

Important Information:

Please read operating manual carefully before operation.

Warning:

- Over-push or over-draw the syringe may result in the fluid sprayed. Use appropriate measures to protect operator and equipment. Be careful during operation.
- When the fluid sprays out on the drive unit please shut down the power supply immediately and clean the drive unit, then turn on the power supply.
- If a trouble happens please contact us or our dealer. Don't repair the equipment by yourself.
- Be careful when inserting or extracting the connection wire between controller and drive unit to prevent the plug from damaging.
- If the power line or the plug are worn or damaged please pull out the plug.
- Please shut down the power supply before connecting the external control equipment.

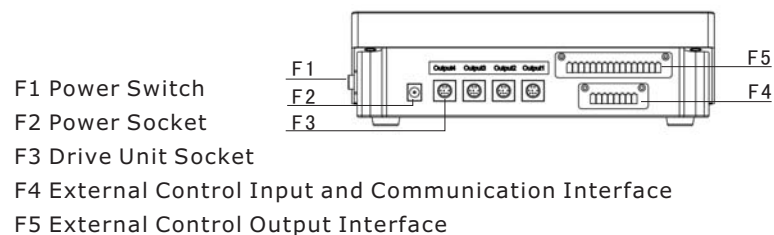
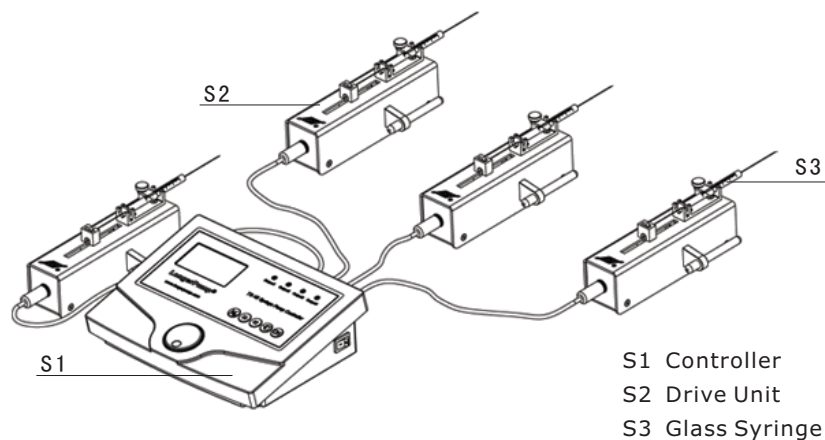
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Introduction

TS series products are controllers of four channels and multi-function syringe pumps. They need to be connected with drive units to constitute syringe pump systems of strong functions and easy-to-operate. They are widely used in biological laboratory. There are 3 types:

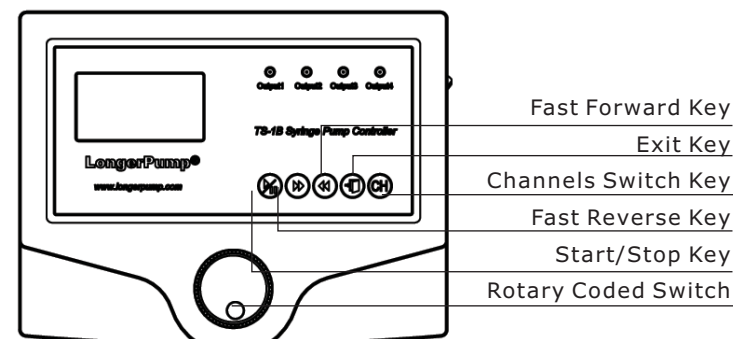
Controller Type	Drive Unit Type	Working Mode
TS-1A	L0107-1A	Infusion-only
TS-2A	L0107-2A	Infusion/Withdrawal
TS-1B	W0109-1B	Infusion/Withdrawal



Note:

Controller and drive unit are connected through 8 pin S terminal. Be careful when insertion or extraction. Please see page 21 for detail information about External control function.

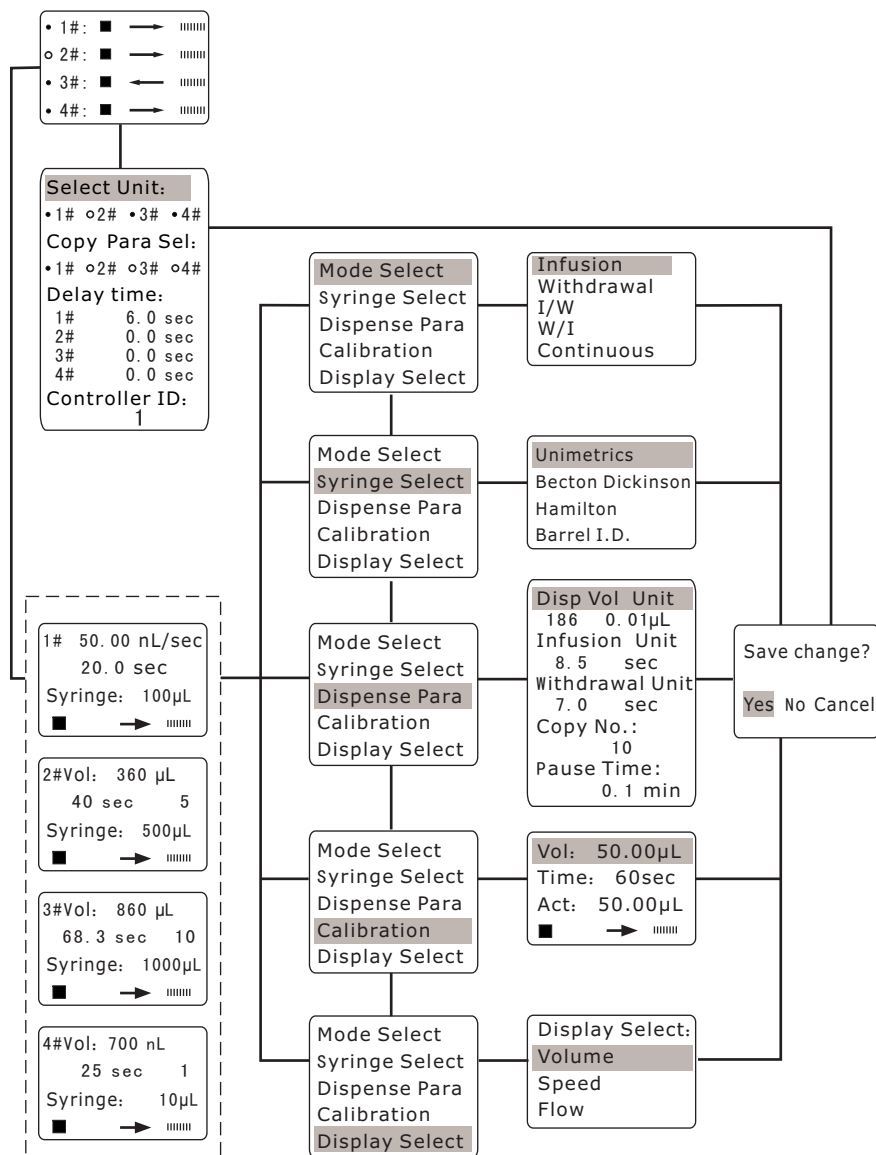
Operation Panel



Basic Operation

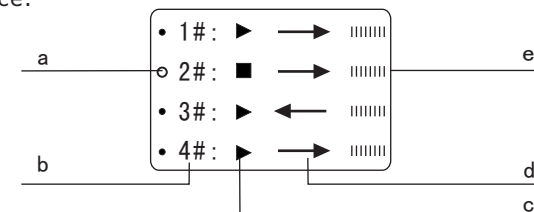
- **Start/Stop Key**
Press the Start/Stop Key to start or stop the pump. In multi-channel working mode, to pause the running state, the pump will prompt if continue the current working state.
- **Fast Forward Key**
In multi-channel working mode, pressing the Fast Forward Key all the enabling channels infuse at the max. speed. In single channel working mode, pressing the Fast Forward Key this channel infuses at the max. speed. Loose this key the pump stops. Other keys are invalid when pressing this key.
- **Fast Reverse Key**
In multi-channel working mode, pressing the Fast Reverse Key all the enabling channels withdraw at the max. speed. In single channel working mode, pressing the Fast Reverse Key this channel withdraws at the max. speed. Loose this key the pump stops. Other keys are invalid when pressing this key.
- **Note:** Fast Forward Key and Fast Reverse Key are invalid when the pump is in running state.
- **Rotary Coded Switch (RCS)**
Turn the Rotary Coded Switch for menu selection or parameter setting. Press the Rotary Coded Switch for confirmation.
- **Note:** Put the finger in the center of the switch to press the RCS. Put the finger on the small concave which is on the side of the switch to turn the RCS.
- **Channels Switch Key**
Switch between different channels.
- **Exit Key**
Cancel current operation and return to previous menu.

Menu Frame Work



Multi-channel Running Interface

Switch on the pump. First initializing, and then display the running interface.

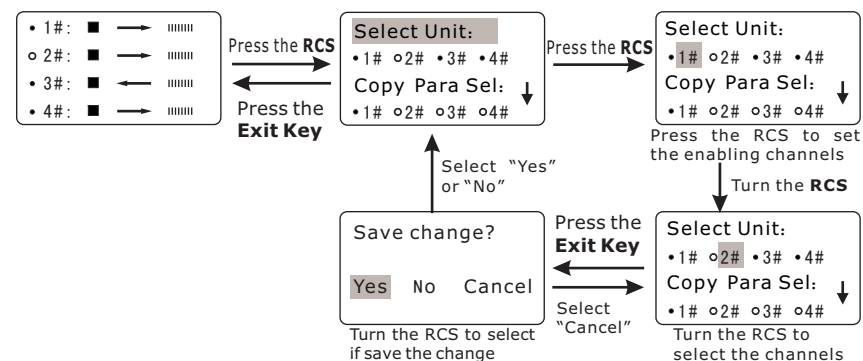


- Enabling symbol: Symbol of enabling or disabling the channels.
 - Means enabling the current channel.  means disabling the current channel. The disabling channel is invalid when the pump is in running state or switching the channels.
- Channel number: Channel serial number.
- Start/Stop state: Display the state of current channel. Start displays . Stop displays . Pause displays .
- Direction: Display running direction. Infusion displays . Withdrawal displays .
- Working mode: Display current working mode. Display  in "infusion, withdrawal, infusion/withdrawal, withdrawal/infusion" modes. Display  in "continuous" mode.

Multi-channel Functions Setting

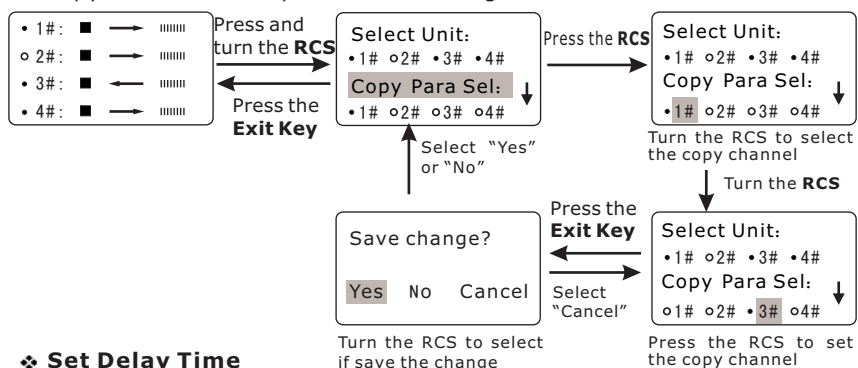
❖ **Select Drive Unit:**

- Means enabling the current channel. O Means disabling the current channel. The disabling channel will not work when the pump is working. The setting method is as below:



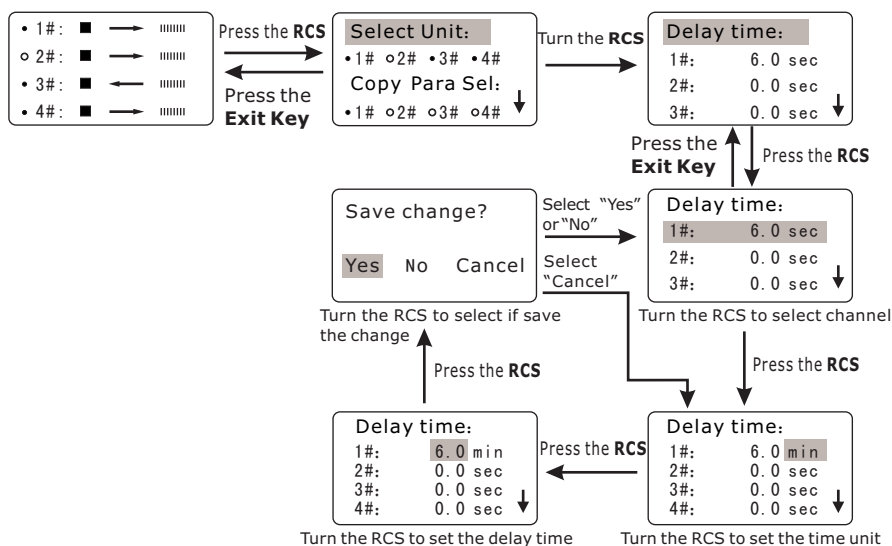
❖ Select Copy Parameters

Select the parameters of one drive unit as copy parameters, all enabling channels will run according to copy parameters. Not setting copy parameters each enabling channel will run according to its own parameters setting. ● Means copy channel; ○ means non-copy channel. Only one channel can be selected as copy channel, or non-copy channel is acceptable. The setting method is as below:



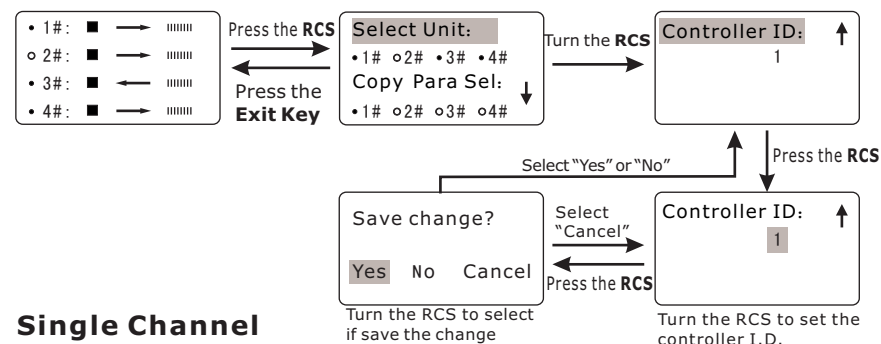
❖ Set Delay Time

Set delay time to start each drive unit in turn. Time units are sec, min and hour. Time numerical value is from 0.1 to 999.9. The setting method is as below:



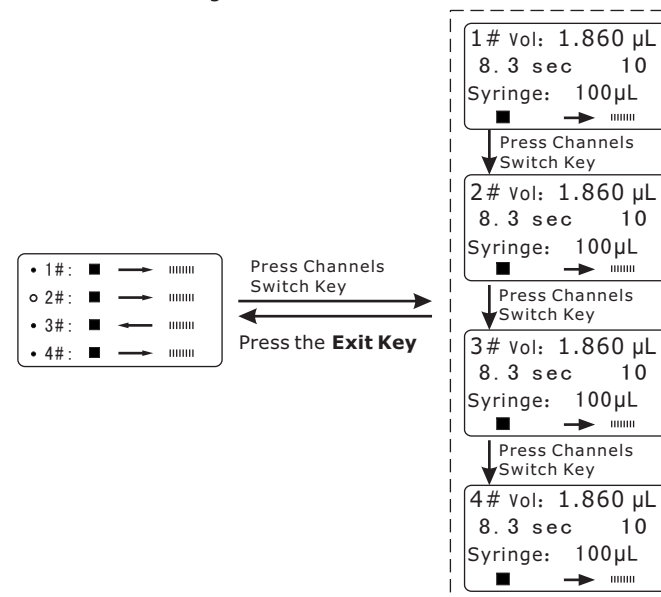
❖ Controller I.D.

When control computer controls many pumps through RS485 interface, it must identify each controller's I.D.. This controller I.D. should be unique. It's the identification of this controller. The controller address serial number is from 1 to 30. The default is 1. The setting method is as below:



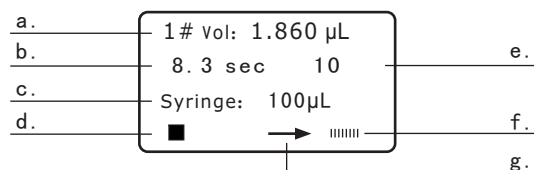
Single Channel Running Interface

Switch on the pump. First initializing, and then display the multi-channel running interface. Press Channels Switch Key to enter single channel running interface. Please see below for detail operation:

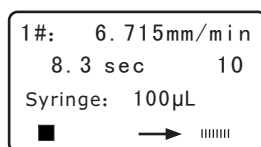


❖ Three Display Modes for Single Channel Running Interface:

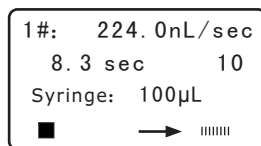
• Volume Display



• Speed Display



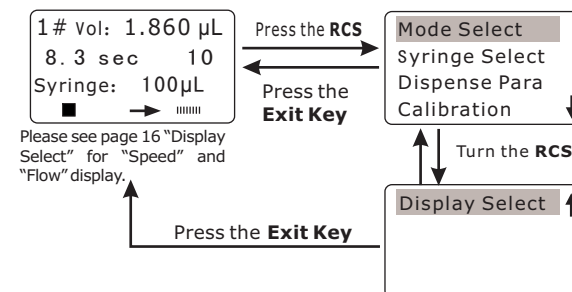
• Flow Rate Display



- Display mode: Display the current volume, flow rates or speed. Please see page 16 "Display Select" for setting method.
- Time: Required time for one time infusing or withdrawal. Counting down when running.
- Syringe: Display selected syringe.
- Start/Stop state: Start displays ► ; Stop displays ■ ; Pause displays ||.
- Copy number: Display dispensing copy number. Counting down when running (no display in "continuous" mode).
- Working mode: Display current working mode. Display ■■■■■ in "infusion, withdrawal, infusion/withdrawal, withdrawal/infusion" modes. Display ◀▶ in "continuous" mode.
- Direction: Display running direction. Infusion displays ► . Withdrawal displays ◀ .

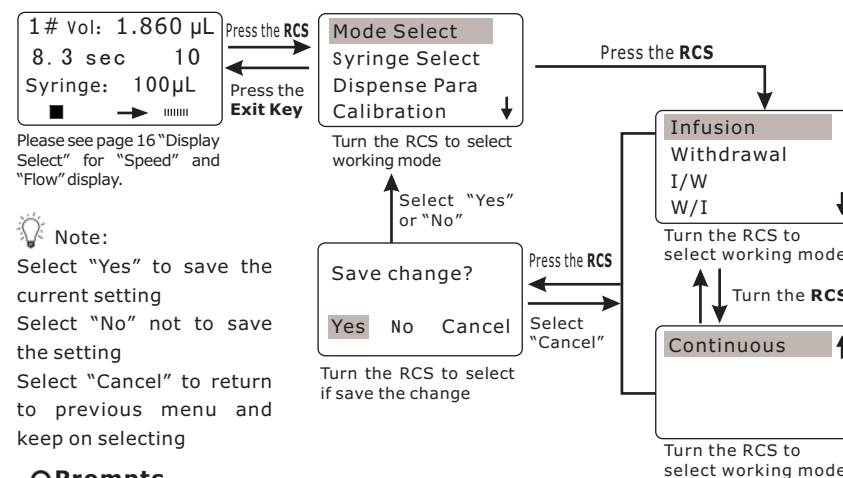
Single Channel Functions Setting

5 functions are set:



💡 Note: TS-1A controller disables Mode Select. It only has infusion working mode.

❖ Working Mode Selection



💡 Note:

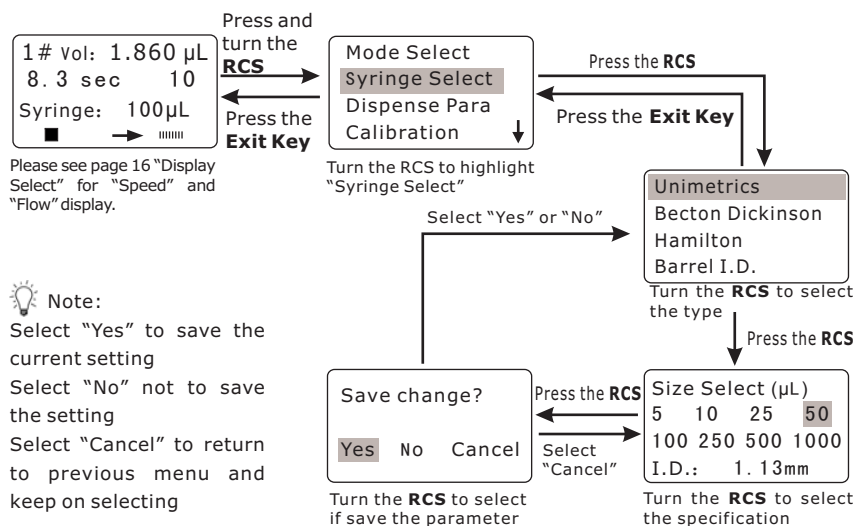
Select "Yes" to save the current setting
Select "No" not to save the setting
Select "Cancel" to return to previous menu and keep on selecting

🔍 Prompts

Infusion: The pump infuses during the whole working course
Withdrawal: The pump withdraws during the whole working course
Infusion/Withdrawal: The pump infuses first and then withdraws during the whole working course
Withdrawal/Infusion: The pump withdraws first and then infuses during the whole working course
Continuous: The pump infuses first and then withdraws, and then cycles continuously
Please see page 11 "Dispensing Parameters Setting" to set the parameters for above working modes.

❖ **Syringe Select**

- Select Standard Syringe



Three syringe manufacturers are listed in the TS-1A,TS-2A menu. Please see below table for specifications:

Unimetrics	Spec(μL)	10	25	50	100	250	500	1000
	I.D.(mm)	0.46	0.73	1.03	1.46	2.3	3.26	4.61
Hamilton	Spec(μL)	10	25	50	100	250	500	
	I.D.(mm)	0.48	0.73	1.03	1.46	2.3	3.26	
SGE	Spec(μL)	25	50	100	250	500		
	I.D.(mm)	0.73	1.03	1.46	2.3	3.26		

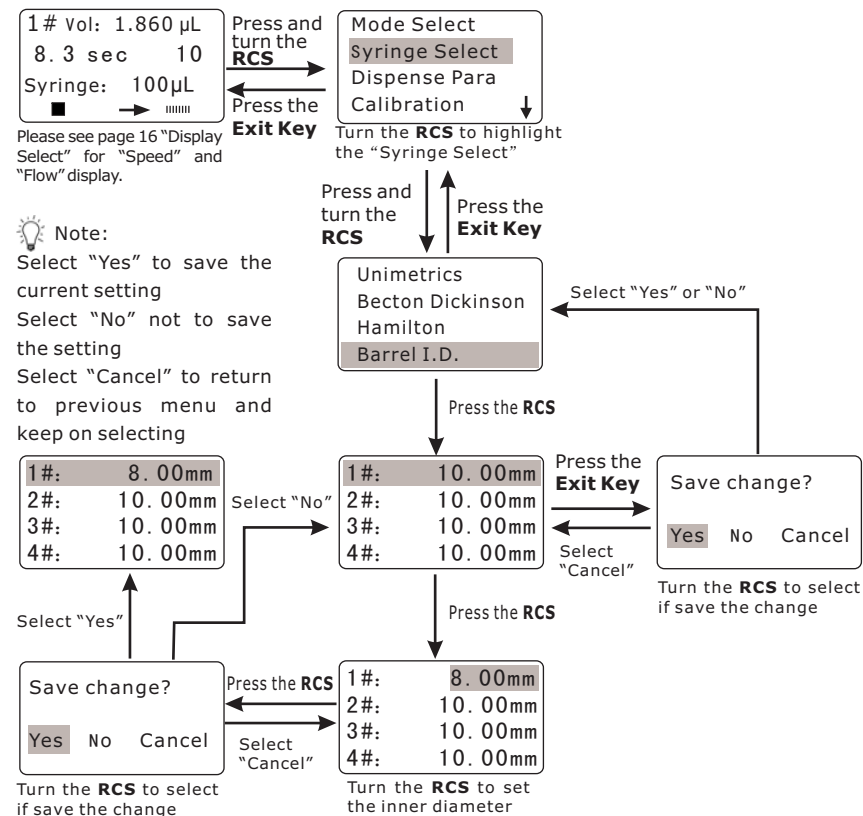
Three syringe manufacturers are listed in the TS-1B menu. Please see below table for specifications:

Unimetrics	Spec(μL)	10	25	50	100	250	500	1000
	I.D.(mm)	0.46	0.73	1.03	1.46	2.3	3.26	4.61
Becton Dickinson	Spec(cc)	1	3	5	10	20	30	60
	I.D.(mm)	4.7	8.59	11.99	14.48	19.05	21.59	26.6
Hamilton	Spec(mL)	1	2.5	5	10	25	50	
	I.D.(mm)	4.61	7.28	10.3	14.57	23.03	32.57	

- Setting and Select the Inner Diameter of the Syringe

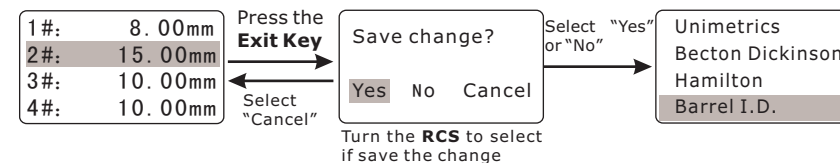
- ### 1. Setting the Inner Diameter of the Syringe

If the syringe used is not listed in the menu the inner diameter of the syringe needs to be measured and entered (0.01 mm - 40 mm). The pump can save 4 inner diameters of the syringes.



- ## 2. Select the Inner Diameter of the Syringe

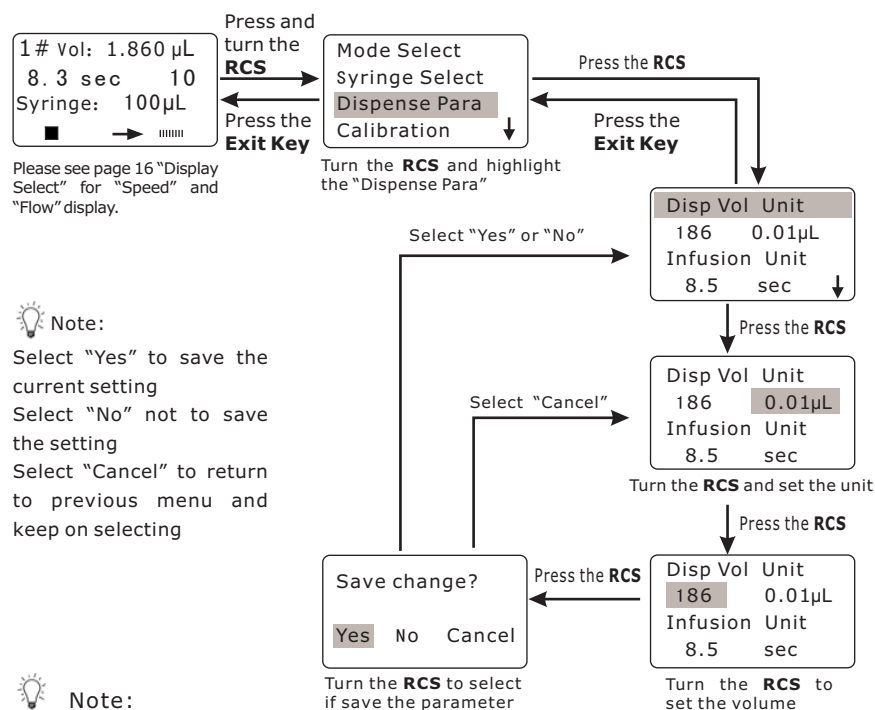
Select the inner diameter of the syringe after setting the inner diameter.



❖ Dispense Parameters Setting

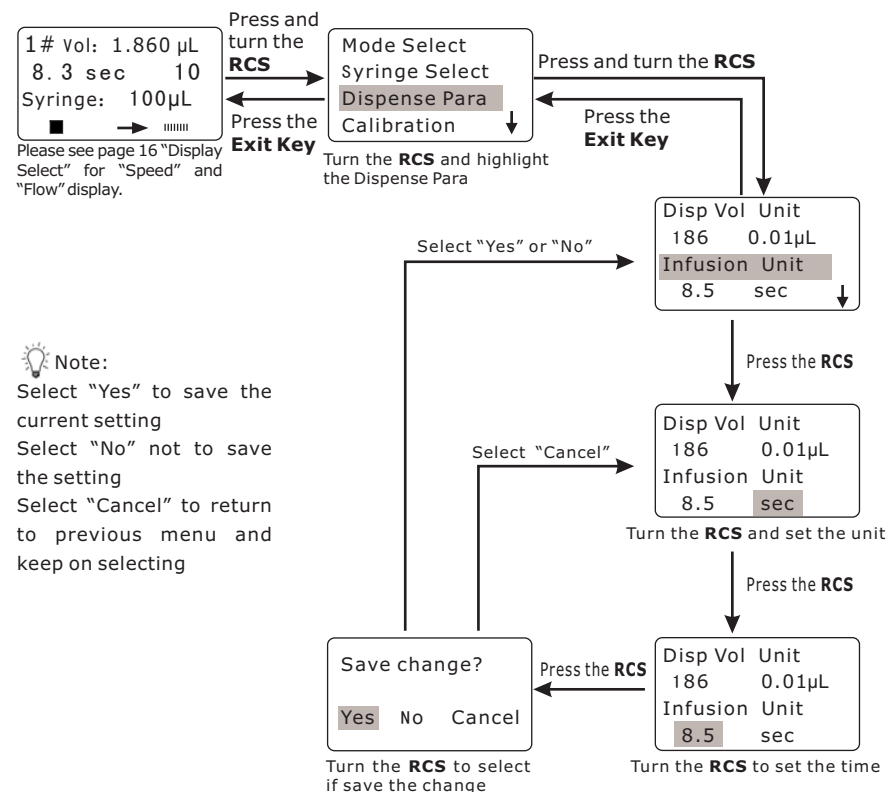
The dispense parameters include dispense volume, infusion time, withdrawal time, copy number and pause time.

- Dispense volume: It is the volume for one time infusion or withdrawal
The volume range is 1 nL to 99.99 mL
There are volume units of nL, 0.01nL, 0.1μL, μL and 0.01mL available.



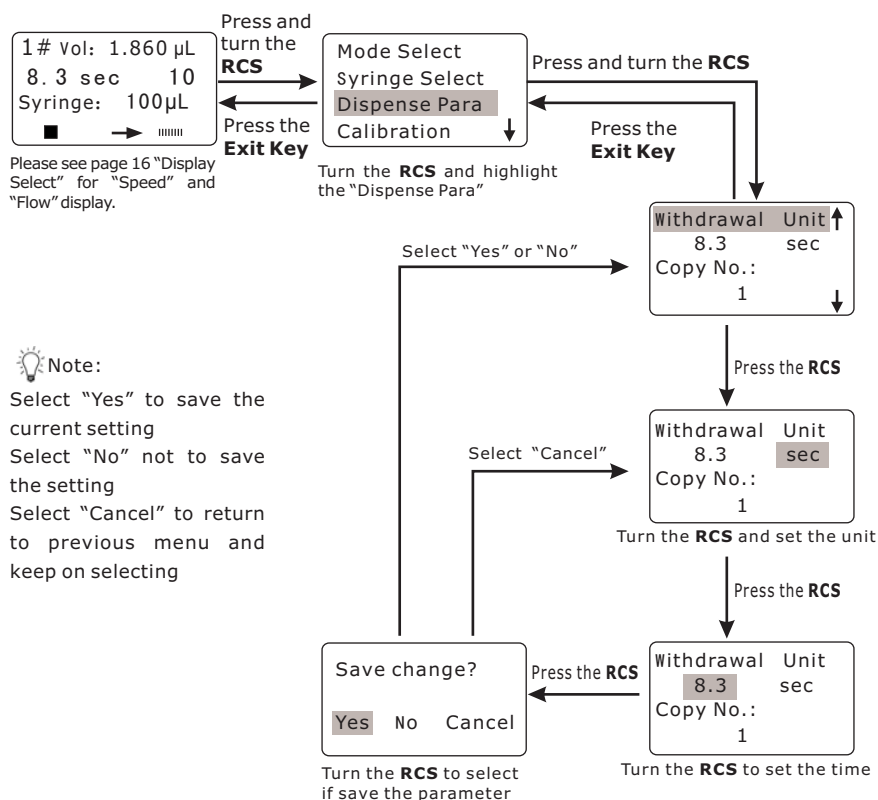
Vol overflow!
8.3 sec 10
Syringe: 100μL

- Infusion time: It is the time for one time infusion
The range of infusion time is from 0.1 second to 999.9 hours
There are time units of second, minute and hour available

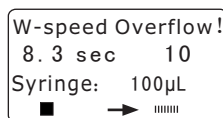


I-speed Overflow!
8.3 sec 10
Syringe: 100μL

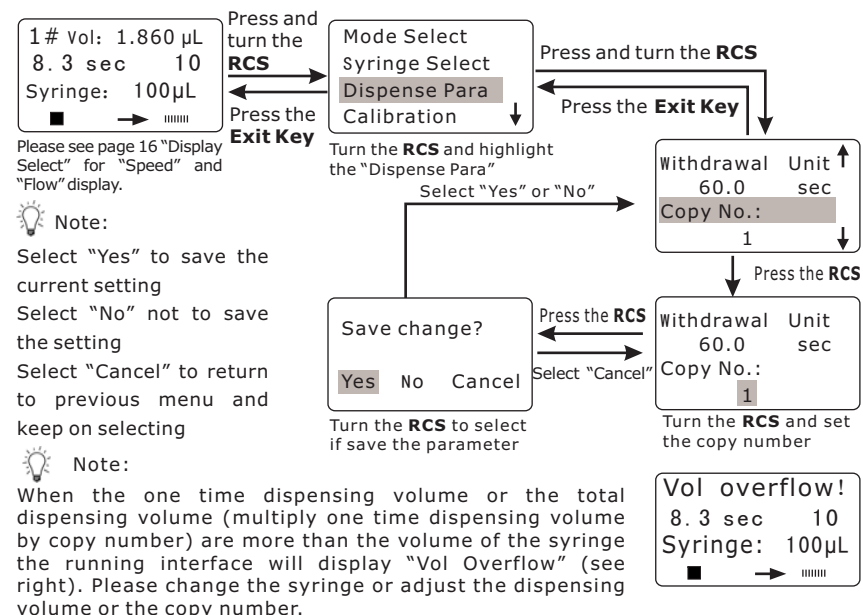
- **Withdrawal time:** It is the time for one time withdrawal
The range of withdrawal time is from 0.1 second to 999.9 hours
There are time units of second, minute and hour available



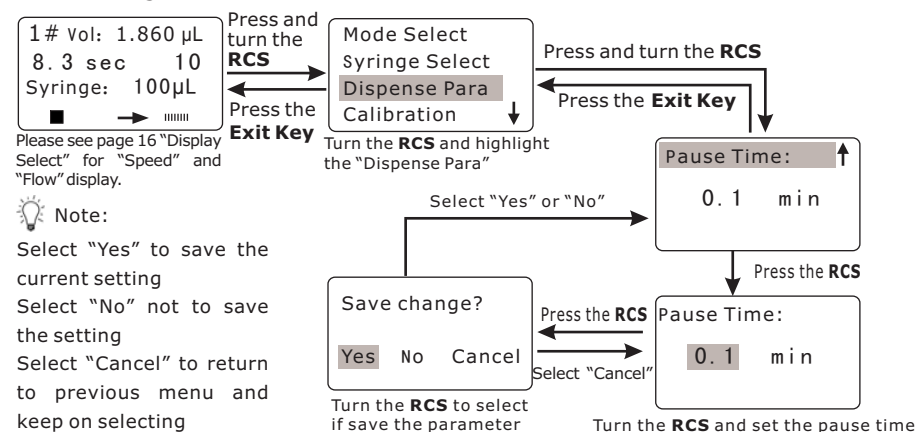
- Note:**
When the pump can't withdrawal the setting volume in the setting time the running interface will display "W-speed Overflow" (see below). Please adjust the dispensing time or the dispensing volume.



- **Copy Number:** It is the total infusion and withdrawal numbers of the whole working course. The range is 1 - 999. In Infusion/Withdrawal (I/W) and Withdrawal/Infusion (W/I) modes, one time working course is finishing one time infusion and withdrawal.

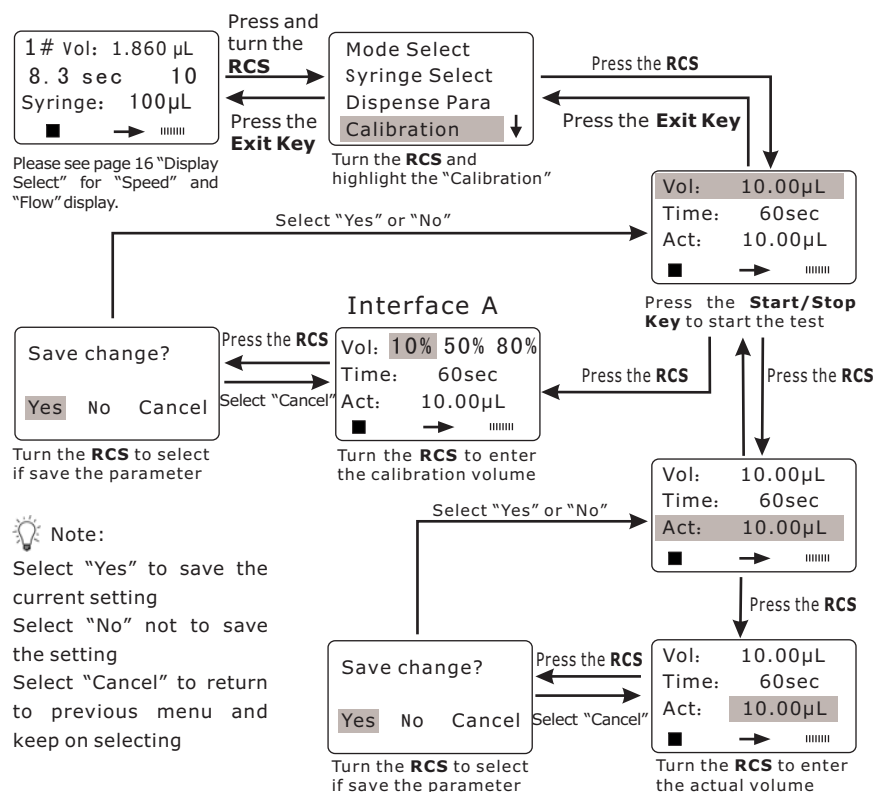


- **Pause Time:** It is the stop time between two dispensing operation. The range is 0.1 - 999.9 min.



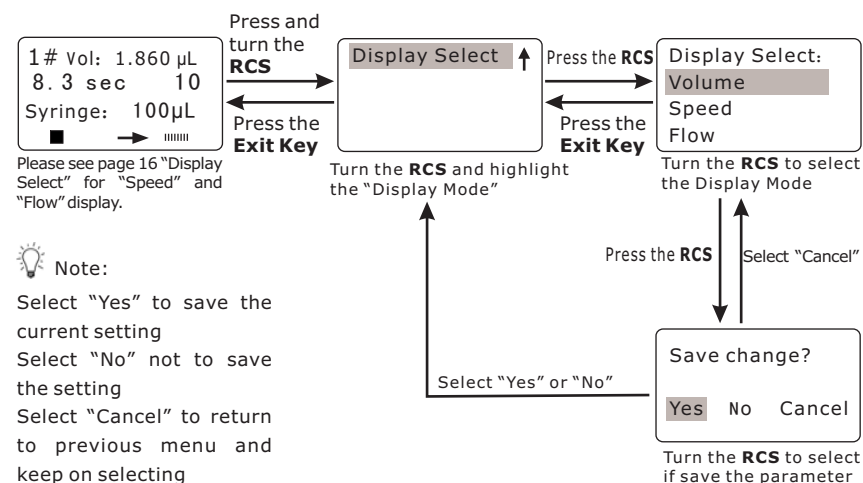
❖ Calibration

When the accuracy of the dispensing volume can not reach 0.5% (in the condition of $\geq 30\%$ of max. infusion distance), calibration is needed to adjust the linear speed of the drive unit.



- **Volume (Vol):** The required volume for calibration
Enter volume setting interface (see Interface A) and turn the **RCS** to set the calibration volume. There are 10%, 50% and 80% of the syringe volume available. When selecting the user-defined syringe the default calibration volume is 50% of the syringe volume. Please see page 9 "Syringe Select" to select suitable syringe.
- **Time:** The calibration time for the pump is 1 minute.
- **Actual volume (Act):** Press the **Start/Stop Key** after setting the calibration volume. Enter the actual volume.

❖ Display Select

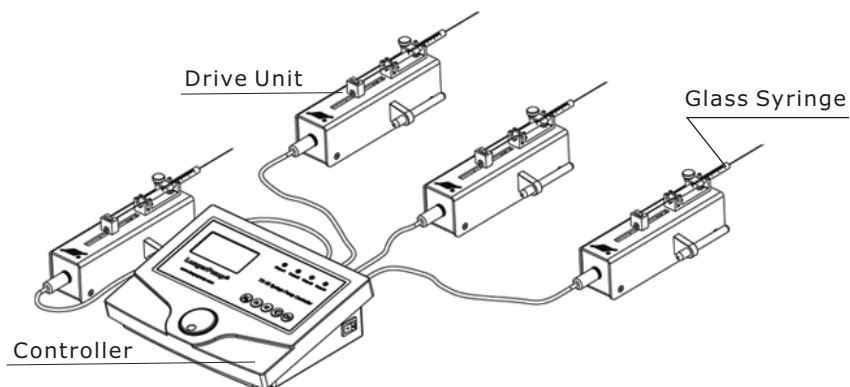


There are volume, speed and flow rate display modes available.

- **Volume:** Display current one time infusion or withdrawal volume
- **Speed:** Display current running speed
- **Flow rates (Flow):** Display current flow rates

Acceptable Drive Units and Syringes

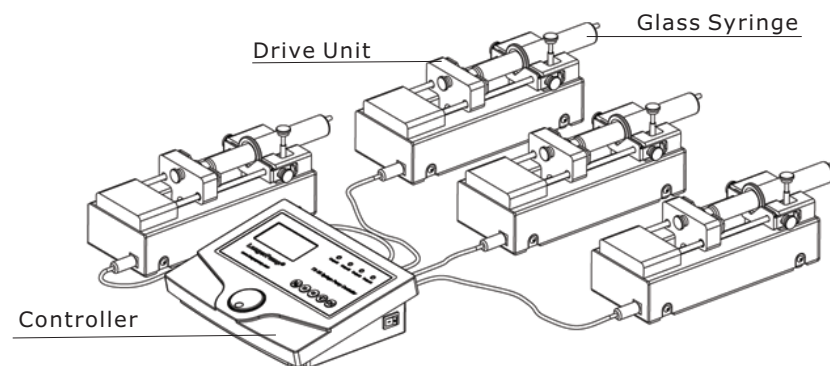
❖ TS-1A/L0107-1A、TS-2A/L0107-2A



Reference Flow Rates List

Syringe Material	Glass Syringe						
Glass Syringe Specification (μL)	10	25	50	100	250	500	1000
Glass Syringe Inner Diameter (mm)	0.46	0.73	1.03	1.46	2.3	3.26	4.61
Flow Rate (/min)	1.318nL 13.18μL	3.320nL 33.20μL	6.610nL 66.10μL	13.282nL 132.82μL	32.96nL 329.6μL	66.22nL 662.2μL	132.42nL 1324.2μL

❖ TS-1B/W0109-1B



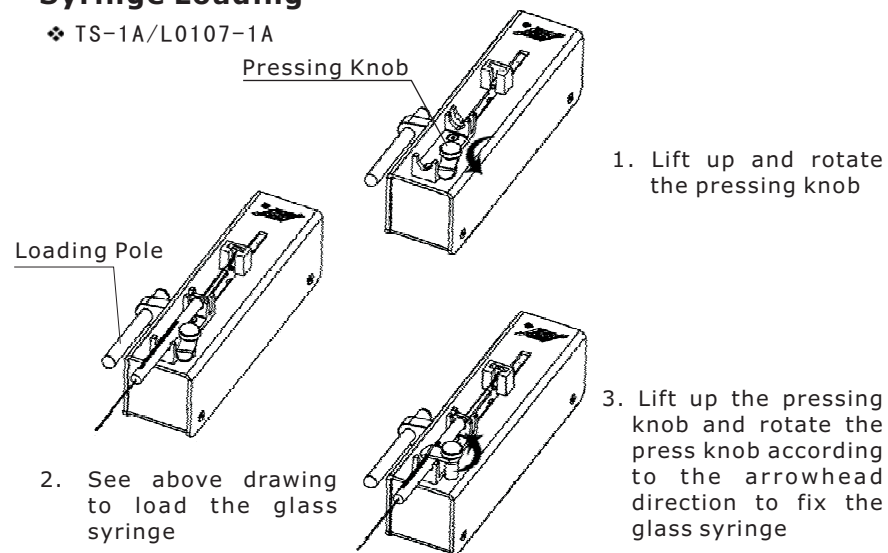
Syringe Material	Glass Syringe						
Syringe Specification (μL)	10	25	50	100	250	500	1000
Flow Rate (/min)	1.318nL 13.18μL	3.320nL 33.20μL	6.610nL 66.10μL	13.282nL 132.82μL	32.96nL 329.6μL	66.22nL 662.2μL	132.42nL 1324.2μL

Syringe Material	Plastic Syringe						
Syringe Specification (cc)	1	3	5	10	20	30	60
Flow Rate (/min)	0.138μL 1.38mL	0.460μL 4.60mL	0.896μL 8.96mL	1.306μL 13.06mL	2.261μL 22.61mL	2.904μL 29.04mL	4.409μL 44.09mL

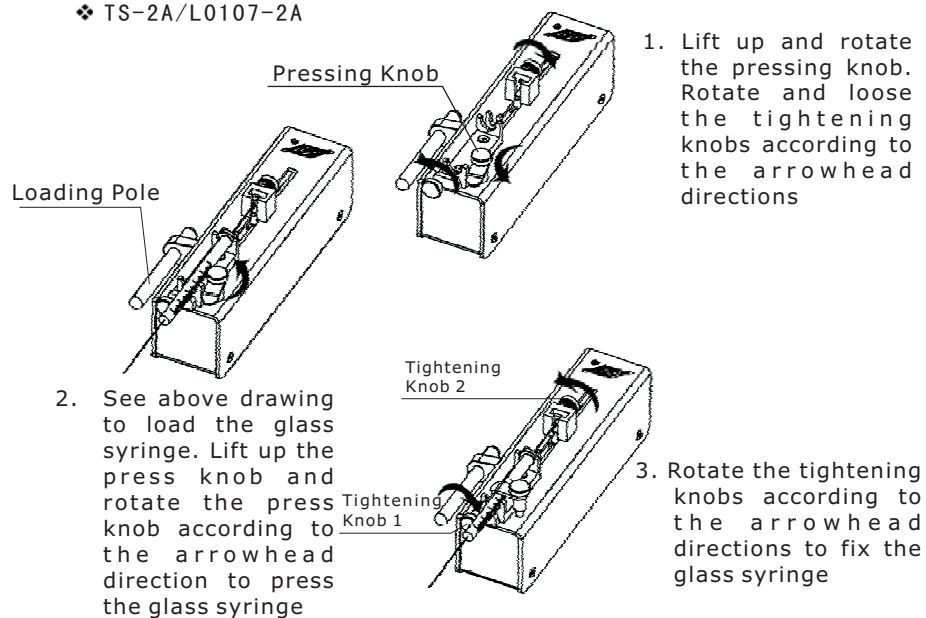
Syringe Material	Plastic Syringe						
Syringe Specification (mL)	1	2.5	5	10	25	50	
Flow Rate (/min)	0.132μL 1.32mL	0.330μL 3.30mL	0.661μL 6.61mL	1.323μL 13.23mL	3.305μL 33.05mL	6.610μL 66.10mL	

Syringe Loading

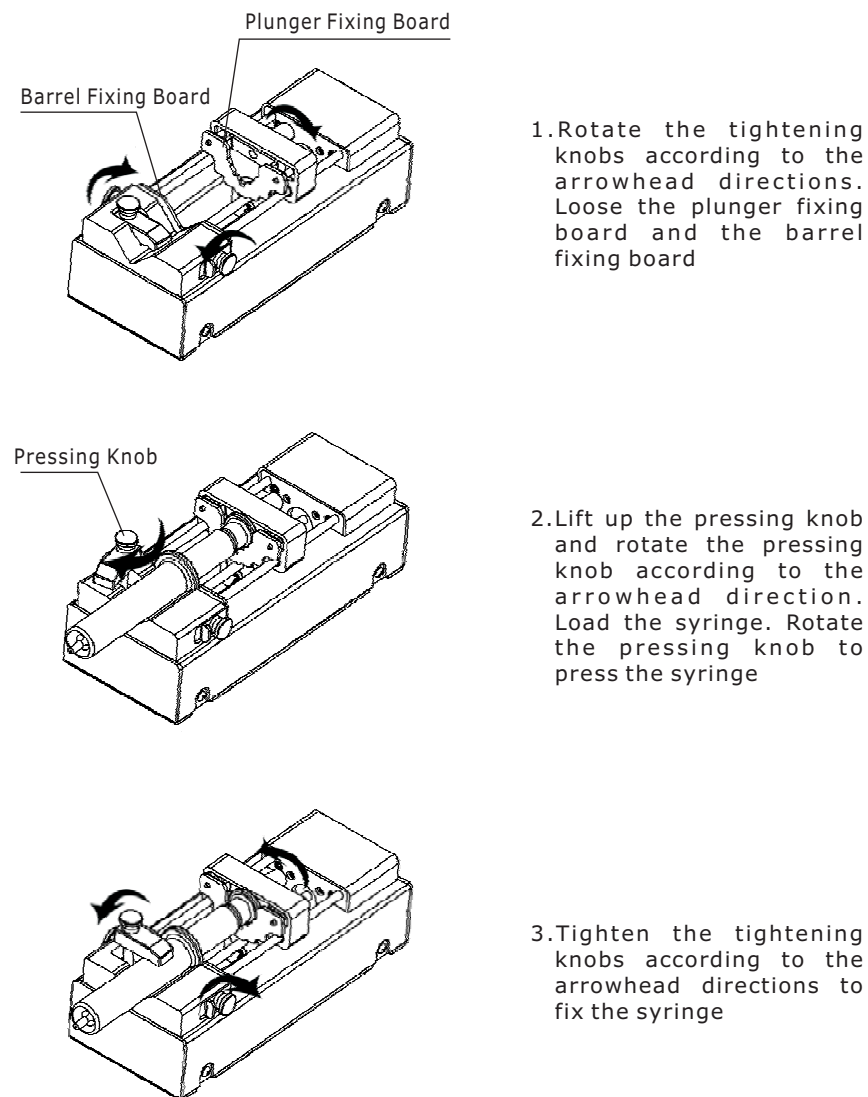
❖ TS-1A/L0107-1A



❖ TS-2A/L0107-2A

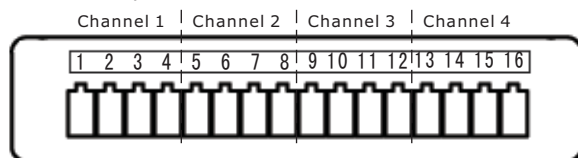


❖ TS-1B/W0109-1B



External Control Function

❖ External Control Output Interface

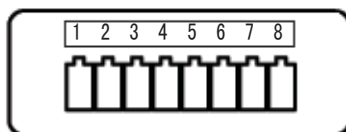


Start/Stop State Output	Stop State: OC gate is open	(1 2)(5 6)(9 10)(13 14)
	Running State: OC gate is close	are 4 suits OC gates
Direction State Output	Infusion: OC gate is open	(3 4)(7 8)(11 12)(15 16)
	Withdrawal: OC gate is close	are 4 suits OC gates

❖ External Control Input and Communication Interface

• Port Definition:

- 1# +5V
- 2# COM
- 3# COM for external control start/stop
- 4# External control start/stop: change to high level, start and stop states switch
- 5# NC
- 6# COM for Rs485
- 7# RS485 B
- 8# RS485 A



 **Note:** 1 - 3# are RS485 communication bus ports. Can connect to the control computer (computer, PLC, SCM).

Maintenance

- Keep the surface of the pump clean and dry. Prevent the liquids from entering the inner of the drive units.
- The surface of drive units are not organic solvent and aggressive liquids resistant. Please pay attention when using.

Note

If a trouble happens, please contact us or our dealers.

Warranty

The warranty period for this product is one year. If repair or adjustment is necessary within the warranty period, the problem will be corrected at no charge if it is not due to misuse or abuse on your part, as determined by the manufacturer. Repair costs outside the warranty period, or those resulting from product misuse or abuse, may be invoiced to you.

TS-1A/L0107-1A, TS-2A/L0107-2A, TS-1B/W0109-1B

Technical Specifications

❖ System Functions

Parameters Setting: The parameters of each channel can be different

Parameters Saving: The parameters of each channel can be saved

Running Control: Each drive unit can be controlled separately; Or four drive units can be controlled to run simultaneously or run at different time

Copy Channel: All drive units can be run according to the parameters of one drive unit of them

Delaying Startup: Delaying startup time of each channel can be controlled separately

Memory Function: Select resume operation or remain stopped when power returns after an interruption

Block Protection: When one drive unit stops accidentally, the system will warm and stop

External Control: Each channel has two ways OC gate output to indicate the start/stop and running direction of this channel

Communication: Realize computer control through RS485 communication interface

❖ Main Functions for Each Channel

Syringe Selection: The syringe can be selected in the manufacturer table which includes manufacturer and size

User-defined Syringe: 4 inner diameter of user-defined syringe barrel can be input and saved

Working Mode Setting: TS-1A has only infusion working mode. TS-2A/TS-1B has 5 working modes available: infusion, withdrawal, infusion/withdrawal, withdrawal/infusion, continuous

Parameters Setting: Set dispensing volume, infusion time, withdrawal time, pause time and copy number

Display Mode Selection: Different parameters (volume, flow rate, linear speed) can be selected in the main display interface

Fast Forward & Fast Reverse: Infusion or withdrawal at the max. speed

Calibration: Acquire accurate volume through calibration

❖ TS-1A/L0107-1A, TS-2A/L0107-2A Specifications

Max. Infusion Distance: 70 mm
Acceptable Glass Syringe : 5 µL - 1000 µL
Linear Speed: 7.94 µm/min - 79.4 mm/min
Adjusting Resolution: 7.94 µm/min
Distance Resolution: 0.165 µm
Linear Force: > 20 N
Setting Mode: Membrane Keypad and rotary coded switch
Accuracy: ≤ ± 0.5% error in the condition of ≥ 30% of max. infusion distance
Display: 128x64 graphic LCD
External Control: Input control: start/stop Output control: start/stop, direction (OC gate)
Communication Interface: RS485
Power: AC 100 V - 240 V or DC12 V/3.2 A
Power Consumption: ≤ 24W
Operating Condition: Temperature 0 - 40 °C Relative humidity < 80 %
Controller Dimensions (L × W × H): 235×178×74
Controller Weight: 0.9 Kg
Drive Unit Dimensions (L × W × H): 180×46×78 (mm)
Drive Unit Weight: 0.6 Kg
IP Rating: IP21

❖ TS-1B/W0109-1B Specifications

Max. Infusion Distance: 90 mm
Acceptable Syringe : 5 µL - 60 mL
Linear Speed: 7.9 µm/min - 79.4 mm/min
Adjusting Resolution: 7.94 µm/min
Distance Resolution: 0.165 µm
Linear Force: > 90 N
Setting Mode: Membrane Keypad and rotary coded switch
Accuracy: ≤ ± 0.5% error in the condition Of ≥ 30% of max. Infusion distance
Display: 128x64 graphic LCD
External Control: Input control: start/stop Output control: start/stop, direction (OC gate)
Communication Interface: RS485
Power: AC 100 V - 240 V or DC 12V/3.2 A
Power Consumption: ≤ 34W
Operating Condition: Temperature 0 - 40 °C Relative humidity < 80 %
Controller Dimensions (L × W × H): 235×178×74
Controller Weight: 0.9 Kg
Drive Unit Dimensions (L × W × H): 245×100×95 (mm)
Drive Unit Weight: 3 Kg
IP Rating: IP41



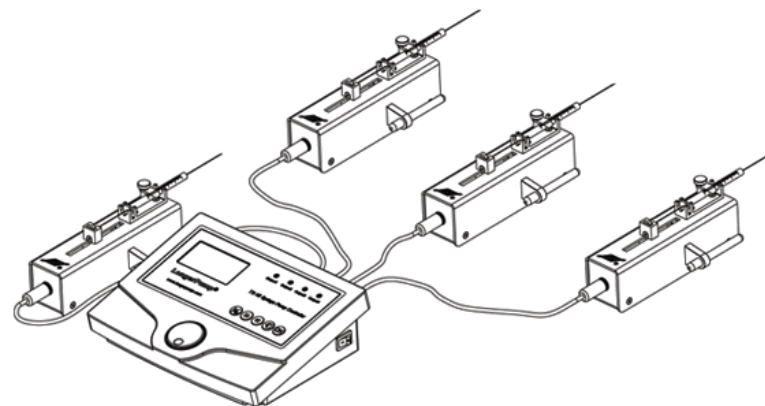
Baoding Longer Precision Pump Co.,Ltd

ADD: Building A,Chuangye Center Baoding
National High - Tech Industrial Development Zone
Baoding, Hebei, China 071051
TEL: 86 - 312 - 3110087 3138553
FAX: 86 - 312 - 3168553
E - mail: longer@longerpump.com
Http:www.longerpump.com

Longer Syringe Pump Operating Manual



**SYRINGE PUMP
OPERATING MANUAL**



TS-1A/L0107-1A
TS-2A/L0107-2A
TS-1B/W0109-1B

Baoding Longer Precision Pump Co., Ltd.