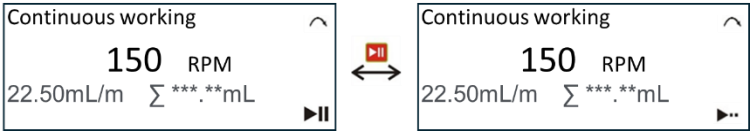
relationship between the flow rate and the tube. Method: Press ∧ , ∨ , < , > or Enter, a certain digit of the speed (flow) key will be highlighted, it means that the digit can be modified. Use < , > key to select the position to be adjusted. Use ∧ , ∨ to adjust the bit value, press Enter key to confirm (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 direction).*

4.5.4. Manual Work

Press ▶I button 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 ▶I key once to stop the pump.

4.5.5. External Control Work

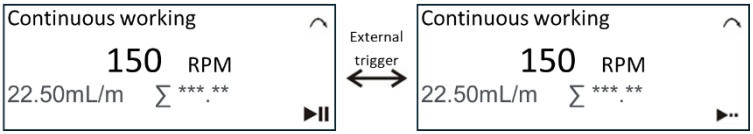
Working in external control mode ① It is necessary to set "Communication Selection" in the **4.3 System Settings** section to OFF. ② Set “Start/Stop Mode” to “Trigger” or “Switch” as required. ③ If external control signals need to be connected, connect the direction signal and start/stop signal (pins 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 after receiving a pulse signal and stops working after receiving 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).

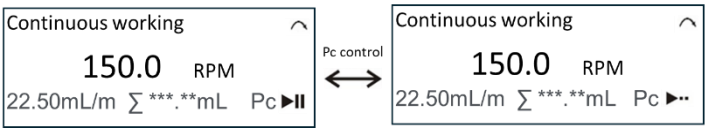
The working interface is as shown below.

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

4.5.6. Communication Work

Working in communication mode ① You need to set "Communication Selection" to ON in the **4.3 System Settings** section; set the baud rate as needed; and 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 to confirm and enter the file saving interface, as shown below.

4.7. Filling and draining

Before the peristaltic pump is used formally, the tube must be filled with liquid. Press and hold the Max key until the tube is filled with liquid.

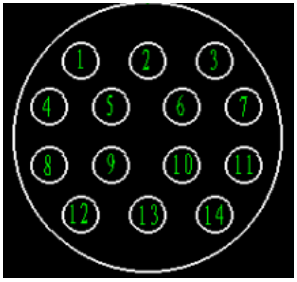
After the pump is finished working, the liquid in the tube must be drained. At this time, first change the direction of the pump (opposite to when it is filled), then press and hold the Max key until the liquid in the tube is drained.

5. External Control Description

This series of peristaltic pumps can be operated and controlled by the buttons 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, f**or use by external controls, the current is less than 100mA.
2-pin	**Red**	**GND, c**ommon ground wire.
3-pin	**Orange**	**F/R**, rotation direction control signal.
4-pin	**Yellow**	**+12V, f**or use by external controls, the current is less than 100mA.

Pins	Color	Definition
5-pin	**Green**	**Iin,** current input (4-20mA), control speed (flow).
6-pin	**Brown, dotted**	**A,** RS485 communication terminal A.
7-pin	**Red, dotted**	**B,** RS485 communication terminal B.
8-pin	**Orange, dotted**	**A,** RS485 communication terminal A.
9-pin	**Blue**	**B,** RS485 communication terminal B.
10-pin	**Purple**	**REM, a**nalog enable port/bottle presence signal port.
11-pin	**Ash**	**S/S,** trigger and switch control signal input port.
12-pin	**White**	**COM, r**elay output common terminal.
13-pin	**Black**	**NO,** relay output normally open terminal.
14-pin	**Yellow, dotted**	**Vin, v**oltage input (0~10V) to control the speed.

Note: This machine is equipped with a 14-core 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.

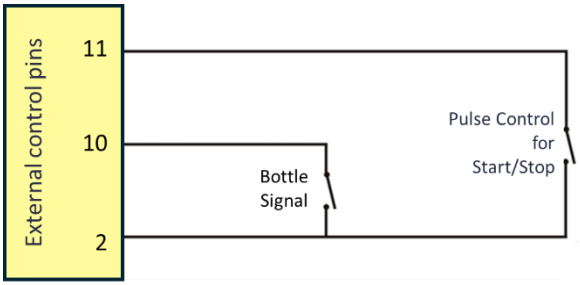
Wiring method 4: Connect pins 2, 3, 5, 10, and 11 of the external control interface to the external control device.

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 application diagram is shown below:

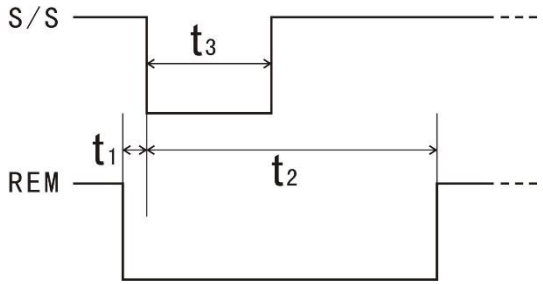
Wiring method 1: Connect pins 2, 10, and 11 of the external control interface to the external control device.



Description:

① Pin 2 and 10 short-circuited indicates that there is a bottle, and opening indicates no bottle. Pin 2 and 11 short-circuited once indicates that a start/stop signal has been received.

② The timing requirements of "start signal" and "bottle signal" are shown in the figure below:

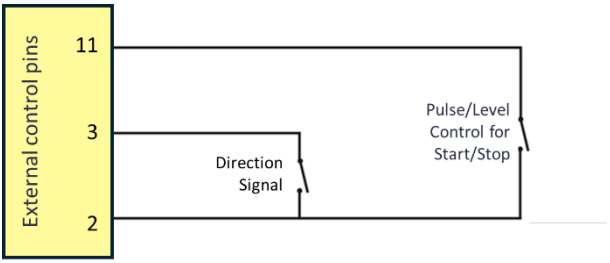


S/S—Start signal; **REM**—Bottle signal; t_1—Bottle signal advance placement time 3; t_2—Bottle signal holding time; t_3—Start signal holding time.

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.



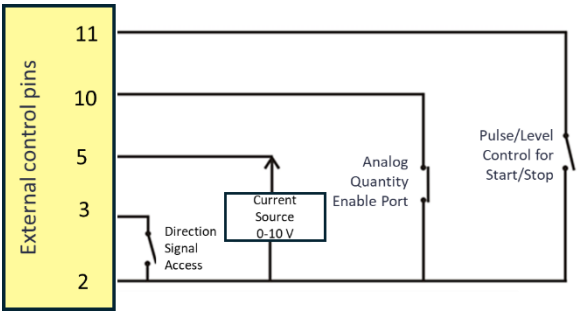
Description:

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.

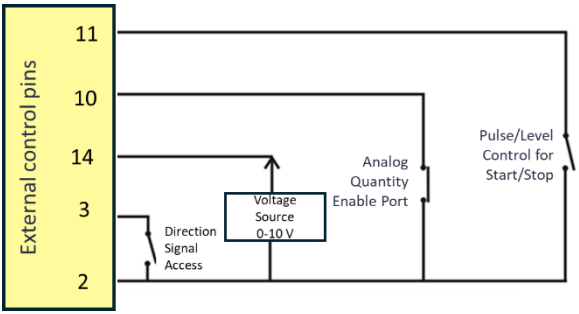
① When "Start-Stop Mode" = "Trigger", PIN11 starts working after receiving a pulse signal, and stops working after receiving another pulse signal.

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.

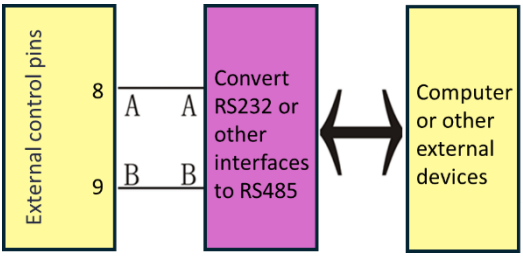
① When "Start-Stop Mode" = "Trigger", PIN11 starts working after receiving a pulse signal, and stops working after receiving another pulse signal.

② When "Start/Stop Mode" = "Switch", PIN11 receives a low-level signal to start working, and receives a high-level signal to stop working.

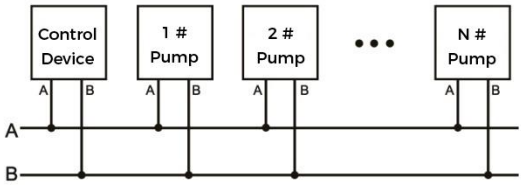
③ When PIN3 receives a low-level direction signal, the pump direction is reverse, and high level is forward.

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.



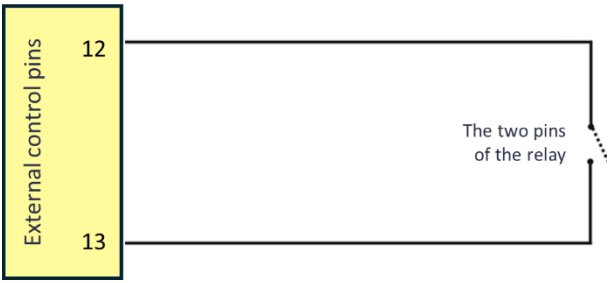
Some applications require remote communication control of multiple peristaltic pumps. According to the above "Wiring Method 4", the 6/8 pin (A) and 7/9 pin (B) of the external control interface can be connected to form a control system as shown in the following figure:



***Note 1**: 1≤N≤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.


External control pins
12
13
The two pins
of the relay

6. Maintenance and Repair

6.1. Product Maintenance

- If the peristaltic pump is not 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 enclosure surface.*

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 phenomena 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, if the power plug is loose, or if the fuse is 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	Check whether the lock 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	Reinstall the pressure 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 or manufacturer

Fault	Cause	Troubleshooting	Remark
not rotate.	the external control signal is connected and meets the requirements.		to resolve it.
The pump roller rotates but no fluid is pumped.	Check whether the tube is installed into place; check whether the tube is damaged or leaking.	Adjust the tube clamps on both sides of the pump head; replace with new tubes.	
During operation, the tube slides to one side along with the roller.	Check whether the tube clamp is locked and secure.	Adjust the tube clamp and fix 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, please contact the dealer or Duoning/Prefluid to get preferential repair and service;
4. Failures caused by the following reasons are not covered by warranty service: modification by end-user, 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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