
Pro Duo Controller (PDC-1000)

액체정량토출시스템 Since1994

PRECISION LIQUID DISPENSING TECHNOLOGY



User manual

 **TAEHA** Corporation

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1 Safety precautions

This manual is applied to products manufactured and sold by Taeha Corp.(here in after referred to as"our company"), therefore must not be used in partial or full copy without permission of our company.

This manual explains the specifications, installation, wiring, maintenance check, abnormal phenomena and measures to be taken for our products. When using this product, please read this manual carefully, pay enough attention to safety and handle it properly.



“**Danger**” means that dangerous situations can occur and death or serious injury could result, if handled incorrectly.



“**Caution**” means that dangerous situations can occur if handled incorrectly. Also, you may get serious injury or physical damage.

In addition, even if it is indicated as caution, it may lead to serious consequences depending on the situation. Since this is important for the safety of the user, please make sure you follow the instructions.

Precautions against electric shock



Danger
<ol style="list-style-type: none"> 1. This equipment is kept under high pressure for a while even after the main power supply is cut off. When performing a wiring work or inspection that touches all terminals of the terminal block, leave it for at least five minutes after shutting off the power before you start the work. 2. To prevent electric shock and malfunction, please provide Class 3 grounding (under 100Ω, wire diameter is thicker than 1.6mm). 3. Inspection and maintenance of this equipment must be performed by a qualified technician(specialist). 4. Do not inspect equipment with wet hands, when the floor is wet or if there is too much moisture. It may cause electric shock. 5. Be careful not to damage the cable, place heavy objects on it or fold it. In case it is damaged, it may cause electric shock.

Precautions against fire



Danger
<ol style="list-style-type: none"> 1. Do not install this equipment near inflammables, combustible organic solvents or vapors. The heat and electrical operation can cause fire. 2. If this equipment malfunctions, disconnect the main power supply of the equipment. The high current may cause a fire.

Precautions against wiring



Danger
<ol style="list-style-type: none"> 1. Before conducting wiring work for maintenance etc., be sure to shut off all the external power supplies used by the equipment. 2. Failure to do so may result in electric shock or damage to the equipment. 3. To supply power or operate the equipment after wiring, be sure to attach the covers inside and outside the equipment. Failure to do so may result in injury and electric shock.



Caution
<ol style="list-style-type: none"> 1. Do not apply main power supply except for that of the voltage specified in this user manual. It may cause malfunction. 2. Make sure that terminal connections and wiring are correct. It may cause malfunction. 3. While the electric current is being applied, do not change the wiring or detach the connector. It may cause injury or equipment failure. 4. If the power wiring in the driving area is wrong, it may cause injury or damage to the equipment due to malfunction. Be careful.

Precautions on installation



Caution
<ol style="list-style-type: none"> 1. Do not install, store and use in places exposed to conductive dust, corrosive gas, flammable gas, high temperature, condensation, wind and rain, etc. 2. Exposure to direct sunlight for a long time will degrade accuracy of the equipment. Do not install, store or use in areas where there is direct sunlight. 3. When installing in an enclosed space, install a separate cooling fan to allow the outside air to flow in and out, in order to maintain the temperature around the equipment at 40°C or less. Overheating may cause fire or other accidents.

Precaution on use



Caution
<ol style="list-style-type: none"> 1. Never modify this equipment. It may cause electric shock, injury, fire or breakdown. 2. Once you modify this equipment, it cannot be covered by our warranty for defects. 3. Before use, be sure to check that all covers are properly installed and verify if there is no foreign material inside the equipment. Depending on the circumstances, unexpected operation can occur and may result in injury. 4. If an alarm occurs during use, remove the cause of the alarm, check the safety and reuse it.



Danger
<ol style="list-style-type: none"> 1. When the equipment of our company is used including robots(multi-joint robot, rectangular coordinate robot, desktop robot), please be sure to install a safety net in the robot operation area, and never approach the operation area during operation. 2. Equipment of our company include driving and rotating parts. Install a safety net on the rotating parts and never approach it during operation.

Precautions for Maintenance and Inspection



Caution
<ol style="list-style-type: none"> 1. When cleaning or repairing the equipment, be sure to turn off the power and check the internal power supply for complete dispensing, and then have it carried out by a qualified maintenance specialist. Maintenance by non-experts can cause breakdown. 2. If there is a breakdown of the equipment, donot disassemble the equipment. Please contact our customer support team. 3. If dust accumulates on the equipment, it may cause malfunction. Clean up the equipment periodically. When cleaning, please shut off the external power completely and check whether the equimnet has been fully dispensed. There is a danger of electric shock.

Precautions for disposal



Caution
<ol style="list-style-type: none"> 1. When this equipment is disposed of treat it as industrial waste

2 General information

2.1 General information

This user manual provides the user and the equipment maintenance specialist with essential information for operating the equipment. Therefore, it is strongly recommended that you should thoroughly understand this user manual.

In order to have easy access to this user manual, it must be placed where it can be easily seen, near the equipment.

2.2 Warranty

Except for a separate agreement and the following cases, the warranty period will be one year in the event of defects.

- Following -

1. In case you modify the equipment without permission by Taeha Corp.
2. If someone other than the technical support person of Taeha Corp. modifies the equipment or repairs the equipment without using the designated parts.
3. If any spare parts other than those specified by Taeha Corp. have been used for the product.
4. In case of intentional damage or damage due to consumer's fault.
5. In case of natural disasters or fire

2.3 Technical support

If necessary, Taeha Corp. will provide technical support service for the customer.

Please contact us by phone or fax.

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Gumi branch office

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Fax : +86 755 2373 3519

Suzhou branch in China

Phone : +86 512 6251 2825

Fax : +86 512 6805 2921

2.4 Precautions



Danger

1. Be sure to use the designated power supply.
The basic power of the equipment is designated as AC220V 50/60Hz.
2. Be sure to use the designated air pressure. The basic air pressure of the equipment is designated as 5kgf/cm².
3. Do not operate with wet hands. There is a risk of electric shock.
4. During the operation, do not turn off the power or shut down the air pressure unless the equipment is in danger/caution. Serious problems may arise with the use of equipment.
5. Contact us in case of severe errors in the equipment.

3 Features of Pro Duo Controller (PDC-1000)

This equipment is to apply the materials using the Desk Top Robot and Dispenser Controller, and is able to adjust the position and the amount of application.

3.1 Appearance

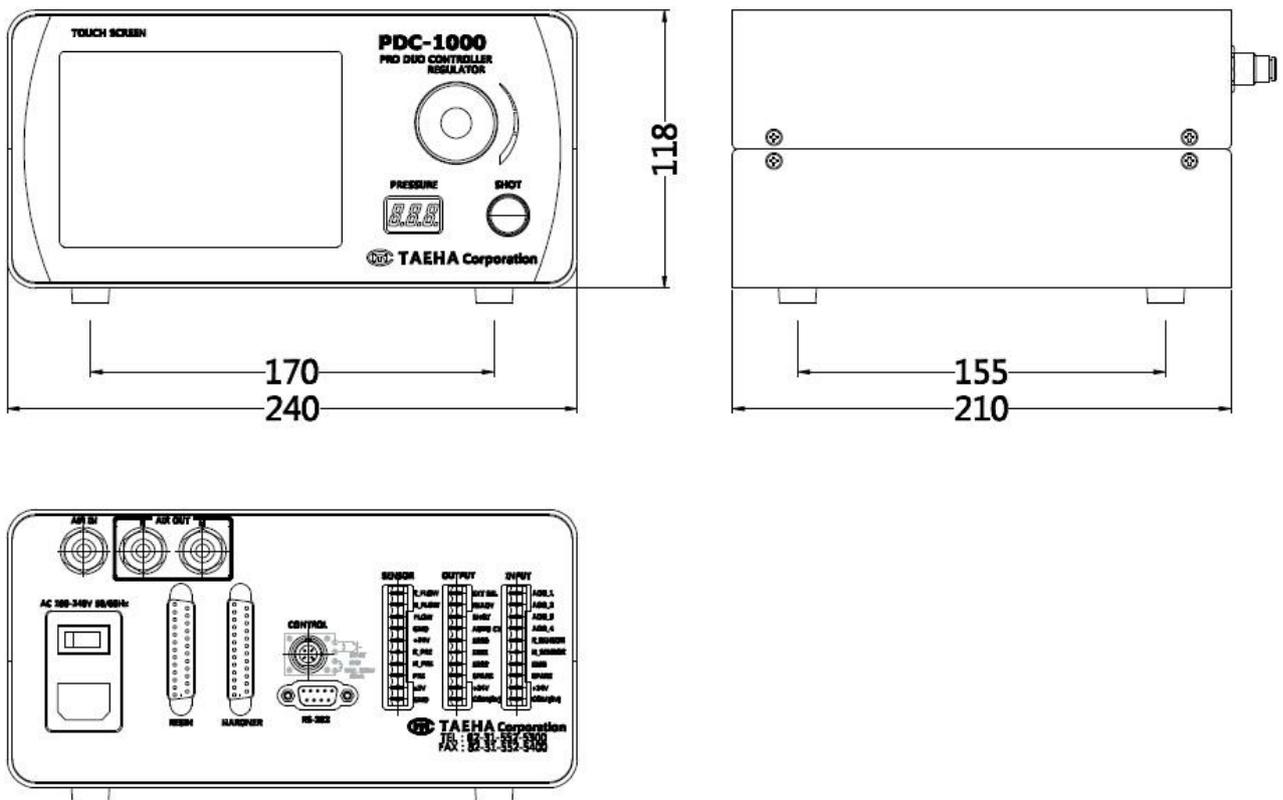


Figure 1. Appearance of PDC-1000

3.2 Specification of PDC-1000

Table 1. Specifications of the PDC-1000

Item	Specification	Remarks
Name	PDC-1000	
Input power	AC 100-240V 50/60Hz	
Power consumption	Max.50W	
Display	5.0inch TFT LCD	e
Operation	Touch Panel, Button, Rotary Knob	
Operation Mode	Time / Steady / Anti / Ratio	
Operation Memory	15ch	
Operating air pressure	5kgf/cm ² (humidity 5% or less)	Air Filter : 5μ
Pressure regulation	0 ~ 5kgf/cm ²	
Air In Port	One Touch Fitting PC(Ø6)	Air Hose
Air Out Port	One Touch Fitting PC(Ø6)	Air Hose
Dosing Connector	21004525-05	21004221-02
Motor Connector	DSUB 25Pin	2ea
Comm. Connector	DSUB 9Pin	RS-232, RS-485(Optional)
Sensor Connector	STL950/10-5.0-V-GREEN	AK950/10-5.0-GREEN Flow Meter (Option) Pressure (Option)
Input Connector	STL950/10-5.0-V-GREEN	AK950/10-5.0-GREEN
Output Connector	STL950/10-5.0-V-GREEN	AK950/10-5.0-GREEN
Weight	About 3.2kg	There is a difference depending on the specifications
Operating temperature	0 ~ 50°C	Avoid direct sunlight
Operating humidity	10 ~ 85%RH(without condensation)	
Vibration resistant	0.5G or less	

3.3 Appearance of driver box

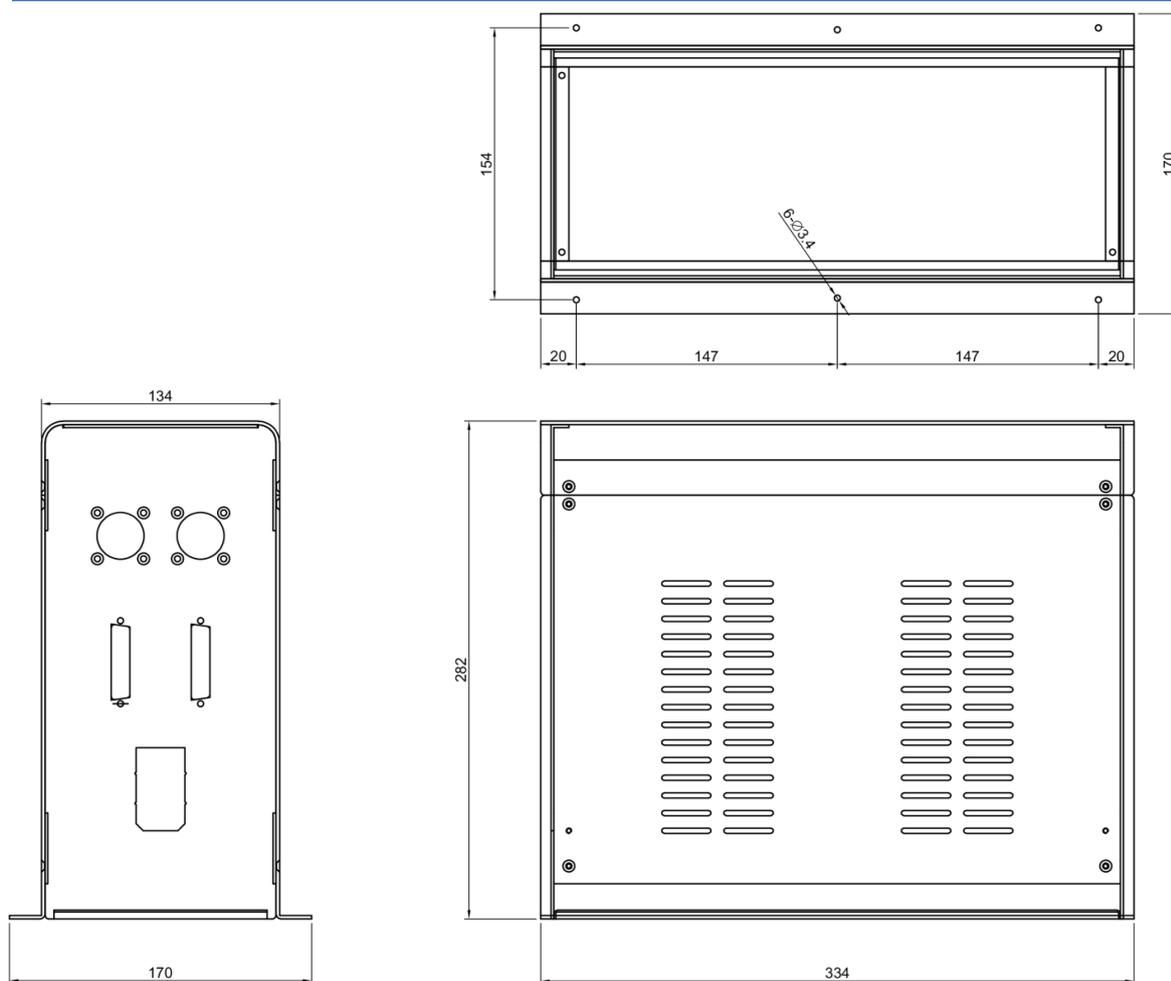


Figure 2. Appearance of 2-component servo driver box

3.4 Specification of driver box

Item	Specification	Remarks
Name	Driver Controller Box	
Input power	AC 200~230VAC 5.6A 50/60Hz	±10%
Power consumption	800W	
Size	170x282x295(mm)	
Weight	2K : 5.5kg	
Motor Connector	14P Connector	Motor+Encoder
I/O Connector	DSUB 25P	Controller I/O + RJ45(RS422)

4 Configuration and operation of PDC-1000

4.1 Configuration and detailed description of PDC-1000

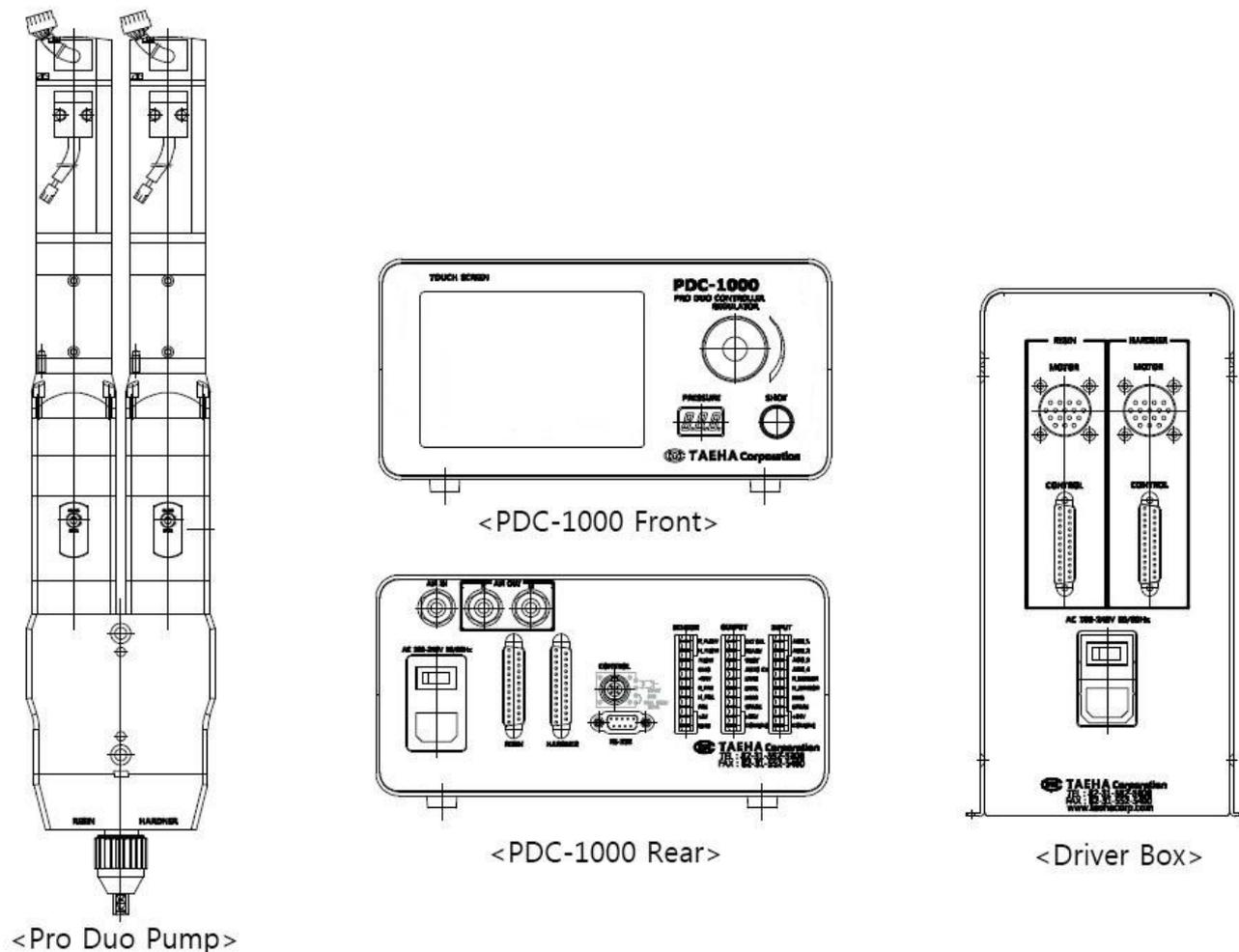
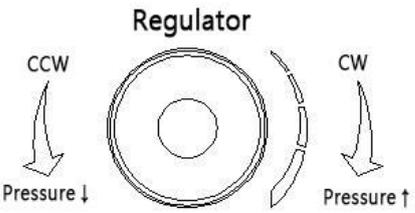
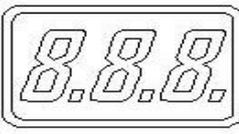
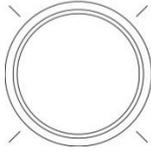
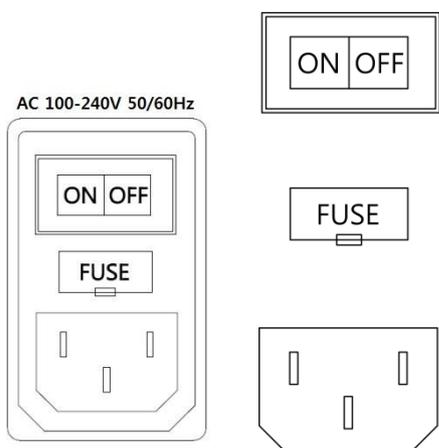
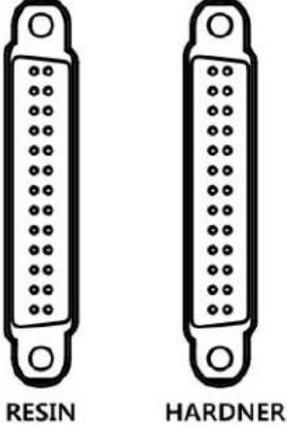


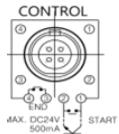
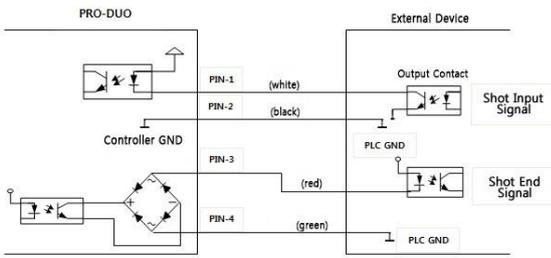
Figure 3. Configuration of PDC-1000

Table 2. Details of the PDC-1000

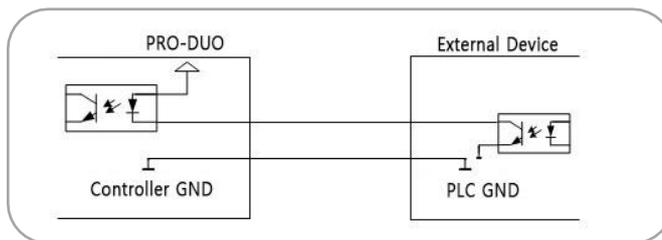
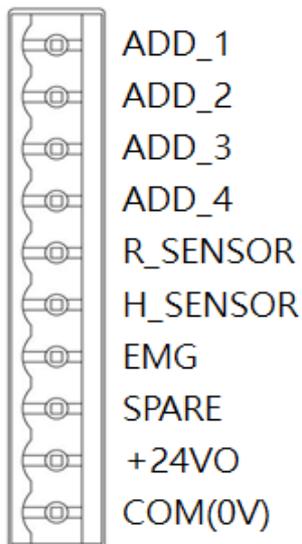
Names and display	Descriptions
<p><Touch Screen></p>	<p>* You can set / check Mode selection, dispensing condition setting, mixing ratio setting, dispensing speed setting, program setting, etc. for operating Pro Duo Pump.</p>

 <p style="text-align: center;">Regulator</p> <p style="text-align: center;"><Regulator(pressure control)></p>	<ul style="list-style-type: none"> * Provide pressure to the Pro Duo Pump to ensure that the resin and hardener are smoothly supplied. * Self-leveling pressure may not be required for low viscosity.
 <p style="text-align: center;"><Pressure></p>	<ul style="list-style-type: none"> * The pressure set in the regulator is displayed. * Unit : kgf/cm²
 <p style="text-align: center;"><Shot></p>	<ul style="list-style-type: none"> * When turned ON, the Pro Duo Pump is activated according to the set mode. * The lamp will light up for as long as the driving time. * It works the same as the “Run” switch on the Touch Screen.
 <p style="text-align: center;"><Combination Switch></p>	<ul style="list-style-type: none"> * Power Switch : Controller power ON/OFF * Fuse Holder : Glass tube small 3A (Spare 1PC included) * AC Receptacle : Power cord inlet AC 100~240V, 50/60Hz Free Volt Be sure to provide grounding.
 <p style="text-align: center;"><Air In Port></p>	<ul style="list-style-type: none"> * Air in port for Ø6 Air Hose * Supply clean air filtered through a 5μ air filter with the moisture removed. (humidity 5% or less)

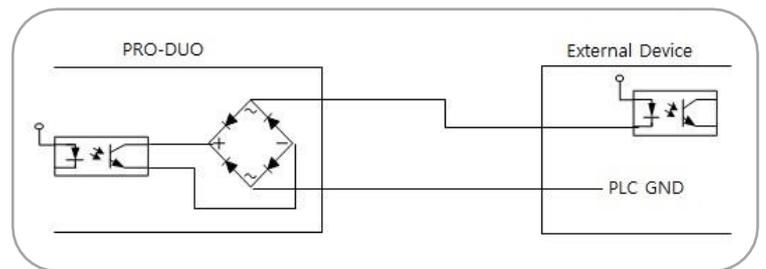
 <p>AIR OUT MORTOR RESIN</p> <p><Resin Air Output and Motor Connection Port ></p>	<ul style="list-style-type: none"> * Connect the provided Auto-Jointer (PH-H4) to the Air Out. * Connect the Cable Connector (SN-10-10) marked "RESIN" to the Motor Cable.
 <p>AIR OUT MORTOR HARDNER</p> <p>< Hardener Air Output and Motor Connection Port ></p>	<ul style="list-style-type: none"> * Connect the Cable Connector marked "HARDNER" to the Motor Cable.
 <p>RESIN HARDNER</p> <p><Motor></p>	<ul style="list-style-type: none"> * The Resin terminal is connected to the Driver Controller and controls the drive motor of the Dispenser on the resin side. * The Hardener terminal is connected to the Driver Controller and controls the drive motor of the Dispenser on the hardener side.

<div style="text-align: center;">  <p><Control></p> </div> <div style="text-align: center;">  <p>< Connection Configuration of the Host Controller and Controller ></p> </div>	<ul style="list-style-type: none"> * Connection port of the dispensing input signal and dispensing end signal. * It uses the Circle 4Pin Connector and outputs the dispensing signal input and dispensing completion signal from the outside. * When controlling the operation start signal from the host controller to the output contact, <ol style="list-style-type: none"> 1) The GND and N24 (com) must be connected between the host controller and the Controller. 2) The operation completion signal is output with the ON pulse for about 30msec after the completion of the dispensing. 3) The operation completion signal is output only in the Time Mode.
<div style="text-align: center;">  <p><COMM></p> </div>	<div style="text-align: center;"> <p>② RX 232 ⑥ RS 485+</p> <p>③ TX 232 ⑦ RS 485-</p> <p>⑤ GND ⑨ BOOT</p> </div> <p><COMM terminal pin configuration></p> <ul style="list-style-type: none"> * D_SUB 9Pin Connector RS-232 communication (②, ③, ⑤, ⑨) pins are used in Controller Firmware Upgrade and Debugging Mode.(User does not use it.) * D_SUB 9Pin Connector RS-485 communication (⑥, ⑦) pins are used for communication with the outside. (RS-485 communication MODBUS RTU protocol)

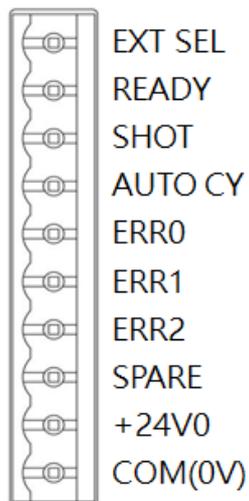
INPUT



- * The INPUT port is controlled by the controller and external devices.
- * **ADD1 ~ ADD4** : When the external program is set to ON in the controller, the channels can be changed from the External Devices, and the dispensing can be conducted according to the previously specified dispensing conditions. It is composed of 16 channels. When changing channels, it is required to have a Delay Time of about 10msec or more.
- * **R.SENSOR** : The sensor for the remaining volume of resin.
- * **H.SENSOR** : The sensor for the remaining volume of hardener.
- * **EMG** : When this signal is received by the emergency stop signal from the external control device, the Dispensing operation will be stopped.
- * **SPARE**
- * **+24VO** : 24V Output
- * **COM(0V)** : Make COMMON match the potential difference with the host controller.

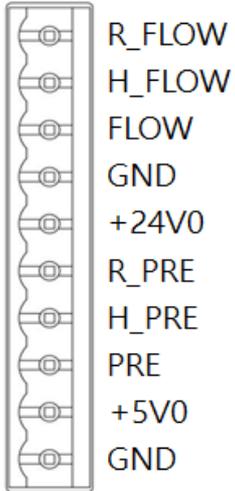


OUTPUT



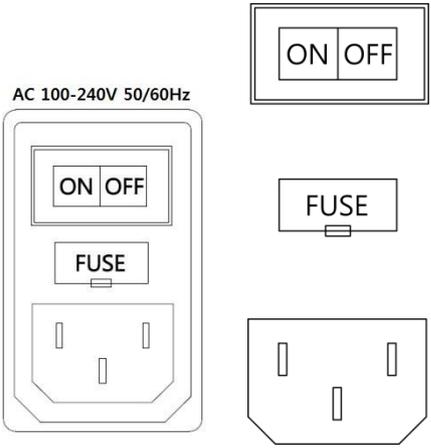
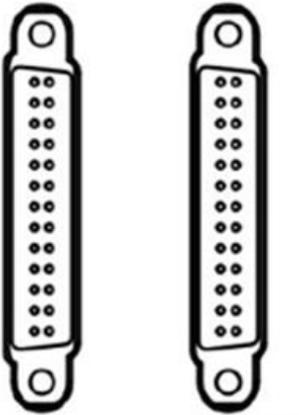
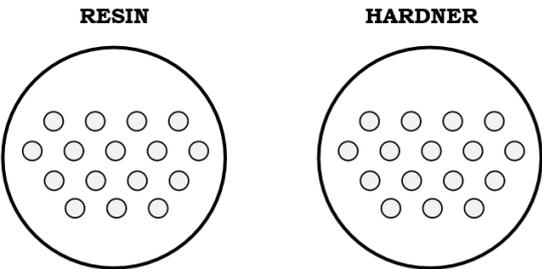
- * The OUTPUT port is used to transmit the status of the controller to the host controller.
- * **EXT SEL** : The Controller indicates to the external devices whether the external control mode is used or not. For the external devices, be sure to check that the external mode pin is ON and then perform the external control.
- * **READY** : Outputs a signal when there is no abnormality in the controller and dispensing is not in progress. When controlling from the host controller, it is necessary to monitor the READY signal, and when it is On, it is necessary to output the dispensing signal.
- * **SHOT** : Indicates the operation status of the Dispenser. It is "ON" when operating and "OFF" when stopped.
- * **AUTO CY.** : Indicates that the Auto Cycle is selected (in operation).
- * **ERR 0~2** : Outputs when an internal alarm occurs.
- * **SPARE**
- * **+24V0** : Used as a power source for the 24V output Sensor. Does not connect to the host controller.
- * **COM(0V)** : Make COMMON match the potential difference with the host controller.

SENSOR



- * The **SENSOR** Port is used to connect to the Controller when the Sensor is applied to the Pump.
- * **R_FLOW** : Port to connect when using the Resin Flow Metering Sensor.
- * **H_FLOW** : Port to connect when using the Hardner Flow Metering Sensor.
- * **FLOW** : Flow Sensor Spare
- * **GND** : GND flow sensor (absolutely prohibited for other purposes)
- * **+24V0**: Power supply of the flow sensor 24V
- * **R_PRE** : Used to connect the Resin Pressure Sensor.
- * **H_PRE** : Used to connect the Hardner Pressure Sensor.
- * **PRE** : Pressure Sensor Spare
- * **+5V0** : Power supply of the pressure sensor 5V
- * **GND** : GND for pressure sensor (absolutely prohibited for other purposes)

4.2 Configuration and detailed description of driver box

Names and display	Description
 <p data-bbox="336 824 619 857"><Combination Switch></p>	<ul style="list-style-type: none"> <li data-bbox="778 409 1318 443">* Power Switch : Controller power on/off <li data-bbox="778 551 1398 629">* Fuse Holder : : Glass tube small 3A (Spare 1PC included) <li data-bbox="778 701 1430 835">* AC Receptacle : Power cord inlet AC 100~240V, 50/60Hz Free Volt Be sure to provide grounding.
 <p data-bbox="344 1328 424 1350">RESIN</p> <p data-bbox="512 1328 643 1350">HARDNER</p>	<ul style="list-style-type: none"> <li data-bbox="778 913 1425 1093">* The Resin terminal is connected to the PDC-1000 and controls the drive motor of the dispenser by receiving the signal input from the Resin side controller. <li data-bbox="778 1171 1430 1350">* The Hardener terminal is connected to the PDC-1000 and controls the drive motor of the dispenser by receiving the signal input from the Hardener side controller.
 <p data-bbox="252 1451 328 1473">RESIN</p> <p data-bbox="539 1451 659 1473">HARDNER</p>	<ul style="list-style-type: none"> <li data-bbox="778 1417 1414 1552">* The Resin terminal is connected to the Dispenser Resin motor and gives a servo driver signal to operate the motor. <li data-bbox="778 1619 1382 1753">* The Hardener terminal is connected to the Dispenser Hardener motor and gives a servo driver signal to operate the motor..

4.3 Time Chart

Table 3. Meaning of the symbol in the PDC-100 time chart

t1	Shot Key Check Time (10ms)
t2	Shot Time
t3	End Time (50ms) (settable)

4.3.1 Time mode

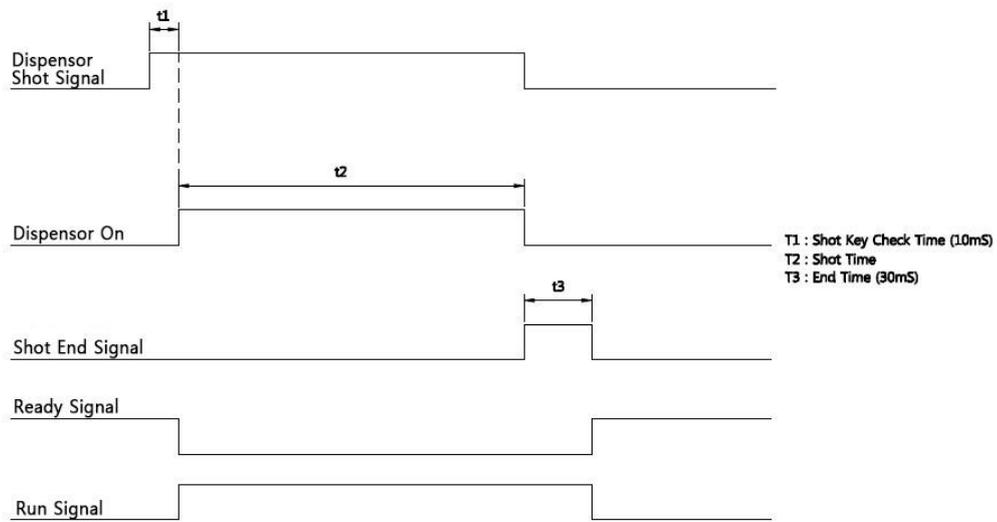


Figure 4. Input time < dispensing time

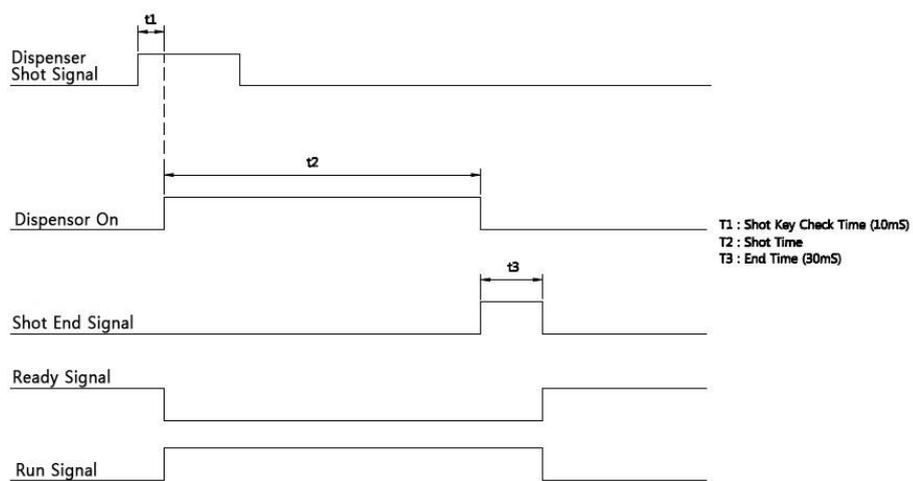


Figure 5. Pressure time > dispensing time

4.3.2 Steady Mode

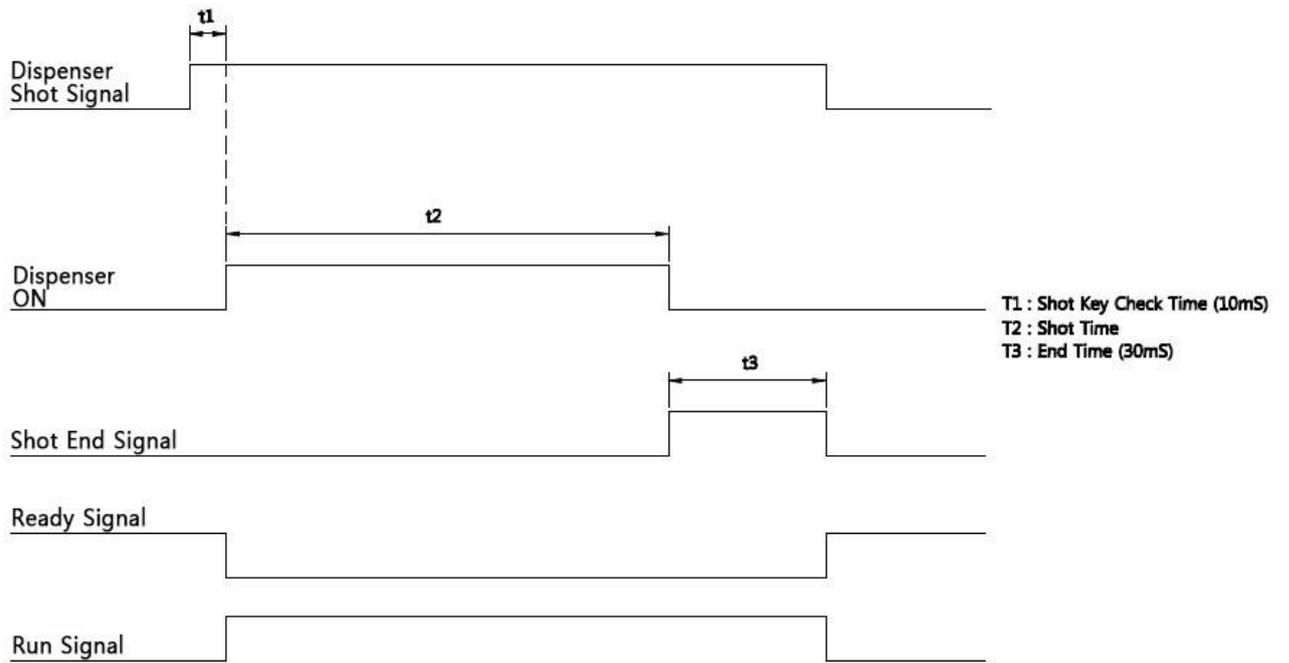


Figure 6. Steady mode

5 Functions of the PD-1000

5.1 Mode setting

5.1.1 Time Mode



Figure 7. Time mode main screen

Time Mode operates only for the dispensing time set for the 1-pulse shot signal, and is mainly accepted and used.

The shot signal is set to the Control 1 and 2 terminals, the "Run" button, and the Shot Switch.

In Time Mode, a shot end signal is generated after dispensing is completed.

If you need to force a stop while driving, press the "Stop" button.

5.1.2 Steady mode



Figure 8. Steady mode main screen

The steady mode operates only while the operation is being executed, and mainly accepts and uses the points set for accepting leads, multipoint ejection, and time from an external controller.

The shot signal can be input with the Control 1 and 2 terminals and the Shot Switch, and is dispensed while the signal is ON.

When dispensing with the "Run" button, it will continue to dispense until the "Stop" button is executed.

When the shot signal is turned on, the shot time increases from 0 and when it is turned off, the time stops.

If you enter this shot time in Time Mode, you can easily set it.

5.1.3 ANTI MODE

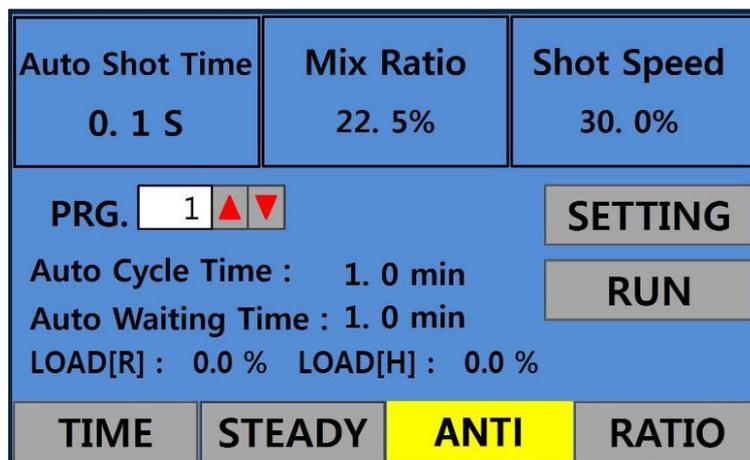


Figure 9. ANTI MODE main screen

The ANTI MODE (intermittent dispensing mode) is to prevent the Mixer from hardening during the pause time.

It is necessary to set the intermittent shot time and the intermittent shot interval respectively, and the intermittent shot pause time is displayed in real time.

At this time, the intermittent shot pause time means the elapsed time of the intermittent dispensing interval time.

The ANTI MODE that gives an ON signal to the "Run" button, Shot Switch, and external device is executed, and when the "Stop" button is pressed, it stops.

ANTI MODE does not provide the Suck-back function to prevent the ball-up phenomenon.

5.1.4 Ratio mode



Figure 10. Ratio mode main screen

Measure the ratio of the subject and hardener in the ratio mode.

The mixing ratio must be specified by the average value of the data measured once, and if there is a change in the average value, the screen "Do you want to change the mixing ratio?" Is displayed when switching to Mode.

To measure the simultaneous ratio, set both the subject and the curing agent to ON.

If you want to measure individual ratios, set each to ON.

5.1.5 After dispensing

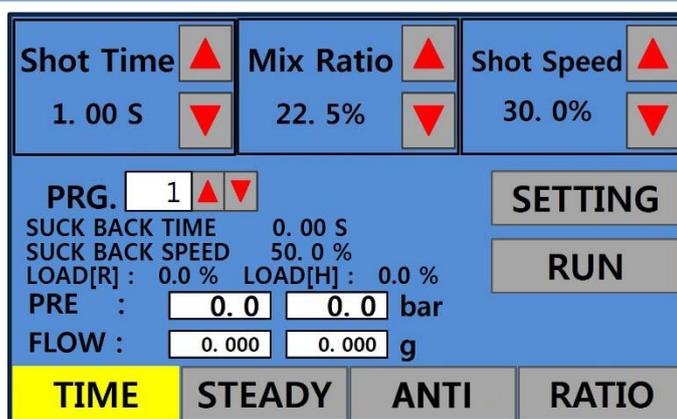


Figure 11. After running the operation screen

A PRE and FLOW Data Box are generated on the main screen.

The first Data Box of PRE means the subject pressure and the second Data Box means the pressure of the hardener.

The first Data Box of FLOW means the subject discharge amount, and the second Data Box means the discharge amount of the curing agent.

5.2 Initial screen

When the power is turned on, the Touch Panel is turned on and the initial screen is displayed.

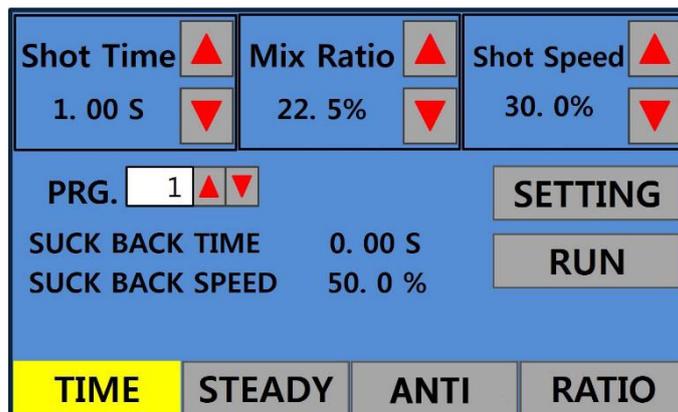


Figure 12. PDC-1000 initial screen

Table 4. Detailed description of initial screen

Names and displays	Description
	<ul style="list-style-type: none"> * Displays the dispensing (driving) time of the Pump. * It can be set by the arrow (up/down) key. * In manual mode, the time cannot be set and only the time when the pump is dispensed (driven) is displayed.
	<ul style="list-style-type: none"> * Set the percentage of hardener to 100% of the resin. (Volume ratio setting) * It can be set by the arrow (up/down) key. * The calculation of the volume ratio when the weight ratio is given $\text{Volume ratio of hardener} = \frac{(\text{Weight ratio of hardener} / \text{Specific gravity of hardener})}{(\text{Weight ratio of resin} / \text{Specific gravity of resin})} \times 100$ <p>Ex> If the weight ratio is 100:50, the specific gravity of resin 1.16, and specific gravity of hardener 0.95,</p> $\frac{50 / 0.95}{100 / 1.16} \times 100 = 61 \text{ (Hardener 61\% for resin 100\%)}$ <p>∴ The mixing ratio is entered as 61%.</p>

	<ul style="list-style-type: none"> * Displays the dispensing volume. (Acting in synchronism with the mixing ratio)
	<ul style="list-style-type: none"> * The dispensing conditions are stored in advance, called out and used when necessary. (Manual, external control is possible) * Displays the channel being applied.
	<ul style="list-style-type: none"> * The suck-back function enables the user to control the condensation at the nozzle end after dispensing. * An excessive setting of the SUCK BACK TIME and SUCK BACK SPEED may cause the liquid to flow back into the pump, so it should be handled with caution. * SUCK BACK TIME: Set it within 20% of the dispensing speed. * SUCK BACK SPEED: Set it within 15% of the dispensing speed.
	<ul style="list-style-type: none"> * LOAD[R] : Display resin pump load factor * LOAD[H] : Display hardener pump load factor
	<ul style="list-style-type: none"> * Used when starting the dispensing.

5.3 Setting screen

If you select the setting on the right side of the initial screen, the screen shown as below will be displayed and you can select the PDC-1000 service condition.

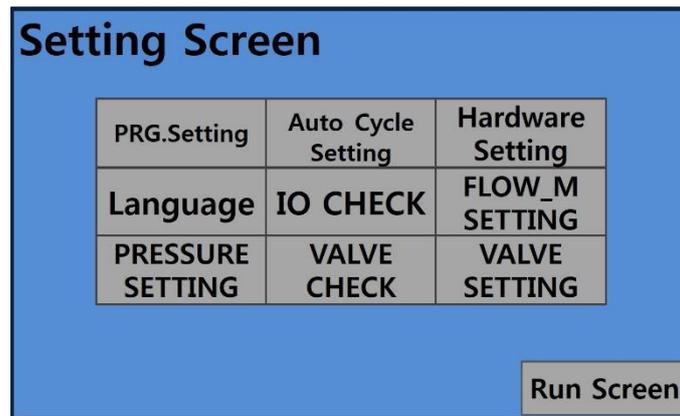


Figure 13. Setting screen

- 1) PRG.Setting
Set the time, rate and speed of general dispensing and intermittent dispensing.
- 2) Auto cycle setting
Set the interval at which to perform intermittent dispensing and the dispensing time.
- 3) Hardware setting
Set whether to use the dispensing control from external devices and whether to use the level sensor.
- 4) Language
Set the language to be used when operating the PDC-1000.
- 5) IO CHECK
Check the status of the I/O contacts of the controller.
- 6) FLOW_M SETTING
Set when using the flow meter.
- 7) PRESSURE SETTING
This option menu is to be used when applying the Pressure Sensor to the Dispenser.
- 8) VALVE CHECK
This option menu is used to apply the Anti Drip Valve to the Dispenser used for the Resin and Hardner.
- 9) VALVE SETTING
This menu is used to apply the Anti Drip Valve to the Dispenser used. It sets the driving condition of the valve.

5.3.1 PRG.Setting

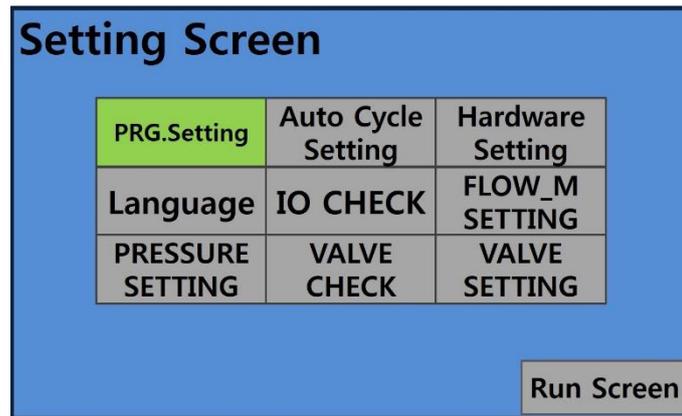


Figure 14. PRG.Setting screen

The Dispensing Setting is a menu to set the Dispenser condition. It can be used to set the Dispensing time, Mix ratio, Dispensing speed, SUCK BACK TIME and SUCK BACK SPEED.

To input the value, press the DATA input window for about 1 second to activate the keypad. You can also set the desired value using the Up/Down Arrow key.

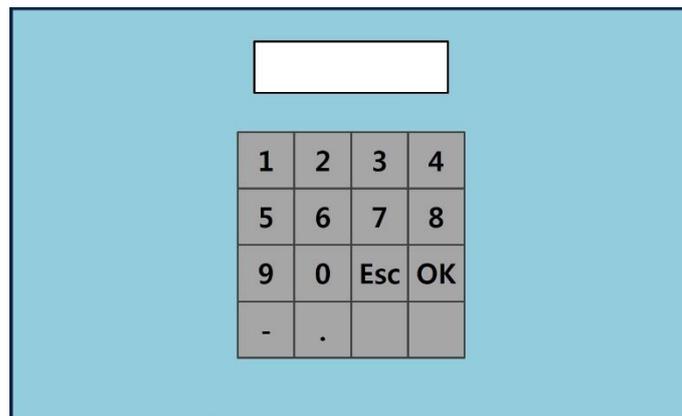
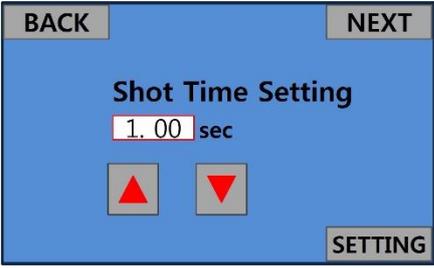
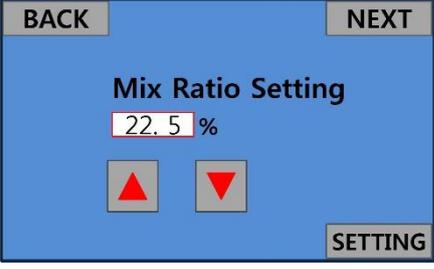
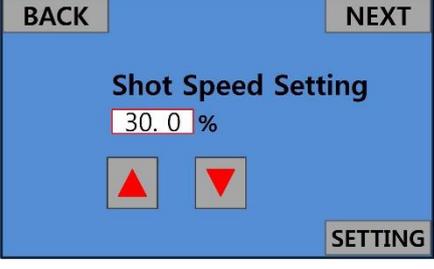
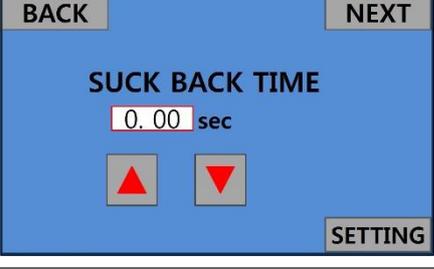
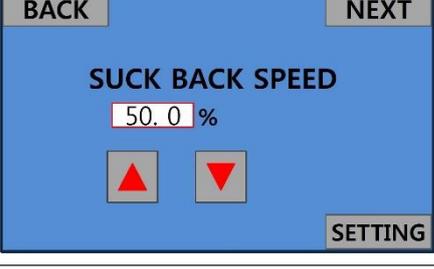


Figure 15. Key pad screen

Table 5. Detailed description of PRG.Setting

Names and display	Description
	<ul style="list-style-type: none"> * Sets the time that the pump is driven (dispensed). * The time can be set in 0.01 second increments.
	<ul style="list-style-type: none"> * Sets the hardener ratio for 100% of the resin. (Set by volume ratio) * Setting range: 1 ~ 120% * The ratio can be set in 0.1% increments.
	<ul style="list-style-type: none"> * Sets the dispensing speed for the resin and hardener Pump. * Setting range: 0 to 100% * It can be set in 0.1% increments.
	<ul style="list-style-type: none"> * You can control ball-up phenomenon after dispensing. * Set it within 20% of the dispensing time. * It can be set in 0.01 second increments.
	<ul style="list-style-type: none"> * You can control the condensation at the nozzle end after dispensing. * Set it within 15% of the dispensing time. * It can be set in 0.1% increments.

5.3.2 Auto cycle setting

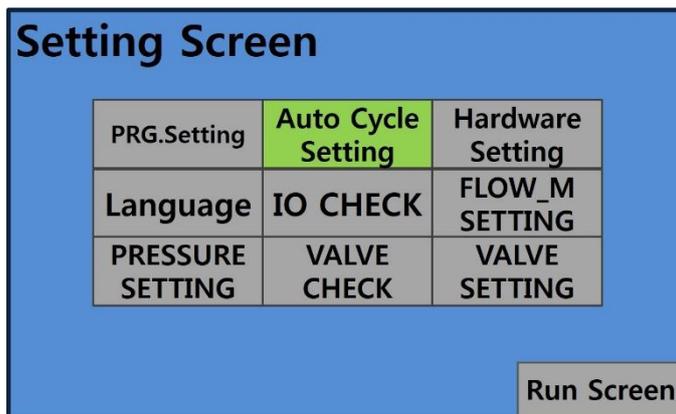


Figure 16. Auto cycle setting

You can set the intermittent dispensing interval and time by selecting the auto cycle setting menu.

Table 6. Detailed description of auto cycle setting

Names and displays	Description
	<p>* Enter the time interval at which to perform the intermittent dispensing. Perform the dispensing every time you set it.</p>
	<p>* Sets the time to perform the dispensing at every interval specified on the “Auto cycle time” setting screen.</p>

5.3.3 Hardware setting

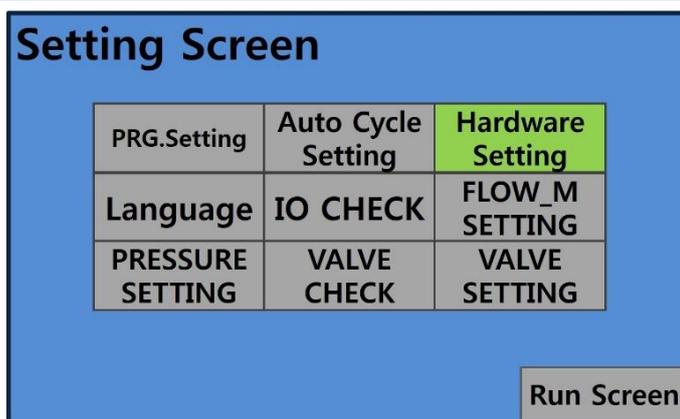
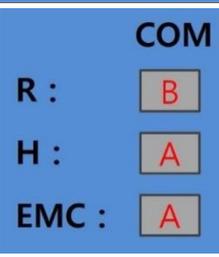


Figure 17. Hardware setting

You can choose whether to use the dispensing control and whether to use the remaining volume sensor.

Table 7. Detailed description of hardware setting

Names and displays	Description
	<ul style="list-style-type: none"> * Set the Modbus RTU address.
	<ul style="list-style-type: none"> * When the Enable External Program is set to ON, the dispensing condition setting on the main screen cannot be conducted, and therefore, the Enable External Program must be set to OFF. * After the completion of the dispensing setting and when the Dispenser control is executed from the host controller, it is used to prevent the set value change and dispensing from being controlled by the controller.
	<ul style="list-style-type: none"> * Set the function to display the status when the remaining volume is low by checking the remaining volume of the resin and hardener. * In order to use this function, the remaining volume sensor must be installed as an Option.
	<ul style="list-style-type: none"> * When the hardening alarm is set to ON, the time value can be set by the time data box or the arrow (up/down) key.
	<ul style="list-style-type: none"> * R : Resin Port * H : Hardner Port * EMC : Emergency Port * Select the contact method of each port. There are 2 methods: A (Normal Open) / B (Normal Close).

5.4 Language setting

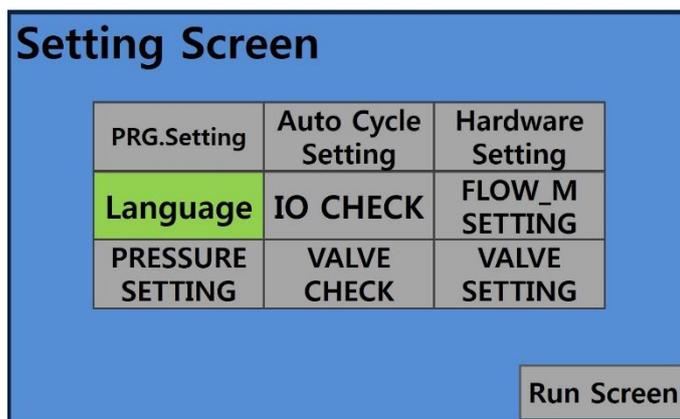


Figure 18. Language setting

In the Language Setting, select the language to be used when operating the Pro Duo Controller. You can set it to Korean, English or Chinese as needed.

Table 8. Detailed descriptions of language setting

Names and displays	Descriptions
	<p>* This is the screen when you set Korean as the language to use.</p>
	<p>* This is the screen when you set English as the language to use.</p>
	<p>* This is the screen when you set Chinese as the language to use.</p>

5.5 IO CHECK

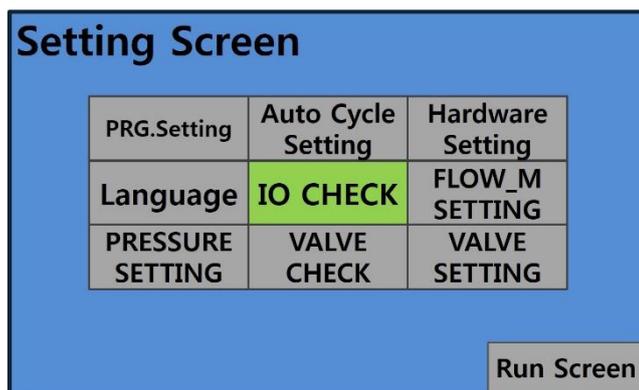
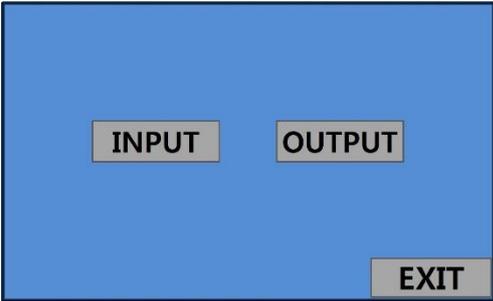
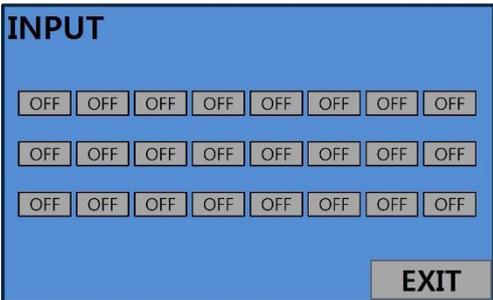
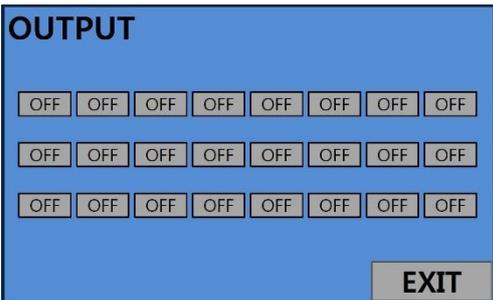


Figure 19. IO Check setting

IO CHK is a function to check the status of the I/O contacts of the Controller, and is used for checking the system.

Table 9. Detailed descriptions of IO Check

Names and displays	Descriptions
	<ul style="list-style-type: none"> * This is the first screen that appears when the IO CHECK menu is selected. * To manage the Input Port, select “INPUT”. * To manage the Output Port, select “OUTPUT”.
	<ul style="list-style-type: none"> * It turns ON / OFF according to whether the Input Port is used or not. * If you short-circuit the corresponding Port and Com from the external ports, ON is displayed.
	<ul style="list-style-type: none"> * It turns ON / OFF according to whether the Output Port is used or not. * You can check the signal to transmit the operation information to the parent device.

5.6 FLOW_M SETTING

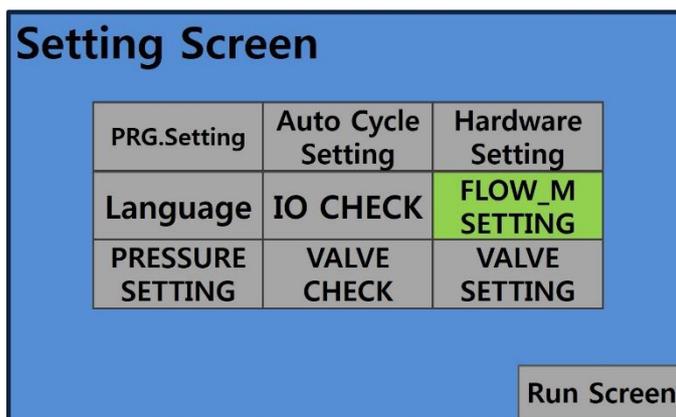


Figure 20. FLOW_M setting menu

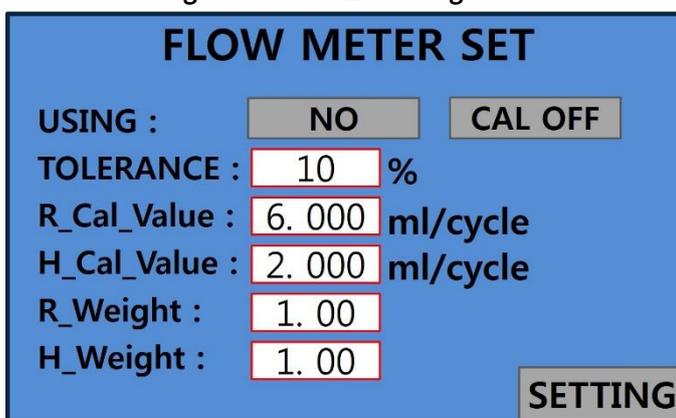


Figure 21. FLOW_M setting screen

FLOW_M SETTING is a menu to set when the Flow Metering is used.

Table 10. Detailed descriptions of flowmeter setting

Item	Description
USING : <input type="button" value="NO"/> <input type="button" value="CAL OFF"/>	* It sets whether the alarm is used when the value exceeds the tolerance value.
TOLERANCE : <input type="text" value="10"/> %	* Set the range of tolerance.
R_Cal_Value : <input type="text" value="6.000"/> ml/cycle H_Cal_Value : <input type="text" value="2.000"/> ml/cycle	* It is automatically set to the average value obtained by repeating the dispensing several times. * R_Cal_Value : It refers to the Resin Calibration Value. * H_Cal_Value : It refers to the Hardener Calibration Value.
R_Weight : <input type="text" value="1.00"/> H_Weight : <input type="text" value="1.00"/>	* R_Weight : It refers to the Resin Weight value. * H_Weight : It refers to the Harder Weight value.

5.7 PRESSURE SETTING

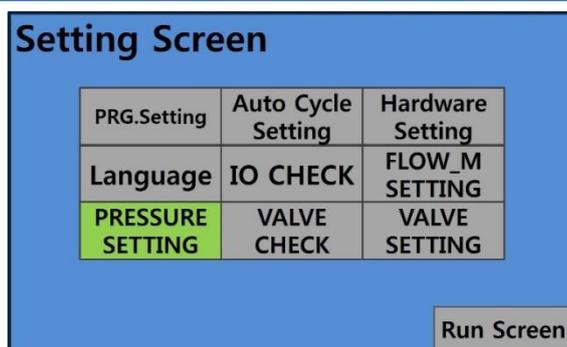


Figure 22. Pressure setting menu

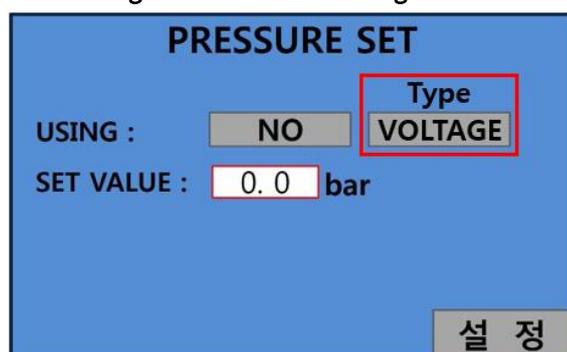


Figure 23. Pressure setting screen

PRESSURE SETTING is the menu used when using the pressure sensor. When operating the system, it detects the clogging of the nozzle or a dispensing malfunction by measuring the pressure of the dispenser output terminal.

Table 11. Detailed descriptions of pressure setting

Item	Description
	<ul style="list-style-type: none"> * Select whether or not to use the alarm of the pressure sensor. * When the dispensing pressure is higher than the setting value, the alarm is triggered to stop dispensing.
	<ul style="list-style-type: none"> * Select the type of analog input signal of the pressure sensor. * “VOLTAGE” : voltage signal 1 ~ 5V * “CURRENT” : current signal 4 ~ 20mA
	<ul style="list-style-type: none"> * Sets the pressure value. * Since the set pressure depends on the dispensing state and the viscosity of the solution, set it to approximately 10% higher than the normal pressure after dispensing.

5.8 VALVE CHECK

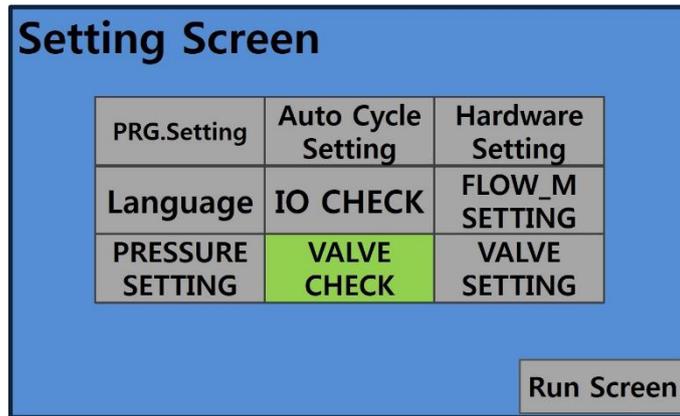


Figure 24. Valve check menu

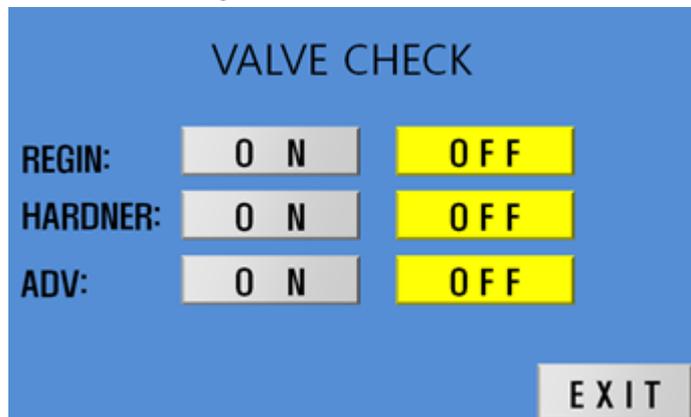


Figure 25. Valve check screen

VALVE CHECK is a menu used when applying the Anti Drip Valve, and checks the operating status of the valve. You can use the ON / OFF button to check the Open / Close status of the Anti Drip Valve on the Resin and Hardner.

5.9 VALVE SETTING

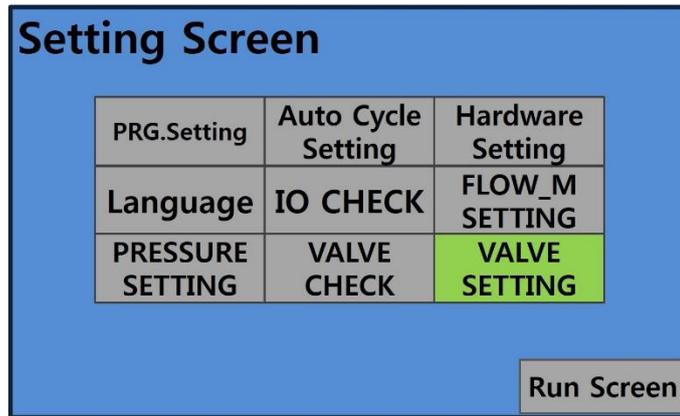


Figure 26. Valve setting menu

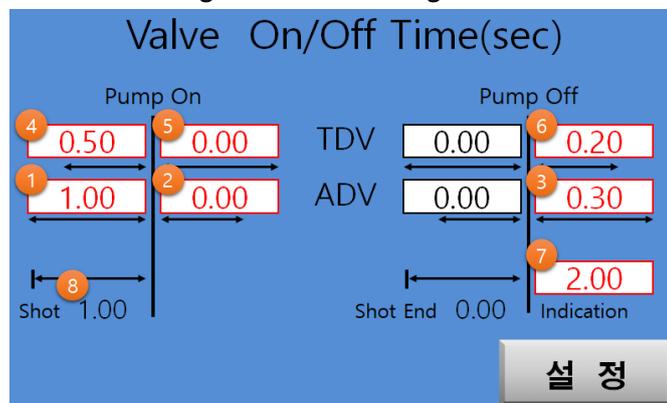


Figure 27. Valve setting screen

The VALVE SETTING is used to apply the Anti Drip Valve to the Dispenser. This enables you to set the operating condition of the valve and set the On Time and Off Time.

Table 12. Detailed descriptions of valve setting

Name		Description
1	ADV On Time Before	Set ADV On Time before Pump operation.
2	ADV On Time After	Set ADV On Time after Pump operation.
3	ADV Off Time	Set ADV Off Time after the end of Pump operation.
4	TDV On Time Before	Set TDV On Time before Pump operation.
5	TDV On Time After	Set the TDV On Time after the Pump operation.
6	TDV Off Time	Set the TDV Off Time after the Pump operation ends.
7	Indicaiton	END Set the signal output time.
8	Shot time	Shows the difference in operating time between Shot and Pump.

- * Time is in seconds. It will be exhibited in 1/100 units.
- * Time will be exhibited based on Pump On / Off time.
- * After time is initialized to 0 when entering Before time.
- * ADV On Time can be entered at the same time or earlier than TDV On Time.
- * ADV Off Time can be entered only at the same time as or after TDV OFF Time.

We have placed the above restrictions for the safety of the equipment.

In summary, ADVs should be opened before TDVs and then closed or opened and closed together.

- * Indication sets the END signal delay time after the SHOT signal (OUTPUT terminal block) ends.

5.10 Emergency stop

If there's danger to the operator's safety or in an emergency situation, the emergency stop button should be pressed.

The Emergency Stop button on this equipment operates as an emergency shutdown function.

The following operations are performed by the Emergency Stop button.

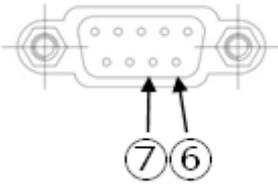
- 1) When the Robot is activated, it stops immediately. If it is stopped, it does not perform any further action.
- 2) Dispensing is stopped from the Dispenser.
- 3) The buzzer sounds and the red warning light turns on.
- 4) Buttons for the operation of each component fail to function.
- 5) In addition, the internal function of the equipment is stopped.

After inspecting the causes of the emergency stop and alarm, you can release the emergency stop button by turning it clockwise.

5.11 Modbus RTU communication

You can check the operation information of PDC-1000 from an external device by Modbus RTU communication.

Table 13, Modbus RTU Connection and communication settings

Item	Description
<p>Port</p>	<ul style="list-style-type: none"> * PDC-1000 rear COMM port ⑥RS485+, ⑦RS485- use (RS-485 2-Wire) 
<p>Communication setting</p>	<ul style="list-style-type: none"> * Baud Rate : 38400bps * Data Bits : 8bit * Stop bits : 1bit * Parity : None
<p>Slave Address(ID)</p>	<ul style="list-style-type: none"> * ID : 101, It can be changed.

The PDC-1000 operates on the mode bus RTU SLAVE and supports register address read operation (FC03).

Table 14. Modbus RTU resister map

Address		Contents	RW	Func.	Description
0x500	1280	RUN/STOP	R	3	0: STOP, 1: RUN
0x501	1281	FAULT/NORMAL	R	3	0: NORMAL, 1: FAULT
0x502	1282	MODE	R	3	0: TIME, 1: STEADY, 2: AUTO CYSLE, 3: RATE
0x503	1283	RATIO(%)	R	3	Mixing ratio
0x504	1284	SPEED(%)	R	3	Shot speed
0x505	1285	Resin pressure	R	3	Resin pump pressure(x0.01), [bar]
0x506	1286	Resin load factor(%)	R	3	Resin pump motor load factor
0x507	1287	Hardener pressure	R	3	Hardener pump pressure(x0.01), [bar]
0x508	1288	Hardener load factor(%)	R	3	Hardener pump motor load factor
0x509	1289	Status word	R	3	Controller rear input connector 8-pin status (Sub 8bit)
0x50A	1290	Status word	R	3	Controller rear output connector 8-pin status (Sub 8bit)
0x50B	1291	Alarm word	R	3	Each bit represents an alarm condition
0x50C	1292	Alarm word	R	3	
0x50D	1293	Cumulative usage time of the motor	R	3	Cumulative usage time of the motor
0x50E	1294				
0x50F	1295	Cumulative usage time of the equipment	R	3	Cumulative usage time of the PDC-1000
0x510	1296				
0x511	1297	VER	R	3	Firmware version (Ex> 40 means ver 4.0)
0x512	1298	HeartBeat	R	3	Normal when heart rate signal and numbers increase

Table 15, Address 1286(0x506) status word

bit	Name	Description	
0	ADD_1	External channel settings 1	Shows the current channel.
1	ADD_2	External channel settings 2	
2	ADD_3	External channel settings 3	
3	ADD_4	External channel settings 4	
4	R_SENSOR	Resin level sensor	Insufficient amount of resin displays the input status of the sensor.
5	H_SENSOR	Hardener level sensor	Insufficient amount of hardener displays the input status of the sensor.
6	EMG	Emergency	Displays the status of the emergency stop signal of the external device.
7	SPARE	Spare	Displays the input status used as a backup.
8~15		Not use.	

Table 16. Address 1287(0x507) status word

bit	Name	Description	
0	EXT. SEL	External control mode ON/OFF	Whether to use external control mode
1	READY	READY status	Shot ready status
2	SHOT	SHOT status	Shot status
3	AUTO CY	Auto cycle status	Auto purge status
4	ERR0	Error status 0	Identifies the type of error.
5	ERR1	Error status 1	
6	ERR2	Error status 2	
7	SPARE	Error status 3	
8~15		Not use	

Table 17. Address 1289(0x509) alarm word

bit	Name	Description
0	R_Enc	Check the resin motor connection status
1	H_Enc	Check the hardener motor connection status
2	R_Motor_Cable	Check the resin motor cable
3	H_Motor_Cable	Check the hardener motor cable
4	R_Servo	Resin servo driver alarm
5	H_Servo	Hardener servo driver alarm
6	R_WARN	Resin warning alarm
7	H_WARN	Hardener warning alarm
8	R_Sensor	Resin level sensor error
9	H_Sensor	Hardener level sensor error
10	Emg	Emergency switch status
11	R_Press	Resin pressure sensor error
12	H_Press	Hardener pressure sensor error
13	Mix_Rate	Mixing ratio error
14	Flow_Rate	Flow ratio error
15	Alarm_Time	Curing alarm
16	R_Com	Resin servo driver communication error
17	H_Com	Hardener servo driver communication error
18	R_Flow_Rate_High	Resin flow upper limit alarm
19	R_Flow_Rate_Low	Hardener flow lower limit alarm
20	H_Flow_Rate_High	Hardener flow upper limit alarm
21	H_Flow_Rate_Low	Hardener flow lower limit alarm
22	ServoNoAns	Servo driver error
23~31		Do not use.

- Modbus RTU communication packet description

Read Holding Registers(Func03)

It is used to read the register data of PDC-1000.

Query

Slave Address (ID)	Function	Start Address		No. of Points		Error check (CRC16)	
		High	Low	High	Low	High	Low
1byte	1byte	1byte	1byte	1byte	1byte	1byte	1byte

Ex) Overall data request: 0x65 03 05 00 00 10 4c ee

Requests data from 16 registers from address 1280 of PDC-1000.

Communication tests are possible by sending a complete data request packet to the PDC-1000.

Response

Slave address	Function	Byte Count	Data		Data		...	Data		Error Check	
			Hi	Lo	Hi	Lo	...	Hi	Lo	Hi	Lo
1byte	1byte	1byte	1byte	1byte	1byte	1byte	...	1byte	1byte	1byte	1byte

Ex) Response : 0x65 03 20 00 00 00 01 80 00 00 00 80 00 00 00 ff 00 00 00 05 00 00 00 00 01 a4 00 00 13 d6 00 28 00 16 2f ac

Transfers data from 0x0500 to 16 registers. Use the register map table to identify the data.

6 Maintenance

This device consists of a Robot section that is in charge of motion operation, a Dispenser (Pro Duo Pump) that is in charge of ejection, and a Dispenser Controller, so regular inspections are required. Perform daily (user-determined) and regular (within 1 year) checks to prevent failures due to several factors..

Danger



Before servicing and inspecting, be sure to take necessary measures such as manual equipment, emergency stop, and power failure. There is a possibility that an operation by Sensor detection may occur inside the device without power off, or by an inspector. It may also cause electric shock.

Do not perform a mega test (measurement of insulation resistance). It may cause a malfunction.

6.1 Alarm Display and Action

The Pro Pump System informs the user of the occurrence of alarms in the following ways when errors occur.

- ✓ Touch Panel
- ✓ Teach Pendant's Alarm Message Display
- ✓ System status I/O contact point output

The related Alarm Code can be confirmed on the front Touch Panel and each Alarm Code is displayed.

The classification of abnormal phenomena is as follows.

- ✓ Alarm that can occur due to H / W protection or damage to internal elements
- ✓ Alarm that can occur with incorrect settings when setting motion programs and points
- ✓ Alarm that may occur due to other erroneous operations

If an alarm of the H / W protection system occurs during operation, the output to the Motor is cut off and the servo is turned off. In order to operate again, it is necessary to turn it off after removing the cause of Alarm, and normal operation is possible.

Caution
For some Alarms, the Alarms are not released after a reset. In this case, it is necessary to restart (power ON / OFF) after the action of the error is completed.

6.2 Component replacement

As the functional usage time of parts elapses, aging may occur and cause equipment failure. Therefore, in order to prevent and store the failure, inspect it regularly and replace it when an abnormality is found.

6.3 PDC-1000 Error I/O

Error contents	E_MODE0	E_MODE1	E_MODE2	E_MODE3
EMERGENCY STOP	OFF	ON	ON	ON
RESIN PUMP Encoder Cable(AL31) ERROR HARDENER PUMP Encoder Cable(AL31) ERROR RESIN PUMP Motor Cable(AL24) ERROR HARDENER PUMP Motor Cable(AL24) ERROR RESIN PUMP SERVO MOTOR ERROR HARDENER PUMP SERVO MOTOR ERROR	ON	OFF	ON	ON
RESIN AMOUNT ERROR HARDENER AMOUNT ERROR	OFF	OFF	ON	ON
GEL ALARM	ON	ON	OFF	ON
REGIN PRESSURE ERROR HARDENER PRESSURE ERROR	ON	OFF	ON	OFF
MIXING RATE ERROR	OFF	OFF	OFF	ON
REGIN_FLOW_HIGH ERROR	ON	ON	ON	OFF
REGIN_FLOW_LOW ERROR	OFF	ON	ON	OFF
HARDENER_FLOW_HIGH ERROR	ON	OFF	OFF	ON
HARDENER_FLOW_LOW ERROR	OFF	OFF	ON	OFF
RESIN SERVO WARNING HARDENER SERVO WARNING RESIN MOTOR_COMM_ERROR HARDENER MOTOR_COMM_ERROR	ON	ON	OFF	OFF
NORMAL	ON	ON	ON	ON

6.4 Trouble Shooting

Table 18. PDC-1000 trouble shooting

Trouble	Possible Cause & Correction
When the dispensed material is not cured	<ul style="list-style-type: none"> * Make sure the mixing ratio is correct. <ul style="list-style-type: none"> ✓ Check if there is a shortage of material in the Tank. ✓ Make sure that the material supply from the material supply device to the Pump inlet is sufficient. ✓ Make sure there is a leak with Pump stopped. ✓ If there is a lump leak of about 10 seconds, replace the Pump consumables. * Check for leaks or blockages in the Mixer. <ul style="list-style-type: none"> ✓ Check the Mixer and Mix Adapter connection for leaks. ✓ Make sure that the inside of the Mixer is cured.
When the dispensing pressure of the material is higher than usual	<ul style="list-style-type: none"> * Make sure the Mixer or Nozzle is hardened or clogged. <ul style="list-style-type: none"> ✓ Replace the Mixer or Nozzle. * Make sure that the Mix Adapter outlet is clogged. <ul style="list-style-type: none"> ✓ Disassemble the Mix Adapter and clean it cleanly.
Error Message – emergency stop	<ul style="list-style-type: none"> * Displays the notation when there is an emergency stop from an external device. * Processing is possible by canceling the non-phase button.
Error Message – hardener alarm	<ul style="list-style-type: none"> * Displayed when the set curing time is reached.
Error Message – hardener pump / resin pump Error	<ul style="list-style-type: none"> * Displayed when the Pump connection is incorrect. * Check the Motor Cable connection.
Error Message – Hardener residual quantity / Resin residual quantity	<ul style="list-style-type: none"> * Displayed when the amount of resin or hardener is insufficient. * Replenish the resin, hardener.

6.5 Inspection and measures

Table 19. Inspection and measures of PDC-1000

Item	Cycle	What to check and what to do	Remarks
Surrounding Environment	Occasionally	Confirm that it meets the usage standards of the equipment.	
Power Voltage	Occasionally	Check if the power is AC220V, 50/60Hz.	
Appearance of the Equipment	Periodically	Check if the connection parts (connector, terminal block, etc.) are loose, and tightly fasten the loose parts.	
Cables	Periodically	Check if the cover is peeled or if there is severe bending.	
Internal State of the Equipment	Periodically	Manage the cleaning condition so that contamination by dust or coating liquid does not cause an interference with the operation of the equipment.	
Supplied Air	Occasionally	Check the piping connection and joints to ensure there is no leakage so that the supplied air maintains normal pressure.	
Purge Condition	Occasionally	If the equipment is stopped for more than 10 minutes, dispense a certain volume depending on the set time so that hardening does not occur at the end of the valve.	
Robot	Occasionally	<ol style="list-style-type: none"> 1) Check for abnormal vibrations or abnormal noises. 2) Check for abnormal heat generation. 3) Check for abnormal vibrations or abnormal noises on the bearing part. 	
Other Checks	Periodically	<ol style="list-style-type: none"> 1) Fastening condition of the fixed parts and joints in the equipment 2) Joined and tightened condition of wiring 3) Arrangement condition around the equipment 	