Peristaltic Pump Filling & Dispensing System FU4B-1&

Controller FC32S-1 Operating Manual

Content

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Please read this operating manual carefully before using the product.

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Longer reserves the right to modify or improve the designs or specifications of such products at any time without notice. Please contact with Longer or certified distributor for up-to-date manuals.

1 General Information

1.1 Precaution

- If tubing leaks or bursts, fluid may spray from the tubing and pump head. Take reasonably practicable measures to ensure the operators' safety.

- Make sure fluid in the tubing has been drained out, no pressure in the pipeline and disconnect pump from mains power, while removing or replacing the tubing.

- Disconnect pump from the mains power before connecting the control signal wire.

- Do not touch the rotor while pump is running.

- Release the track when pump stop running for a long time to avoid tubing deformation caused by squeezing.

- Keep the rotor clean and dry to avoid tubing excessive wear and premature failure of pump head or driver.

- Please do not add lubricating oil to the rotor by yourself, any improper operation could corrode the pump head housing or dislocate the tubing

- Please connect the power cord, control cable, communication cable in correct way, and do not damage the plug.

- Make sure the product is grounding reliably.

- The pump head can't resist organic solvent and corrosive liquid. Please clean the liquid left on the surface of the product in time.

- When in quick succession tap the touch screen or touch a point by continuous pressure, the screen will enter the blue screen for the touch screen sensor calibration. Please tap the cross point according to the instruction on the screen, and the screen will automatically exit the calibration function when the calibration is done.

- When the controller FC32S-1 and dispensing system FU4B-1 are connected properly, FU4B-1 could be controlled through FC32S-1.

1.2 Warranty and Service

1.2.1 Warranty Service

(1) Longer's obligation under this warranty is limited to a period of one (1) year from the date of original purchase. Within the 1 year of warranty period, Longer will replace or repair any defective parts free of charge. This warranty doesn't cover consumable part (tubing).

(2) Warranty does not cover:

- The repair or exchange of the entire unit after the warranty period.
- Any damage or failure caused by improper installation, storage, maintenance or usage, not in compliance with operating manual.
- Beyond or violate the conditions listed in contract or technical agreement.
- Any damage or failure caused by attempts by personnel other than authorized Longer representatives to install, repair, modify or remove the product.
- Any damage or failure caused by non-Longer parts, or user-replaceable parts purchased from unauthorized distributors.
- Any damage or failure caused by accidents or human errors (including wrong power supply voltage, corrosion, fall-off, etc.)
- Any damage or failure caused by natural disaster or other irresistible force (earthquake, fire, etc.).
- Other product damage or failure not caused by defects in design, material and workmanship.

1.2.2 Maintenance Service

- Customer will be charged for the repair or replacement of the parts or accessories after warranty period.

- Parts can be replaced within 3 working days. Longer will inform customer of the date in advance if out of 3 working days.

1.2.3 Service Commitment

- Longer commits to provide customer solutions to any quality complaint within 2 working days.

- Longer commits to reply to customer's requirement of on-site technical supports or training within 2 working days.

1.2.4 Dispute Settlement

Dispute over product quality or service will be handled according to contract or agreement. If there is no related contract or agreement, it shall be resolved by the disputing parties through consultation. Otherwise, it will be resolved according to relevant national laws and regulations.

1.3 Repair Notes

Please contact Longer or its distributor, and provide the product serial number before returning the product. Products which has been contaminated with, or exposed to, toxic chemicals or any other substance hazardous to health must be decontaminated before returning to Longer or its distributor. You must ship the product in its original packaging or better, to insure it against possible damage or loss during the transport.

1.4 Contacts Information

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2 Product Introduction

2.1 FU4B-1&FC32S-1 Main Features

Dispensing and filling system FU4B-1 & controller FC32S-1 is one kind of intelligent peristaltic pump system. FC32S-1 adopts 7 inch touch screen, which could display more information simultaneously, and it is easy to set up different parameter configurations. One FU4B-1 contains 4 driving units. One FC32S-1 could control 32 driving units (channels) at most. The system could be equipped with many different pump head: YZ series, FG series, DMD15-13, BZ series, etc., and is compatible with many different tubing.

Dispensing and filling system FU4B-1:
- The housing is made by 304sst with better corrosive resistance.
- Driving unit for each channel is independent, which made the system easily configured with customer's system.
- With modular structure, the dispensing and filling system could be stacked for more than 4 channels. And one FC32S-1 could control 32 channels at most.
- The address of each channel can be set through the membrane keypad and displayed on the LED.
- Each channel has "no bottle-no fill" function with individual input interface for the "no bottle" signal.
- The dispensing and filling system could run in two modes: online mode and offline mode. In the online mode, the system will start the dispensing process when receives the external start signal, and will not dispense when receives the "no bottle" signal. In the offline mode, the system will be controlled through FC32S-1.

Controller FC32S-1
- FC32S-1 controller adopts 7 inch touch screen. The menu-type interface could display more information simultaneously and make it easier to configure and operate.
- There are two ways to operate the controller: 1. Manual operation on the tough screen. 2. Computer or other microprocessor operation through communication commands.
- The controller could communicate singly or in a multi-pump configuration through RS-485 interface, and supports Modbus RTU protocol. The communication address, baud rate, parity and stop bit could be set through the touch screen.
- The start/stop status and CW/CCW direction of each channel could be controlled individually.
- All channels could be fast filling or backflowing at high speed simultaneously or individually.
- The back suction angel and delay time could be set according to the actual application, the all channels will perform the back suction simultaneously.
- The password function protects the system parameter and prevents the misoperation.

> ➢ The dispensing parameters could be saved as a parameter set which could be recalled easily.
> ➢ Dispensing volume of every channel could be calibrated through percentage, volume, weighing or multi-weighing method.
> ➢ Dispensing volume of each channel could be adjusted when system is running, which helps to get accurate volume without shutting down.

2.2 Unpacking

To unpack the system, follow below steps:

1）Take out the system and accessories from the shipping carton.
2）Check the packing list to make sure all components are present.
3） Any questions, please contact Longer or local distributor.

2.3 System Structure

2.3.1 Product Composition

Dispensing and filling system:

Dimension of FU4B-1: 663x261x177(mm)

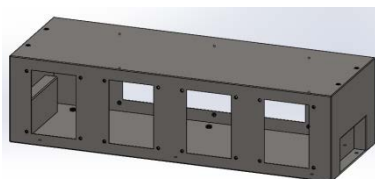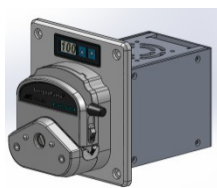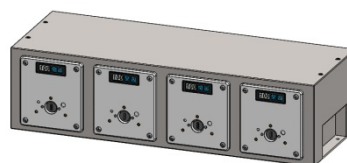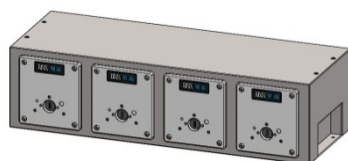| Pump head	Driving unit	Channel

Channels	SST housing	Dispensing& filling system
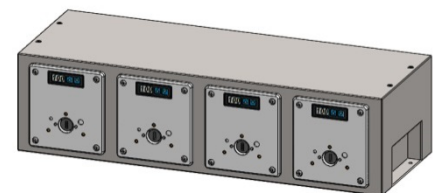
Dispensing & filling system with multi-channels
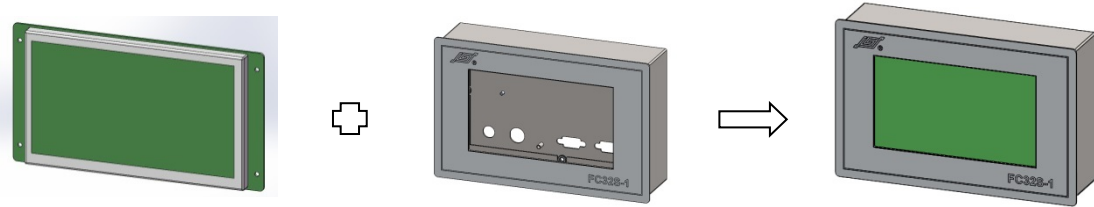
| Dispensing & filling system	Dispensing & filling system	
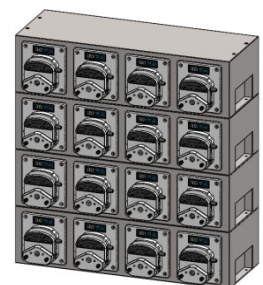
Controller:

Dimension: 228x146x67(mm)

Adopting 7 inch touch screen, could display more information simultaneously, and it is more easier to set up different parameter configurations. The housing is made of 304 stainless steel with better corrosion resistance.

2.3.2 Electrical Connection Introduction

2.3.2.1 Electrical Interface of FU4B-1
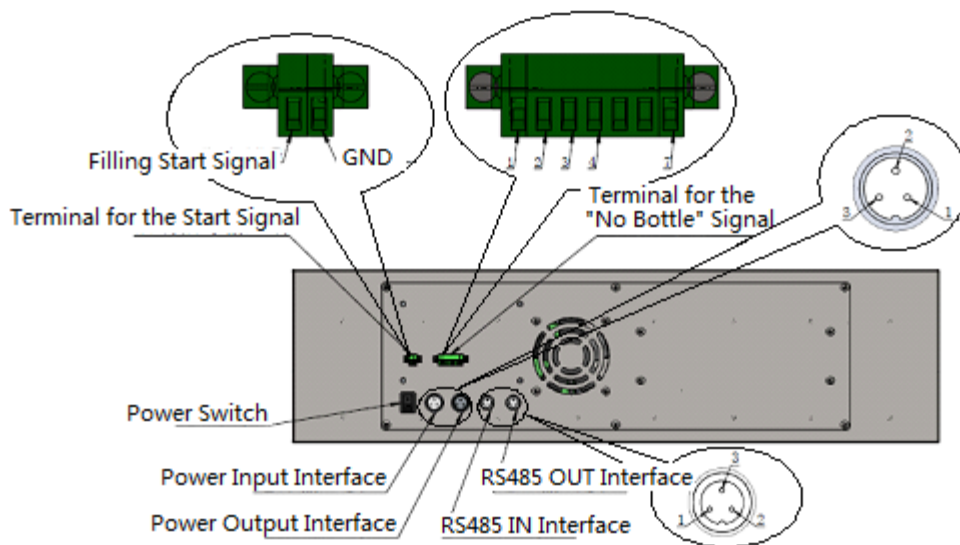
Power switch: For FU4B-1 only, not including FC32S-1.

Power input interface: The applicable power supply range is 176VAC-264VAC, This interface is used to connect FU4B-1 to the mains supply. When the system has more than one FU4B-1, this interface is used to connect FU4B-1 to the "power output interface" of another FU4B-1. Definition of the pins: 1: L, 2: FG, 3: N.

Power output interface: This interface is used to output the power supply and connect FU4B-1 to the "power input interface" of another FU4B-1. Definition of the pins: 1: L, 2: FG, 3: N.

RS485 input interface: This interface is used to connect FU4B-1 to FC32S-1 controller through communication cable. When the whole system has more

than one FU4B-1, this interface is used to connect FU4B-1 to the "RS485

output interface" of another FU4B-1. Definition of the pins: 1：RS485-A，

2：RS485-B，3：G.

RS485 output interface: This interface is used to connect FU4B-1 to the "RS485

input interface" of another FU4B-1. Definition of the pins: 1：RS485-A，2：

RS485-B，3：G.

Terminal for the start signal: This terminal is used to receive the external start signal.

When the system is working in the online mode, receiving the start signal will

start one filling operation. The signal can be a switch signal or a TTL signal.

Pin 1 is for the start signal+, pin 2 is for the GND.

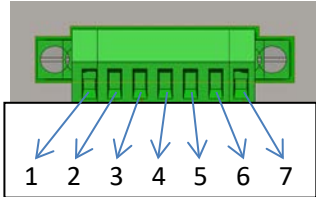| Item	The type of external start signal	Type of trigger	Set of "Start Pulse" on the touch screen	Note
1	TTL level signal	Rising edge of the TTL signal will trigger the one filling operation.	Raise	1. Pin 1 connects to external start signal+, Pin 2 connects to GND of the signal. 2. Low level should be: <=0.8V High level should be: 3V-24V 3. When the voltage of the signal is between 0.8V and 3V, there may be misoperation of the system.
		Falling edge of the TTL signal will trigger the one filling operation.	Fall	
2	Switch Signal	The switch changing from close to open will trigger the filling action.	Raise	The Pin 1 and Pin 2 of the terminal connect to the switch.
		The switch changing from open to close will trigger the filling action	Fall	

Note: The input circuit schematic of the start filling signal
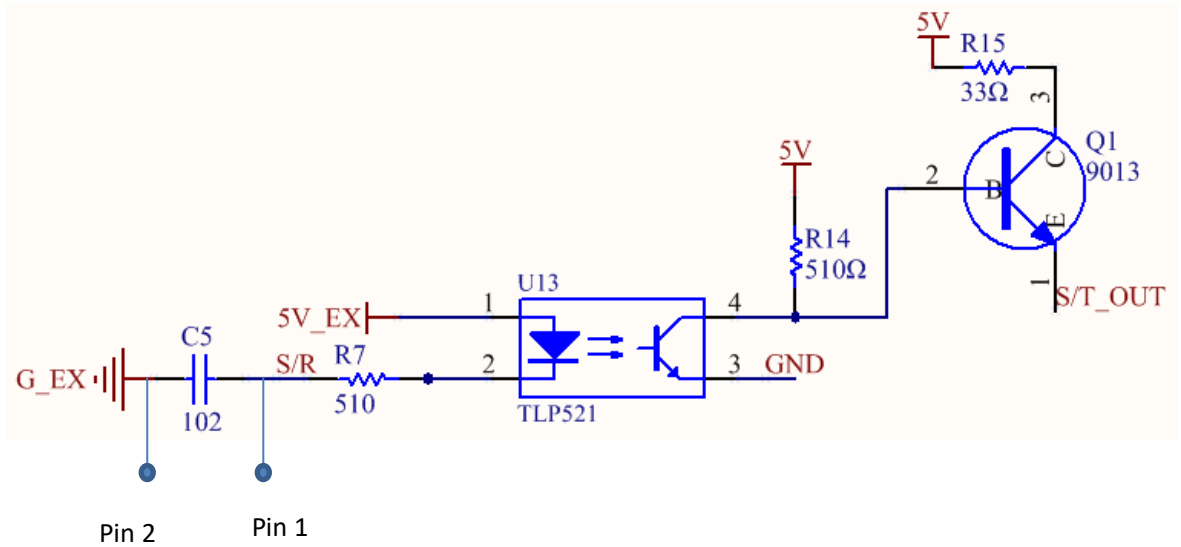
Terminal for the "no bottle" signal: This terminal is used to receive the "no bottle" signal. When FU4B-1 is integrated into the filling machine, FU4B-1 will not do the filling operation when receives the "no bottle" signal. Pin 1 receives the signal for channel 1, Pin 2 receives the signal for channel 2, Pin 3 receives the signal for channel 3, Pin 4 receives the signal for channel 4, Pin 7 receives GND. Pin 5 and 6 are reserved.

Note: the channel 1 described above is the channel at actual position 1 from the right hand when you are facing the pump. Please refer to below picture for the actual position of each channel. The actual channel number will not change along with the channel address setting through software.

Channel 4   Channel 3   Channel 2   Channel 1
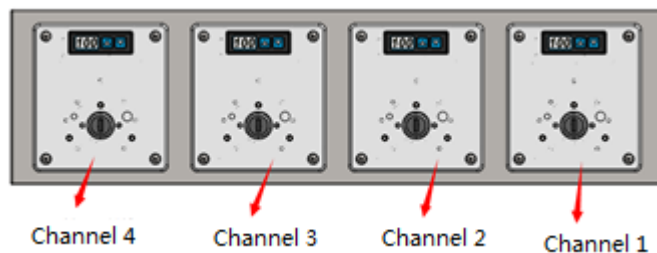
The type of "no bottle" signal	Control Logic of "no bottle- no fill"	Set of "Bottle Signal" on the touch screen	Interface	Note
Switch Signal	The closed switch means there is no bottle in the corresponding channel and the channel will not do the filling operation.	Close	 1 2 3 4 5 6 7	Pin 1 to Pin 4 connect to the "no bottle" signal+, Pin 7 connect to the GND.
	The open switch means there is no bottle in the corresponding channel and the channel will not do the filling operation.	Open		

Note: The input circuit schematic of the "no bottle" signal (Same for Pin 3 and 4)

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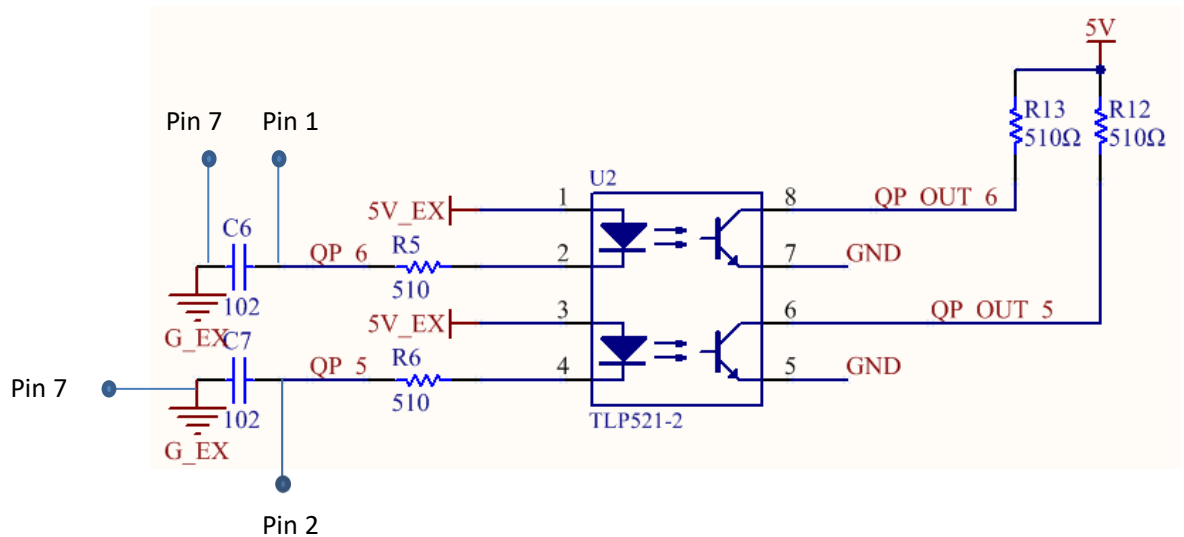
2.3.2.2 Electrical Interface of FC32S-1

Computer Interface RS485
Balance Interface RS232
Power Input Interface
FU4B-1 Interface RS485
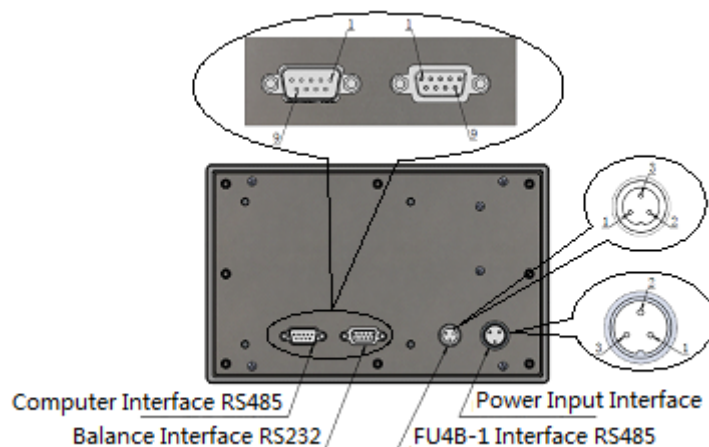
Power Input Interface: The applicable power supply is 88VAC-264VAC. This interface is used to connect the controller to mains supply. Definition of the pins: 1: L, 2: FG, 3: N.

FU4B-1 Interface RS485: This interface is used to connect the controller to FU4B-1 through communication cable. Definition of the pins: 1: A, 2: B, 3: G.

Balance Interface RS232: This interface is used to connect the controller to balance through communication cable. The port is DB9 (male), definition of the pins: 2: RXD, 3: TXD, 5:GND, others: reserved. (Standard product only supports Ohaus balance FR224CN. For other balance, Longer will provide customized controller.)

Computer Interface RS485: This interface is used to connect the controller to PC or other microprocessor. The protocol is Modbus RTU, refer to Appendix A for the detail. The port is DB9 (female), definition of the pins: 2: RS485-A, 3: RS485-B, 5: GND, others: reserved.

2.4 Specification

Setting range of dispensing volume: 0.01ml-9999.99ml (resolution：0.01ml)
Setting range of dispensing time: 0.1s-6000s (resolution：0.1s)
Setting range of interval time: 0.5s-999.9s (resolution：0.1s)
Setting range of dispensing cycle: 0-999999, "0" means unlimited cycle
Setting range of back suction angle: 0-1000°
Setting range of delay time before back suction: 0s-60s (resolution：0.1s)
Channel quantity: 32 at most
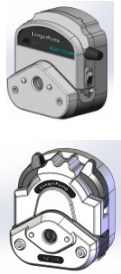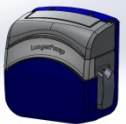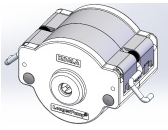
Please refer to below table for the applicable pump head, tubing, and recommended filling volume.

Pump Head		Applicable Tubing (Silicone)	The Min Filling Volume Recommended (ml)	Max Filling Volume per second (ml/s)
YZ1515x & YZII15		13#	0.3	0.5
		14#	1.0	2.3
		19#	2.6	5.1
		16#	4.6	9.1
		25#	10	19
		17#	15	30
FG15-13		13#	0.3	0.5
		14#	1.0	2.3
		19#	2.6	5.1
		16#	4.6	9.1
		25#	10	19
		17#	15	30
DMD15-13		2×13#	0.1	0.9
		2×14#	0.2	2.3
		2×19#	0.5	5.9
		2×16#	2.0	10
		2×25#	5.0	25
YZII25		15#	8.5	17
		24#	15	24
		35#	18	36
		36#	25	48
YZ2515x		15#	8.0	17
		24#	12	24
FG25-13		15#	9	17
		24#	12	24

2.5 Working Condition

Power supply for FU4B-1：AC180-260V/300W 50/60Hz
Power supply for FC32S-1：AC90-260V/10W 50/60Hz
IP rating：IP31
Temperature：0℃-40℃
Relative humidity：20%-80%

3 Hardware Setup

3.1 Dispensing & Filling System FU4B-1 Installation

3.1.1 FU4B-1 Outline Dimension
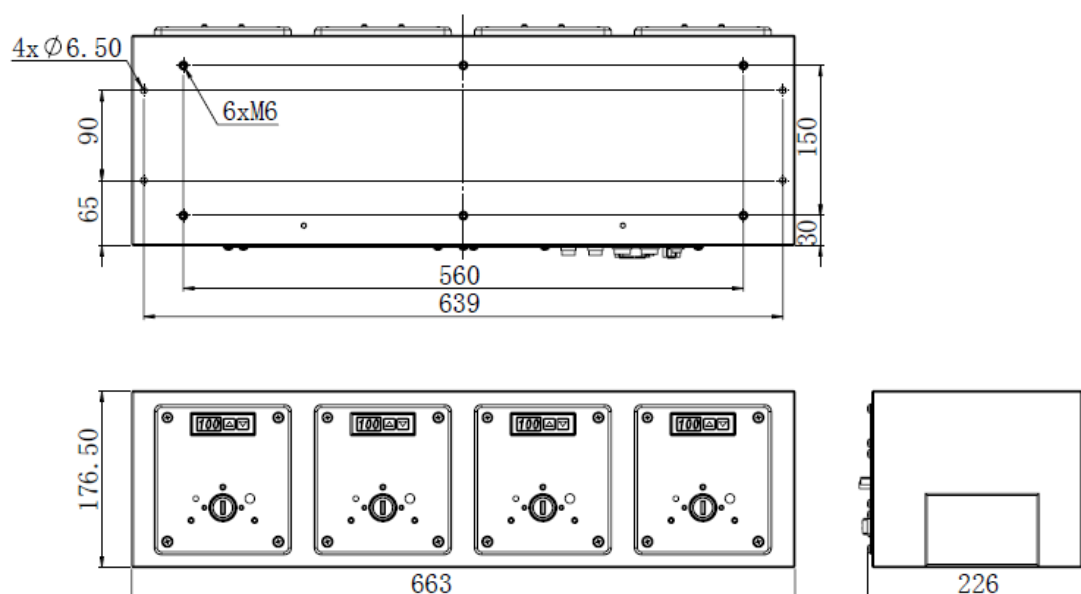
3.1.2 FU4B-1 Mounting

FU4B-1 could be fixed on the soleplate or housing of the filling machine through six hexagon socket cap screws M6X16 (with spring washer and flat washer).
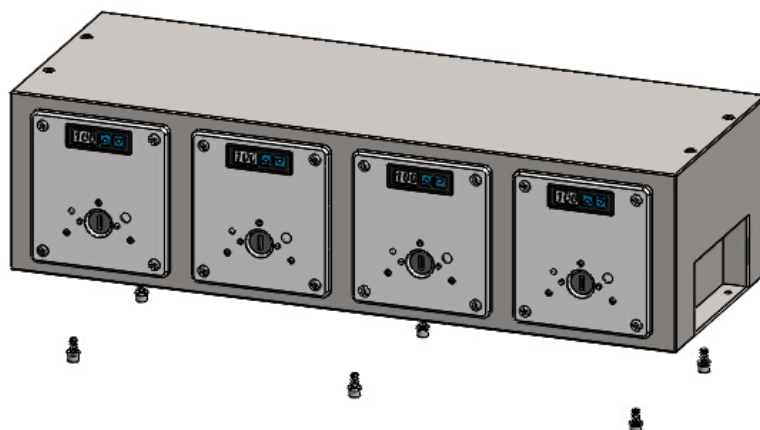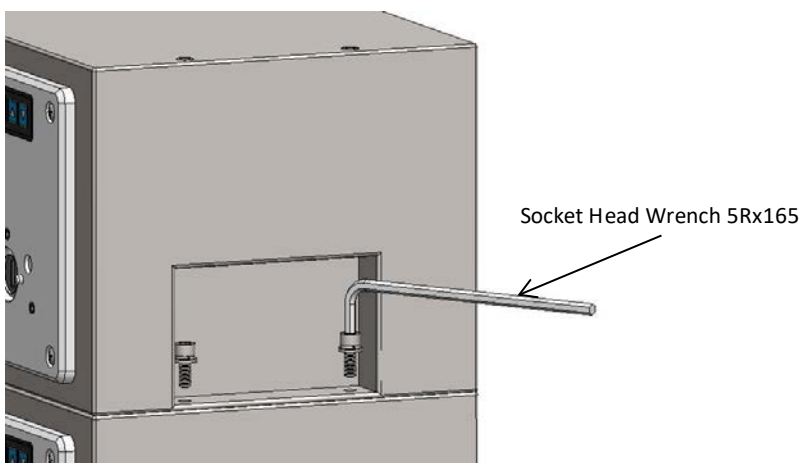
Mounting hole dimension:
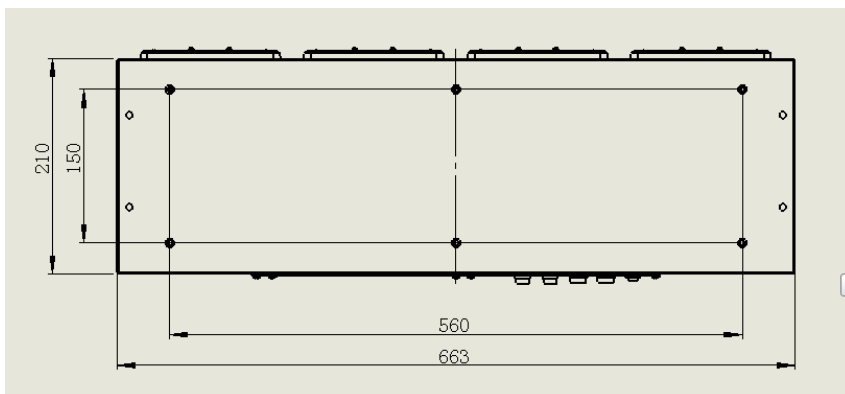
3.1.3 Multi-units of FU4B-1 Installation

When the system has more than one FU4B-1, adjacent units need to be connected through four mounting screws M6X16(with spring washer and flat washer). Use power cord and communication cable for interconnection to connect the adjacent units.

Socket Head Wrench 5Rx165

3.2 Pump Head Mounting

3.2.1 YZ1515x/YZ2515x/YZII15/YZII25 Pump Head Mounting

Insert the tang of the pump head shaft into the slot of the black rubber coupling, and insert the alignment pin of the drive unit into the alignment hole on the back of the pump head, then tighten the mounting screws.
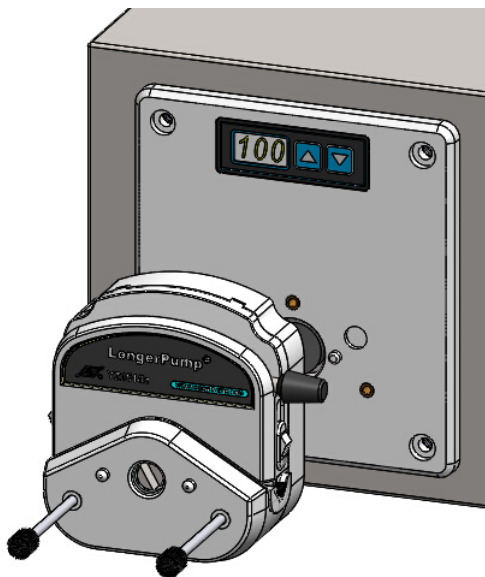
3.2.2 FG15-13/FG25-13 Pump Head Mounting and Removal

Mounting the pump head:

Mount the mounting plate on the drive unit through tightening three mounting screws M4X10. Insert the tang of the pump head shaft into the slot of the black rubber coupling, turn the pump head 45 degree relative to the vertical direction, engage the bayonet on the mounting plate with the bayonet slot on the back of the pump head, turn the pump head clockwise until it locks into an upright position.

Remove the pump head:

Push the locking lever back and turn the pump head anti-clockwise about 45 degree. Then take off the pump head from the mounting plate.
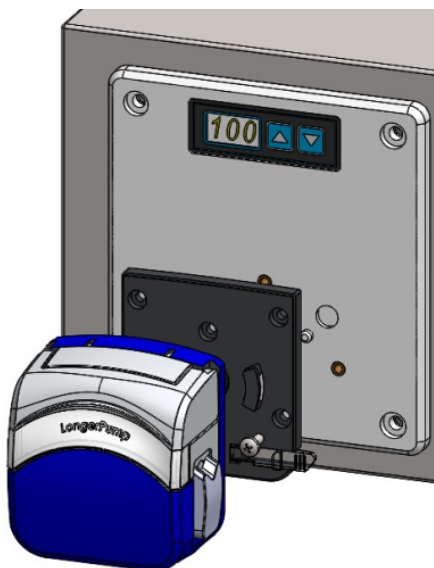
3.2.3 DMD15-13 Pump Head Mounting and Tubing loading

Pump Head Mounting:

Mount the mounting plate on the drive unit through four cross recess head screws

M4X12. Release the two levers to open the pump head and remove the compression block. Insert the tang of the pump head shaft into the slot of the black rubber coupling. Press the pump head firmly against the mounting plate. Turn the pump head to align the mounting holes on the pump head with the mounting holes on the mounting plate. Insert the two mounting screws (hexagon socket head cap screw M3X10) into the mounting holes, then tighten them.

Socket Head Wrench 2.5Rx114.5
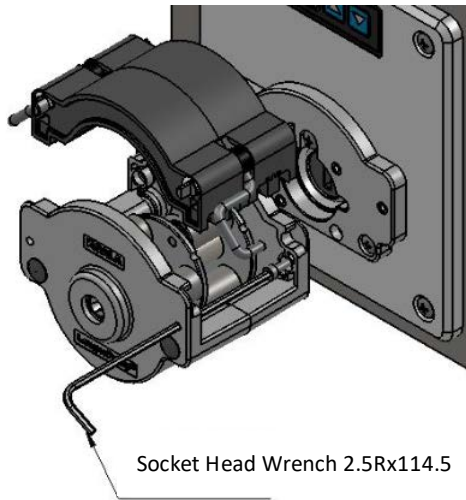
Tubing Loading:

Release the levers to remove the compression block. Insert the tubing fitting assembly into the compression block.

Note: When use 25# tubing, the separating block needs to be fixed at the outermost positioning hole.

2*13#
2*14#

2*19#
2*16#

2*25#
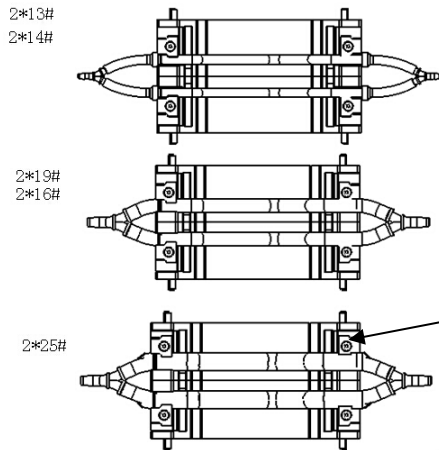
Four separating blocks need to be fixed
at the outermost positioning hole.

Put the compression block with tubing fitting assembly back to the pump head, and lock the levers.
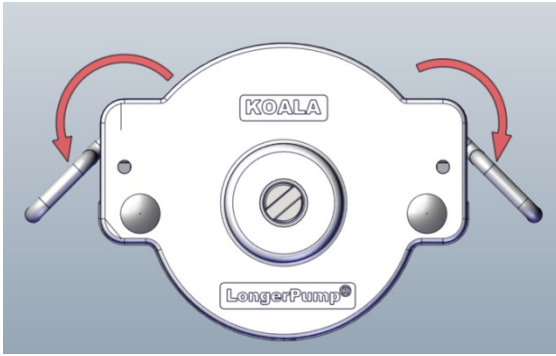
3.3 Controller FC32S-1 Installation

3.3.1 FC32S-1 Dimension

Min Installation

Dimension

130mm
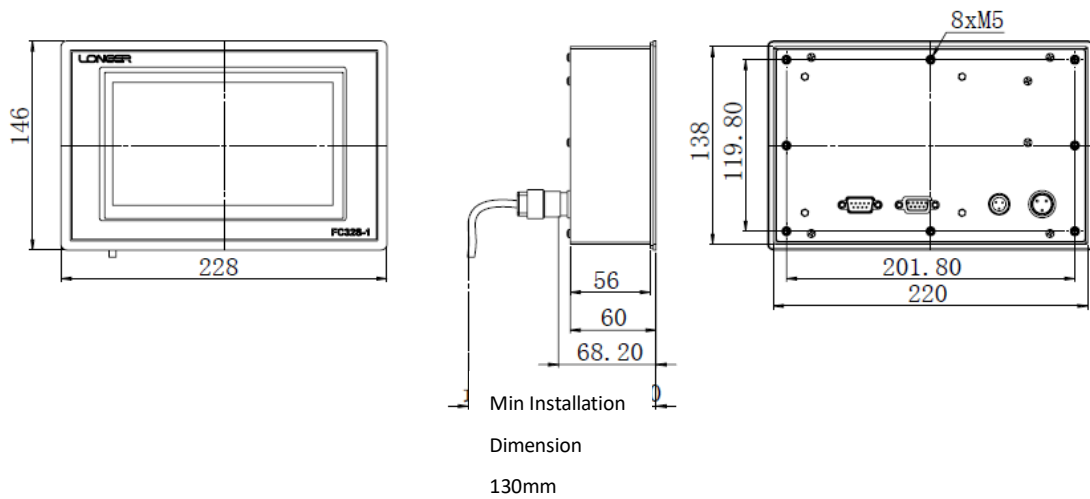
3.3.2 FC32S-1 Mounting

Insert the controller into the mounting hole of the front cover. Mount the controller on the front cover through four retainer brackets and four cross recess head screws M5X12. The mounting hole of the front cover is 139x221mm. The standard retainer bracket requires thickness of the front cover as 2mm to 4mm. For other thickness, the retainer bracket will need customizing.

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FC32S-1 Controller

Screw x4

Front Cover

Mounting Hole 139*221mm

Retainer Bracket x4
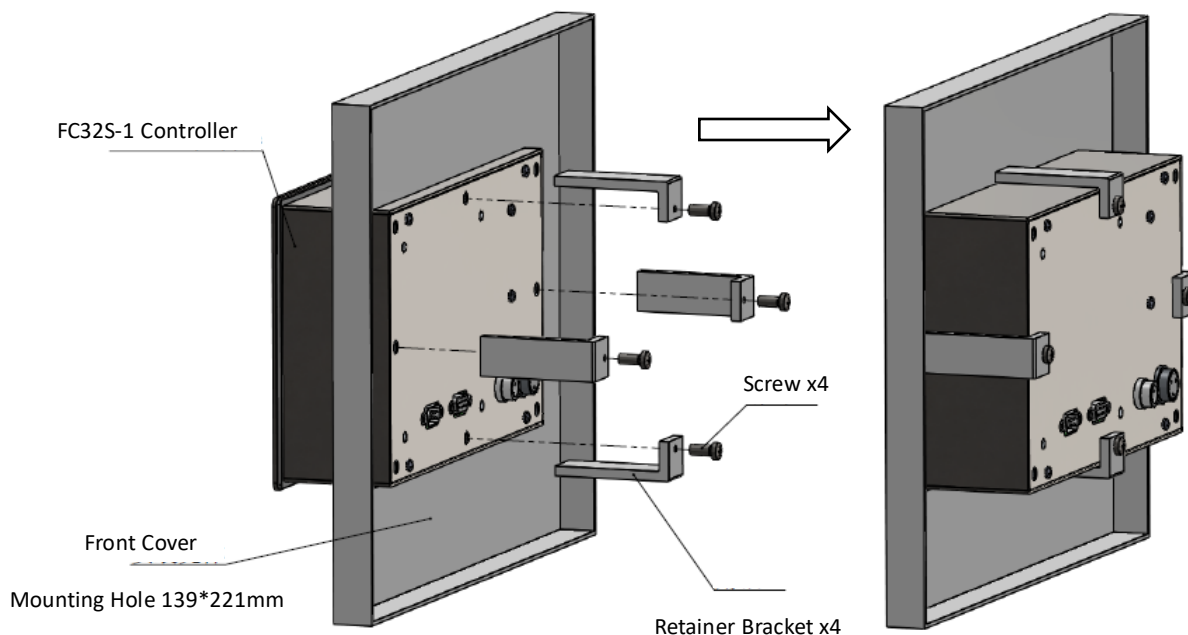
Considering the connector of the cable, the installation space behind the back of controller is at least 130mm.

3.4 Cabling

Power cord for dispensing and filling system: used to connect the FU4B-1 and mains supply.

Power cord for controller: used to connect the controller FC32S-1 and mains supply.

Power cord for interconnection: plug one connector of the power cord in the "Power Output Interface" of one FU4B-1, and plug another connector of the power cord in the "Power Input Interface" of another FU4B-1.

Communication cable: used to connect the controller FC32S-1 and the dispensing and filling system FU4B-1.

Communication cable for interconnection: plug one connector of the cable in the "RS485 OUT Interface" of one FU4B-1, and plug another connector of the cable in the "RS485 IN Interface" of another FU4B-1.
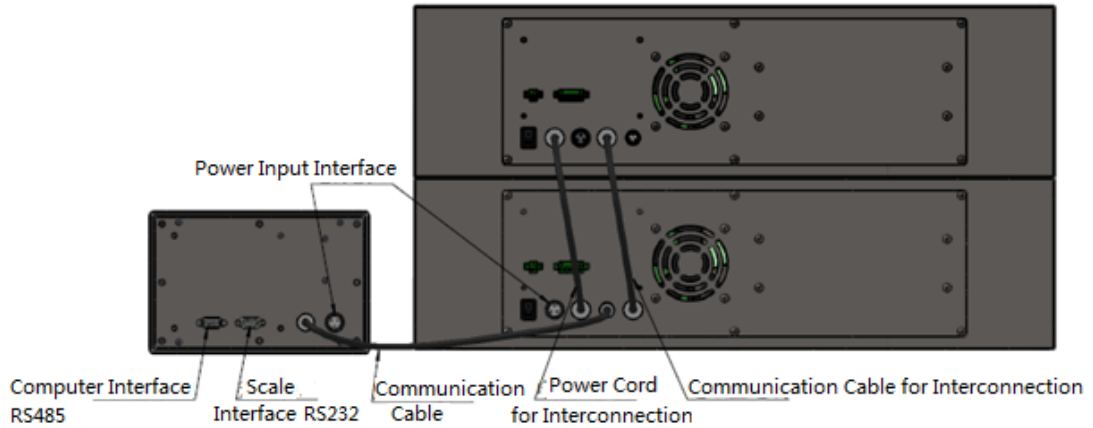
4 System Operating

4.1 Power On

Please setup the hard ware according to the Chapter 3, and power on the system.

Note:

Before power on the controller FC32S-1, make sure the controller has been power-off more than 5 seconds, otherwise the controller may not work properly.

Turn on the power switch of FU4B-1, then all driving units will be powered up and the system is stopped. If there is unfinished filling operation on the controller FC32S-1, then FU4B-1 will run according to the control signal sent from FC32S-1.
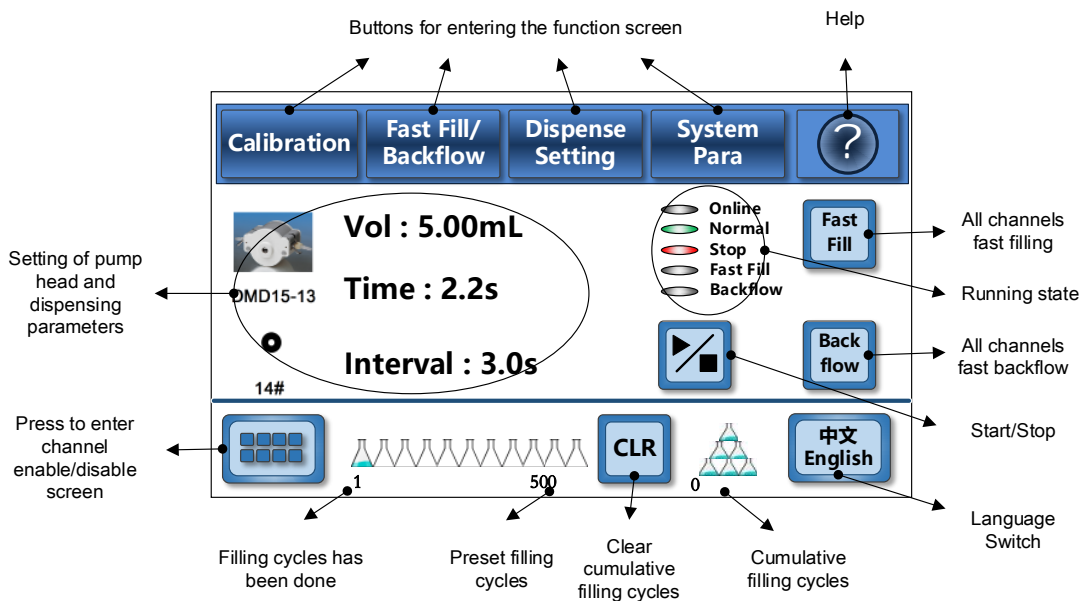
Run Screen After Power On (Offline Mode)
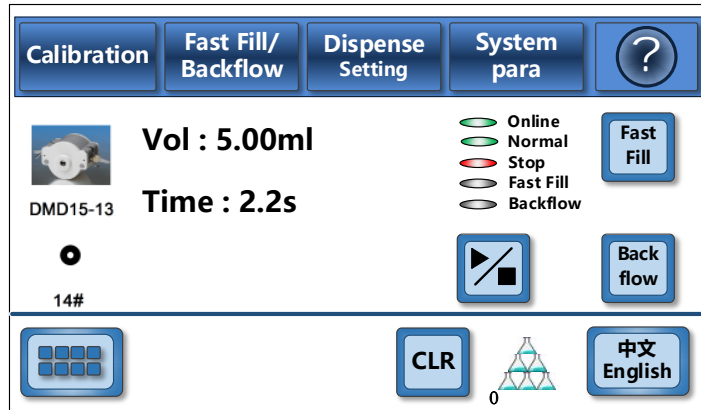
Run Screen After Power On (Online Mode)

4.2 Channel Address Setting

Each driving unit of FU4B-1 has individual 3 digitals LED and 2 membrane keys. The 3 digitals LED could display two kinds of information.

Percentage adjustment mode: LED displays the adjusted percentage of filling volume, which could be set through the controller (refer to Chapter 4.3.6.1) or the 2 membrane keys (refer to Chapter 4.6).

Address setting mode: LED displays the channel address, which is set through the 2 membrane keys.
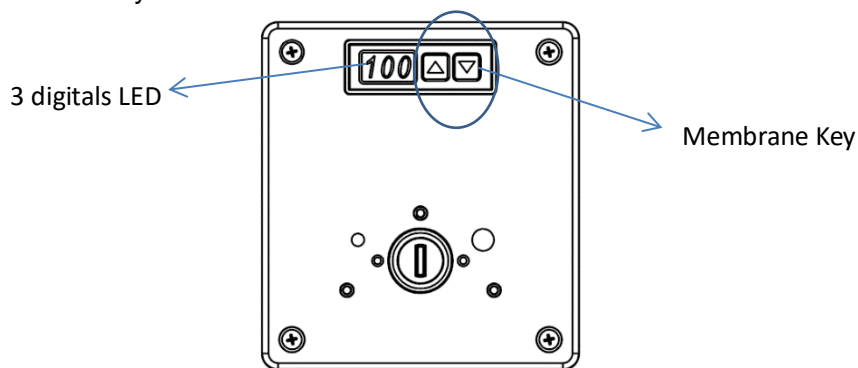
When FU4B-1 is powered up, the LED will display the percentage adjusted of filling volume, and default value is 100. Press and hold the key ▼ for 2 seconds, the LED will display the channel address.

In the Address setting mode, the first digital of the LED displays A, the second and third digitals of the LED display the channel address 01-32.

Set the channel address: press and hold the key ▲ for 2 seconds, the digitals start flashing. Then press ▲ key, the address number will increase, press ▼ key, the address number will reduce. 5 seconds after the setting, the LED will stop flashing and the address will be saved.

Note:

1. The address number of each channel must be equal to or smaller than the channel quantity, otherwise the controller will report error.
2. The address number of each channel must be unique, otherwise the controller will report error, and the channel can't be calibrated precisely.
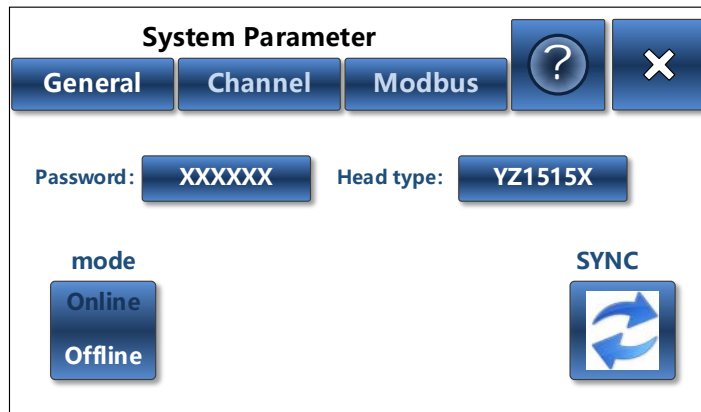
4.3 Controller Operation
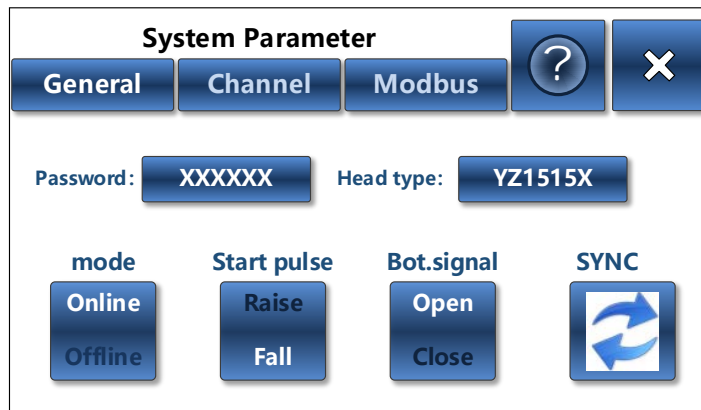
4.3.1 Run Screen
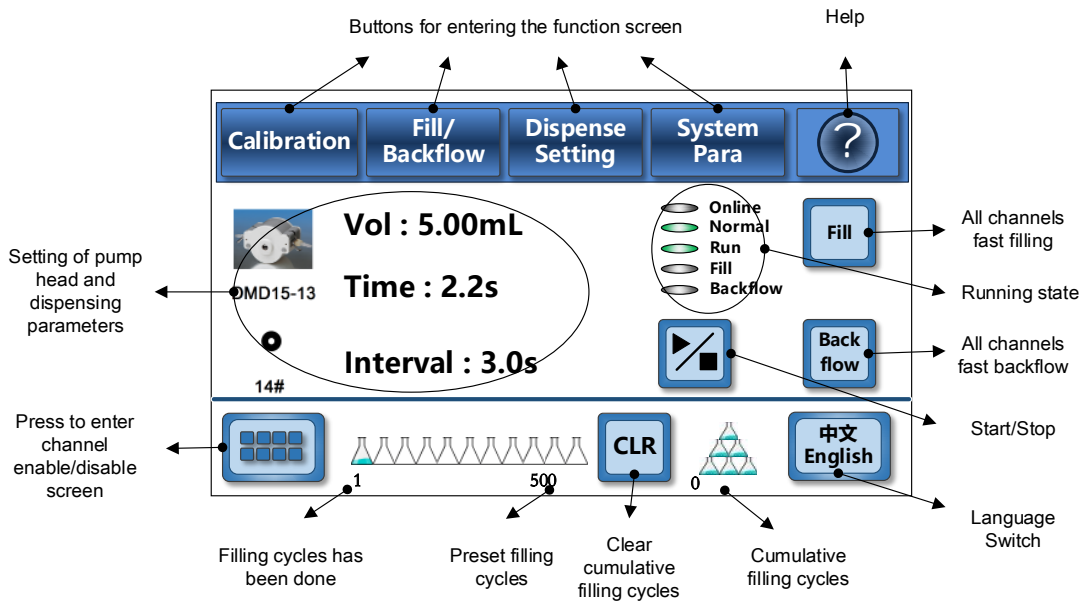
Run Screen (Offline)
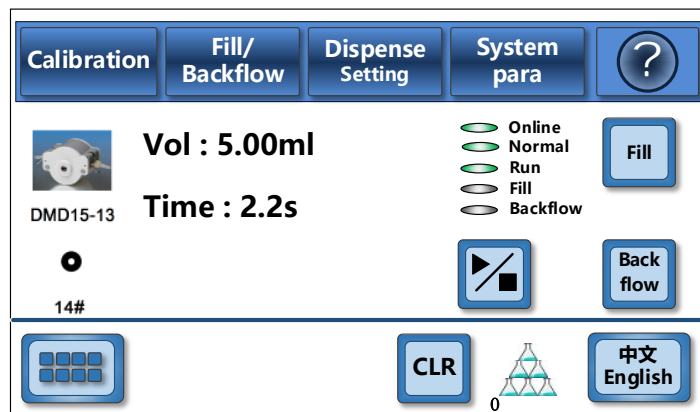
Run Screen (Online)

4.3.2 System Parameter Configuration

System Parameter Screen (Offline)

System Parameter Screen (Online)

4.3.2.1 Password Enter, Setting and Cancel

FC32S-1 controller has password protection function to prevent accidental changes to system parameters. The default password is 123456.

Enter Password:

Tap any point of the screen, pop up the Password Enter screen. Enter the password

and Tap [Enter] button to confirm. If the entered password is correct, it is allowed to configure the system parameters. If the entered password is wrong, there will be notice of "Password Invalid".

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→ Delete previous character

→ Exit and return to previous screen

→ Confirm and return to previous screen
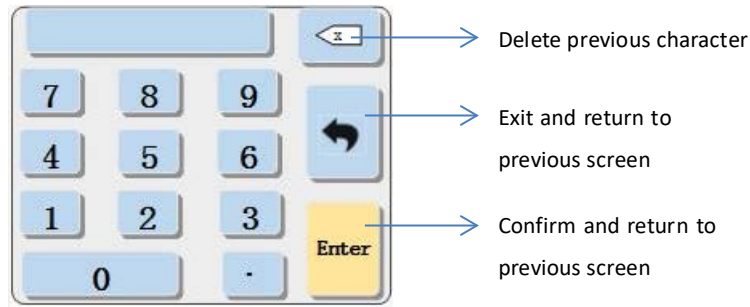
Set Password:

Tap [Password: XXXXXX] button to pop up Password Setting screen. Tap [New password: XXXXXX] button and set the new password. Tap [Again: XXXXXX] button and enter the same new password again. Tap [✓] icon to save the new password. If the two passwords do not match, there will be notice of "Invalid! Passwords don't match." The new password needs to be reset again.

Cancel Password Protection

Set the password as 0, the password protection function will be cancelled. Then no need to enter the password anymore before setting the system parameters.

4.3.2.2 Pump Head Selection

Many pump heads can be selected on FC32S-1: YZ1515X, YZ2515X, YZII15, YZII25, FG15-13, FG25-13, DMD15-13.

Tap [Head type: YZ1515X] button, pop up the Pump Head Selection screen. Tap the photo of the pump head used, and return to the System Parameter Setting screen.

Tap [✗] icon to save the pump head selection and return to Run screen.

Note: The calibration coefficient will restore the default value after changing the pump head.

4.3.2.3 Online/ Offline Mode Setting

FU4B-1&FC32S-1 has two control modes: online and offline.

Online Mode: The one filling operation starts when receiving external start signal. And the "no bottle- no fill" function (system will not fill when receives "no bottle" signal) is also valid in online mode. When FU4B-1&FC32S-1 is integrated into the filling machine, the filling operation and bottle movement could be synchronous through

the external start signal and the "no bottle" signal. When system is in the online mode, the light for the mode is green ⬭ Online   .

   Offline Mode: The filling operation is controlled trough the FC32S-1 controller. When system is in the offline mode, the light for the mode is gray ⬭ Online   .

4.3.2.3.1   Online Mode Setting
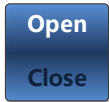
Mode
[Online | Offline]

a. Tap [Online/Offline] button to switch the online and offline mode, when "Online" is highlighted, the mode is set as online.

Start pulse
[Raise | Fall]

b. Tap [Raise/Fall] button to switch the type of trigger. Refer to chapter 2.3.2.1 for the definition of the trigger type.

Bot.signal
[Open | Close]

c. Tap [Open/Close] button to switch the control logic of "no bottle- no fill". Refer to chapter 2.3.2.1 for the definition of the control logic type.

d. Tap [✖] icon to save the online mode setting and return to Run screen.

4.3.2.3.2   Offline Mode Setting

Mode
[Online | Offline]

a. Tap [Online/Offline] button to switch the online and offline mode, when "Offline" is highlighted, the mode is set as online.

b. Tap [✖] icon to save the offline mode setting and return to Run screen.

4.3.2.4 Channel Setting

Enter the Channel Setting screen to set the channel quantity and the filling direction.

a. Tap [**Channel**] button to enter the Channel Setting screen.

b. Tap **Channel Qty:** [16] key to enter the channel quantity, 32 at most. Then the screen will display the buttons for filling direction setting of each channel, 8 buttons at most on one page. Tap [◀] or [▶] to switch the pages.

c. Tap icon to switch the filling direction as clockwise or counter-clockwise. For the clockwise direction, the left of the pump head is upstream (suction side), and right of the pump head is downstream (pressure side). For the counter-clockwise direction, the right of the pump head is the upstream (suction side), the left of the pump head is the downstream (pressure side).

d. Tap icon to save the channel setting and return to Run screen.

4.3.2.5 Communication Parameter Setting

Through the RS485 interface, the PC and other microprocessor could communicate with FC32S-1 to set all parameters and control the filling action of FU4B-1.

Communication parameters:
    Equipment address：1-247
    Baud rate：1200bps, 9600bps, 19200bps, 38400bps
    Parity: NONE、ODD、EVEN
    Stop bit：1，2

Communication parameter setting：

a. Tap **Modbus** button to enter the Communication Parameter Setting screen.
b. Tap "address", "Baud rate", "Parity", "Stop bit" keys to select the correct parameters.

c. Tap icon to save the communication parameter setting and return to Run screen.

4.3.2.6 Parameters Synchronization

After changing the drive unit or controller, Parameter Sync function could download all parameters from controller to all the drive units at the same time, which make sure the parameters drive units received are same as the ones on the controller.

SYNC

Tap icon to download the parameters from controller to all the drive units.
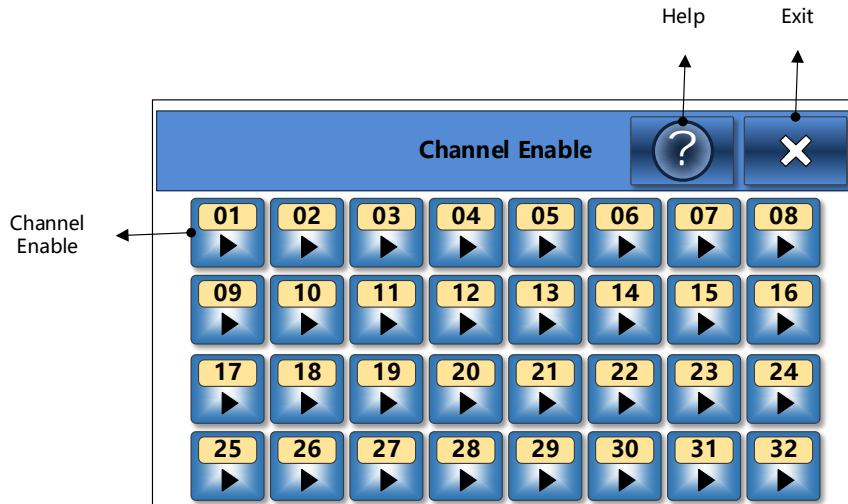Note:
(1) Before parameter sync operation, make sure all parameters on the controller have been saved.

(2) The parameter sync operation is only necessary after changing drive unit or controller.

4.3.3 Channel Enable and Disable

Channel Enable: the channel is allowed to do the filling operation.
Channel Disable: the channel is not allowed to do the filling operation.

Tap ⬚ icon on the Run screen to enter the Channel Enable screen.

Tap the channel button ⬚...⬚, to enable or disable the channel.
Note:
(1) Only the channel, which address number is equal to or smaller than channel quantity, could be enabled or disabled.
(2) When there is communication error between the drive unit and the controller, the channel could not be enabled or disabled.

4.3.4 Dispensing Parameter Setting

4.3.4.1 Function Introduction

The dispensing parameters could be stored as program in FC32S-1, which could be recalled easily. You could save up to 5 programs in FC32S-1. After downloading the program to FU4B-1, FU4B-1 will do the filling operation according to the new parameters.
Note:
The calibration cofficient will be the default value after downloading the new parameter program.

Fill Parameter Screen
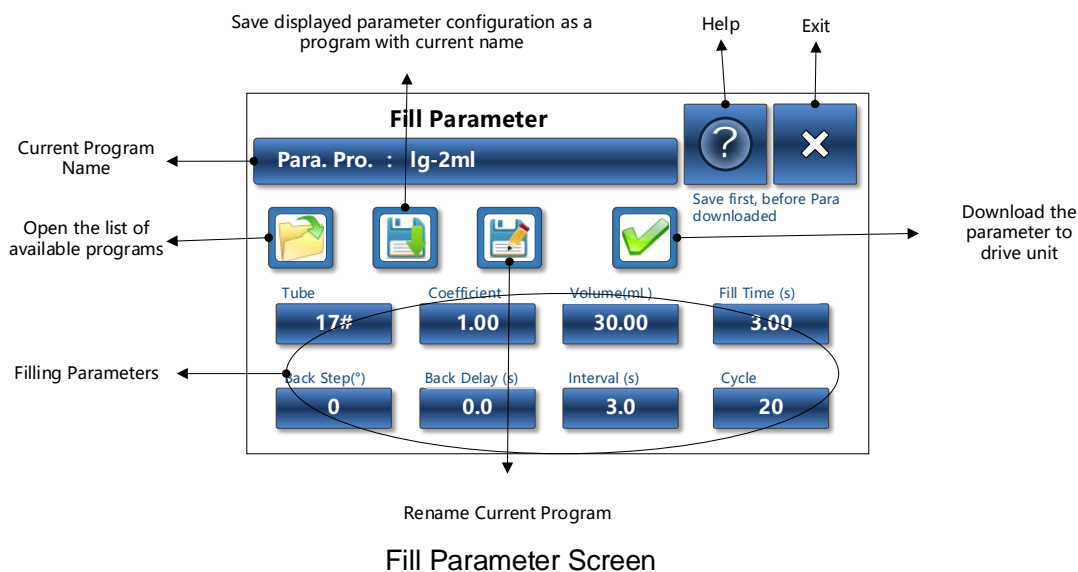
Filling parameter definition and the range of setting:

Tube: tube size suitable for the selected pump head.

Coefficient: when the actual filling volume is too much different from the target filling volume (such as filling viscous liquid), all channels could be calibrated roughly through setting the coefficient. The setting range is from 0.1 to 50. How to set the coefficient: target filling volume = actual filling volume * coefficient. For example: when the target filling volume is 5ml, and the actual filling volume is 4ml, then the coefficient should be 1.25 (=5/4).

Filling volume: filling volume in one cycle, the setting range is 0.01ml-9999.99ml.

Filling time: filling time in one cycle, the setting range is 0.1s-6000s.

Back Step: The angle of the back suction to eliminate the drips, the setting range is 0-1000°.

Back delay: The delay time between the filling operation and back suction, which cooperates with Back Step to eliminate the drips. The setting range is 0s-60s.

Interval: The time between each fill when in offline mode. The setting range is 0.5s-999.9s.

Cycle: The desired number of fills when in offline mode. The setting range is 0-999999. 0 means unlimited cycle.

4.3.4.2 Save The Parameters As A Program

a. Tap **Dispense Setting** button to enter the Fill Parameter screen. The name of current program is displayed on **Para. Pro. : lg-2ml** .

b. Tap the parameter buttons (tube, coefficient, filling volume, filling time, back step, back delay, interval and cycle) to select or enter the parameters.

c. Tap icon to save the parameters as a program with current name.

4.3.4.3 Recall A Program

a. Tap **Dispense Setting** button to enter the Fill Parameter screen. The name of current

program is displayed in **Para. Pro. : lg-2ml** .

b. Tap icon to open the list of available programs.

c. Select the desired program and return to the Fill Parameter screen. Then the parameters saved in the program will be displayed.

4.3.4.4 Rename A Program

a. Tap **Dispense Setting** button to enter the Fill Parameter screen. The name of current

program is displayed in **Para. Pro. : lg-2ml** .

b. Tap icon to pop up the Name Edit screen.

c. Enter the new name for current program: press button to delete previous

character, tap button to cancel the renaming and return to the Fill

Parameter screen, tap **Enter** button to save the new name to current program and return to the Fill Parameter screen.

4.3.4.5 Download the Parameter

a. Tap **Dispense Setting** button to enter the Fill Parameter screen. The name of current

program is displayed in **Para. Pro. : lg-2ml** .

b. Select a program, change the parameters and save the program.

c. Tap icon to download the parameters saved in current program to the drive unit.

Note:

The calibration cofficient will be the default value after downloading the new parameter program.

4.3.5 Fast Filling and Backflow

Fast Fill: when the pump is running fast filling, the liquid is filled into the tube at high speed, and the filling direction is same as the normal filling operation.
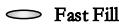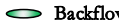
Backflow: when the pump is running backflow, the liquid is transferred back to the upstream (suction side) of the tube at high speed, the liquid moving direction is the opposite direction of the normal filling operation.

Note:

1. All channels could run fast filling or backflow simultaneously, and each channel could also do it individually.

2. The disabled channel (refer to chapter 4.3.3) also could run fast filling or backflow.

Fast Fill & Backflow Screen
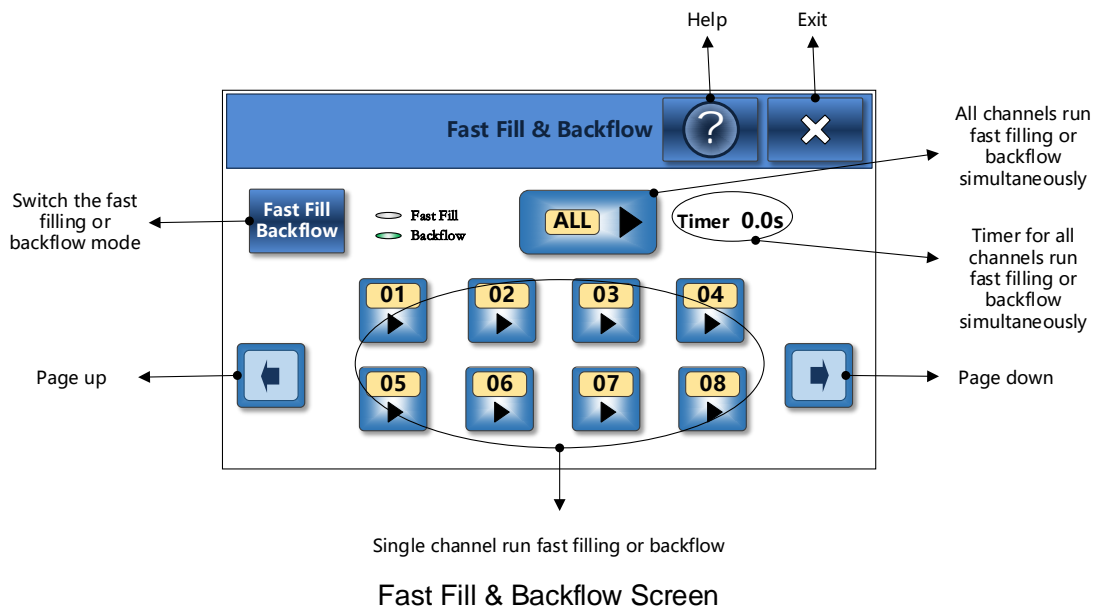
4.3.5.1 All Channels Run Fast Filling or Backflow Simultaneously

a. Tap **Fast Fill/ Backflow** button to enter the Fast Fill & Backflow screen.

b. Tap **Fast Fill Backflow** button to switch the fast filling or backflow mode. The green light ⬭ Fast Fill ⬭ Backflow indicates the current mode.

c. Press and hold **ALL ▶** button, all channels run the fast filling or backflow simultaneously, and the timer is counting.

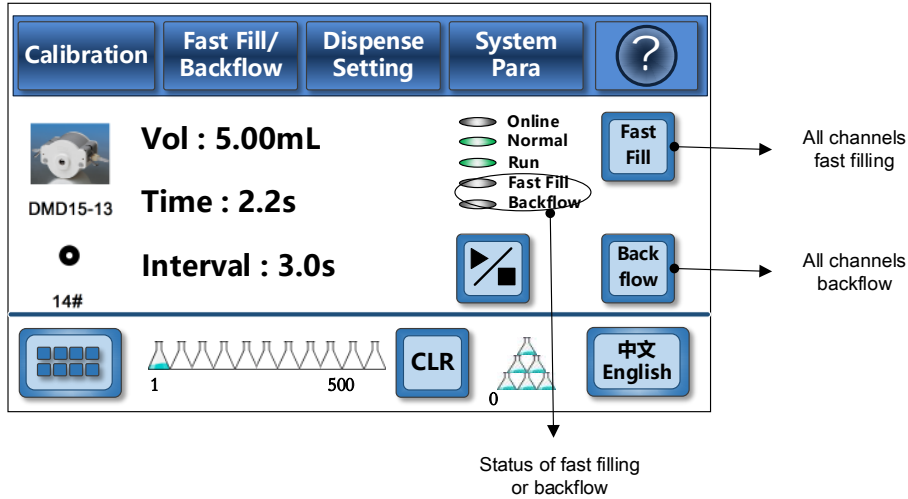d. Release the **ALL ▶** button, all channels stop running the fast filling or

backflow.

Note:

If there is no time requirement, all channels could run fast filling or backflow simultaneously through pressing and holding [Fast Fill] or [Back flow] on the Run screen. Release the buttons, all channels stop running the fast filling or backflow.

Status of fast filling
or backflow

4.3.5.2 Single Channel Run Fast Filling or Backflow

a. Tap [Fast Fill/Backflow] button to enter the Fast Fill & Backflow screen.
b. The screen displays the buttons for start/stop fast filling or backflow of each channel, 8 buttons at most on one page. Tap [◀] or [▶] to switch the pages.

c. Tap [Fast Fill Backflow] button to switch the fast filling or backflow mode. The green light
   ◯ Fast Fill
   ◯ Backflow   indicates the current mode.

d. Tap [01 ▶] button to start the fast filling or backflow, and the button changes to

   [01 ■] .

e. Tap [01 ■] button to stop the fasting filling or backflow, then the button changes

to [01 ▶] .

4.3.6 Filling Volume Calibration

Four methods of calibration are available to ensure the filling volume accuracy. Each channel could be individually calibrated through percent adjustment, volume calibration, weighing calibration and multiple weighing calibration.

4.3.6.1 Percent Adjustment

The filling volume could be adjusted through setting the volume percent. The setting range is ±20% of the target volume. This method is suitable for the application that the accuracy requirement is not very critical and quick adjustment is needed.

For example: the target filling volume is set as 5ml, and the accuracy requirement is ±5%. If the actual volume is about 3% lower than target volume (0.15ml), then drag the cursor to the position of 3% or press [—] or [+] to set the cursor at the position of 3%. After calibration, the actual volume will be closing to 5ml.
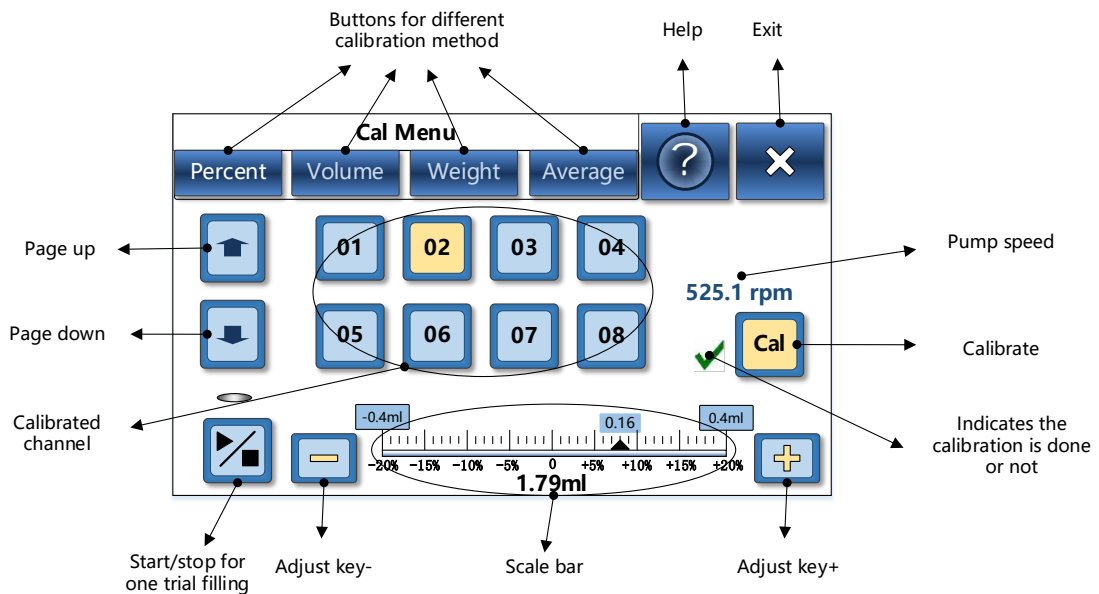
Percent Calibration Screen

a. Tap [Calibration] button to enter the Calibration screen.

b. Tap [Percent] button to enter the Percent Calibration screen.

c. The screen displays the button of each channel, 8 buttons at most on one page.

Tap [▲] or [▼] to switch the pages.

d. Tap button to select the channel to be calibrated, and the button changes the color to .

e. One trial filling:

When the system is in the offline mode:

Tap to perform one trial filling, and the running light is green . When the one trial filling is completed, the running light is gray. Before the one trial filling is completed, you could tap to stop the filling.

When the system is in the online mode:

There is no button on the Percent Calibration screen, perform the one trial filling trough external start signal.

f. Drag the cursor to the desired position or press or to set the cursor at desired position.

g. Tap button to calibrate. When the calibration is done, there is . If there is error during the calibration, there is , and recalibration is needed. After the calibration, the indicated pump speed is changed according to the calibration result.

Note:

The adjusted percent will be indicated on the 3 digitals LED of the corresponding channel.

4.3.6.2 Volume Calibration

The calibration is done through entering the actual filling volume.

Volume Calibration Screen

a. Tap **Calibration** button to enter the Calibration screen.
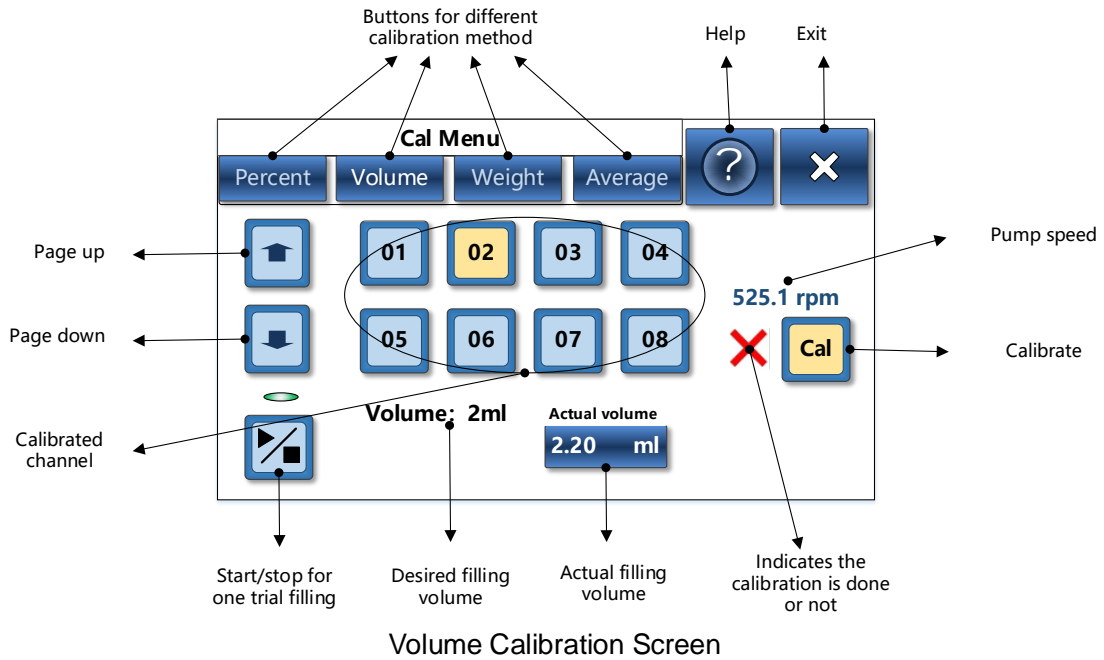
b. Tap **Volume** button to enter the Volume Calibration screen.

c. The screen displays the button of each channel, 8 buttons at most on one page.

Tap ⬆ or ⬇ to switch the pages.

d. Tap **01** button to select the channel to be calibrated, and the button changes the color to **01**

e. One trial filling:

When the system is in the offline mode:

Tap ▶ to perform one trial filling, and the running light is green ▶. When the one trial filling is completed, the running light is gray. Before the one trial filling is completed, you could tap ▶ to stop the filling.

When the system is in the online mode:

There is no ▶ button on the Volume Calibration screen, perform the one trial filling trough external start signal.

f. Tap **2.20 ml** button to enter the actual filling volume.

g. Tap **Cal** button to calibrate. When the calibration is done, there is ✔. If there is error during the calibration, there is ✖, and recalibration is needed. After the calibration, the indicated pump speed is changed according to the calibration result.

4.3.6.3 Weighing Calibration

The filling volume calibration is done by entering the weight (g) of the actual filling volume. The weight could be entered manually or read from Ohaus balance (model: FR224CN) directly.

4.3.6.3.1 Weighing Calibration In the Offline Mode
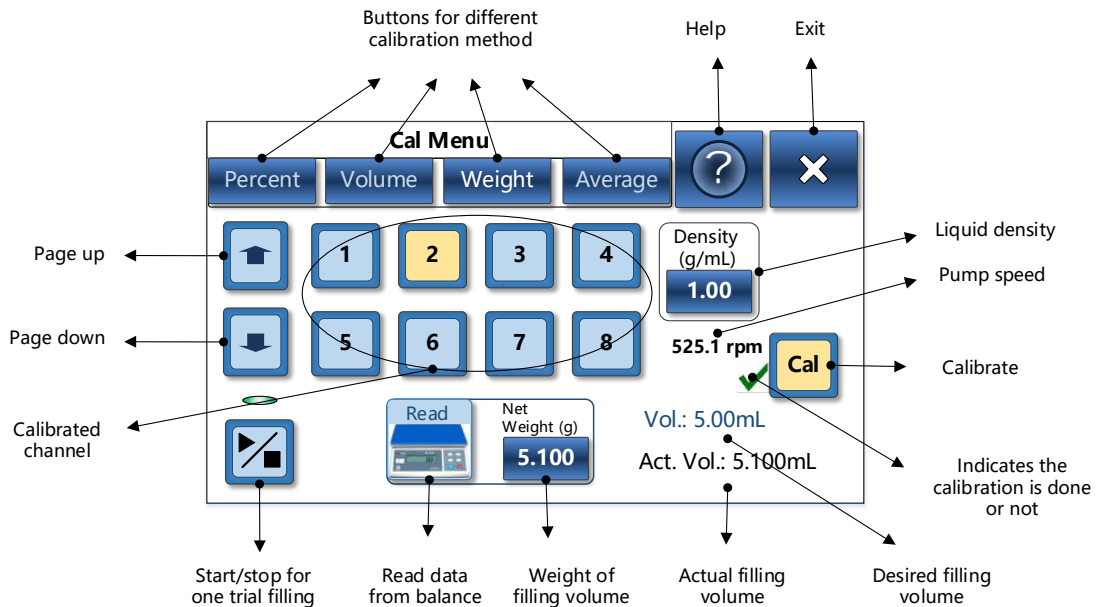
Weighing Calibration Screen (Offline)

a. Tap **Calibration** button to enter the Calibration screen.

b. Tap **Weight** button to enter the Weighing Calibration screen.

c. The screen displays the button of each channel, 8 buttons at most on one page.

Tap ⬆ or ⬇ to switch the pages.

h. Tap **01** button to select the channel to be calibrated, and the button changes the color to **01**.

d. Tap to perform one trial filling, and the running light is green . When the one trial filling is completed, the running light is gray. Before the one trial filling is completed, you could tap to stop the filling.

e. Tap to enter the density of the liquid (g/mL).

f. Tap to enter the actual weight of filling volume, or tap to read the data of weight from the balance directly. Then Act. Vol.: 0.000mL indicates the actual volume in mL (volume= weight/density).

g. Tap button to calibrate. When the calibration is done, there is . If there is error during the calibration, there is , and recalibration is needed. After the calibration, the indicated pump speed is changed according to the calibration result.

4.3.6.3.2 Weighing Calibration In the Online Mode

When the system is operating in the online mode, there is no button for the one trial filling. More keys for the weight entering are provided: Total weight key, Bottle weight key and Residual key. The relationship between these keys are :

Total weight= bottle weight + net weight of filling volume

Bottle weight=net bottle weight+ residual

Actual weight of filling volume= net weight + residual

Actual filling volume= actual weight of filling volume/ density

Residual: the amount of liquid left on the wall after pouring out the liquid.

Weighing Calibration Screen (Online)

a. Tap **Calibration** button to enter the Calibration screen.

b. Tap **Weight** button to enter the Weighing Calibration screen.

c. The screen displays the button of each channel, 8 buttons at most on one page.

Tap ⬆ or ⬇ to switch the pages.

d. Tap **01** button to select the channel to be calibrated, and the button changes

the color to **01** .

e. Tap **Density (g/mL) 1.00** to enter the density of the liquid (g/mL).

f. Tap **Residual (uL) 100** to enter the residual (uL).

g. **To enter the net weight directly** (net weight= total weight- bottle weight, and

bottle weight= net bottle weight+ residual): tap **Net Weight (g) 5.200** to enter the net weight of

filling volume. Then **Act. Vol.: 5.300mL** indicates the actual filling volume (actual filling

volume=net weight/ density + residual).

To calculate the net weight:

Put the filled bottle with liquid on the balance, tap Total Weight (g) **6.200** to enter the total weight,

or read the total weight from balance through tapping Read . Then pour out the

liquid from the bottle, and put the bottle on the balance, tap Bottle Weight (g) **1.000** to enter the

bottle weight, or read the bottle weight from balance through tapping Read . Then

the net weight of filling volume will be calculated automatically and indicated on

Net Weight (g) **5.200** , and the actual filling volume will be calculated and indicated on

Act. Vol.: 5.300mL .

h. Tap **Cal** button to calibrate. When the calibration is done, there is ✔. If there

is error during the calibration, there is ✘, and recalibration is needed. After the

calibration, the indicated pump speed is changed according to the calibration

result.

4.3.6.4 Multi-weighing Calibration

Weighing up to 3 times, entering each weighing data, then the average volume of actual filling will be calculated automatically. And the calibration is done based on the average volume. The weight could be entered manually or read from Ohaus balance (model: FR224CN) directly.

4.3.6.4.1 Multi-weighing Calibration In the Offline Mode

Multi-Weighing Calibration Screen (Offline)

a. Tap **Calibration** button to enter the Calibration screen.

b. Tap **Average** button to enter the Multi-Weighing Calibration screen.

c. Tap **2** to enter the number of the channel which is going to be calibrated. (channel number ≤ channel quantity)

d. Tap [icon] to perform one trial filling, and the running light is green [icon]. When the one trial filling is completed, the running light is gray. Before the one trial filling is completed, you could tap [icon] to stop the filling. In the multi-weighing calibration method, you could run several times of "one trial filling", and record the each filling weight.

e. Tap **Density (g/mL) 1.00** to enter the density of the liquid (g/mL).

f. Tap **1st** button, then [Read] **Net weight(g) 3.00** is the interface to input the first set of data. Tap **Net weight(g) 3.00** to enter the net weight of filling volume, or tap [Read] to read the data of net weight from the balance directly. Then **Act. Vol.: 5.000mL** indicates the

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actual filling volume based on the first data (actual volume= net weight/density). If you tap **Cal** button to calibrate now, the calibration is only based on the first data.

g. Tap **2nd** button, then [Read | Net weight(g) | **3.00**] is the interface for the second set of data. Tap [Net weight(g) | **3.00**] to enter the net weight of filling volume, or tap [Read] to read the data of net weight from the balance directly. Then Act. Vol.: 5.000mL indicates the average volume of the first data and the second data (average volume= (net weight 1 + net weight 2)/2/density). If you tap **Cal** button to calibrate now, the calibration is based on average volume of the first data and the second data.

h. Tap **3rd** button, then [Read | Net weight(g) | **3.00**] is the interface for the third set of data. Tap [Net weight(g) | **3.00**] to enter the net weight of filling volume, or tap [Read] to read the data of net weight from the balance directly. Then Act. Vol.: 5.000mL indicates the average volume of the three filling data (average volume= (net weight 1 + net weight 2+ net weight 3)/3/density). If you tap **Cal** button to calibrate now, the calibration is based on average volume of the three filling data.

i. Tap **Cal** button to calibrate. When the calibration is done, there is ✔. If there is error during the calibration, there is ✖, and recalibration is needed. After the calibration, the indicated pump speed is changed according to the calibration result.

4.3.6.4.2 Multi-weighing Calibration In the Online Mode

When the system is operating in the online mode, there is no button for the one trial filling. More keys for the weight entering are provided: Total weight key, Bottle weight key and Residual key. The relationship between these keys are :
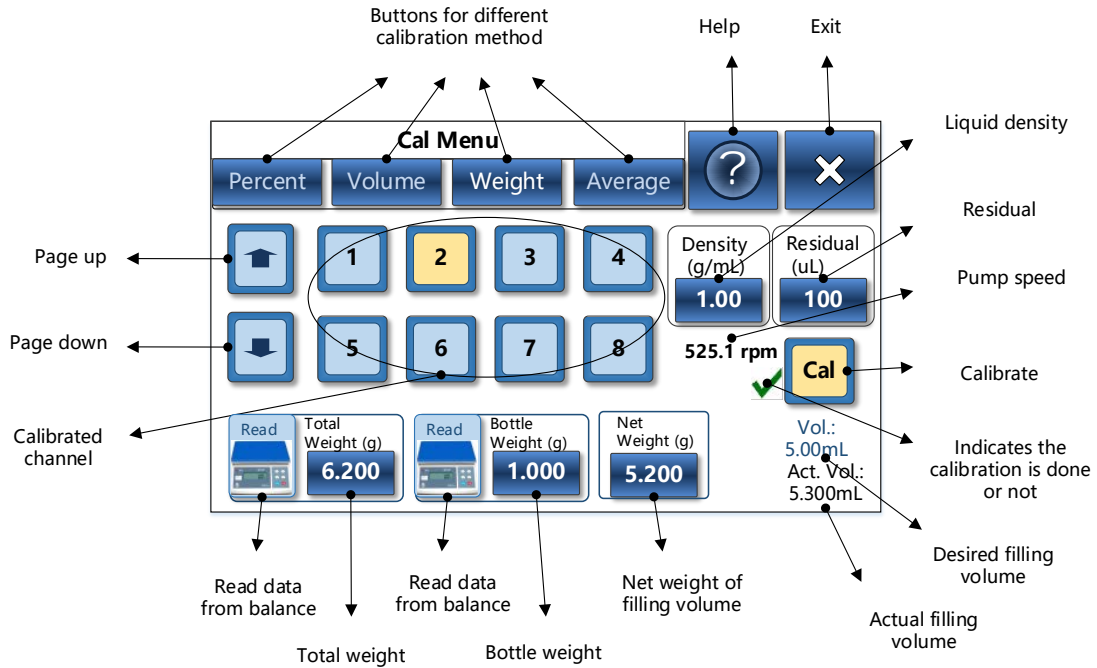
Total weight= bottle weight + net weight of filling volume

Bottle weight=net bottle weight+ residual

Actual weight of filling volume= net weight + residual

Actual filling volume= actual weight of filling volume/ density

Residual: the amount of liquid left on the wall after pouring out the liquid.
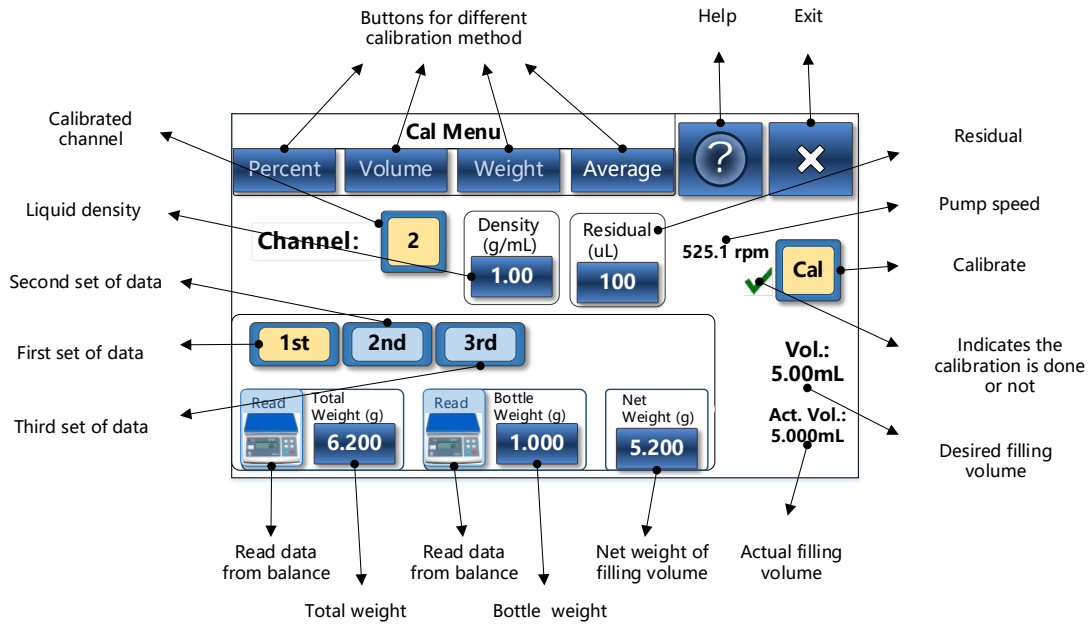
Screen of Multi-weighing Calibration In the Online Mode

a. Tap **Calibration** button to enter the Calibration screen.

b. Tap **Average** button to enter the Multi-Weighing Calibration screen.

c. Tap **2** to enter the number of the channel which is going to be calibrated. (channel number ≤ channel quantity)

d. Tap **▶/■** to perform one trial filling, and the running light is green **▶/■**. When the one trial filling is completed, the running light is gray. Before the one trial filling is completed, you could tap **▶/■** to stop the filling. In the multi-weighing calibration method, you could run several times of "one trial filling", and record the each filling weight.

e. Tap **Density (g/mL) 1.00** to enter the density of the liquid (g/mL).

f. Tap **1st** button, then **1st 2nd 3rd / Read Total Weight (g) 6.200 / Read Bottle Weight (g) 1.000 / Net Weight (g) 5.200** is the interface to input the first set of data.

To enter the net weight directly (net weight= total weight- bottle weight, and bottle

weight= net bottle weight+ residual): tap **Net Weight (g) 5.200** to enter the net weight of filling volume.

To calculate the net weight automatically:

Put the filled bottle with liquid on the balance, tap **Total Weight (g) 6.200** to enter the total weight, or read the total weight from balance through tapping **Read**. Then pour out the liquid from the bottle, and put the bottle on the balance, tap **Bottle Weight (g) 1.000** to enter the bottle weight, or read the bottle weight from balance through tapping **Read**. Then the net weight of filling volume will be calculated automatically and indicated on **Net Weight (g) 5.200** .

After getting the net weight, **Act. Vol.: 5.300mL** indicates the actual filling volume based on the first data (actual volume= net weight/density). If you tap **Cal** button to calibrate now, the calibration is only based on the first data.

g. Tap **2nd** button, then **[1st | 2nd | 3rd | Read Total Weight (g) 6.200 | Read Bottle Weight (g) 1.000 | Net Weight (g) 5.200]** is the interface for the second set of data. Follow the step f to enter the net weight. Then

Act. Vol.: 5.000mL indicates the average volume of the first data and the second data (average volume= (net weight 1 + net weight 2)/2/density). If you tap **Cal** button to calibrate now, the calibration is based on average volume of the first data and the second data.

h. Tap **3rd** button, then **[1st | 2nd | 3rd | Read Total Weight (g) 6.200 | Read Bottle Weight (g) 1.000 | Net Weight (g) 5.200]** is the

interface for the third set of data. Follow the step f to enter the net weight. Then

Act. Vol.:
5.000mL

indicates the average volume of the three filling data (average volume=

(net weight 1 + net weight 2+ net weight 3)/3/density). If you tap **Cal** button to calibrate now, the calibration is based on average volume of the three filling data.

i. Tap **Cal** button to calibrate. When the calibration is done, there is ✔. If there is error during the calibration, there is ✘, and recalibration is needed. After the calibration, the indicated pump speed is changed according to the calibration result.

4.3.7 Control FU4B-1 through FC32S-1

When the system is running in the offline mode, the FU4B-1 could be started or stopped through FC32S-1.
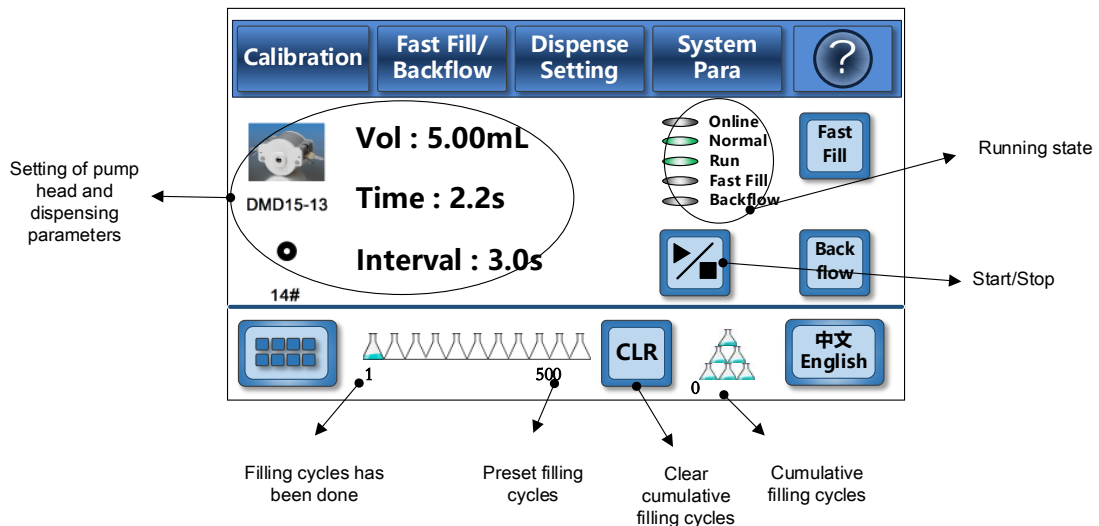
Run Screen in the Offline Mode

Tap ▶/■ button on the Run Screen to start the filling system FU4B-1. The running state will display ⬭ **Run** . And the filling process dynamically, the left number indicates the filling cycles which have been done, the right number indicates the target cycles need to be done. 0 indicates the cumulative filling cycles have been done. When the target cycles are completed, FU4B-1 will stop automatically, and the running state will display ⬭ **Stop** .
When the target cycles have not been completed, or one fill has not been completed, FU4B-1 could be stop through tapping ▶/■ button. And the running state will

display ⬭ **Stop** . Tap ▶❚ button again, FU4B-1 will restart the filling operation and re-counting. To ensure the filling accuracy, the filling process can't be suspended. Note:

(1) Error will be reported if there is any error, such as ⬭ **Error B01** , then some driving units may not be able to operate normally. Please refer to Appendix B for the meaning of the error and the recommended solution.

(2) Before the target cycles have been completed, the filling system can't perform system configuration or filling volume calibration.

4.3.8 Chinese/ English Language Selection

Tap 中文 English button on the Run Screen to pop up the Language Selection Screen. Tap 中文 Chinese or 英文 English and return to the Run Screen.

4.4 External Control FU4B-1 in the Online Mode

When the system is working in the Online mode, the filling operation could be started through external start signal. And the "no bottle- no fill" function (system will not fill when receives "no bottle" signal) is also valid in online mode. When FU4B-1&FC32S-1 is integrated into the filling machine, the filling operation and bottle movement could be synchronous through the external control signal and the "no bottle" signal.

Calibration	Fast Fill/ Backflow	Dispense Setting	System para	?

DMD15-13

Vol : 5.00ml

Time : 2.2s

● Online
● Normal
● Run
● Fast Fill
● Backflow

Fast Fill

▶❚

Back flow

○

14#

⬛ CLR △ 0 中文 English
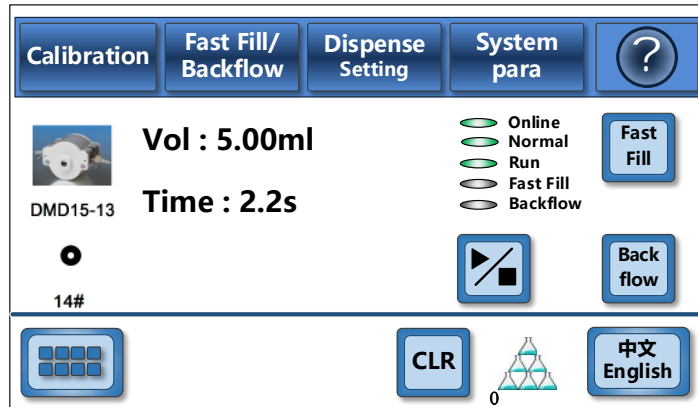
Run Screen (Online)

4.4.1 Start One Filling through External Start Signal

a. Connect the external start signal wire to FU4B-1 according to Chapter 2.3.2.1.

b. Power up the system, then set the online mode and the "Start Pulse" according to Chapter 4.3.2.3.

c. Tap ▶❚ button on Run Screen, then FU4B-1 is ready for the filling operation, and the running state is ⬭ **Run** .

d. Filling machine issues the start signal to FU4B-1, then the effective channel starts one filling operation. When the target volume is reached, the system will stop and get ready for the next start signal.

Note:

(1) Before the one filling operation is completed, FU4B-1 will not response to another start signal.

(2) Before the one filling operation is completed, tap ![button] button on Run Screen to stop one filling operation, and the running state is ⬭ Stop . Before getting ready for the filling operation, FU4B-1 will not response to start signal.

4.4.2 No Bottle No Fill

a. Connect the "no bottle" signal wire to FU4B-1 according to Chapter 2.3.2.1.
b. Power up the system, then set the online mode and the "Bottle Signal" according to Chapter 4.3.2.3.
c. When FU4B-1 receives start signal, those channels, receiving "no bottle" signal, will not do the filling operation.

4.5 Communication Control

Computer communicates with FC32S-1 through RS485 communication interface supporting Modbus RTU protocol. Computer could set all parameters and control the operation through sending commands to FC32S-1.

a. Connect communication cable to FC32S-1 according to Chapter 2.3.2.2.
b. Set the communication parameter according to Chapter 4.3.2.5.
c. Send the commands to FC32S-1 according to Appendix A "FC32S-1 Controller Modbus Communication Protocol" to set the filling parameters and control the filling operation.

Note:

The control function through communication is same as the control through touch screen, using commands instead of manual operation. Please refer to Chapter 4.3 and 4.4 for the parameter setting and operation control.

4.6 Online Percent Adjustment through Membrane Key

Each driving unit of FU4B-1 has individual 3 digitals LED and 2 membrane keys. The 3 digitals LED could display channel address or the volume percent set through FC32S-1 (refer to Chapter 4.3.6.1). The LED and membrane key could also be used to adjust the volume percent online.
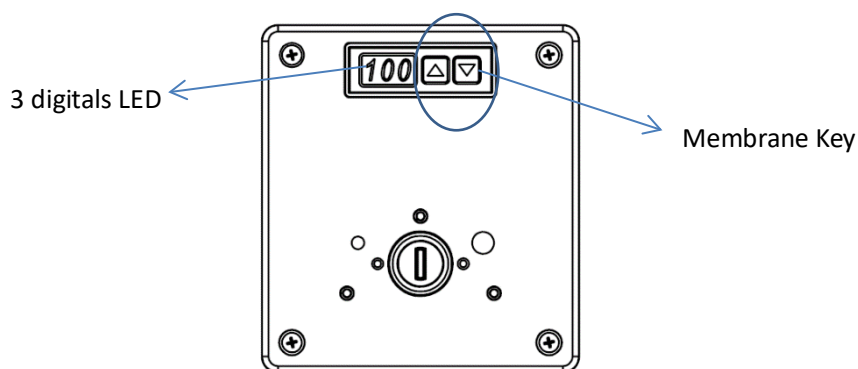
3 digitals LED

Membrane Key

When FU4B-1 is powered up, the LED will display the percentage adjusted of filling volume, and default value is 100.

Note:

When LED displays channel address, press and hold ▼ key for 2 seconds, the LED will display the volume percentage.

In the percentage adjustment mode, press and hold ▲ for 2 seconds, the digitals start flashing. Then press ▲ key, the percentage will increase, press ▼ key, the percentage will reduce. 5 seconds after the setting, the LED will stop flashing and the percentage will be saved. The setting range is 80% -120% of the target volume.

Note:
The percentage set through the membrane key will be displayed on the scale bar of Percent Calibration Screen.

4.7 Touch Screen Sensor Calibration

After long-term use, calibration is necessary because it is difficult to perfectly align the touch screen's coordinates with the display underneath it. Otherwise, the button or icon can't be properly activated, and the system may not correctly act upon the soft button presses and taps.
Calibration Steps:
a. Tap any area (without any button) of the touch screen interface in a quick succession until hear a "beep--" long tone. Then the blue calibration screen pop up.
b. Tap the cross dot according to the instruction on the screen: left top, right top, right bottom. Then the calibration is done, and return to the operating screen.

| Calibration | Fast Fill/ Backflow | Dispense Setting | System Para | ? |

Vol : 5.00mL

Time : 2.2s

Interval : 3.0s

DMD15-13

14#

- Online
- Normal
- Run
- Fast Fill
- Backflow

Fast Fill

Back flow

CLR

中文 English

1   500   0

Tap in quick succession →

Press The Cross Dot In Left_Top

Tap the cross dot ↓

Press The Cross Dot In Right_Top

← Tap the cross dot

Press The Cross Dot In Right_Bottom

↑ Tap the cross dot
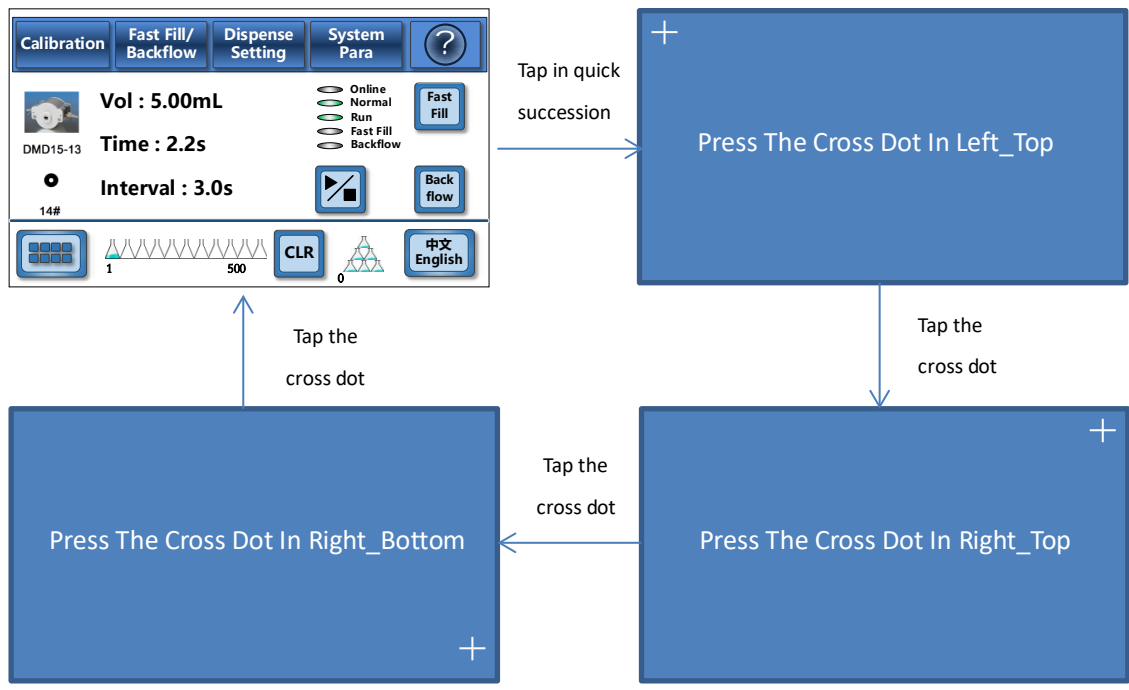
Appendix A: FC32S-1 Modbus Communication Protocol

Parameter	New Address	Data Type	Note
Start/Stop	0x00	uint_16	S: start the filling operation B: stop the filling operation
Reserved	0x01	uint_32	N/A
Reserved	0x02		

Fast Filling	0x03	uint_16	Low order byte:
			        channel address：0x01-0x20 (1-32), broadcast address: 0x3f.
			High order byte:
			        S: start fast filling operation
			        B: stop fast filling operation.

Backflow	0x04	uint_16	Low order byte:
			        channel address：0x01-0x20 (1-32), broadcast address: 0x3f.
			High order byte:
			        S: start backflow operation
			        B: stop backflow operation.

Actual Filling Volume (low order byte)	0x05	uint_32	Volume range: 10ul-9999990ul, in increments of 10uL, Data range: 10-9999990, in increments of 10. Write the data in hex. Low order byte first.
Actual Filling Volume (high order byte)	0x06		
Channel to be Calibrated	0x07	uint_16	Low order byte: channel address in hex. Once FC32S-1 receives the channel address, the system will calibrate the volume automatically according to set parameters.

Percent Adjustment	0x08	uint_16	Low order byte:
			        channel address in hex.
			High order byte:
			        percentage to be adjusted. Percentage range: 80%-120%. Data range: 80-120, integer. Write the data in hex.

Density	0x09	uint_16	Density range: 0.5-16(g/ml), in increments of 0.01g/ml. Data range: 50-1600, integer. Write the data in hex. Example: 1g/ml, value is 100 in dec, and the hex value is 64H
Residual	0x0a	uint_16	Residual range: 0-999(uL), in increments of 1uL. Data range: 0-999, integer. Write the data in hex. Example: 5ul, hex value is 5H

Modbus Parameter Setting	0x10	uint_16	Bit15~Bit8：FC32S-1 address in the communication bus, range: 1-247 Bit7、 Bit6： =**00:** 1200bps， =**01:** 9600bps， =**10:** 19200bps， =**11:** 38400bps； Bit5、 Bit4： =**00:** none parity， =**01:** odd parity， =**10:** even parity， others invalid； Bit3、 Bit2： =**01:** 1 stop bit， =**10:** 2 stop bits， Others invalid
Language	0x11	uint_16	0x0000：Chinese； 0x0001：English； =OTHERS invalid
Reserved	0x12	uint_16	N/A
Password (low order byte)	0x13	uint_32	Six numbers, write in hex, low order byte first. The password becomes effective immediately when FC32S-1 receives the high order byte. Example: password is 123456, written as 1E240 H. Ox14: 1H,0x13: E240 H.
Password (high order byte)	0x14		
Clear Cumulative Filling Cycles	0x15	uint_16	0: clear the cumulative filling cycles, low order byte first. The cumulative filling cycles will be cleared when FC32S-1 receives the high order byte.
	0x16	uint_16	
Pump Head	0x17	uint_16	**0x0001**: DMD15-13-B； **0x0002**：YZ1515X/YZII15； **0x0003**：YZ2515X/YZII25； **0x0004**：FG15
Channel Quantity	0x18	uint_16	Range: 1-32, integer. Write data in hex.
Channel Enable and Filling Direction	0x19	uint_16	Bit7-Bit0: channel address, range: 0-31, write in hex. Bite15-Bit14: =01, channel enable =10, channel disable Others, invalid Bit13-Bit12: =01, filling direction is clockwise. =10, filling direction is counter clockwise. Others, invalid
Operation Setting	0x1a	uint_16	Bit7, Bit6: =**01**, offline mode =**10**, online mode Others, invalid BIT5、BIT4：=**01,** start pulse logic "Raise" =**10**,start pulse logic "Fall" Others, invalid； Bit3-Bit0: =**0001,** no bottle logic "Open"； =**0010,** no bottle logic "Close"

			Others, invalid;
Current Program Number	0x1b	uint_16	Program number, range: 0-4

Parameter	New Address	Type	Note
Program No.	0x20	uint_16	O for program no.1
Program Name 1	0x21	uint_16	The first character of the program name, could be lower case letter or number, using ASCII code in hex.
Program Name 2	0x22	uint_16	The second character of the program name, could be lower case letter or number, using ASCII code in hex.
Program Name 3	0x23	uint_16	The third character of the program name, could be lower case letter or number, using ASCII code in hex.
Program Name 4	0x24	uint_16	The fourth character of the program name, could be lower case letter or number, using ASCII code in hex.
Program Name 5	0x25	uint_16	The fifth character of the program name, could be lower case letter or number, using ASCII code in hex.
Program Name 6	0x26	uint_16	The sixth character of the program name, could be lower case letter or number, using ASCII code in hex.
Tubing Spec	0x27	uint_16	Refer to the tubing spec list in Table A-1.
Coefficient	0x28	uint_16	Coefficient range: 0.1-50,in increments of 0.01. Data range: 10-5000, integer. Write data in hex.
Filling Volume (low order byte）	0x29	uint_32	Volume range: 10-9999990(uL), in increments of 10uL Data range: 10-9999990, in increments of 10. Write the data in hex. Low order byte first. The filling volume is valid after receives high order byte.
Filling Volume (high order byte）	0x2a		
Filling Time	0x2b	uint_16	Filling time range: 0.01-99.99 seconds, in increments of 0.01 second. Data range: 1-9999, integer. Write the data in hex.
Back Step	0x2c	uint_16	Back step range: 0-1000°, in increments of 1°. Data range: 0-1000, integer. Write the data in hex.
Back delay	0x2d	uint_16	Back delay range: 0-60.0 (second), in increments of 0.1 second. Data range: 0-600, integer. Write the data in hex.
Interval	0x2e	uint_16	Interval range: 0.5-999.9 (second), in increments of 0.1 second. Data range: 5-9999, integer. Write the data in hex.
Filling Cycles (low order byte)	0x2f	uint_32	Range: 0-999999. Low order byte first. The filling cycle is valid after receives high order byte.
Filling Cycles (high order byte)	0x30		

Parameter	New Address	Data Type	Note
Program No.	0x40	uint_16	1 for program no.2
Program Name 1	0x41	uint_16	The first character of the program name, could be lower case letter or number, using ASCII code in hex.
Program Name 2	0x42	uint_16	The second character of the program name, could be lower case letter or number, using ASCII code in hex.
Program Name 3	0x43	uint_16	The third character of the program name, could be lower case letter or number, using ASCII code in hex.
Program Name 4	0x44	uint_16	The fourth character of the program name, could be lower case letter or number, using ASCII code in hex.
Program Name 5	0x45	uint_16	The fifth character of the program name, could be lower case letter or number, using ASCII code in hex.
Program Name 6	0x46	uint_16	The sixth character of the program name, could be lower case letter or number, using ASCII code in hex.
Tubing Spec	0x47	uint_16	Refer to the tubing spec list in Table A-1.
Coefficient	0x48	uint_16	Coefficient range: 0.1-50,in increments of 0.01. Data range: 10-5000, integer. Write data in hex.
Filling Volume (low order byte）	0x49	uint_32	Volume range: 10-9999990(uL), in increments of 10uL Data range: 10-9999990, in increments of 10. Write the data in hex. Low order byte first. The filling volume is valid after receives high order byte.
Filling Volume (high order byte）	0x4a		
Filling Time	0x4b	uint_16	Filling time range: 0.01-99.99 seconds, in increments of 0.01 second. Data range: 1-9999, integer. Write the data in hex.
Back Step	0x4c	uint_16	Back step range: 0-1000°, in increments of 1°. Data range: 0-1000, integer. Write the data in hex.
Back delay	0x4d	uint_16	Back delay range: 0-60.0 (second), in increments of 0.1 second. Data range: 0-600, integer. Write the data in hex.
Interval	0x4e	uint_16	Interval range: 0.5-999.9 (second), in increments of 0.1 second. Data range: 5-9999, integer. Write the data in hex.
Filling Cycles (low order byte)	0x4f	uint_32	Range: 0-999999. Low order byte first. The filling cycle is valid after receives high order byte.
Filling Cycles (high order byte)	0x50		

Parameter	New Address	Data Type	Note
Program No.	0x60	uint_16	2 for program no.3
Program Name 1	0x61	uint_16	The first character of the program name, could be lower case letter or number, using ASCII code in hex.
Program Name 2	0x62	uint_16	The second character of the program name, could be lower case letter or number, using ASCII code in hex.
Program Name 3	0x63	uint_16	The third character of the program name, could be lower case letter or number, using ASCII code in hex.
Program Name 4	0x64	uint_16	The fourth character of the program name, could be lower case letter or number, using ASCII code in hex.
Program Name 5	0x65	uint_16	The fifth character of the program name, could be lower case letter or number, using ASCII code in hex.
Program Name 6	0x66	uint_16	The sixth character of the program name, could be lower case letter or number, using ASCII code in hex.
Tubing Spec	0x67	uint_16	Refer to the tubing spec list in Table A-1.
Coefficient	0x68	uint_16	Coefficient range: 0.1-50,in increments of 0.01. Data range: 10-5000, integer. Write data in hex.
Filling Volume (low order byte）	0x69	uint_32	Volume range: 10-9999990(uL), in increments of 10uL Data range: 10-9999990, in increments of 10. Write the data in hex. Low order byte first. The filling volume is valid after receives high order byte.
Filling Volume (high order byte）	0x6a		
Filling Time	0x6b	uint_16	Filling time range: 0.01-99.99 seconds, in increments of 0.01 second. Data range: 1-9999, integer. Write the data in hex.
Back Step	0x6c	uint_16	Back step range: 0-1000°, in increments of 1°. Data range: 0-1000, integer. Write the data in hex.
Back delay	0x6d	uint_16	Back delay range: 0-60.0 (second), in increments of 0.1 second. Data range: 0-600, integer. Write the data in hex.
Interval	0x6e	uint_16	Interval range: 0.5-999.9 (second), in increments of 0.1 second. Data range: 5-9999, integer. Write the data in hex.
Filling Cycles (low order byte)	0x6f	uint_32	Range: 0-999999. Low order byte first. The filling cycle is valid after receives high order byte.
Filling Cycles (high order byte)	0x70		

Parameter	New Address	Data Type	Note
Program No.	0x80	uint_16	3 for program no.4
Program Name 1	0x81	uint_16	The first character of the program name, could be lower case letter or number, using ASCII code in hex.
Program Name 2	0x82	uint_16	The second character of the program name, could be lower case letter or number, using ASCII code in hex.
Program Name 3	0x83	uint_16	The third character of the program name, could be lower case letter or number, using ASCII code in hex.
Program Name 4	0x84	uint_16	The fourth character of the program name, could be lower case letter or number, using ASCII code in hex.
Program Name 5	0x85	uint_16	The fifth character of the program name, could be lower case letter or number, using ASCII code in hex.
Program Name 6	0x86	uint_16	The sixth character of the program name, could be lower case letter or number, using ASCII code in hex.
Tubing Spec	0x87	uint_16	Refer to the tubing spec list in Table A-1.
Coefficient	0x88	uint_16	Coefficient range: 0.1-50,in increments of 0.01. Data range: 10-5000, integer. Write data in hex.
Filling Volume (low order byte）	0x89	uint_32	Volume range: 10-9999990(uL), in increments of 10uL Data range: 10-9999990, in increments of 10. Write the data in hex. Low order byte first. The filling volume is valid after receives high order byte.
Filling Volume (high order byte）	0x8a		
Filling Time	0x8b	uint_16	Filling time range: 0.01-99.99 seconds, in increments of 0.01 second. Data range: 1-9999, integer. Write the data in hex.
Back Step	0x8c	uint_16	Back step range: 0-1000°, in increments of 1°. Data range: 0-1000, integer. Write the data in hex.
Back delay	0x8d	uint_16	Back delay range: 0-60.0 (second), in increments of 0.1 second. Data range: 0-600, integer. Write the data in hex.
Interval	0x8e	uint_16	Interval range: 0.5-999.9 (second), in increments of 0.1 second. Data range: 5-9999, integer. Write the data in hex.
Filling Cycles (low order byte)	0x8f	uint_32	Range: 0-999999. Low order byte first. The filling cycle is valid after receives high order byte.
Filling Cycles (high order byte)	0x90		

Parameter	New Address	Data Type	Note
Program No.	0xa0	uint_16	4 for program no.5
Program Name 1	0xa1	uint_16	The first character of the program name, could be lower case letter or number, using ASCII code in hex.
Program Name 2	0xa2	uint_16	The second character of the program name, could be lower case letter or number, using ASCII code in hex.
Program Name 3	0xa3	uint_16	The third character of the program name, could be lower case letter or number, using ASCII code in hex.
Program Name 4	0xa4	uint_16	The fourth character of the program name, could be lower case letter or number, using ASCII code in hex.
Program Name 5	0xa5	uint_16	The fifth character of the program name, could be lower case letter or number, using ASCII code in hex.
Program Name 6	0xa6	uint_16	The sixth character of the program name, could be lower case letter or number, using ASCII code in hex.
Tubing Spec	0xa7	uint_16	Refer to the tubing spec list in Table A-1.
Coefficient	0xa8	uint_16	Coefficient range: 0.1-50,in increments of 0.01. Data range: 10-5000, integer. Write data in hex.
Filling Volume (low order byte)	0xa9	uint_32	Volume range: 10-9999990(uL), in increments of 10uL Data range: 10-9999990, in increments of 10. Write the data in hex. Low order byte first. The filling volume is valid after receives high order byte.
Filling Volume (high order byte)	0xaa		
Filling Time	0xab	uint_16	Filling time range: 0.01-99.99 seconds, in increments of 0.01 second. Data range: 1-9999, integer. Write the data in hex.
Back Step	0xac	uint_16	Back step range: 0-1000°, in increments of 1°. Data range: 0-1000, integer. Write the data in hex.
Back delay	0xad	uint_16	Back delay range: 0-60.0 (second), in increments of 0.1 second. Data range: 0-600, integer. Write the data in hex.
Interval	0xae	uint_16	Interval range: 0.5-999.9 (second), in increments of 0.1 second. Data range: 5-9999, integer. Write the data in hex.
Filling Cycles (low order byte)	0xaf	uint_32	Range: 0-999999. Low order byte first. The filling cycle is valid after receives high order byte.
Filling Cycles (high order byte)	0xb0		

Table A-1 Tubing Spec List

Tubing Spec	Address: 0x27/0x47/0x67/0x87/0xa7
13#	00
14#	01
19#	02
16#	03
25#	04
17#	05
18#	06
15#	07
24#	08
35#	09
36#	0A

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Appendix B: Error and the Recommended Solution

Error displayed on the controller FC32S-1 and the recommended solution:

Item	Display	Meaning	Possible Reason	Solution
1	D**	**: the number indicates the channel address. D**: the motor of channel with address ** is stuck. Only could display one channel address each time, and small address has high priority.	Motor or other hardware is damaged, can't work properly.	Contact Longer.
			Over load, beyond motor capability.	Check the pump head and tubing to meet the filling system, and check whether the tubing is blocked.
2	B**	**: the number indicates the channel address. B**: communication failure between FC32S-1 and the channel with address **. Only could display one channel address each time, and small address has high priority.	More than one channel is set same address. Or any channel address is bigger than channel quantity.	Check the channel address, and modify it to correct one.
			Connection failure between FU4B-1 and FC32S-1.	Check the communication cable connected correctly, or whether there is any damage to the cable.
			Existing interference signal in environment.	Eliminate the interference.
			The channel has hardware or software failure.	Contact Longer.

Error displayed on the LED of each drive unit and the recommended solution:

Item	Display	Meaning	Possible Reason	Solution
1	E01	Parameter storage error occurs	When the power off occurs in the process of parameter storage, E01 will be displayed on the LED	Re-download the parameters to drive unit.

		on this drive unit.	after next power on. And the actual parameters of the drive unit will return to the default setting.	
2	E02	Parameter error occurs on this drive unit.	When the parameter is incorrect (such as exceeding the upper or lower limits), E02 will be displayed on the LED. And the actual parameters remain at the previous correct parameters.	Modify the parameter and re-download it
3	E03	The motor of this drive unit is stuck.	Motor or other hardware is damaged, can't work properly.	Manually clear the alarm. Contact Longer.
			Load is too large, beyond motor capability.	Manually clear the alarm. Check the pump head and tubing to meet the filling system, and check whether the tubing is blocked.

Note:

Press and hold the key to clear the alarm on the LED.