APEX DYNAMICS, INC.

Smart Lubrication System

Technical Instruction

Original instruction

Content

Manual name	Manual No.
Smart Lubrication System Technical Instruction	LUG20001907 16-01

1. Safety Information

1.1 Overview

All personnel must read the entire manual instructions carefully and ensure full understanding the contents before operating, installing and maintaining the SMART Lubrication System. This is to avoid unnecessary danger during operation.

Lubrication System only can be used on pinion or linear guide, it is prohibited for other applications. APEX DYNAMIC can not take the responsibility for the damage under those abnormal usage.

1.2 Maintenance and Storage

- Turn off the power during maintenance and suggest wear gloves and goggles
- Store lubrication system into circulated freely environment
- The grease should be stored in sealed barrel and fix the storage position under room temperature environment
- Avoiding storage in process region, high temperature surface, splashing liquid or on the electrical devices. And consider the suitability for replacement
- Make sure screw the plug on both hand-set and oil cup when lubricator is stop working
- Avoiding inject the prohibitive oil/grease into the lubricator
- Use the funnel or assistant tool when inject the oil into the lubricator to avoid oil leakage to ground or equipment that cause the accident

1.3 Safety Regulation

Please do not ignore Safety Regulation which may cause unnecessary injury or loss of company asset. APEX will not be liable for following situations:

- Incorrect assembly and failure to comply with method of installation, operation, setting-up, maintenance, repair, may result in danger.
- Self-Disassembly of Lubricator
- Self-Modification of Lubricator
- Using Unsuitable Oil
- Using Non-Original Manufacturer Component
- Performing Incorrect method of Trouble shooting

1.4 Hazard Instruction

The Hazard warning is defined as four types of danger level:

Danger

Danger refer to hazards with a high risk of severe physical injury or immediate fatality

Warning

Warning refers to hazards with moderate risk of severe physical injury or potential fatality.

Caution

Caution refers to hazards with a low risk of moderate physical injury.

Note

Note refers to hazards with a slight risk of moderate physical injury.

1.5 Warning Symbol

All users must pay attention to the symbols of Hazard warnings mentioned in Manual as shown in table:

Symbol	Explanation of Symbols
	Hazards due to general causes
	Hazards due to dangerous electrical voltage
	Hazards due to environment pollution
	Wear personal protective equipment (Gloves)
	Wear personal protective equipment (Goggles)

2. Lubrication Specification

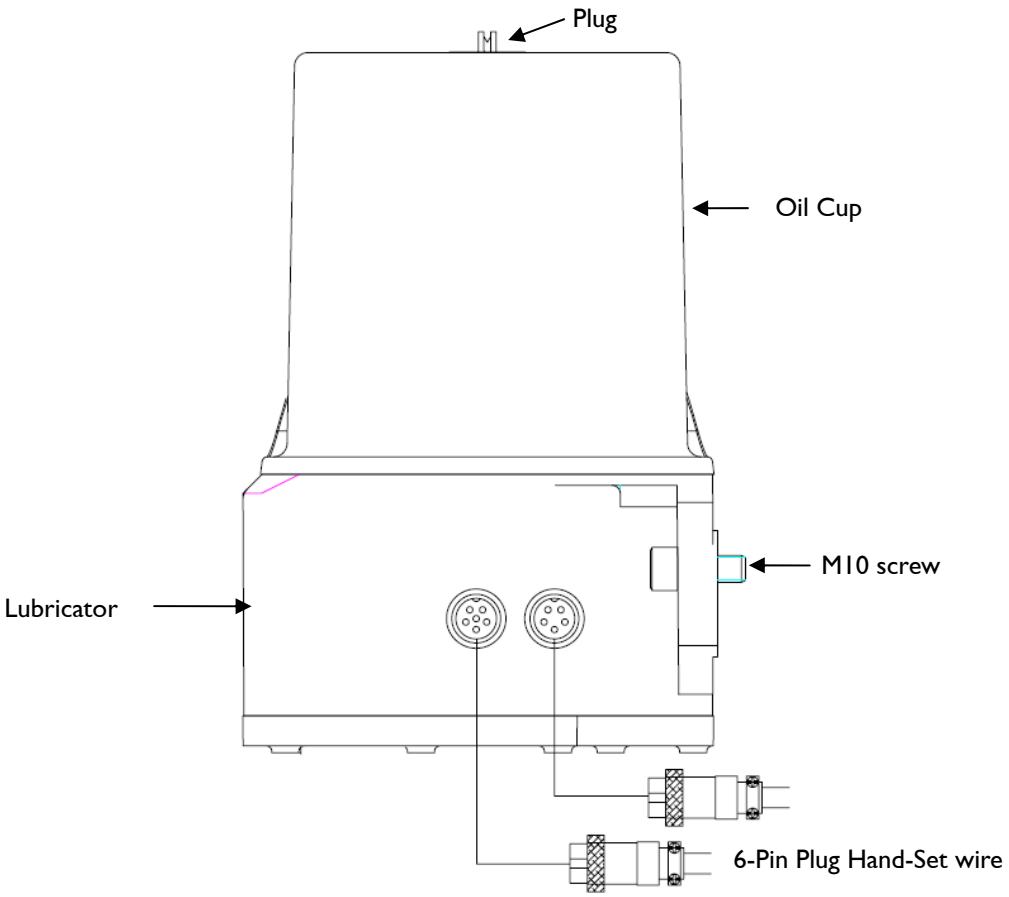
2.1 Electrical Specification

Input Power	DC24V ± 10%
Power Consumption	12W max
Operating Current	I max≦500mA
Output / Input	1 Set Status Output ; 1Set Command Input
Status Output Max. Current	100mA
Command Input Max. Current	50mA
Operating Temperature	-25~70 C
Control mode	PLC mode 0、TIMER mode 1 、PLC mode 2

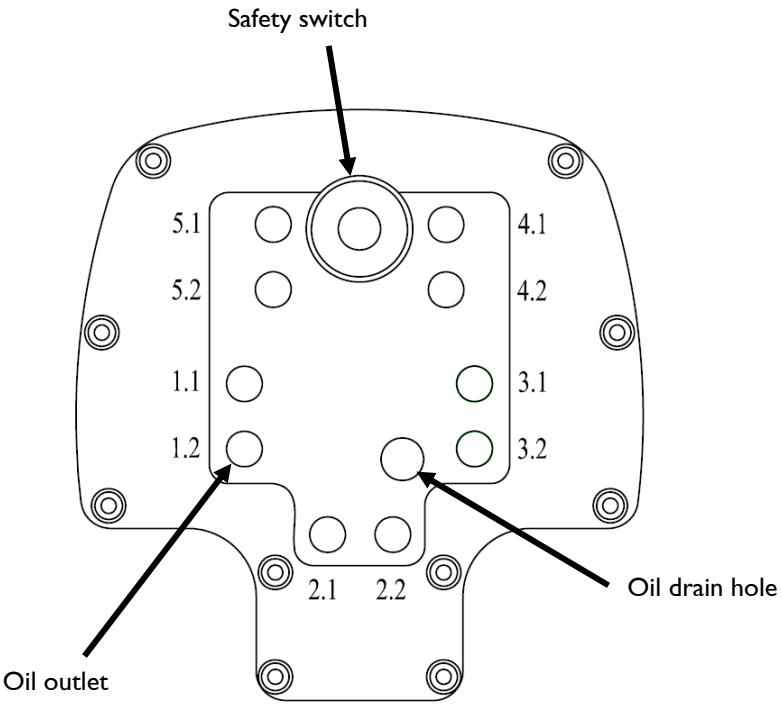
Note: Herewith mode 0 and mode 2 which can be controlled by PLC, the original setup is PLC mode 0. Request Hand-Set connection if needs to change the mode.

2.2 Lubricator appearance illustration

Lubricator Side View



Lubricator Bottom View



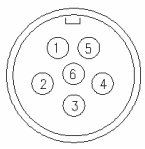
- The lubricator will stop dispensing once the safety switch is removed. This function can prevent the oil leakage from oil outlet during the maintenance operation.

Socket Side View

6-Pin Plug (Hand-Set Wire)

1.Output DC 24V
2.GND
3.I_BUSY
4.RS485
5.RS485

6-Pin Socket on Lubricator

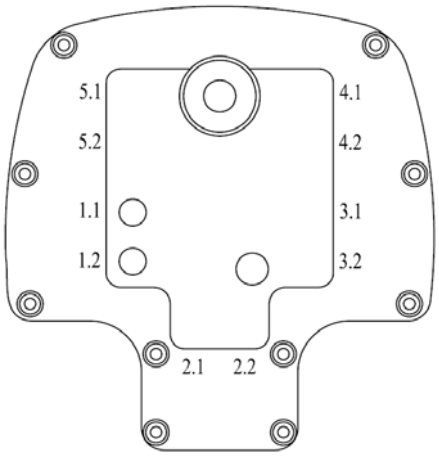


5-Pin Socket (Power Wire)

1.Output Signal
2.Input Signal
4.Input DC 24V
5.GND

5-Pin Plug on Lubricator

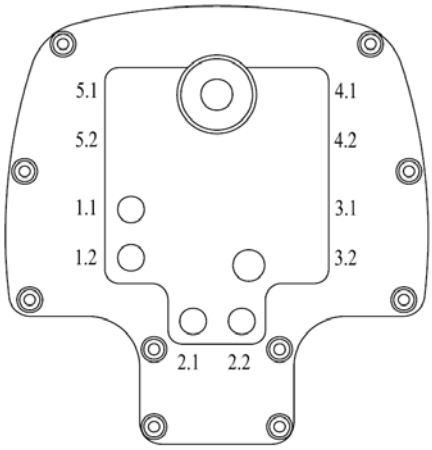
2.3 Outlet Position of Each Lubricator Model



LUG-2102

LUG-2102:
1.1 Outlet : per stroke 0.15cm^3
1.2 Outlet : per stroke 0.15cm^3

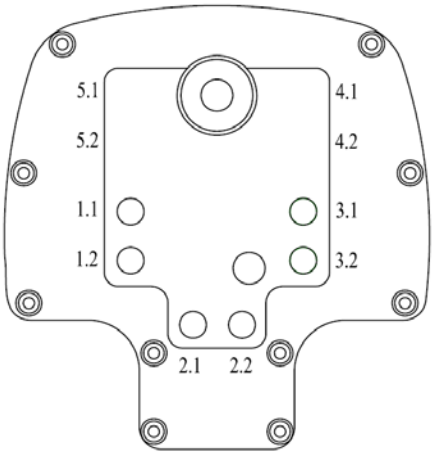
Other Oil Outlets are sealed



LUG-2204

LUG-2204:
1.1 Outlet : per stroke 0.15cm^3
1.2 Outlet : per stroke 0.15cm^3
2.1 Outlet : per stroke 0.15cm^3
2.2 Outlet : per stroke 0.15cm^3

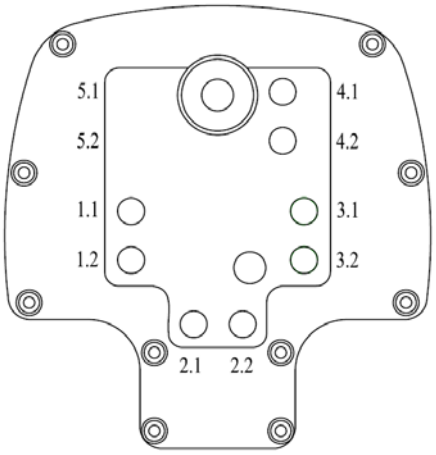
Other Oil Outlets are sealed



LUG-2306

LUG-2306:
1.1 Outlet : per stroke 0.15cm^3
1.2 Outlet : per stroke 0.15cm^3
2.1 Outlet : per stroke 0.15cm^3
2.2 Outlet : per stroke 0.15cm^3
3.1 Outlet : per stroke 0.15cm^3
3.2 Outlet : per stroke 0.15cm^3

Other Oil Outlets are sealed

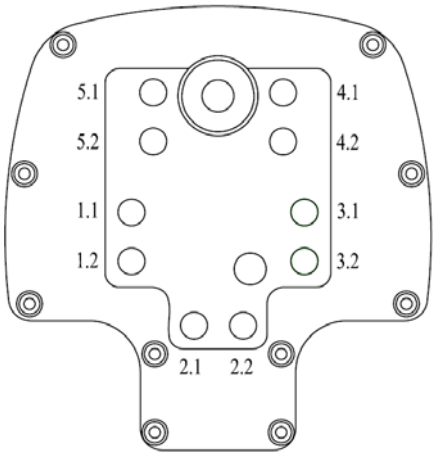


LUG-2408

LUG-2408:

1.1 Outlet : per stroke 0.15cm^3
1.2 Outlet : per stroke 0.15cm^3
2.1 Outlet : per stroke 0.15cm^3
2.2 Outlet : per stroke 0.15cm^3
3.1 Outlet : per stroke 0.15cm^3
3.2 Outlet : per stroke 0.15cm^3
4.1 Outlet : per stroke 0.15cm^3
4.2 Outlet : per stroke 0.15cm^3

Other Oil Outlets are sealed



LUG-2510

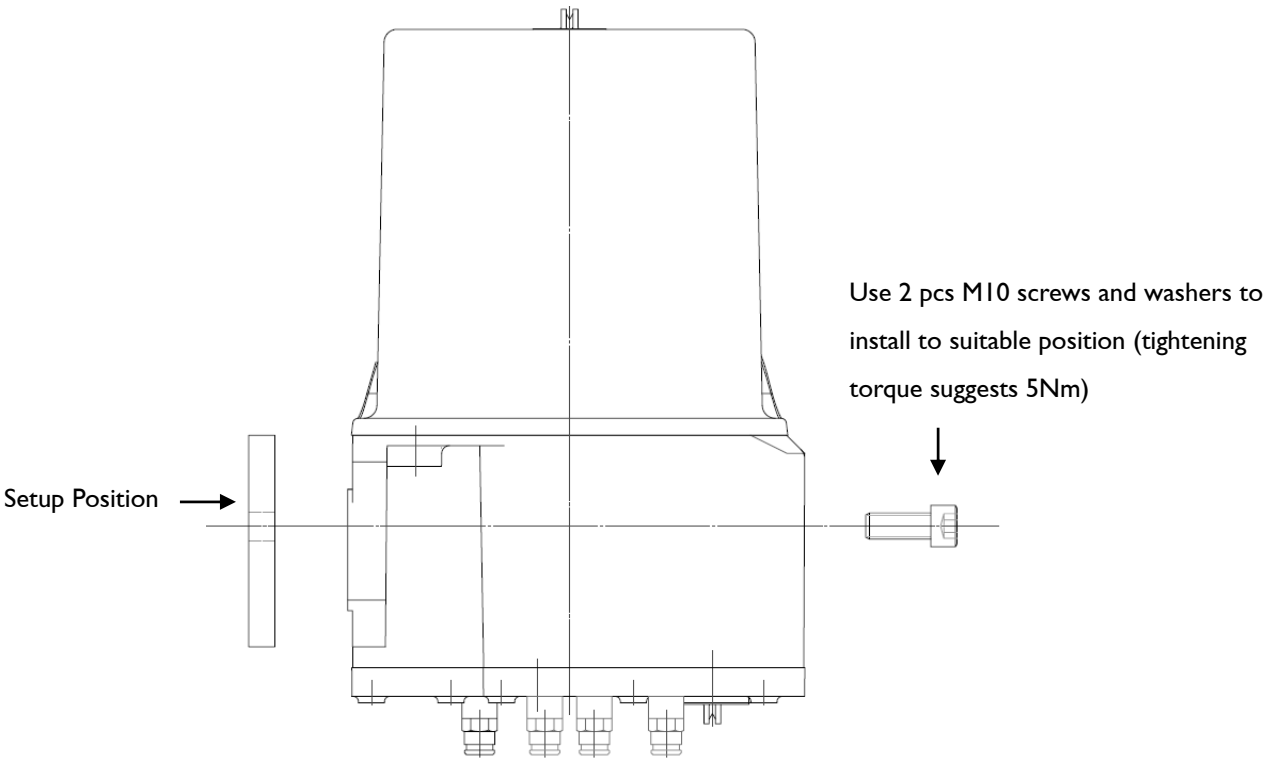
LUG-2510:

1.1 Outlet : per stroke 0.15cm^3
1.2 Outlet : per stroke 0.15cm^3
2.1 Outlet : per stroke 0.15cm^3
2.2 Outlet : per stroke 0.15cm^3
3.1 Outlet : per stroke 0.15cm^3
3.2 Outlet : per stroke 0.15cm^3
4.1 Outlet : per stroke 0.15cm^3
4.2 Outlet : per stroke 0.15cm^3
5.1 Outlet : per stroke 0.15cm^3
5.2 Outlet : per stroke 0.15cm^3

Other Oil Outlets are sealed

2.4Lubrication Setup Introduction

APEX DYNAMIC, INC. provide the 2 pcs M10 screws and 2 pcs washer for installation. Be aware to install the lubricator in sufficient brightness with well circulated freely environment. And avoid to storage in process region, high temperature surface, splashing liquid or on the electrical devices, also consider the suitability for replacement. Moreover, the tube installation should compatible with system and PLC machine safety standard.



3. PLC Control

PLC transfer different output control signals to Lubricator power plug PIN 2, this can control function of lubricator greasing action, delivered grease volume. The control signal of the Lubricator PLC can be divided into 2 molds as mode 0 and mode 2, the Chapter 3 focuses on mode 0, Mode 2 control signals can refer in section 4.6.2.

3.1 Power System Wire

⚠ Caution

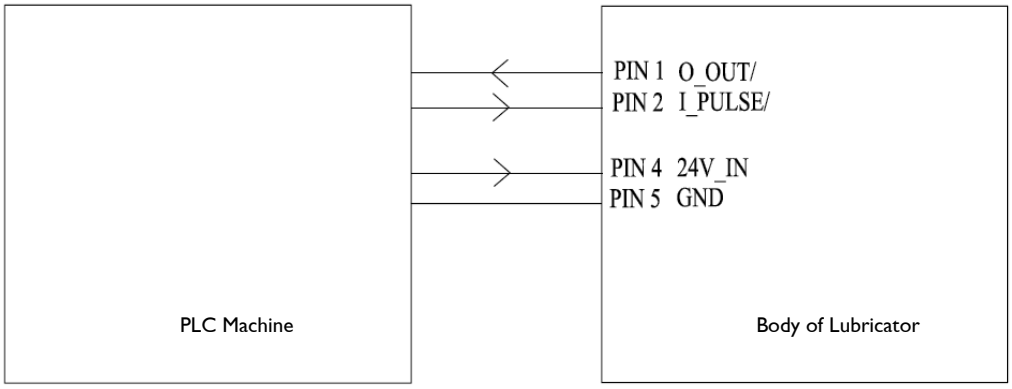
APEX provide the power connector, and the user can use the suitable wire to match the connector bore and application. The current resistance at least 1.5A.

The isolation transformer or power supply can produce output DC 24V under control of PLC machine and provided Lubricator with required power DC 24V.

⚠ Warning

The isolation transformer or power supply should be certificated product, to avoid the risk of electric shock to the user or equipment

Wiring Diagram of Power System



Circuit Protection Switch

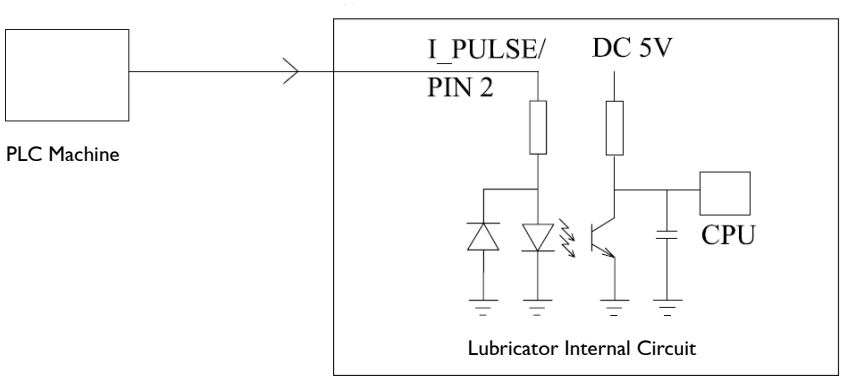
(Fuse), Rated Current = 1.1A

⚠ Caution

When the input voltage of Lubricator is higher than specified voltage, this will cause damage to the lubricator.

3.1.1 Command Input Signal Wiring

PLC signal convey to lubricator



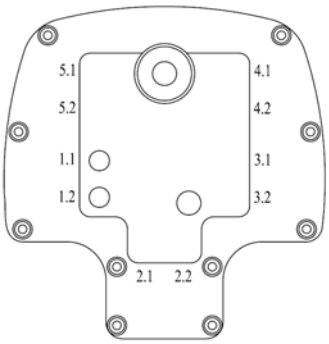
Lubricant Input Electrical Specifications

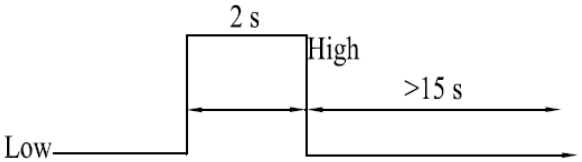
Input
Rated Voltage : DC 24V，
Rated Current : 50mA

3.2 Various Control Signal of PLC model 0

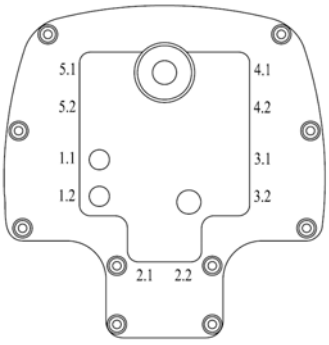
Each Lubricator model has control signal and mechanism as illustrated below, LOW as 0V and HIGH as 24V Signal.

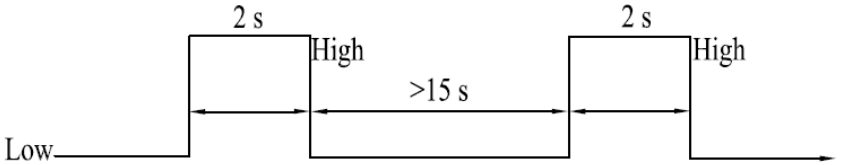
3.2.1 Model LUG-2102





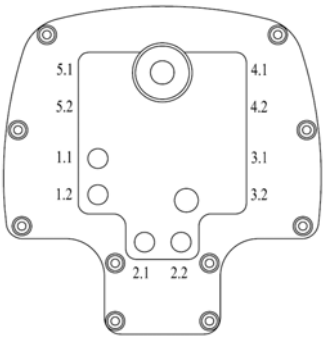
Pump 1 pushed 1 stroke to outlet 1.1 or 1.2 dispensing 0.15cm^3 of oil when Lubricator received one 2s HIGH signal.

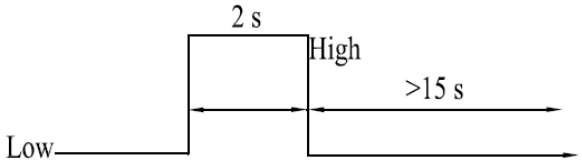




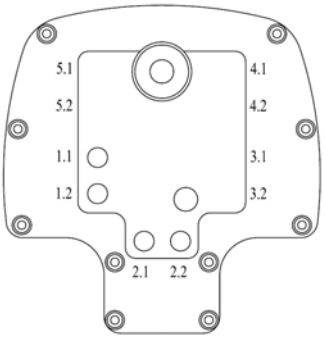
Pump 1 pushed 1 strokes to outlet 1.1 and 1.2 individually dispensing 2 strokes of 0.15cm^3 of oil (total 0.3cm^3 grease) when Lubricator received two 2s HIGH signal. Ensure cycle interval of two 2s HIGH signal is at least 15s.

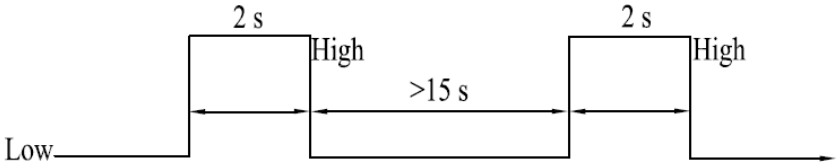
3.2.2 Model LUG-2204



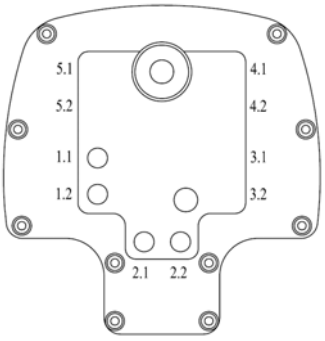


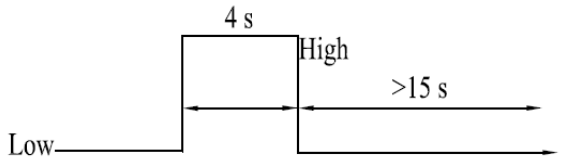
Pump 1 pushed 1 stroke to outlet 1.1 or 1.2 dispensing 0.15cm^3 of oil when Lubricator received one 2s HIGH signal.



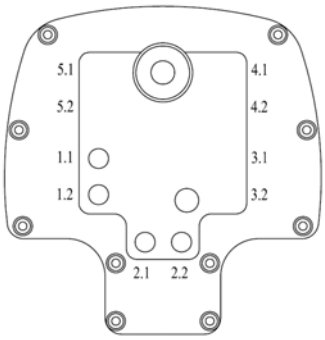


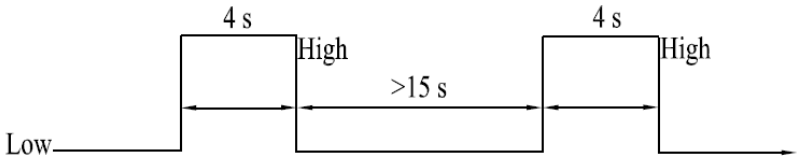
Pump 1 pushed 1 stroke to each outlet 1.1 and 1.2 dispensing 0.15cm^3 of oil individually when Lubricator received two 2s HIGH signal. Ensure cycle interval of two 2s HIGH signal is at least 15s.



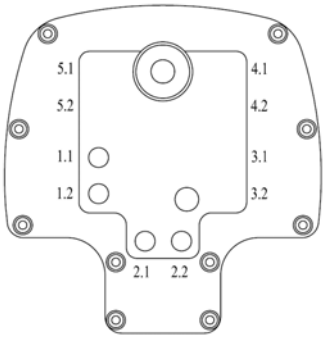


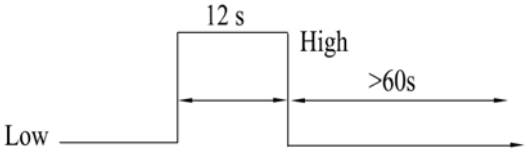
Pump 2 pushed 1 stroke to outlet 2.1 or 2.2 dispensing 0.15cm^3 of oil when Lubricator received one 4s HIGH signal.





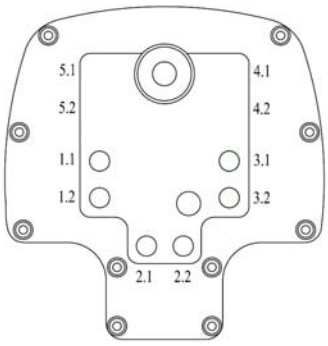
Pump 2 pushed 1 stroke to each outlet 2.1 and 2.2 dispensing 0.15cm^3 of oil individually when Lubricator received two 4s HIGH signal. Ensure cycle interval of two 4s HIGH signal is at least 15s.

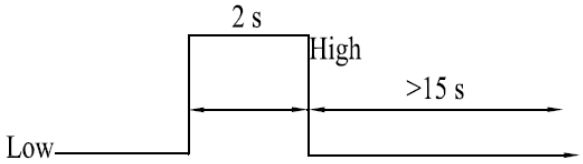




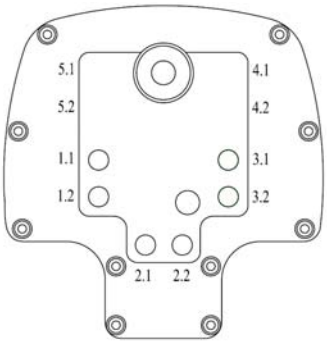
Pump 1 and 2 pushed 1 stroke to each outlet 1.1, 1.2, 2.1 and 2.2 dispensing 0.15cm^3 of oil individually when Lubricator received once 12s HIGH signal.

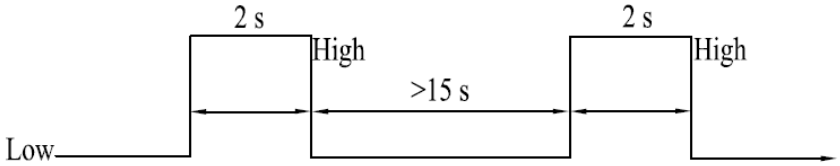
3.2.3 Model LUG-2306



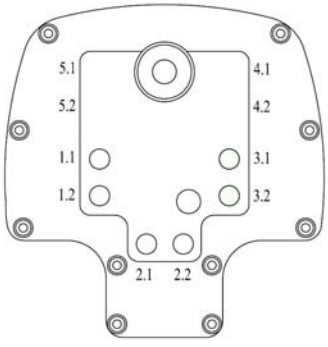


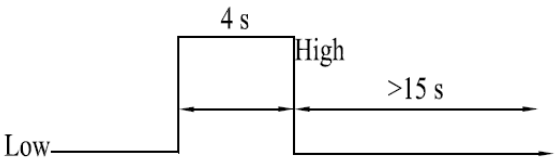
Pump 1 pushed 1 stroke to outlet 1.1 or 1.2 dispensing 0.15cm^3 of oil when Lubricator received one 2s HIGH signal.



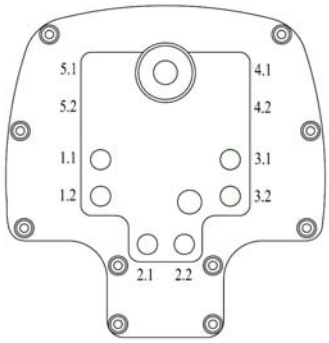


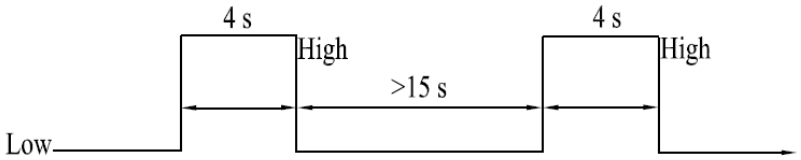
Pump 1 pushed 1 stroke to each outlet 1.1 and 1.2 dispensing 0.15cm^3 of oil individually when Lubricator received two 2s HIGH signal. Ensure cycle interval of two 2s HIGH signal is at least 15s.



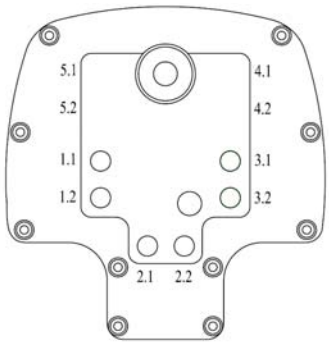


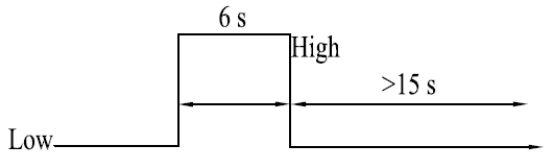
Pump 2 pushed 1 stroke to outlet 2.1 or 2.2 dispensing 0.15cm^3 of oil when Lubricator received one 4s HIGH signal.



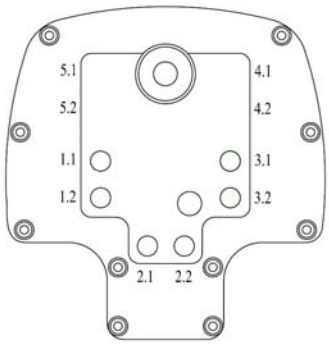


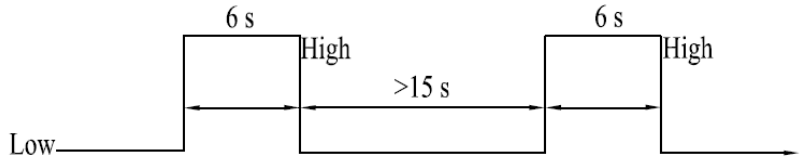
Pump 2 pushed 1 stroke to each outlet 2.1 and 2.2 dispensing 0.15cm^3 of oil individually when Lubricator received two 4s HIGH signal. Ensure cycle interval of two 4s HIGH signal is at least 15s.



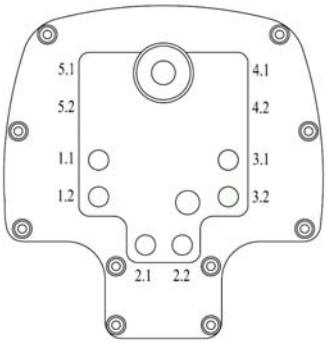


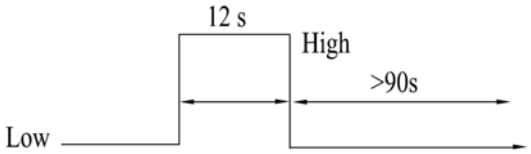
Pump 3 pushed 1 stroke to outlet 3.1 or 3.2 dispensing 0.15cm^3 of oil when Lubricator received one 6s HIGH signal.





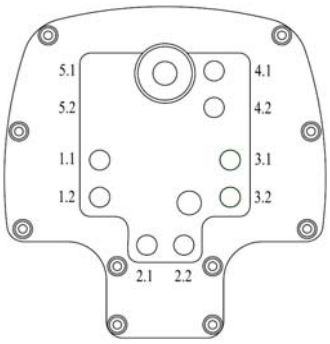
Pump 3 pushed 1 stroke to each outlet 3.1 and 3.2 dispensing 0.15cm^3 of oil individually when Lubricator received two 6s HIGH signal. Ensure cycle interval of two 6s HIGH signal is at least 15s.

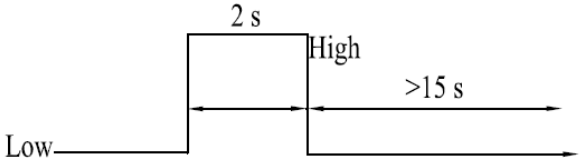




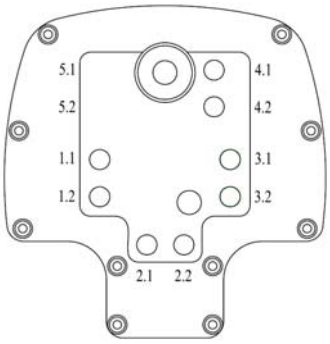
Pump 1, 2 and 3 pushed 1 stroke to each outlet 1.1, 1.2, 2.1, 2.2, 3.1 and 3.2 dispensing 0.15cm^3 of oil individually when Lubricator received once 12s HIGH signal.

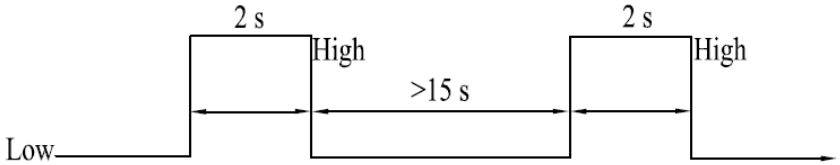
3.2.4 Model LUG-2408



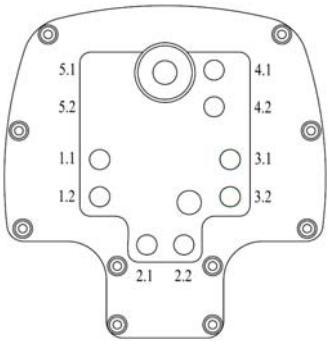


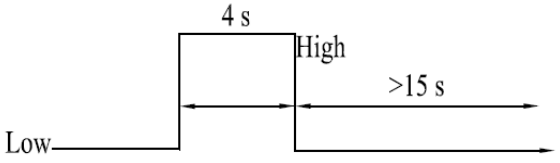
Pump 1 pushed 1 stroke to outlet 1.1 or 1.2 dispensing 0.15cm^3 of oil when Lubricator received one 2s HIGH signal.



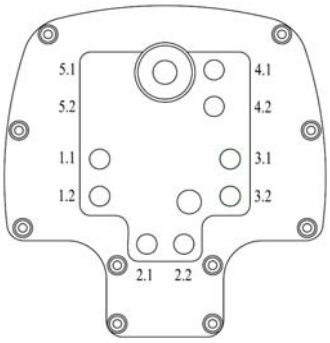


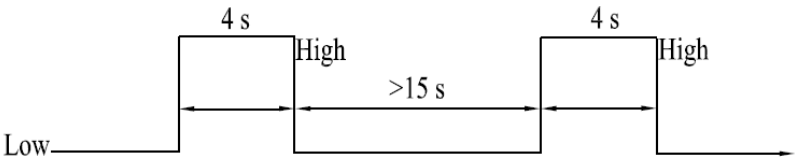
Pump 1 pushed 1 stroke to each outlet 1.1 and 1.2 dispensing 0.15cm^3 of oil individually when Lubricator received two 2s HIGH signal. Ensure cycle interval of two 2s HIGH signal is at least 15s.



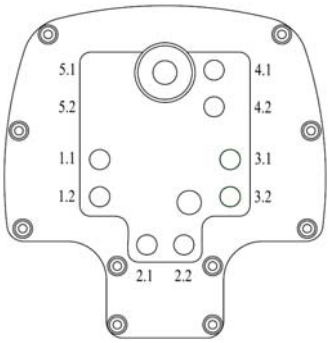


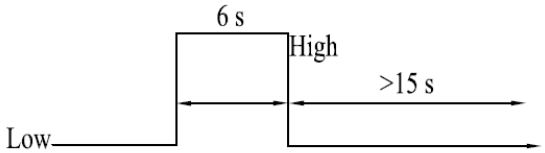
Pump 2 pushed 1 stroke to outlet 2.1 or 2.2 dispensing 0.15cm^3 of oil when Lubricator received one 4s HIGH signal.



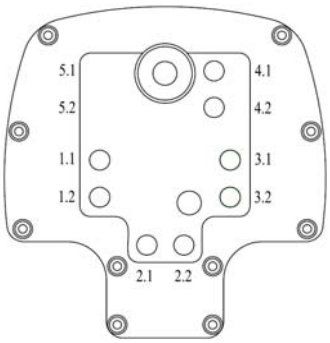


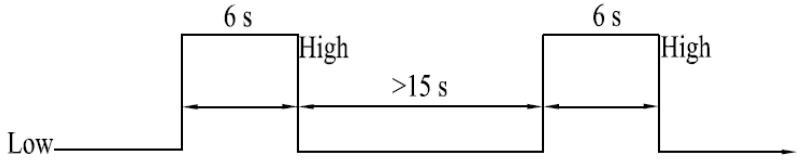
Pump 2 pushed 1 stroke to each outlet 2.1 and 2.2 dispensing 0.15cm^3 of oil individually when Lubricator received two 4s HIGH signal. Ensure cycle interval of two 4s HIGH signal is at least 15s.



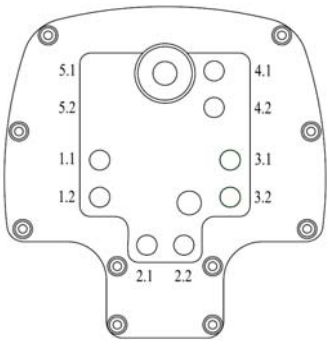


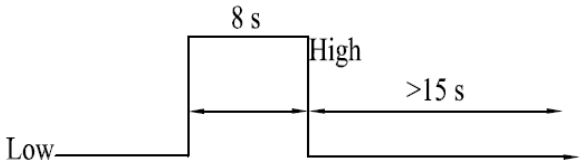
Pump 3 pushed 1 stroke to outlet 3.1 or 3.2 dispensing 0.15cm^3 of oil when Lubricator received one 6s HIGH signal.



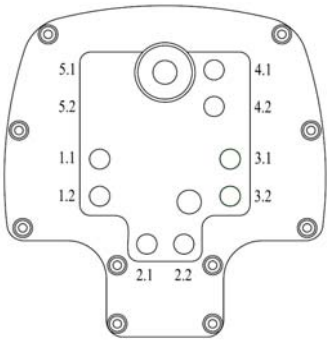


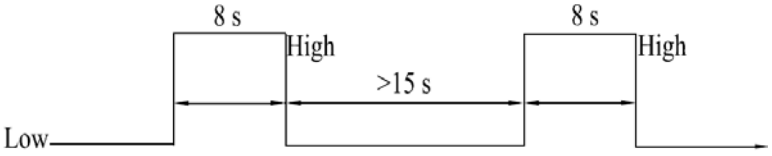
Pump 3 pushed 1 stroke to each outlet 3.1 and 3.2 dispensing 0.15cm^3 of oil individually when Lubricator received two 6s HIGH signal. Ensure cycle interval of two 6s HIGH signal is at least 15s.



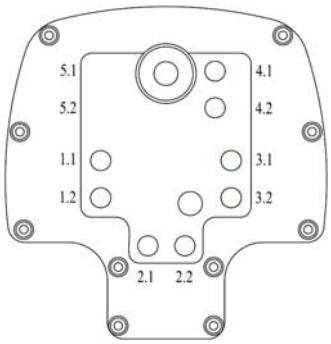


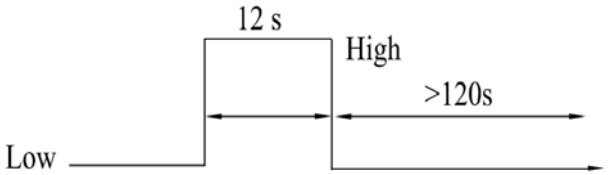
Pump 4 pushed 1 stroke to outlet 4.1 or 4.2 dispensing 0.15cm^3 of oil when Lubricator received one 8s HIGH signal.





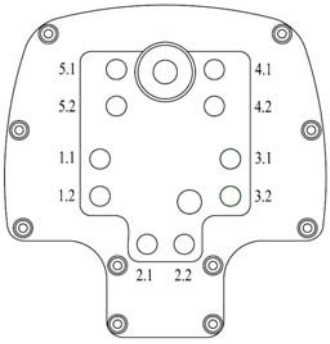
Pump 4 pushed 1 stroke to each outlet 4.1 and 4.2 dispensing 0.15cm^3 of oil individually when Lubricator received two 8s HIGH signal. Ensure cycle interval of two 8s HIGH signal is at least 15s.

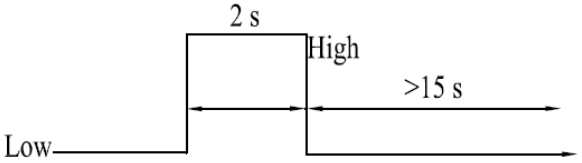




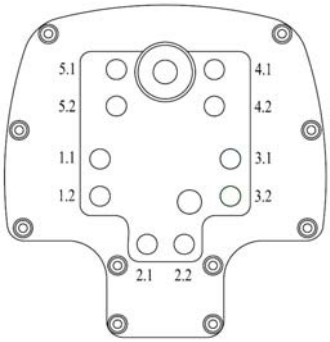
Pump 1, 2, 3 and 4 pushed 1 stroke to each outlet 1.1, 1.2, 2.1, 2.2, 3.1, 3.2, 4.1 and 4.2 dispensing 0.15cm^3 of oil individually when Lubricator received once 12s HIGH signal.

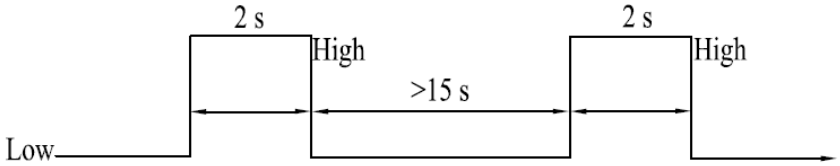
3.2.5 Model LUG-2510



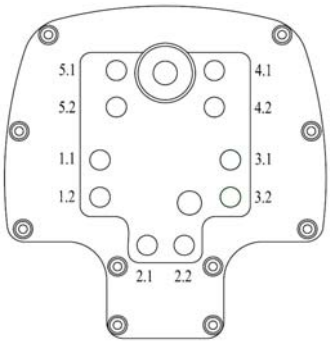


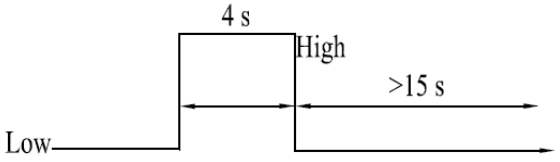
Pump 1 pushed 1 stroke to outlet 1.1 or 1.2 dispensing 0.15cm^3 of oil when Lubricator received one 2s HIGH signal.



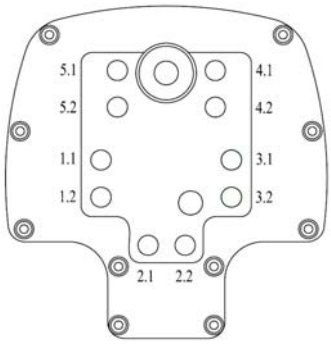


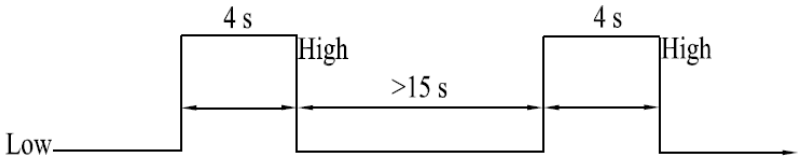
Pump 1 pushed 1 stroke to each outlet 1.1 and 1.2 dispensing 0.15cm^3 of oil individually when Lubricator received two 2s HIGH signal. Ensure cycle interval of two 2s HIGH signal is at least 15s.



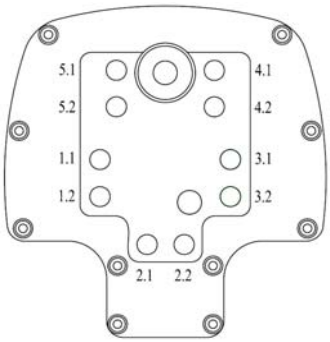


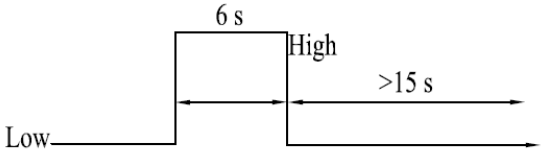
Pump 2 pushed 1 stroke to outlet 2.1 or 2.2 dispensing 0.15cm^3 of oil when Lubricator received one 4s HIGH signal.



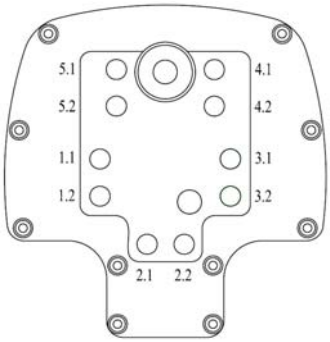


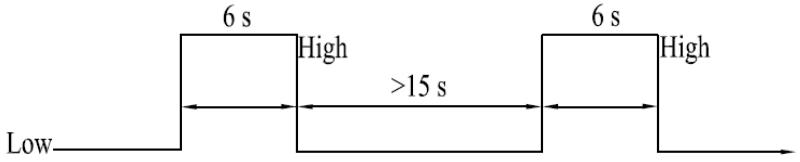
Pump 2 pushed 1 stroke to each outlet 2.1 and 2.2 dispensing 0.15cm^3 of oil individually when Lubricator received two 4s HIGH signal. Ensure cycle interval of two 4s HIGH signal is at least 15s.



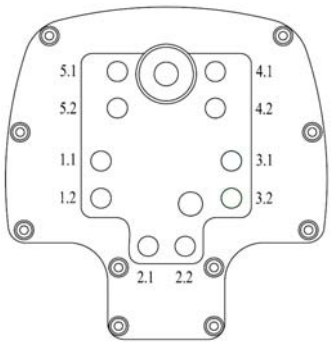


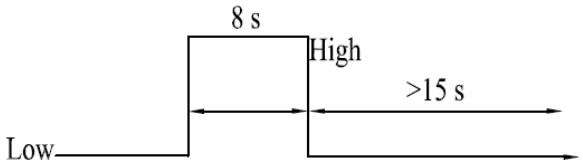
Pump 3 pushed 1 stroke to outlet 3.1 or 3.2 dispensing 0.15cm^3 of oil when Lubricator received one 6s HIGH signal.



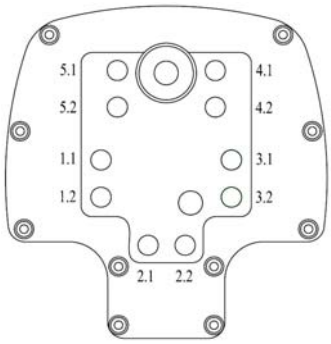


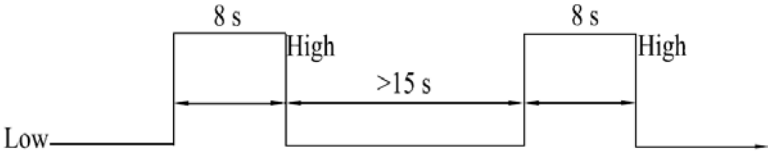
Pump 3 pushed 1 stroke to each outlet 3.1 and 3.2 dispensing 0.15cm^3 of oil individually when Lubricator received two 6s HIGH signal. Ensure cycle interval of two 6s HIGH signal is at least 15s.



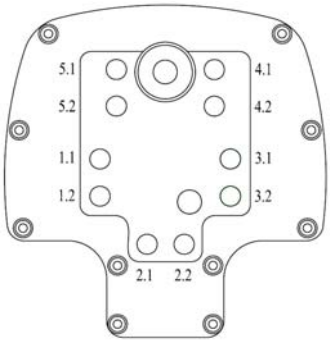


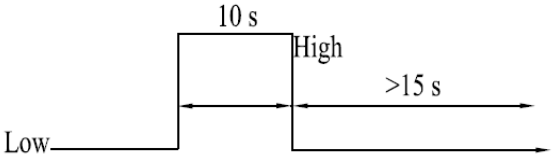
Pump 4 pushed 1 stroke to outlet 4.1 or 4.2 dispensing 0.15cm^3 of oil when Lubricator received one 8s HIGH signal.



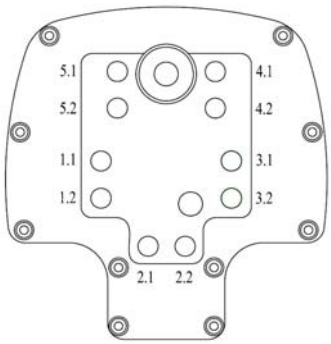


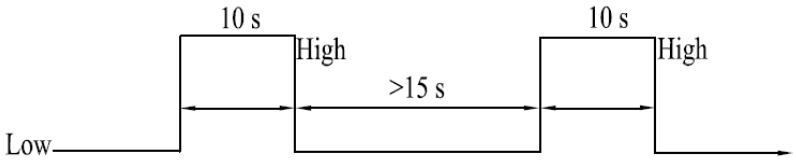
Pump 4 pushed 1 stroke to each outlet 4.1 and 4.2 dispensing 0.15cm^3 of oil individually when Lubricator received two 8s HIGH signal. Ensure cycle interval of two 8s HIGH signal is at least 15s.



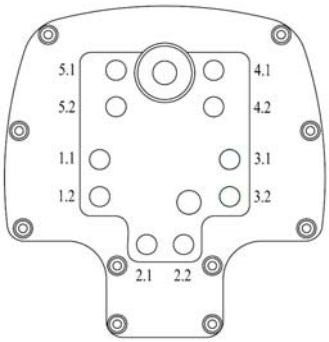


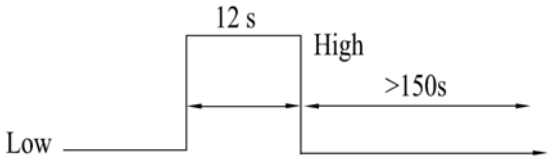
Pump 5 pushed 1 stroke to outlet 5.1 or 5.2 dispensing 0.15cm^3 of oil when Lubricator received one 10s HIGH signal.





Pump 5 pushed 1 stroke to each outlet 5.1 and 5.2 dispensing 0.15cm^3 of oil individually when Lubricator received two 10s HIGH signal. Ensure cycle interval of two 10s HIGH signal is at least 15s.





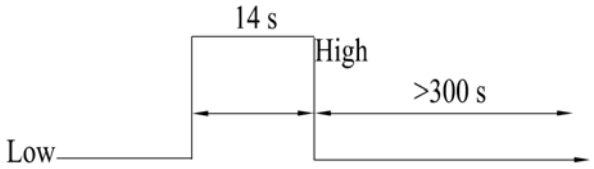
Pump 1, 2, 3, 4 and 5 pushed 1 stroke to each outlet 1.1, 1.2, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, 5.1 and 5.2 dispensing 0.15cm^3 of oil individually when Lubricator received once 12s HIGH signal.

3.3 Additional Function

3.3.1 Filling of Empty Tube with Grease

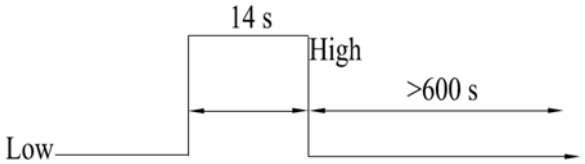
May use PLC output 14s HIGH signal after completed installing Lubricator Tube to perform oiling continuously 10 times and user use this function to allow empty tube filled with oil. After receiving the PLC signal of each Lubricator model, volume of oil supply to each outlet as follows:

LUG-2102:



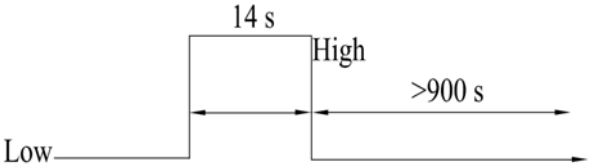
1.1 Outlet : 10 x 0.15cm^3 = 1.5cm^3
1.2 Outlet : 10 x 0.15cm^3 = 1.5cm^3

LUG-2204:



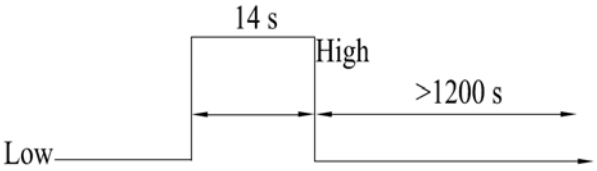
1.1 Outlet : 10 x 0.15cm^3 = 1.5cm^3
1.2 Outlet : 10 x 0.15cm^3 = 1.5cm^3
2.1 Outlet : 10 x 0.15cm^3 = 1.5cm^3
2.1 Outlet : 10 x 0.15cm^3 = 1.5cm^3

LUG-2306:



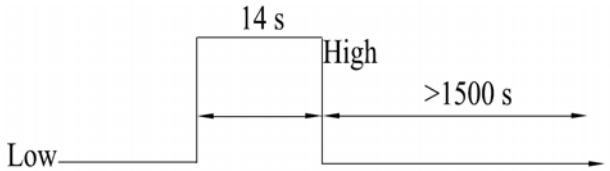
1.1 Outlet : 10 x 0.15cm^3 = 1.5cm^3
1.2 Outlet : 10 x 0.15cm^3 = 1.5cm^3
2.1 Outlet : 10 x 0.15cm^3 = 1.5cm^3
2.2 Outlet : 10 x 0.15cm^3 = 1.5cm^3
3.1 Outlet : 10 x 0.15cm^3 = 1.5cm^3
3.2 Outlet : 10 x 0.15cm^3 = 1.5cm^3

LUG-2408:



1.1 Outlet : 10 x 0.15cm^3 = 1.5cm^3
1.2 Outlet : 10 x 0.15cm^3 = 1.5cm^3
2.1 Outlet : 10 x 0.15cm^3 = 1.5cm^3
2.2 Outlet : 10 x 0.15cm^3 = 1.5cm^3
3.1 Outlet : 10 x 0.15cm^3 = 1.5cm^3
3.2 Outlet : 10 x 0.15cm^3 = 1.5cm^3
4.1 Outlet : 10 x 0.15cm^3 = 1.5cm^3
4.2 Outlet : 10 x 0.15cm^3 = 1.5cm^3

LUG-2510:

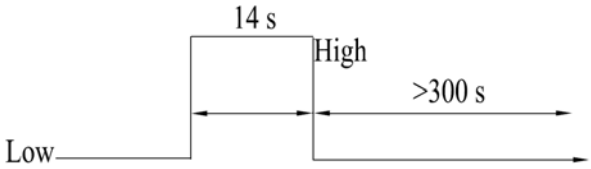


1.1 Outlet : 10 x 0.15cm^3 = 1.5cm^3
1.2 Outlet : 10 x 0.15cm^3 = 1.5cm^3
2.1 Outlet : 10 x 0.15cm^3 = 1.5cm^3
2.2 Outlet : 10 x 0.15cm^3 = 1.5cm^3
3.1 Outlet : 10 x 0.15cm^3 = 1.5cm^3
3.2 Outlet : 10 x 0.15cm^3 = 1.5cm^3
4.1 Outlet : 10 x 0.15cm^3 = 1.5cm^3
4.2 Outlet : 10 x 0.15cm^3 = 1.5cm^3
5.1 Outlet : 10 x 0.15cm^3 = 1.5cm^3
5.2 Outlet : 10 x 0.15cm^3 = 1.5cm^3

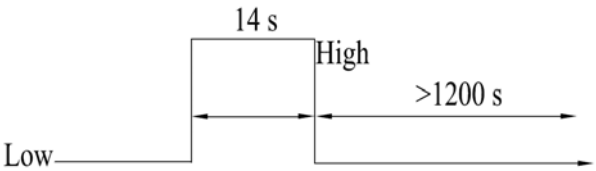
3.3.2 Release Trapped Air

Use PLC output 14s HIGH signal to perform oiling continuously and remove trapped air in internal tube.

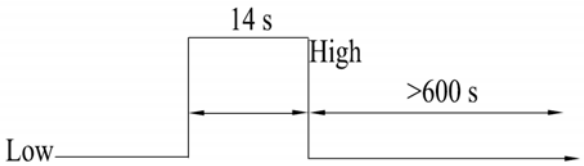
LUG-2102:



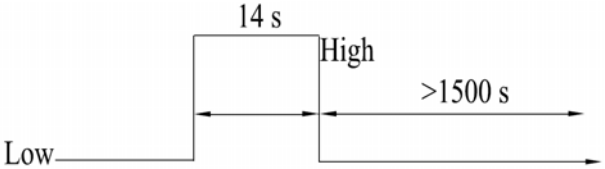
LUG-2408:



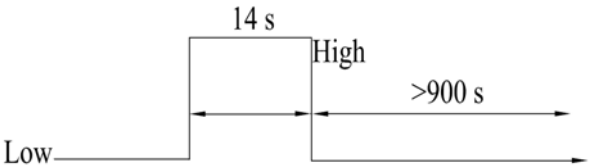
LUG-2204:



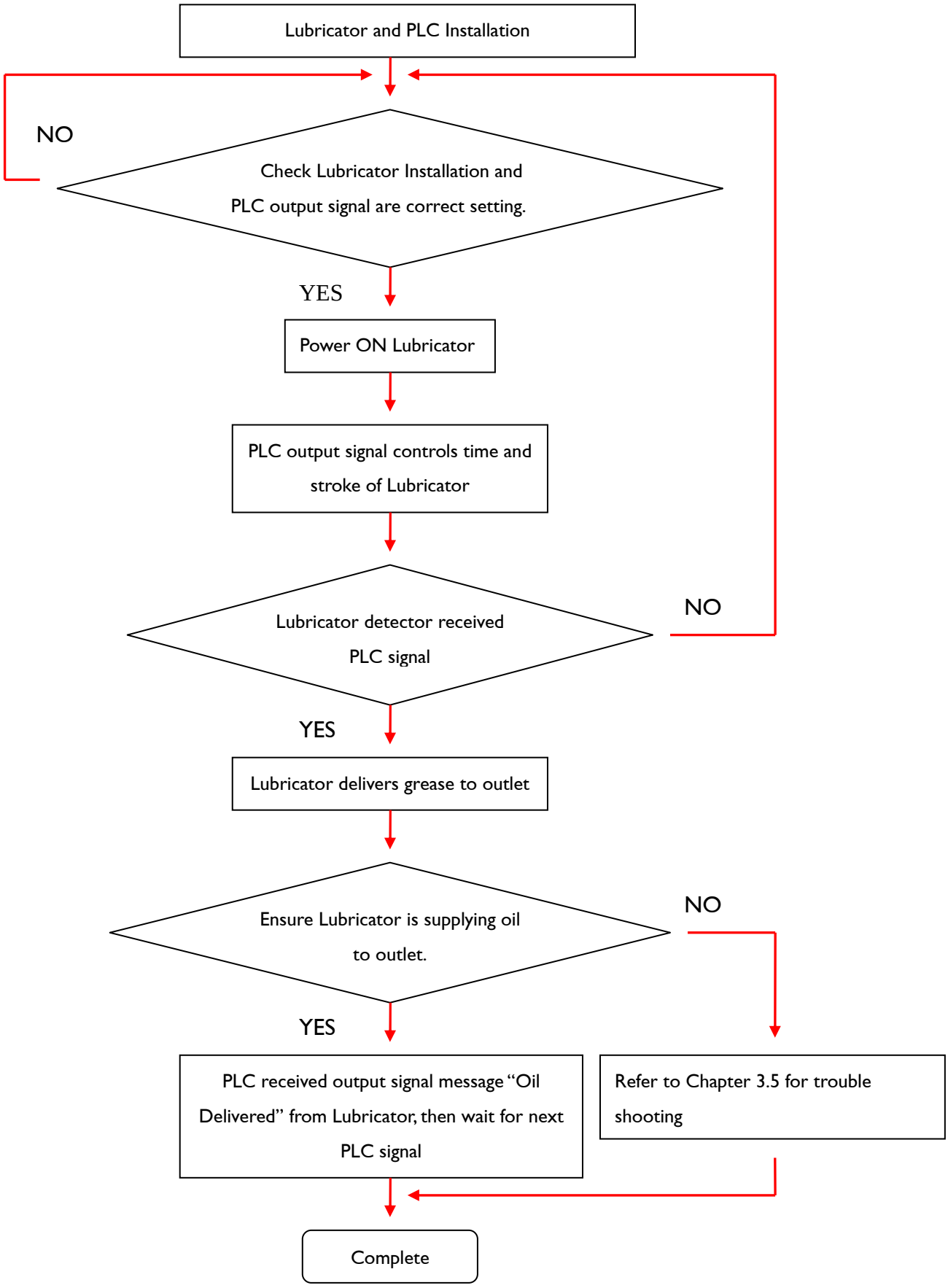
LUG-2510:



LUG-2306:



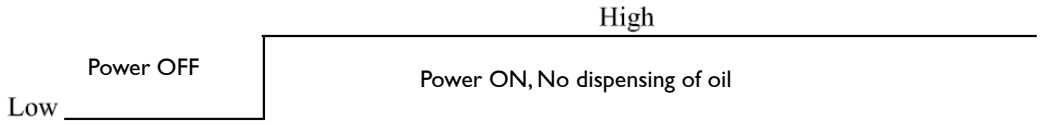
3.4 Lubricator Installation Procedure (PLC Mode 0 Control)



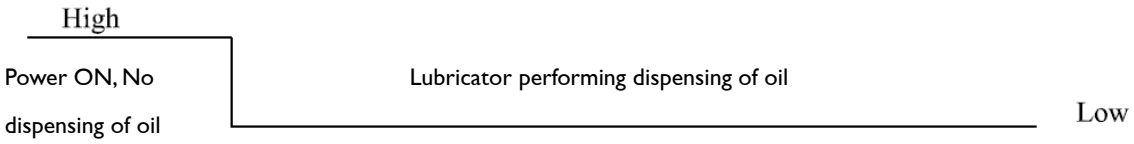
3.5 Lubricator Troubleshooting

PIN 1 of Lubricator power supply connected to PLC machine, the PIN 1 will output different signal to PLC, so that PLC knows status of lubricator. Lubricator output signal with the corresponding information as follows. Displaying 0V signal as LOW, 24V signal as HIGH.

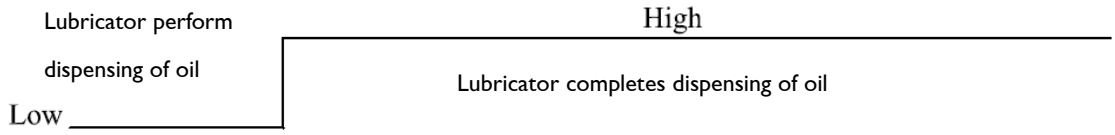
3.5.1 Waveform of Grease Dispensing



Power ON Lubricator, PIN 1 output signal as HIGH, at this time Lubricator then will receive the PLC command.

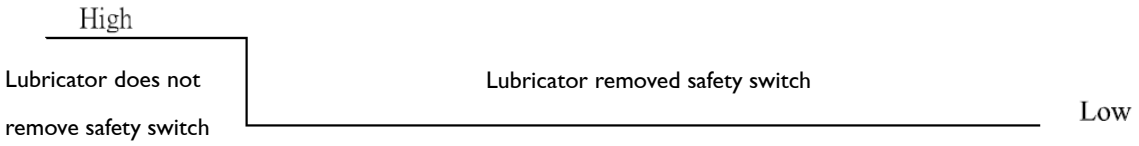


When Pin 1 output signal changed from HIGH to LOW, this means PLC knows Lubricator is performing dispensing of oil to outlet and at this moment Lubricator will ignore PLC command.

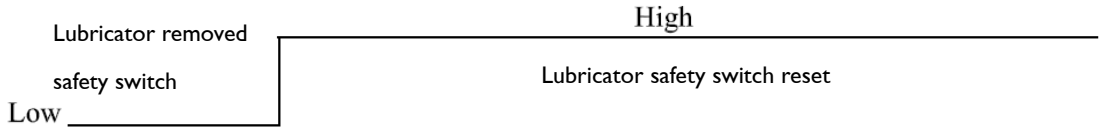


When Pin 1 output signal change from LOW to HIGH, this means PLC knows Lubricator completes dispensing of oil to outlet.

3.5.2 Waveform Pattern of with or without safety switch



When Lubricator power ON, and the safety switch have been removed, the output signal change from HIGH to LOW on PIN 1. At this moment, Lubricator will ignore PLC command. This function can be used to avoid dispensing of oil during maintenance.

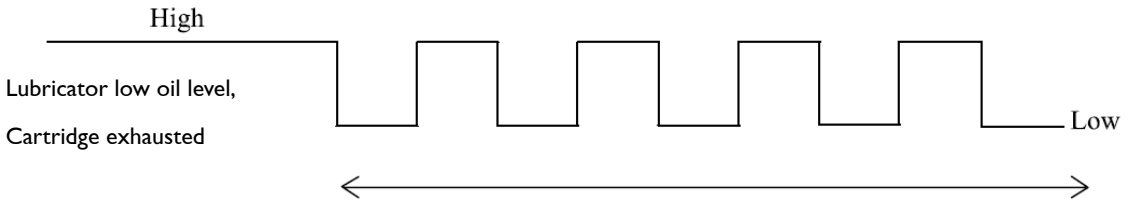


Once the safety switch has been reset, the output signal change from LOW to HIGH on PIN 1, the lubricator will be restarted at this moment.

3.5.3 Waveform Pattern of Malfunction

Lubricator malfunction, PIN 1 will continue to output LOW signal, at this status, please follow the below table for Lubricator troubleshooting.

Malfunction	Reason	Remedy
Lubricator cannot dispense oil	PA tube filled with oil contains trapped air	Refer chapter 3.3 for trouble shooting
	Lubricator PA tube blocked	Inspect PA tube for foreign particle blockage or tube length is too long.
	Lubricator motor idling	Contact APEX Manufacturer



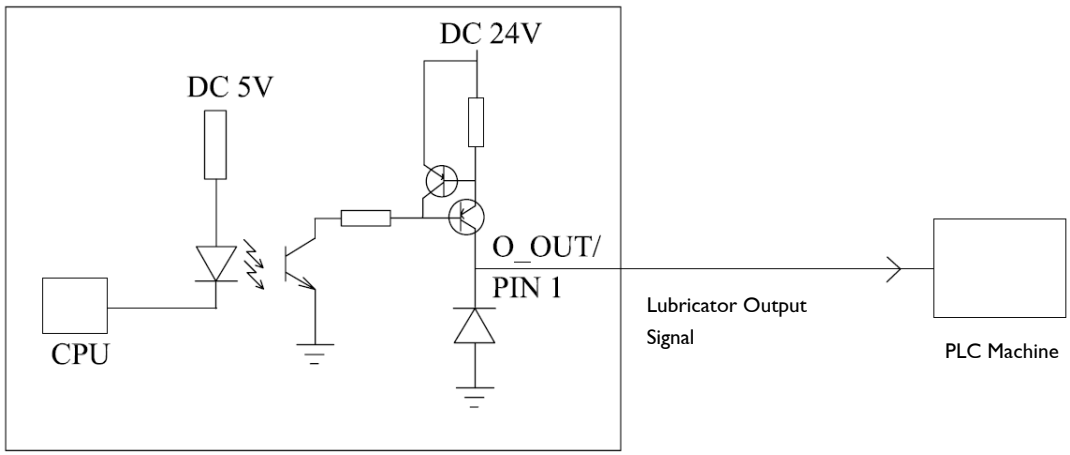
Lubricator Output signal 0.5Hz when Cartridge exhausted

When the lubricator is running out of the lubricant, the magnet of the dobber will be detected by internal sensor. Then PIN1 will output 0.5HZ signal continuously, and it will stops outlet oil. The lubricator requests to refill lubricant, then back to start outlet oil. The PLC cannot give commands to the lubricator before replenishing oil.

Malfunction	Reason	Solution
Lubricator cannot dispense oil	Sensor detects low oil level	Refer to APPENDIX B for replenishing the new oil

3.5.4 Lubricator PLC Control Output Wiring Instruction

Wiring of Lubricator Output signal to the PLC machine.



Internal Circuit of Mother Board

Lubricator Output Electrical Specification

Rated Output Voltage : DC 24V
Maximum Output Current : 100mA

4. Hand-Set

A APEX developed the Lubricator Hand-Set controller to perform regular routine grease supply function and real-time feedback to Hand-Set informing user Lubricator current status so no need to go through PLC transfer signal to achieve target.

4.1 Power System Wiring (TIMER Control)

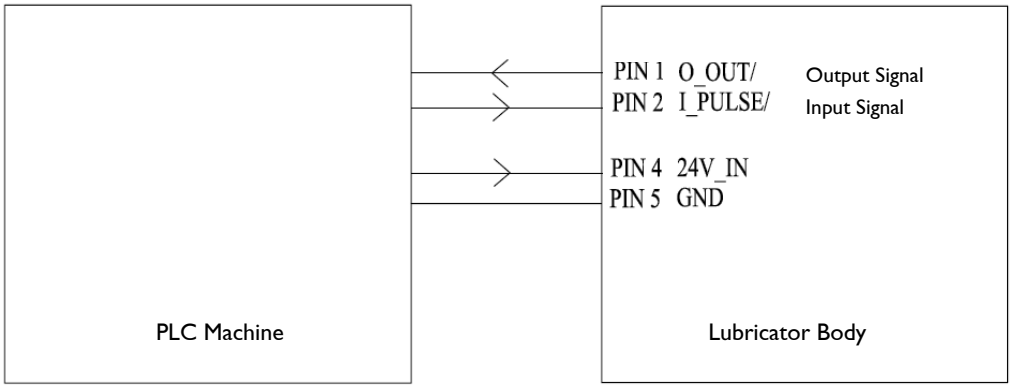
Hand-Set of Lubricator requires DC24V power from PLC machine or independent power source.

Caution

APEX provide the power connector, and the user can use the suitable wire to match the connector bore and application. The current resistance at least 1.5A.

4.1.1 PLC Machine Power Supply

Power supply system Wiring diagram

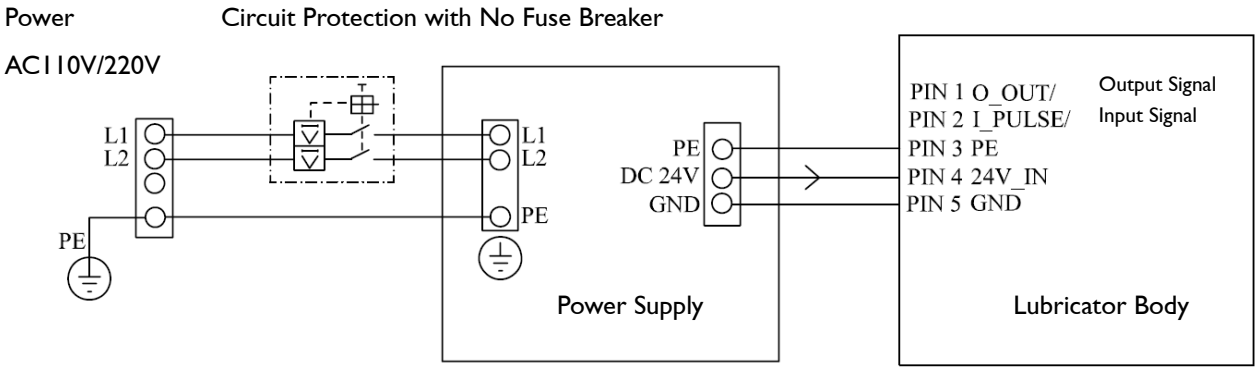


Circuit Protection Switch (Fuse). Rated Current = 1.1A

4.1.2 Independent Voltage Supply

Lubricator can use PLC machine and also install an independent voltage source for power supply. The independent voltage source can be a power supply device, converting Single-Phase AC 110V / 220V, 50 / 60Hz to DC 24V. During the installation, the input side of power supply should include a circuit protection with no fuse breaker, and selection of non-fuse switch must meet the specifications of the power supply, otherwise it will not be able to protect the circuit.

Power System Wiring diagram



Circuit Protection Switch
(Fuse), Rated Current = 1.1A

Warning

When the input voltage of Lubricator is higher than specified voltage, this will cause damage to the lubricator.

4.2 Instruction of Hand-Set

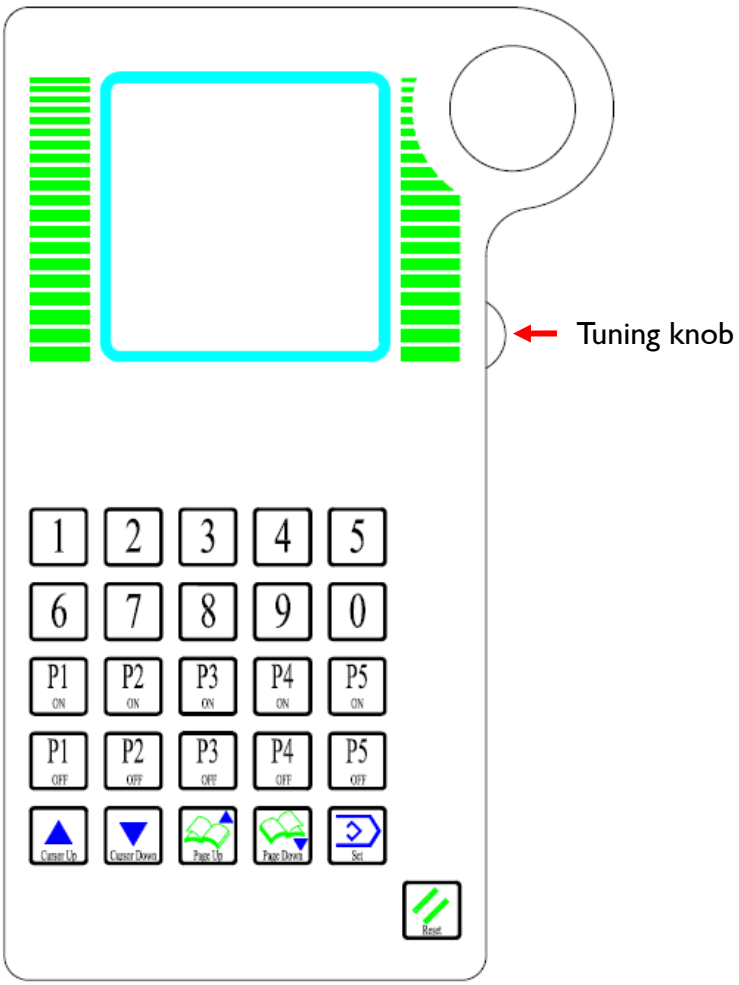
Lubricator Hand-Set has a friendly interface design, and easy to allow user to quickly install, operate, and set functions according to user needs. A brief overview are as follows:

- Setting of Lubricator timing and oiling frequency
- Both display screen symbol & Key pad are the same
- Self-Monitoring system (While operating, fault / error can be detected anytime to avoid damage the lubricator)
- All parameters stored in EEPROM (No loss of stored data when power is OFF)

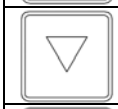
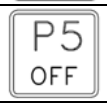
Note

For Hand-Set setting,APEX defined Pump P1 oil supply outlets as 1.1 and 1.2; Pump P2 oil supply outlets as 2.1 and 2.2; Pump P3 oil supply outlets as 3.1 and 3.2; Pump P4 oil supply outlets as 4.1 and 4.2; Pump P5 oil supply outlets as 5.1 and 5.2

Hand-Set Top View



4.3 Function of Hand-Set

	Numerical Key1		Set
	Numerical Key2		System Reset
	Numerical Key3		Pump 1 continuous dispensing
	Numerical Key4		Pump 2 continuous dispensing
	Numerical Key5		Pump 3 continuous dispensing
	Numerical Key6		Pump 4 continuous dispensing
	Numerical Key7		Pump 5 continuous dispensing
	Numerical Key8		Pump 1 stop dispensing
	Numerical Key9		Pump 2 stop dispensing
	Numerical Key0		Pump 3 stop dispensing
	Cursor Up		Pump 4 stop dispensing
	Cursor Down		Pump 5 stop dispensing
	Page Up	Tuning knob	Adjust the screen brightness
	Page Down		

4.4 Display Screen of Hand-Set

S1	S5	S9
 APEX DYNAMICS, INC. Key in password： ‖ * * * * ‖ M:1.00 T:1.00 Press ↵ to confirm	Power voltage: 24.0 P1 cycle and timer： cycle: 000001 Timer: 0000001 P2 cycle and timer： cycle: 000001 Timer: 0000001 page up page down	Clear motor timer: 0 Operating code use: 0 Operating code: 1234 page up page down
S2	**S6**	**S10**
Mode Selection： 0 0 : PLC 1 : TIMER 2: : PLC P1 cycle： 000 days 00 hours 00 minutes P1 motion： 01 times P2 cycle： 000 days 00 hours 00 minutes P2 motion： 01 times page up page down	P3 cycle and timer： cycle: 000001 Timer: 0000001 P4 cycle and timer： cycle: 000001 Timer: 0000001 page up page down	Error message 1-5 page up page down
S3	**S7**	**S11**
P3cycle： 000 days 00 hours 00 minutes P3 motion： 01 times P4 cycle： 000 days 00 hours 00 minutes P4 motion： 01 times page up page down	P5 cycle and timer： cycle: 000001 Timer: 0000001 page up page down	Error message 6-10 page up page down
S4	**S8**	**S12**
P5cycle： 000 days 00 hours 00 minutes P5 motion： 01 times page up page down	Language Display(語文版本)：0 0:English (英文) 1:Chinese (中文) page up page down	utput signal mode: 0 Clear memory： 0 Error detective：0 Error counter：01 Operating mode：00 page up page down

S13	S17	S21
P1 ADC parameter: 00 P2 ADC parameter: 00 P3 ADC parameter: 00 P4 ADC parameter: 00 P5 ADC parameter: 00 Unauthorized setting prohibition	Power voltage: 24.0 P1 cycle and timer： cycle: 000001 Timer: 0000001 P2 cycle and timer： cycle: 000001 Timer: 0000001 2.2 operating page up page down	P3 cycle and timer： cycle: 000001 Timer: 0000001 P4 cycle and timer： cycle: 000001 Timer: 0000001 4.2 operating page up page down
S14	**S18**	**S22**
Power voltage: 24.0 P1 cycle and timer： cycle: 000001 Timer: 0000001 P2 cycle and timer： cycle: 000001 Timer: 0000001 1.1 operating page up page down	P3 cycle and timer： cycle: 000001 Timer: 0000001 P4 cycle and timer： cycle: 000001 Timer: 0000001 3.1 operating page up page down	P5 cycle and timer： cycle: 000001 Timer: 0000001 5.1 operating page up page down
S15	**S19**	**S23**
Power voltage: 24.0 P1 cycle and timer： cycle: 000001 Timer: 0000001 P2 cycle and timer： cycle: 000001 Timer: 0000001 1.2 operating page up page down	P3 cycle and timer： cycle: 000001 Timer: 0000001 P4 cycle and timer： cycle: 000001 Timer: 0000001 3.2 operating page up page down	P5 cycle and timer： cycle: 000001 Timer: 0000001 5.2 operating page up page down
S16	**S20**	**S24**
Power voltage: 24.0 P1 cycle and timer： cycle: 000001 Timer: 0000001 P2 cycle and timer： cycle: 000001 Timer: 0000001 2.1 operating page up page down	P3 cycle and timer： cycle: 000001 Timer: 0000001 P4 cycle and timer： cycle: 000001 Timer: 0000001 4.1 operating page up page down	Power voltage: 24.0 P1 cycle and timer： cycle: 000001 Timer: 0000001 P2 cycle and timer： cycle: 000001 Timer: 0000001 P1 motor idling page up page down

S25	S29	S33
Power voltage: 24.0 P1 cycle and timer： cycle: 000001 Timer: 0000001 P2 cycle and timer： cycle: 000001 Timer: 0000001 P2 motor idling page up page down	Power voltage: 24.0 P1 cycle and timer： cycle: 000001 Timer: 0000001 P2 cycle and timer： cycle: 000001 Timer: 0000001 Motor1 or pipe block page up page down	P5 cycle and timer： cycle: 000001 Timer: 0000001 Motor5 or pipe block page up page down
S26	**S30**	**S34**
P3 cycle and timer： cycle: 000001 Timer: 0000001 P4 cycle and timer： cycle: 000001 Timer: 0000001 P3 motor idling page up page down	Power voltage: 24.0 P1 cycle and timer： cycle: 000001 Timer: 0000001 P2 cycle and timer： cycle: 000001 Timer: 0000001 Motor2 or pipe block page up page down	Power voltage: 24.0 P1 cycle and timer： cycle: 000001 Timer: 0000001 P2 cycle and timer： cycle: 000001 Timer: 0000001 Grease exhausted page up page down
S27	**S31**	**S35**
P3 cycle and timer： cycle: 000001 Timer: 0000001 P4 cycle and timer： cycle: 000001 Timer: 0000001 P4 motor idling page up page down	P3 cycle and timer： cycle: 000001 Timer: 0000001 P4 cycle and timer： cycle: 000001 Timer: 0000001 Motor3 or pipe block page up page down	Power voltage: 24.0 P1 cycle and timer： cycle: 000001 Timer: 0000001 P2 cycle and timer： cycle: 000001 Timer: 0000001 Memory reading error page up page down
S28	**S32**	**S36**
P5 cycle and timer： cycle: 000001 Timer: 0000001 P5 motor idling page up page down	P3 cycle and timer： cycle: 000001 Timer: 0000001 P4 cycle and timer： cycle: 000001 Timer: 0000001 Motor4 or pipe block page up page down	Power voltage: 24.0 P1 cycle and timer： cycle: 000001 Timer: 0000001 P2 cycle and timer： cycle: 000001 Timer: 0000001 Memory writing error page up page down

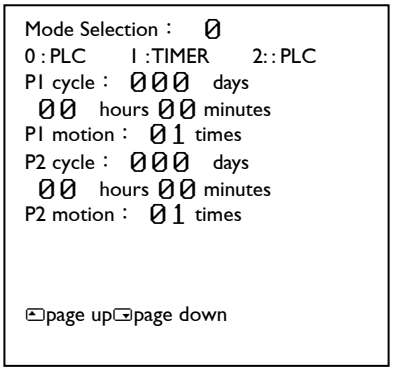
S37		
Power voltage: 24.0 P1 cycle and timer： cycle: 000001 Timer: 0000001 P2 cycle and timer： cycle: 000001 Timer: 0000001 INVALID COMMAND page up page down		
S38		
Power voltage: 24.0 P1 cycle and timer： cycle: 000001 Timer: 0000001 P2 cycle and timer： cycle: 000001 Timer: 0000001 Use in timer mode page up page down		
S39		
Mode Selection： 0 0 : PLC 1 : TIMER 2: : PLC P1 cycle： 000 days 00 hours 00 minutes P1 motion： 01 times P2 cycle： 000 days 00 hours 00 minutes P2 motion： 01 times RANGE 1~99 page up page down		
S40		
Mode Selection： 0 0 : PLC 1 : TIMER 2: : PLC P1 cycle： 000 days 00 hours 00 minutes P1 motion： 01 times P2 cycle： 000 days 00 hours 00 minutes P2 motion： 01 times Lubricator stop page up page down		

4.5 Procedure of Set-Up

S1

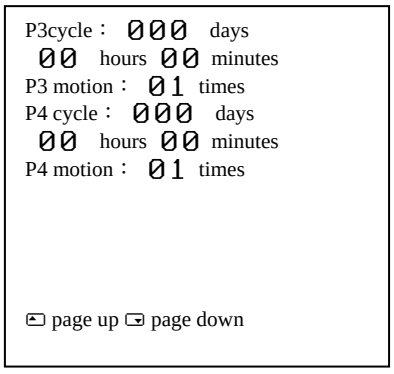
Press Set

S2



Press Page down

S3



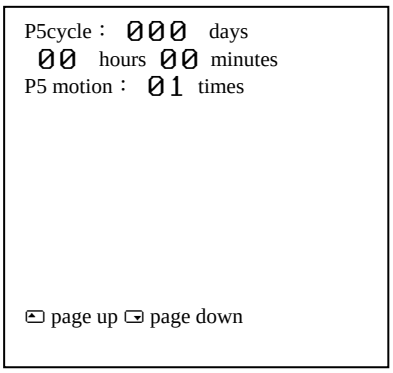
Press Page down

S1 screen will display on Hand-Set when connected to power of lubricator, enter password to go to next setting. The default setting of password is 1234.

1. Select Mode: Setting the lubricator control mode, 0 is the PLC mode 0 control. For details, please refer to Chapter 3: 1 is TIMER mode 1 control. detailed description refer to "Section 4.6.1". 2 is PLC mode 2 control, detailed description refer "Section 4.6.2". When setting mode 0 or mode 2, P1, P2 action override and period, the parameter value cannot be set.
2. P1 Cycle : Set P1 Cycle Time to begin supply Oil at Outlet. 1.1 or 1.2
3. P1 Motion : Set P1 motion 1 stroke per outlet dispenses 0.15cm^3 after countdown of P1 cycle time.
4. P2 Cycle : Set P2 Cycle Time to begin supply Oil at Outlet. 2.1 or 2.2
5. P2 Motion : Set P2 motion 1 stroke per outlet dispenses 0.15 cm^3 after countdown of P2 cycle time.

1. P3 Cycle : Set P3 Cycle Time to begin supply Oil at Outlet. 3.1 or 3.2
2. P3 Motion : Set P3 motion 1 stroke per outlet dispenses 0.15cm^3 after countdown of P3cycle time.
3. P4 Cycle : Set P4 Cycle Time to begin supply Oil at Outlet. 4.1 or 4.2
4. P4 Motion : Set P4 motion 1 stroke per outlet dispenses 0.15cm^3 after countdown of P4 cycle time.

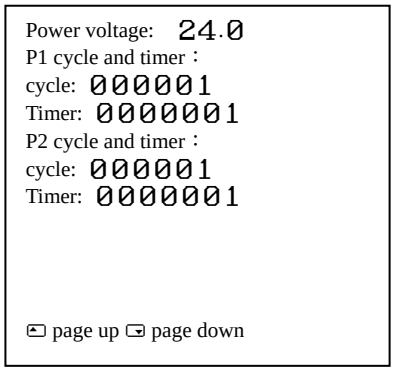
S4



1. P5 Cycle : Set P5 Cycle Time to begin supply Oil at Outlet. 5.1 or 5.2
2. P5 Motion : Set P5 motion 1 stroke per outlet dispenses 0.15cm^3 after countdown of P5 cycle time.

Press Page down

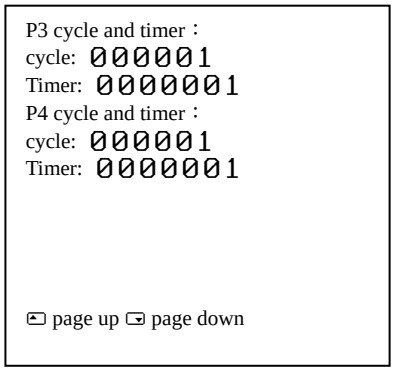
S5



1. Power Voltage:
   Show the input voltage of lubricantor. When the display show 24V means the input voltage is 24V currently.
2. P1 cycle :
   Record the cumulative cycle time of P1 pump
3. P1 Timer:
   Show the countdown of P1 outlet dispense. The unit is minute.
4. P2 cycle :
   Record the cumulative cycle time of P2 pump
5. P2 Timer:
   Show the countdown of P2 outlet dispense. The unit is minute.

Press Page down

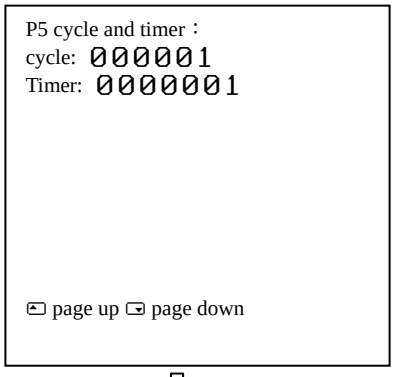
S6



1. P3 cycle :
   Record the cumulative cycle time of P3 pump
2. P3 Timer:
   Show the countdown of P3 outlet dispense. The unit is minute.
3. P4 cycle :
   Record the cumulative cycle time of P4 pump
4. P4 Timer:
   Show the countdown of P4 outlet dispense. The unit is minute.

Press Page down

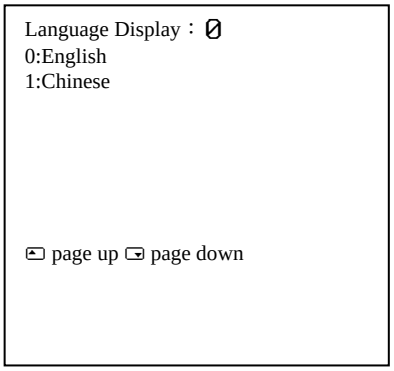
S7



1. P5 cycle :
   Record the cumulative cycle time of P5 pump
2. P5 Timer:
   Show the countdown of P5 outlet dispense. The unit is minute.

Press Page down

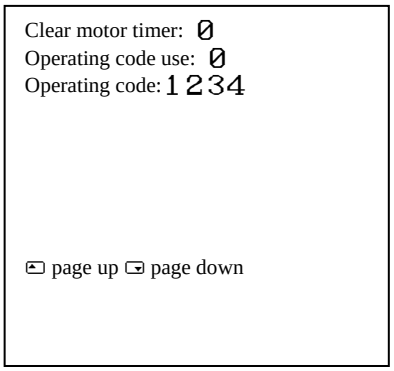
S8



Hand-Set Language display setting key 0 for English or 1 for Chinese then press SET.

Press Page down

S9



1. Clear motor timer records:

Press Set 1 to clear the total strokes record to 0 times of pump 1, pump 2, pump 3, pump 4 and pump 5.

2. Password setting option:

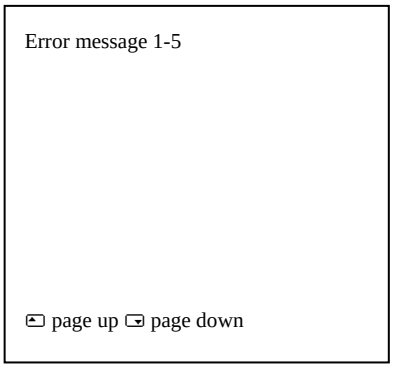
Press Set 1 to activate and 0 as inactive.

3. Modify the password:

Press Set 1 to modify the password.

Press Page down

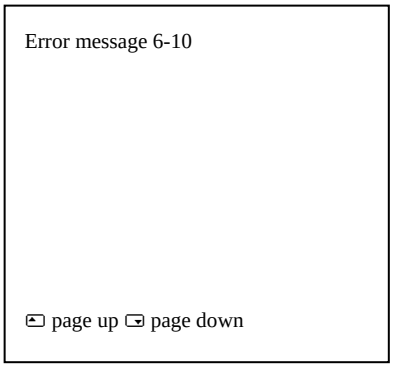
S10



Show the error message history records from Items 1 to 5.

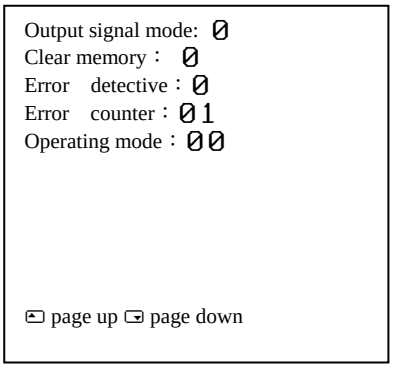
Press Page down

S11



Show the error message history records from Items 6 to 10.

S12



Press correct password on S1 display screen will go to S8 setting screen.
Password is 7890.

1. Output signal mode:

Setting up to 0 for PLC mode 0 and PLC mode 2 control: setting up to 1 for TIMER mode 1.

2. Clear Memory:

Press 1 to allow system initialization (Note: all parameters and information will become manufacturer setting) , Press 0 system will not initialize.

3. Error detective:

Press 1 system will monitor motor idling error; Press 0 system will not detect motor idling error.

4. Error counter:

Press the no. of times to set function "motor error detection times". When Motor error reached setting "error detection times", System will display error information. But this function should be used under error detective function is activated.

5. Operating mode:

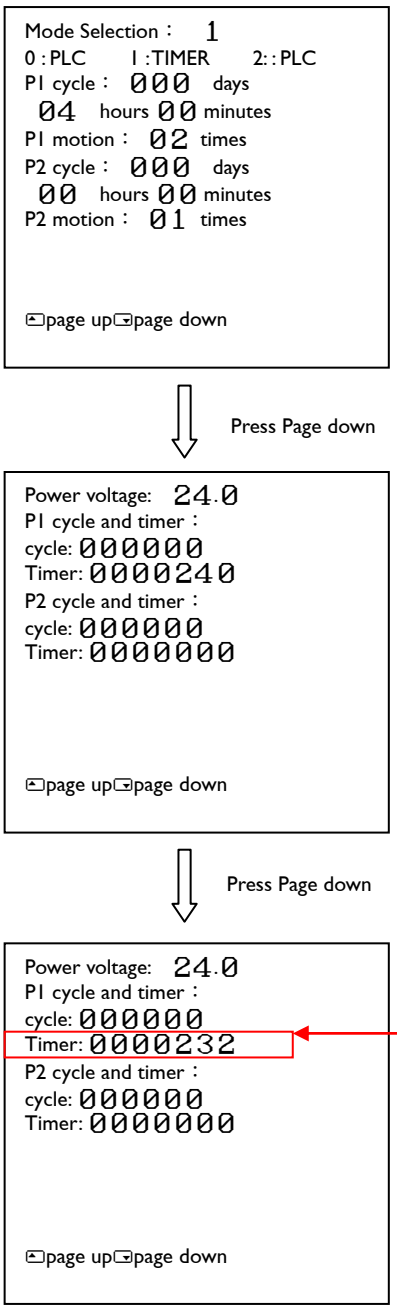
Press 00 for Standard setting, or for customized demand settings.

4.6 Instruction of System Mode

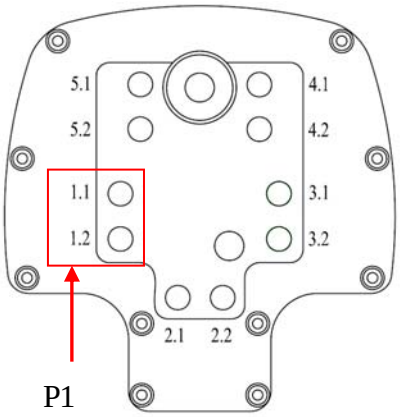
4.6.1 Instruction of TIMER Mode 1

After selecting TIMER Mode, use Hand-Set to set oiling frequency interval and timing. Below are operating examples of each model. When the Lubricator is powered off, please note that the counting time of the device will restart.

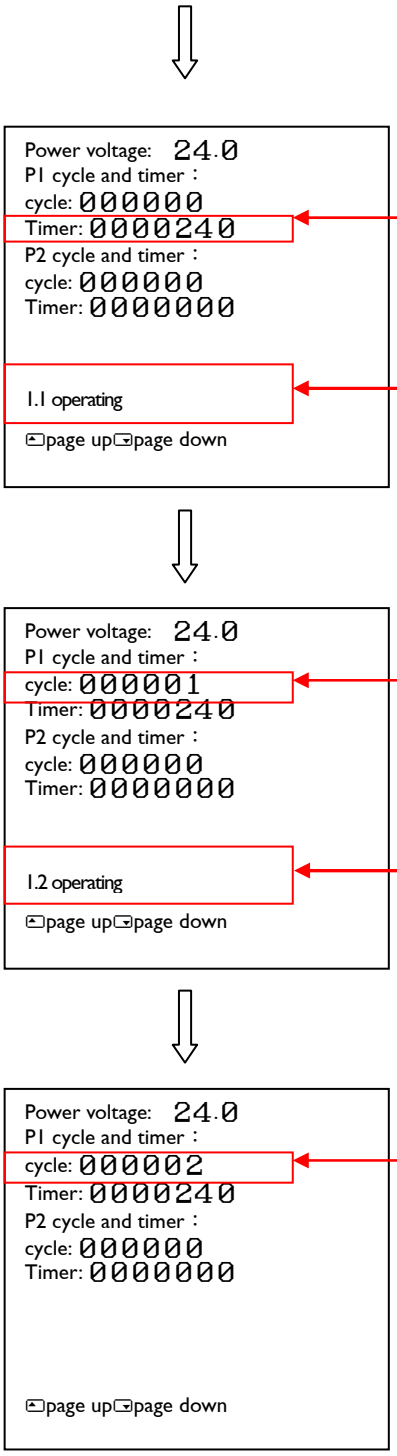
4.6.1.1 Pump 1 dispensing setting



Select 1 Timer Mode, then set P1 cycle time 4hours and P1 motion 2 times. This means after 4 hours P1 will push 2 strokes at outlet 1.1 and 1.2 alternately with each outlet 1.1 & 1.2 dispensing 0.15 cm^3, total oil 0.3cm^3



Time elapsed 8 minutes



Timer countdown finishes, system restarts countdown again

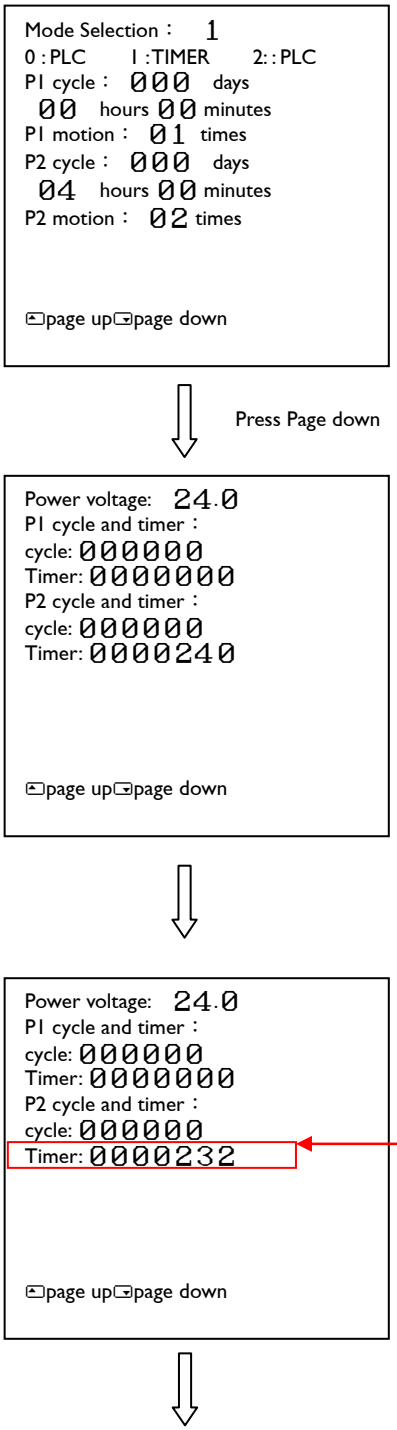
Pump 1 begins dispensing oil 0.15 cm^3 at outlet 1.1

P1 cycle records 1 cycle as total no. of stroke

Pump 1 begins dispensing oil 0.15 cm^3at outlet 1.2

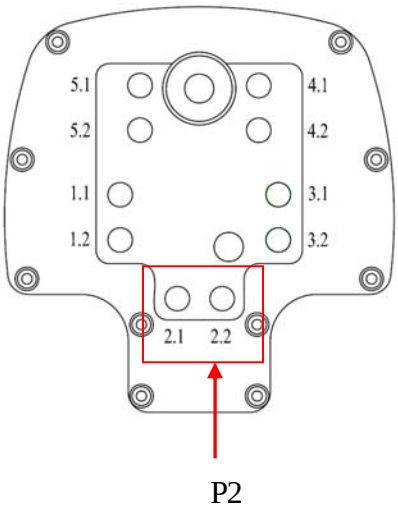
P1 cycle records 2 cycles as total no. of stroke with each outlet 1.1 & 1.2 dispensing 0.15 cm^3 total grease 0.3cm^3

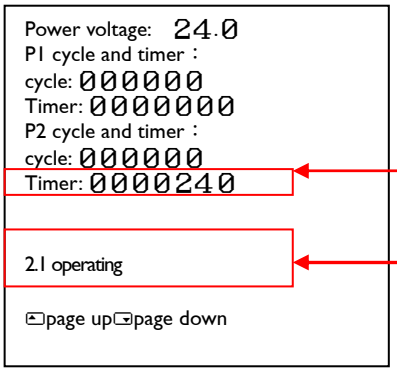
4.6.1.2 Pump 2 dispensing setting



Time elapsed 8 minutes

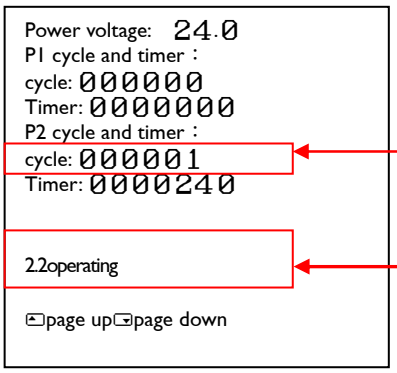
Select 1 Timer Mode, then set P2 cycle time 4hours and P2 motion 2 times. This means after 4 hours P2 will push 2 strokes at outlet 2.1 and 2.2 alternately with each outlet 2.1 & 2.2 dispensing 0.15 cm^3, total oil 0.3cm^3





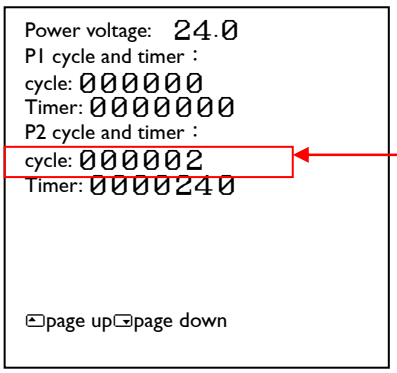
Timer countdown finishes, system restarts countdown again.

Pump 2 begins dispensing oil 0.15 cm^3at outlet 2.1.



P2 cycle records 1 cycle as total no. of stroke

Pump 2 begins dispensing oil 0.15 cm^3at outlet 2.2.



P2 cycle records 2 cycles as total no. of stroke with each outlet 2.1 & 2.2 dispensing 0.15 cm^3 total grease 0.3cm^3

4.6.1.3 Pump 3 dispensing setting

Mode Selection： 1
0 : PLC 1 : TIMER 2: : PLC
P1 cycle： 000 days
00 hours 00 minutes
P1 motion： 01 times
P2 cycle： 000 days
00 hours 00 minutes
P2 motion： 01 times

page up page down

Press Page down

P3cycle： 000 days
04 hours 00 minutes
P3 motion： 02 times
P4 cycle： 000 days
00 hours 00 minutes
P4 motion： 01 times

page up page down

Press Page down

P3 cycle and timer：
cycle: 000000
Timer: 0000240
P4 cycle and timer：
cycle: 000000
Timer: 0000000

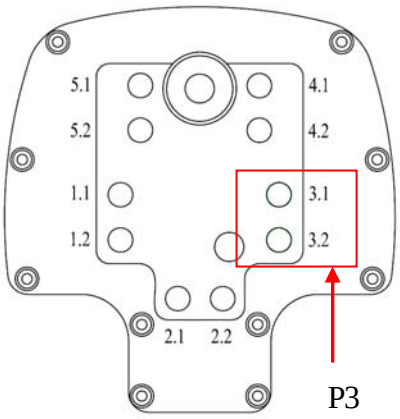
page up page down

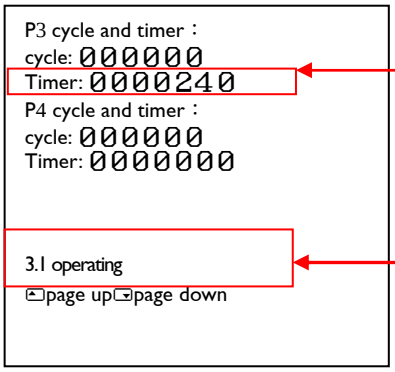
P3 cycle and timer：
cycle: 000000
Timer: 0000232
P4 cycle and timer：
cycle: 000000
Timer: 0000000

page up page down

Time elapsed 8 minutes

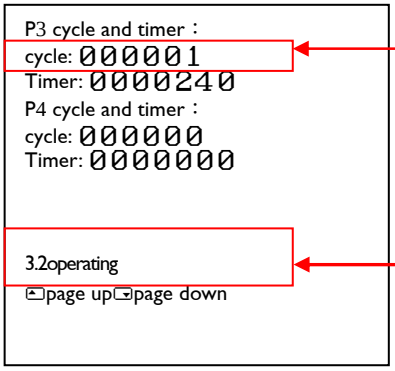
Select 1 Timer Mode, then set P3cycle time 4hours and P3 motion 2 times. This means after 4 hours P3 will push 2 strokes at outlet 3.1 and 3.2 alternately with each outlet 3.1 & 3.2 dispensing 0.15 cm^3, total oil 0.3cm^3





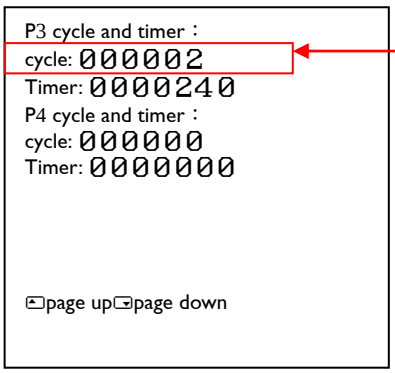
Timer countdown finishes, system restarts countdown again.

Pump 3 begins dispensing oil 0.15 cm^3 at outlet 3.1.



P3 cycle records 1 cycle as total no. of stroke

Pump 3 begins dispensing oil 0.15 cm^3at outlet 3.2.



P3 cycle records 2 cycles as total no. of stroke with each outlet 3.1 & 3.2 dispensing 0.15 cm^3 total oil 0.3cm^3

4.6.1.4 Pump 4 dispensing setting

Mode Selection： 1
0 : PLC 1 : TIMER 2: : PLC
P1 cycle： 000 days
00 hours 00 minutes
P1 motion： 01 times
P2 cycle： 000 days
00 hours 00 minutes
P2 motion： 01 times

page up page down

Press Page down

P3cycle： 000 days
00 hours 00 minutes
P3 motion： 01 times
P4 cycle： 000 days
04 hours 00 minutes
P4 motion： 02 times

page up page down

Press Page down

P3 cycle and timer：
cycle: 000000
Timer: 0000000
P4 cycle and timer：
cycle: 000000
Timer: 0000240

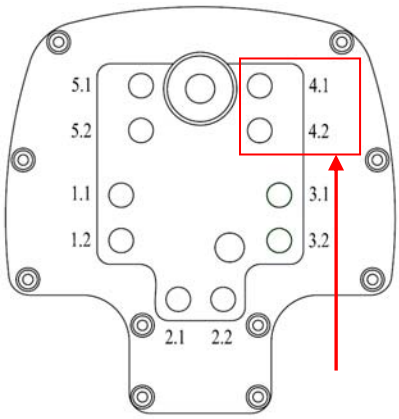
page up page down

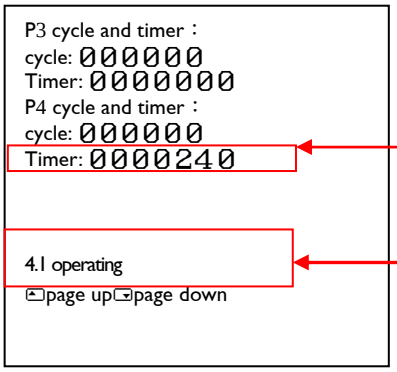
P3 cycle and timer：
cycle: 000000
Timer: 0000000
P4 cycle and timer：
cycle: 000000
Timer: 0000232

page up page down

Time elapsed 8 minutes

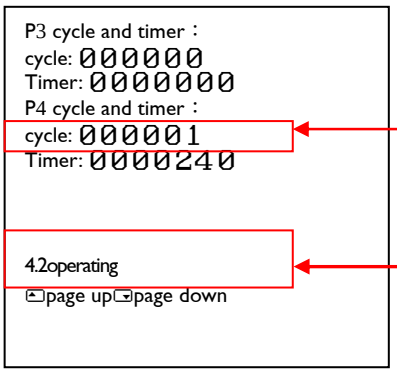
Select 1 Timer Mode, then set P4cycle time 4hours and P4 motion 2 times. This means after 4 hours P4 will push 2 strokes at outlet 4.1 and 4.2 alternately with each outlet 4.1 & 4.2 dispensing 0.15 cm^3, total oil 0.3cm^3





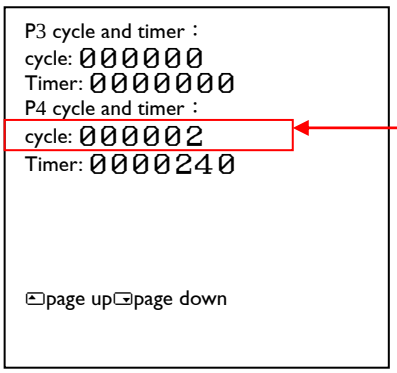
Timer countdown finishes, system restarts countdown again.

Pump 4 begins dispensing oil 0.15 cm^3 at outlet 4.1.



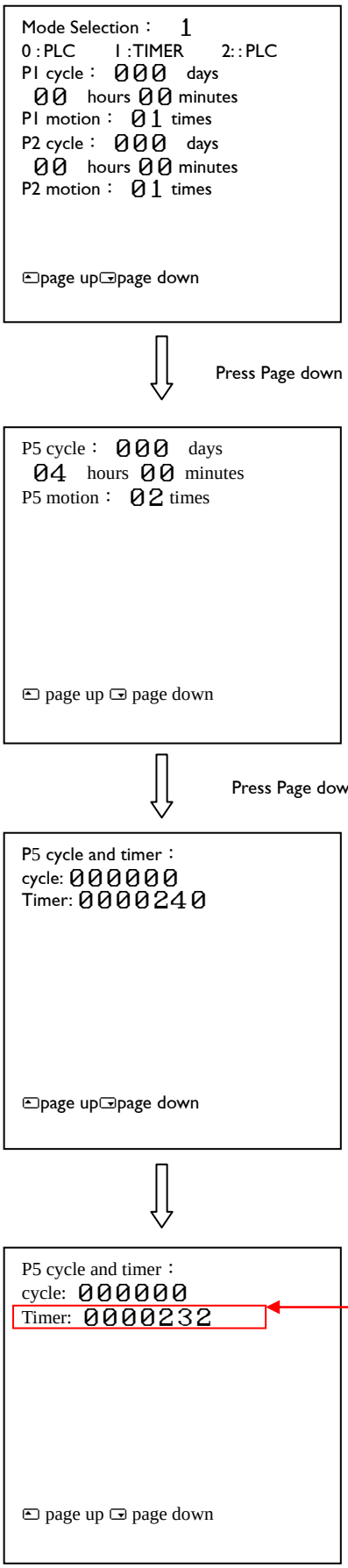
P4 cycle records 1 cycle as total no. of stroke

Pump 4 begins dispensing oil 0.15 cm^3at outlet 4.2.

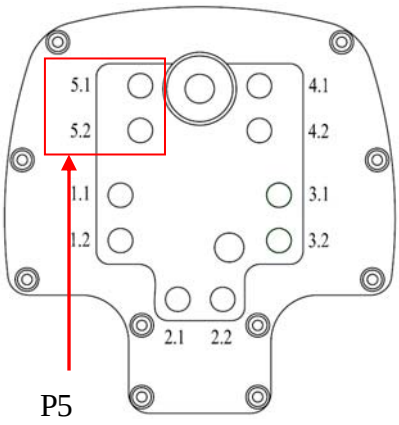


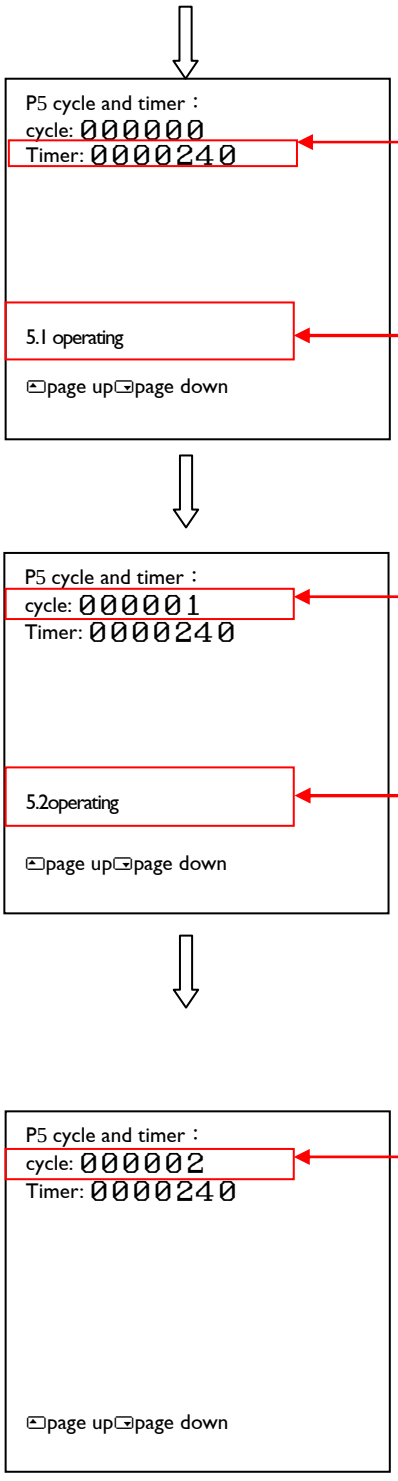
P4 cycle records 2 cycles as total no. of stroke with each outlet 4.1 & 4.2 dispensing 0.15 cm^3 total oil 0.3cm^3

4.6.1.5 Pump 5 dispensing setting



Select 1 Timer Mode, then set P5cycle time 4hours and P5 motion 2 times. This means after 4 hours P5 will push 2 strokes at outlet 5.1 and 5.2 alternately with each outlet 5.1 & 5.2 dispensing 0.15 cm^3, total oil 0.3cm^3





Timer countdown finishes, system restarts countdown again.

Pump 5 begins dispensing oil 0.15 cm^3 at outlet 5.1.

P5 cycle records 1 cycle as total no. of stroke

Pump 5 begins dispensing oil 0.15 cm^3at outlet 5.2.

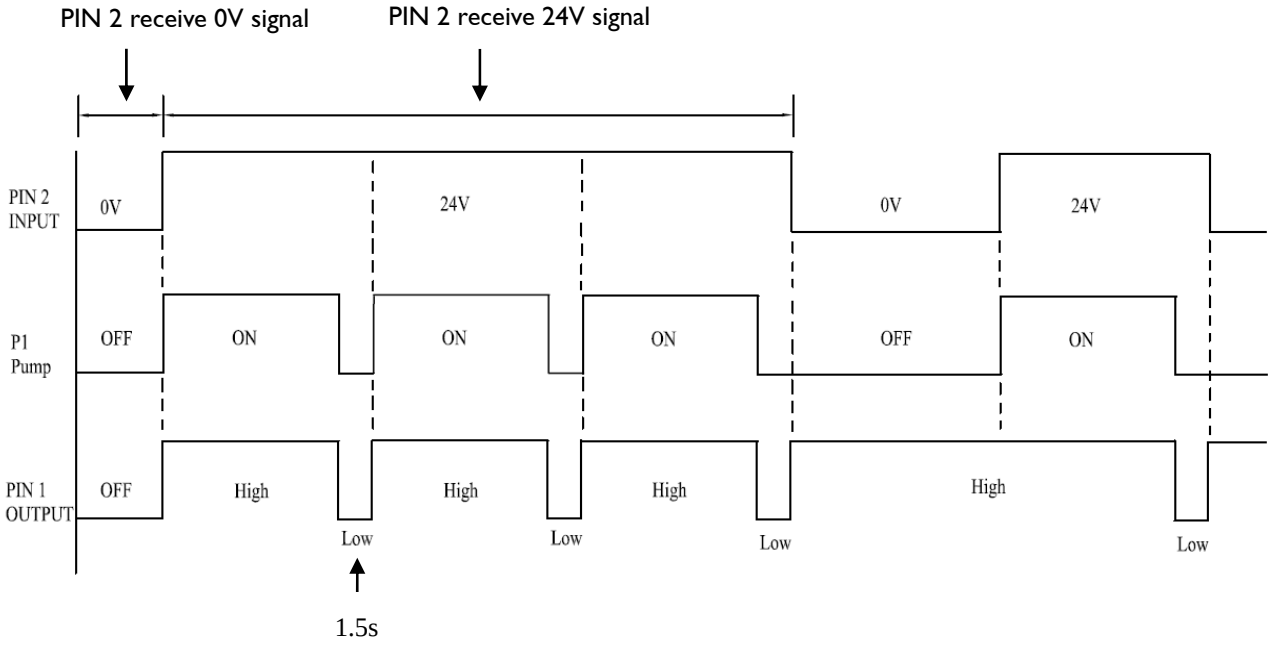
P5 cycle records 2 cycles as total no. of stroke with each outlet 5.1 & 5.2 dispensing 0.15 cm^3 total oil 0.3cm^3

4.6.2 Instruction of PLC Mode 2

The main purpose of PLC mode 2 control is to set up and input the duration time of the 24V signal which from PIN2 pin of lubricator power connector, and then can be control each oil outlet for oil dispense, and following the changed by output signal, notify PLC machine current situation of the lubricator, request to set up mode 2 if you need to use it, the following is the PLC mode 2 control schematic.

4.6.2.1 Model LUG-2102

PLC control diagram:



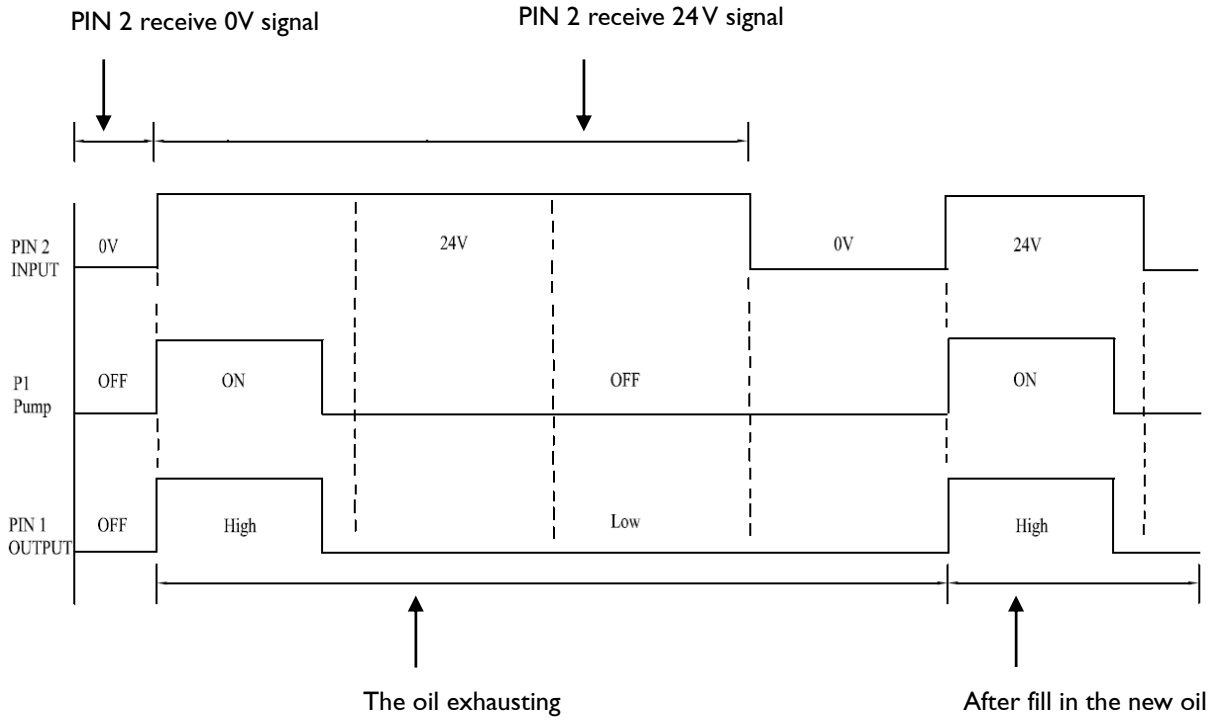
(1) Lubricator power ON, pump P1 outlet to dispense oil continuously when the PIN 2 receiving 24V signal. One stroke per outlet will dispense oil 0.15cm^3.

(2) When the pump P1 complete the dispensing 1 time, PIN 1 output signal changed from HIGH to LOW, the signal duration is 1.5s. This function is applied to inform PLC that the Lubricator has been accomplished dispensed 1 cycle time.

(3) When PIN 2 receiving the signal from 24V to 0V, pump 1 will stop dispensing. Meanwhile, PIN 1 output HIGH signal continuously.

It is known from the PLC mode 2 control diagram that the P1 oil outlet has the same oil dispensing time. Therefore, it is only requested to set the duration of the signal input to the PIN2 pin 24V to control the oil discharge times of the P1 oil outlet. The time taken for each dispensing of the outlet is 22S.

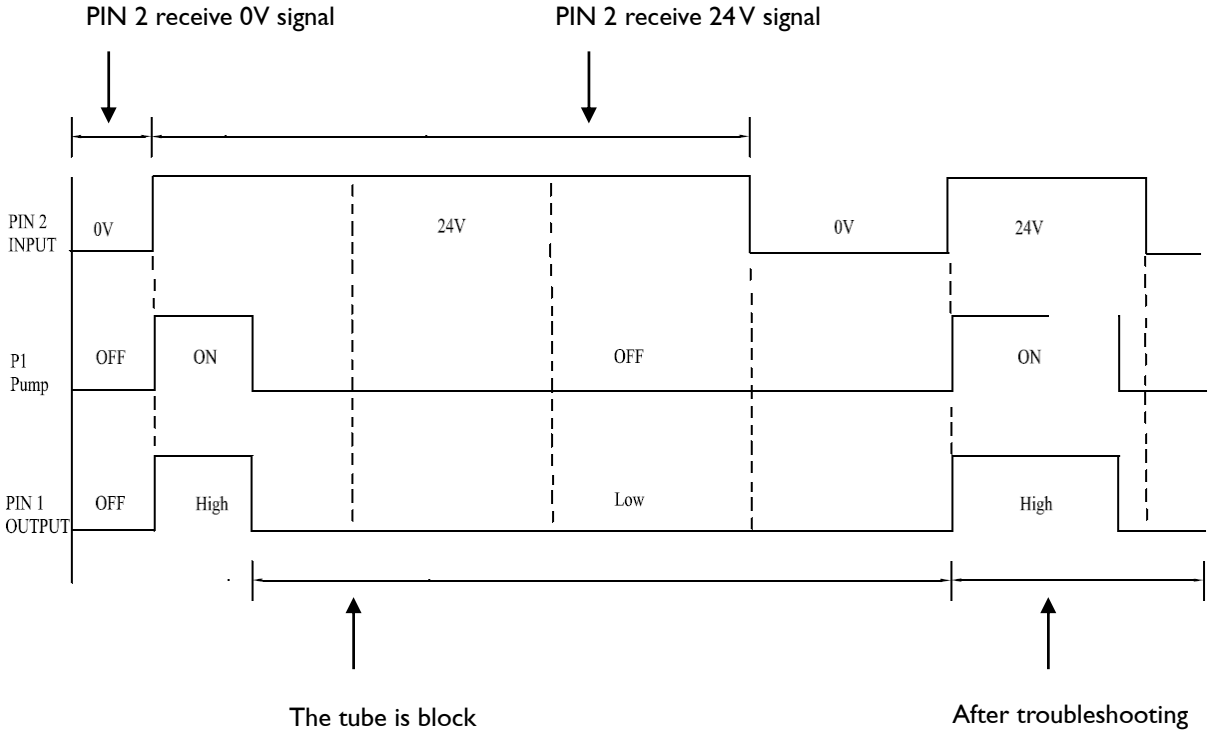
The signal waveform on PIN1 when oil exhausting:



(1) When lubricator detect the exhausting oil, and P1 will stops outlet oil, then PIN 1 will output the signal from HIGH to LOW which inform the user to replenish the oil.. During this duration, the pump 1 can not be dispensed.

(2) After replenish the oil into lubricator, PIN 1 will output the signal from LOW to HIGH, the pump 1 can restart to dispense the oil.

The signal waveform on PIN 1 when lubricator can not dispense (The tube is block)

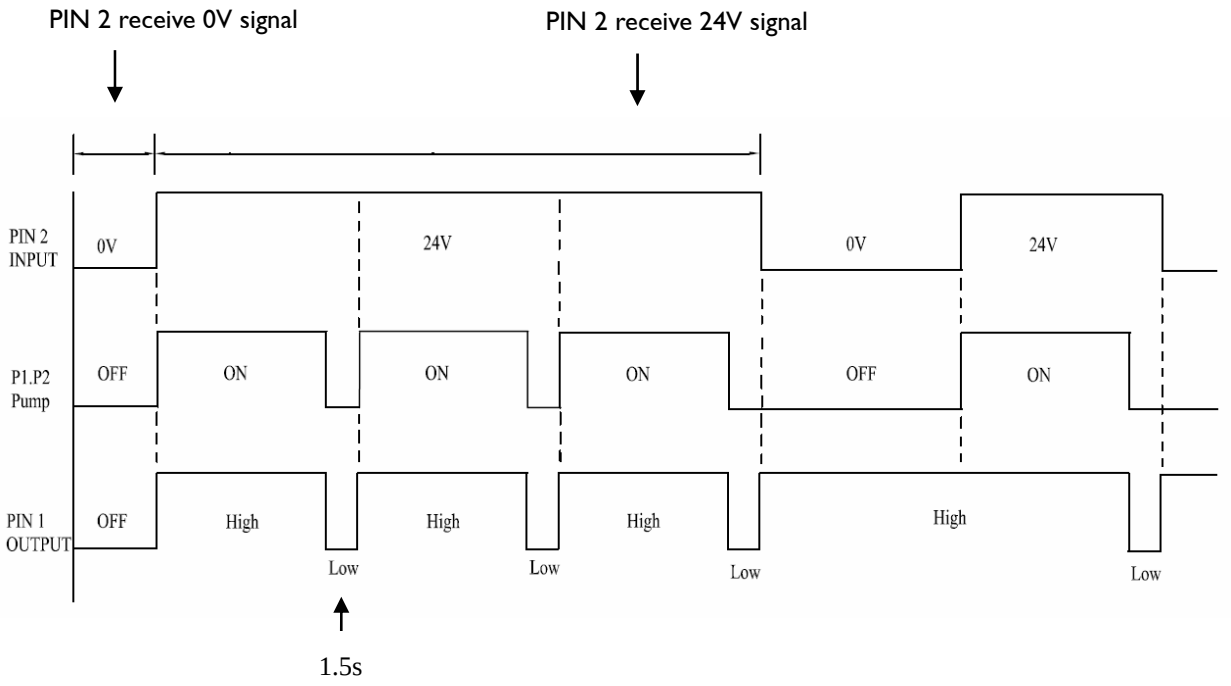


(1) When lubricator detect the malfunction (ex: the tube is block), PIN 1 will change the signal from HIGH to LOW, and stop dispense the oil.

(2) After troubleshooting, PIN 1 will change the signal from LOW to HIGH and restart to dispense the oil. The troubleshooting instruction please refer to page 73.

4.6.2.2 Model LUG-2204

PLC control diagram:



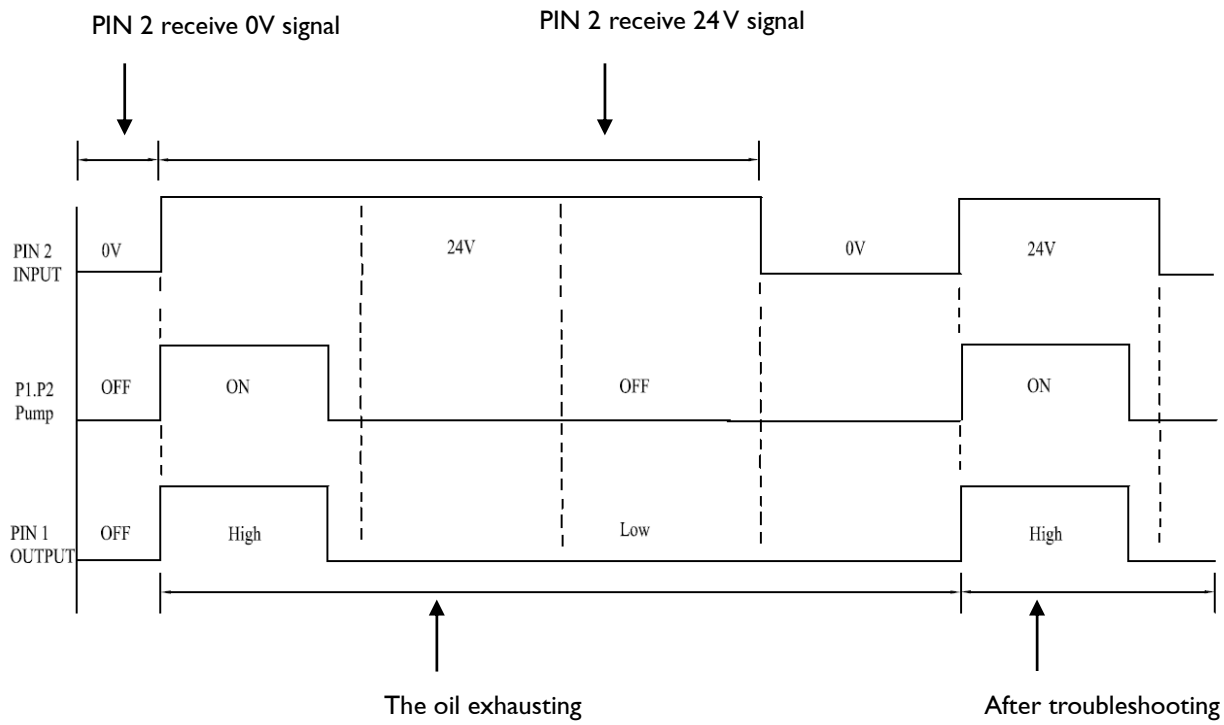
(1) Lubricator power ON, pump P1 and P2 outlet to dispense oil continuously when the PIN 2 receiving 24V signal. One stroke per outlet will dispense oil 0.15cm^3

(2) When the pump P1 and P2 complete the dispensing 1 time, PIN 1 output signal changed from HIGH to LOW, the signal duration is 1.5s. This function is applied to inform PLC that the Lubricator has been accomplished dispensed 1 cycle time.

(3) When PIN 2 receiving the signal from 24V to 0V, pump P1 and P2 will stop dispensing. Meanwhile, PIN 1 output signal HIGH continuously.

The duration is the same of one stroke per outlet of P1, P2, according to the PLC model 2 control diagram. Hence, we can control the stroke times per outlet for pump P1 and P2 by the duration of 24V signal on PIN 2. The duration of both Pump P1 and P2 are 44s for one stroke.

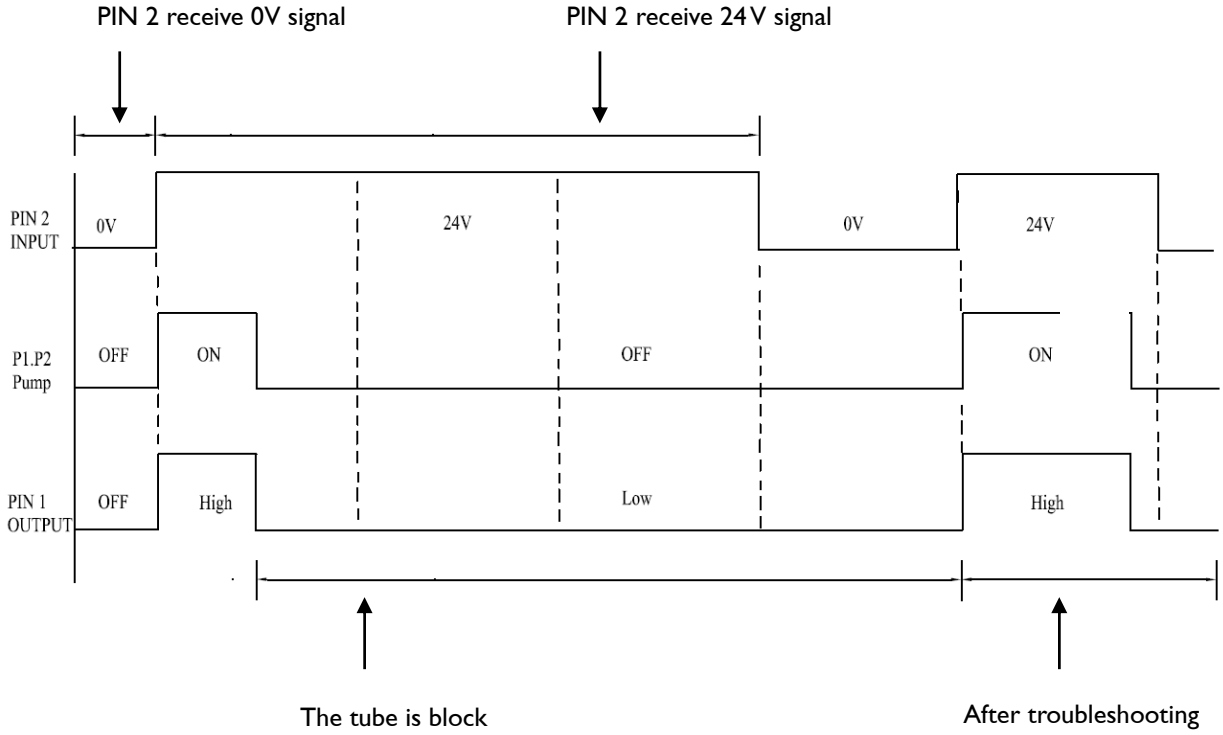
The signal waveform on PIN1 when oil exhausting:



(1) When lubricator detect the exhausting oil, and P1、P2 will stops outlet oil, then PIN 1 will output the signal from HIGH to LOW which inform the user to replenish the oil. During this duration, the pump P1 and P2 can not be dispensed.

(2) After replenish the oil into lubricator, PIN 1 will output the signal from LOW to HIGH. Meanwhile, the pump P1 and P2 can restart to dispense the oil.

The signal waveform on PIN 1 when lubricator can not dispense (The tube is block)

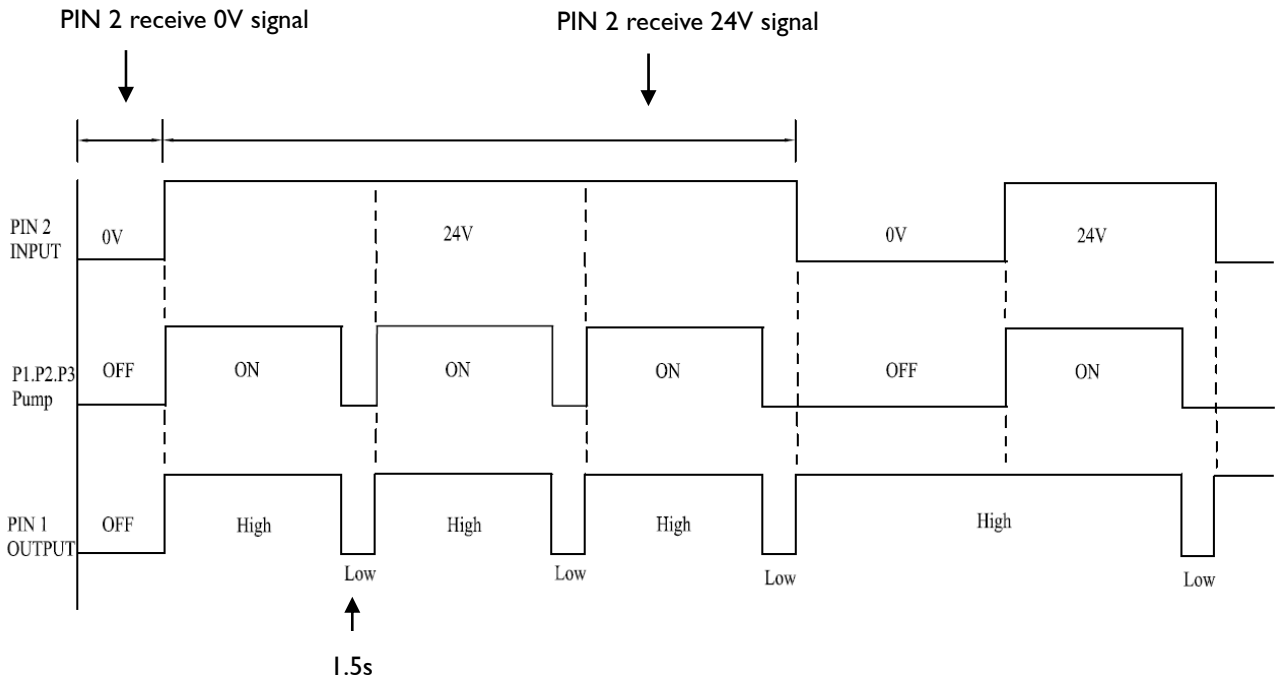


(1) When lubricator detect the malfunction (ex: the tube is block), pump P1 and P2 stop dispense the oil immediately. Meanwhile, PIN 1 will change the signal from HIGH to LOW for inform the malfunction message to user.

(2) After troubleshooting, PIN 1 will change the signal from LOW to HIGH. Meanwhile, pump P1 and P2 restart to dispense the oil. The troubleshooting instruction please refer to page 73.

4.6.2.3 Model LUG-2306

PLC control diagram:



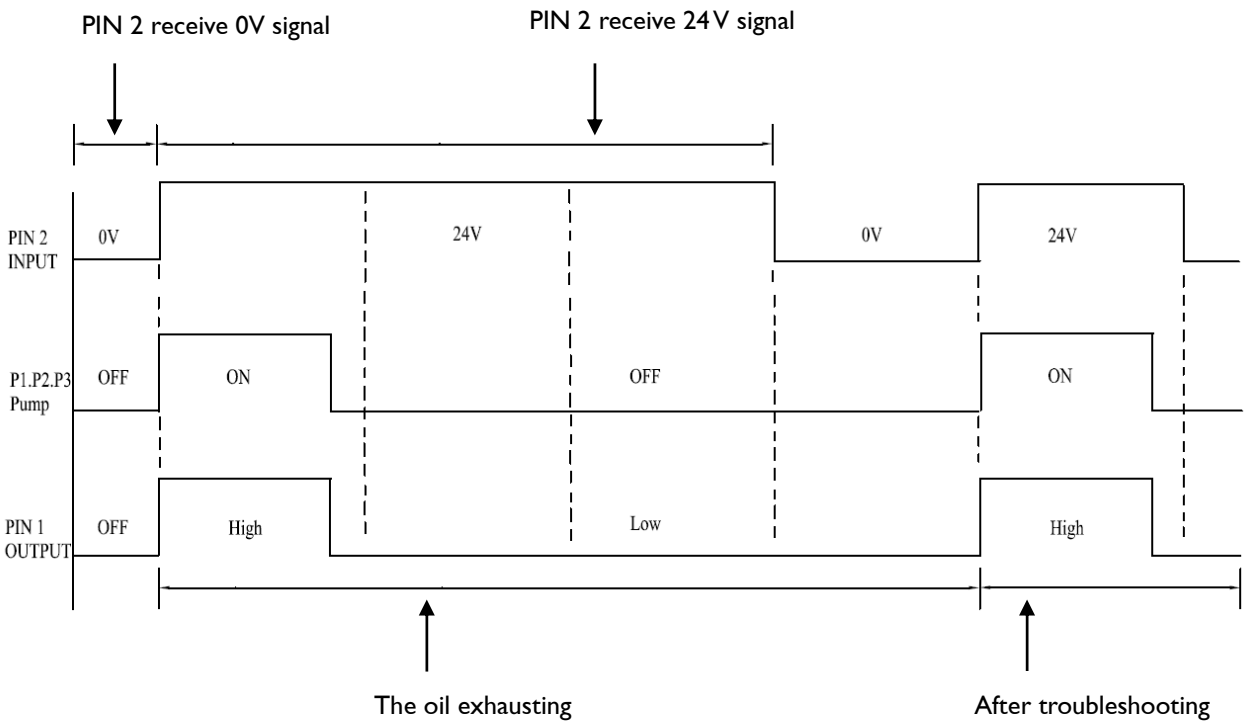
(1) Lubricator power ON, pump P1, P2 and P3 outlet to dispense oil continuously when the PIN 2 receiving 24V signal. One stroke per outlet will dispense oil 0.15cm^3.

(2) When the pump P1、P2 and P3 complete the dispensing 1 time, PIN 1 output signal changed from HIGH to LOW, the signal duration is 1.5s. This function is applied to inform PLC that the Lubricator has been accomplished dispensed 1 cycle time.

(3) When PIN 2 receiving the signal from 24V to 0V, pump P1, P2 and P3 will stop dispensing simultaneously. Meanwhile, PIN 1 output HIGH signal.

The duration is the same of one stroke per outlet of P1, P2, P3 according to the PLC model 2 control diagram. Hence, we can control the stroke times per outlet for pump P1 and P2 by the duration of 24V signal on PIN 2. The duration of both Pump P1、P2 and P3 are 66s for one stroke.

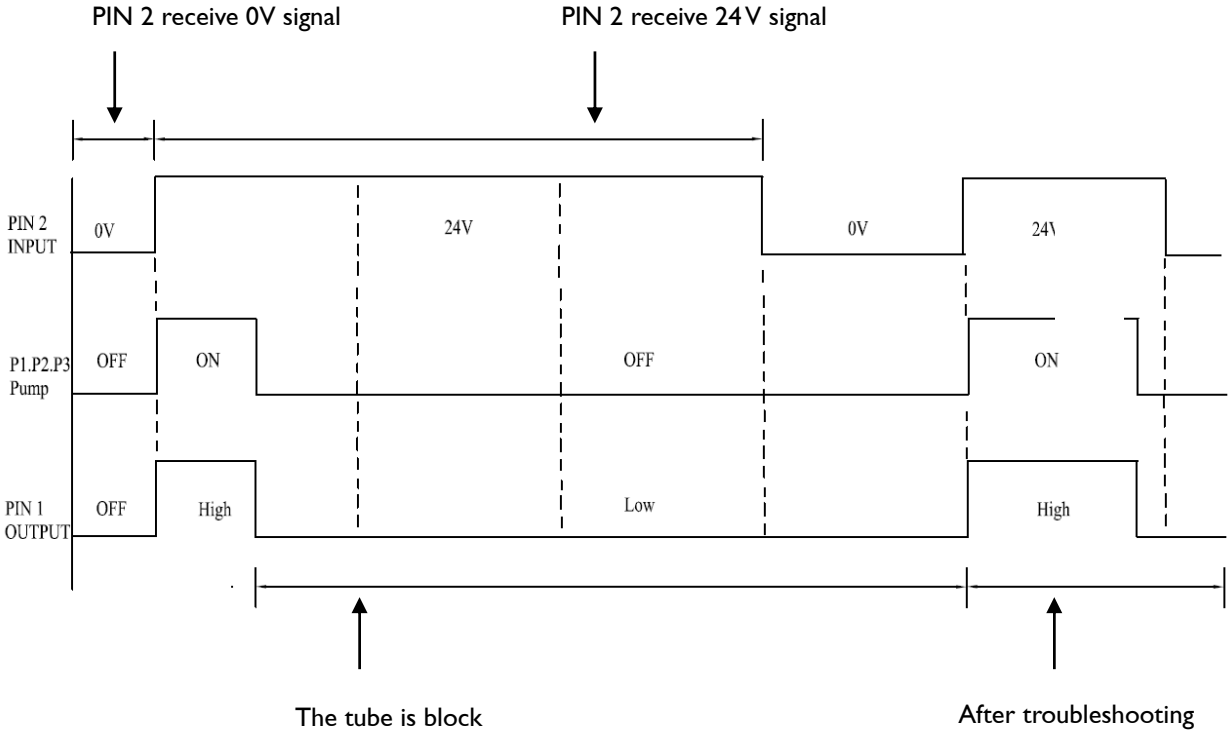
The signal waveform on PIN1 when oil exhausting:



(1) When lubricator detect the exhausting oil, and P1、P2、P3 will stops outlet oil, then PIN 1 will output the signal from HIGH to LOW which inform the user to replenish the oil. During this duration, the pump P1、P2 and P3 can not be dispensed.

(2) After replenish the oil into lubricator, PIN 1 will output the signal from LOW to HIGH, the pump P1, P2 and P3 can restart to dispense the oil.

The signal waveform on PIN 1 when lubricator can not dispense (The tube is block)

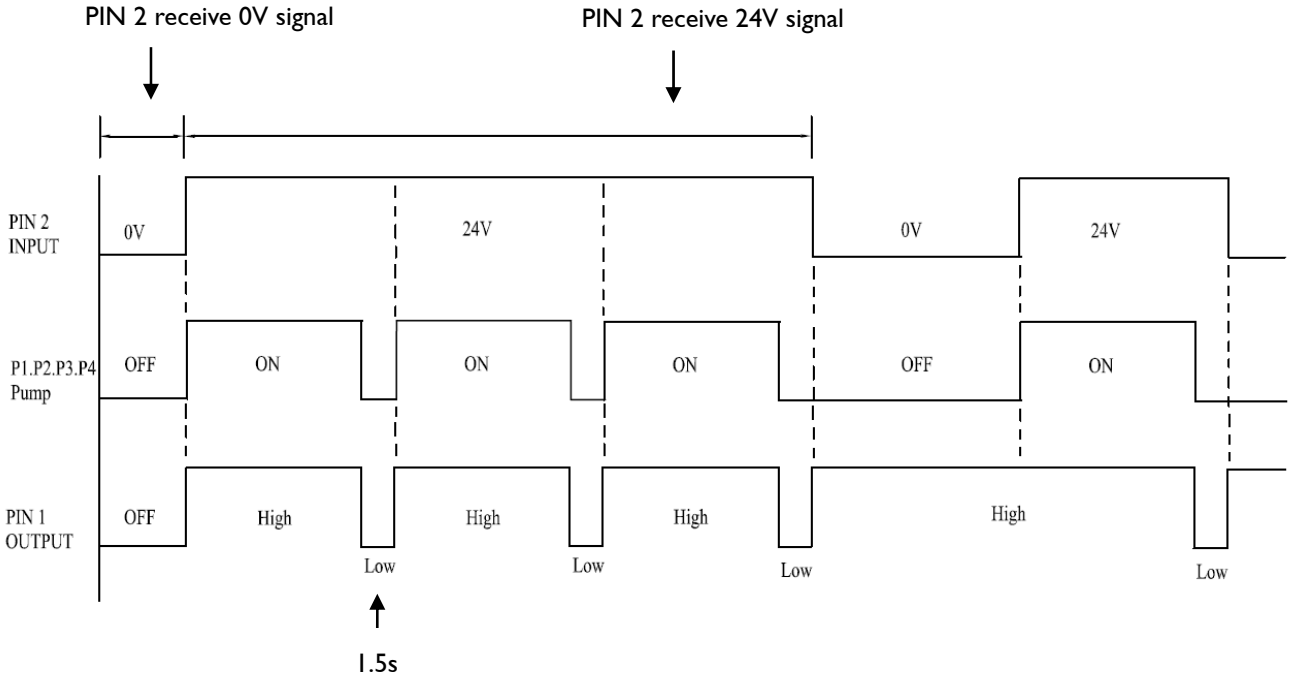


(1) When lubricator detect the malfunction (ex: the tube is block), pump P1, P2 and P3 stop dispense the oil immediately. Meanwhile, PIN 1 will change the signal from HIGH to LOW for inform the malfunction message to user.

(2) After troubleshooting, PIN 1 will change the signal from LOW to HIGH. Simultaneously, pump P1, P2 and P3 restart to dispense the oil. The troubleshooting instruction please refer to page 73.

4.6.2.4 Model LUG-2408

PLC control diagram:



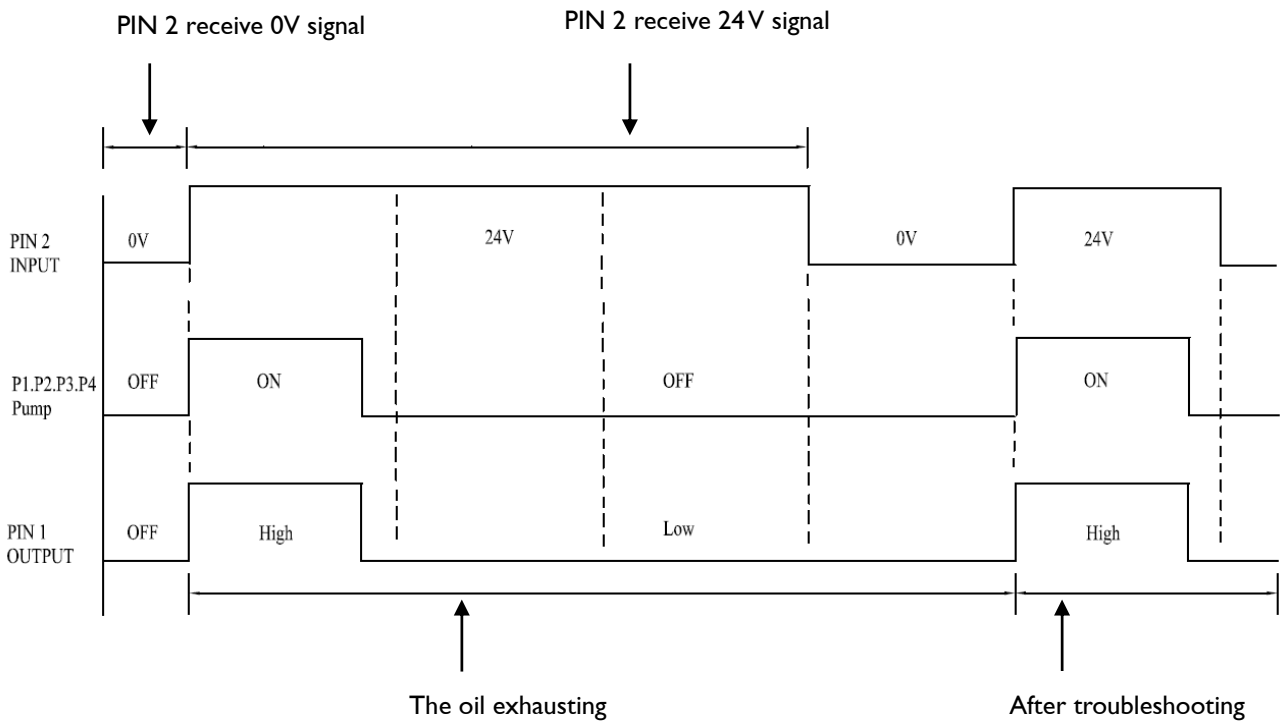
(1) Lubricator power ON, pump P1, P2, P3 and P4 outlet to dispense oil continuously when the PIN 2 receiving 24V signal. One stroke per outlet will dispense oil 0.15cm^3 individually.

(2) When the pump P1、P2、P3 and P4 complete the dispensing 1 time, PIN 1 output signal changed from HIGH to LOW, the signal duration is 1.5s. This function is applied to inform PLC that the Lubricator has been accomplished dispensed 1 cycle time.

(3) When PIN 2 receiving the signal from 24V to 0V, pump P1, P2, P3 and P4 pumps will stop dispensing. Meanwhile, PIN 1 output HIGH signal.

The duration is the same of one stroke per outlet of P1, P2, P3, P4 according to the PLC model 2 control diagram. Hence, we can control the stroke times per outlet for pump P1 and P2 by the duration of 24V signal on PIN 2. The duration of both Pump P1、P2、P3 and P4 are 88s for one stroke.

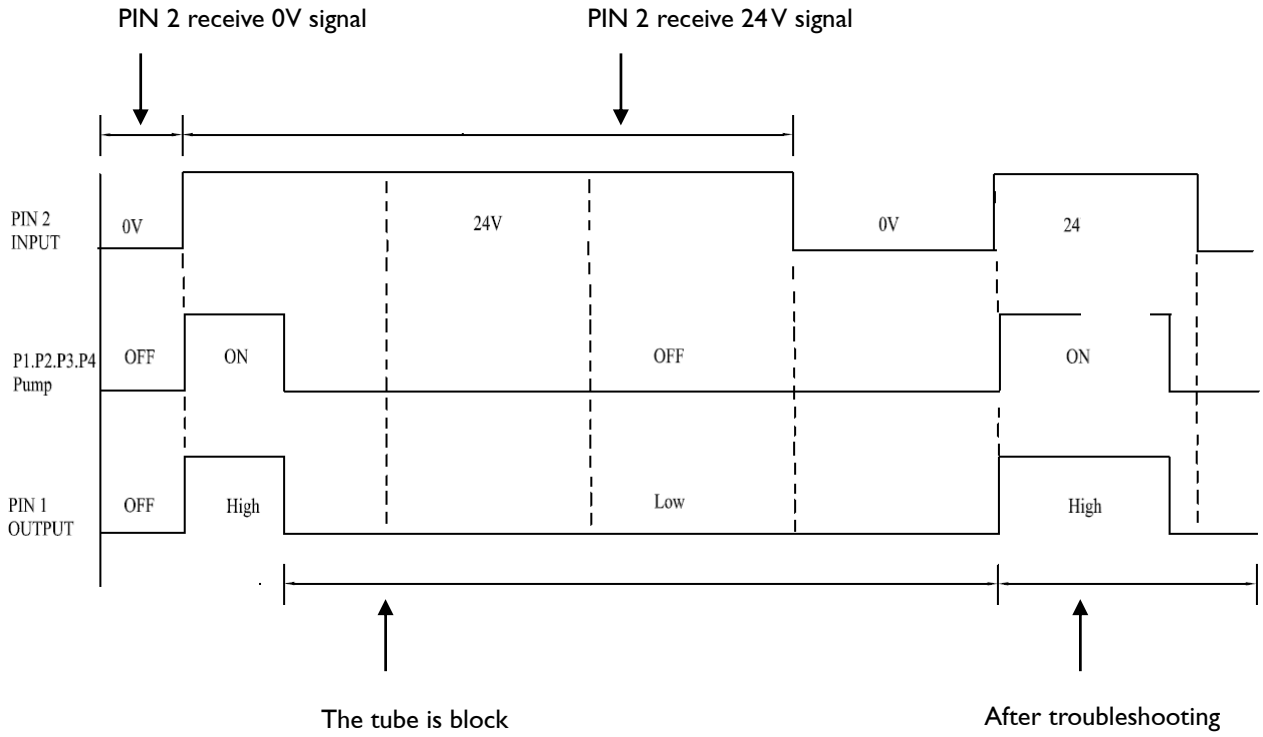
The signal waveform on PIN1 when oil exhausting:



(1) When lubricator detect the exhausting oil, and P1、P2、P3、P4 will stops outlet oil, then PIN 1 will output the signal from HIGH to LOW which inform the user to replenish the oil. During this duration, the pump P1、P2、P3 and P4 can not be dispensed.

(2) After replenish the lubricant into lubricator, PIN 1 will output the signal from LOW to HIGH. Meanwhile, the pump P1, P2, P3 and P4 can restart to dispense the oil.

The signal waveform on PIN 1 when lubricator can not dispense (The tube is block)

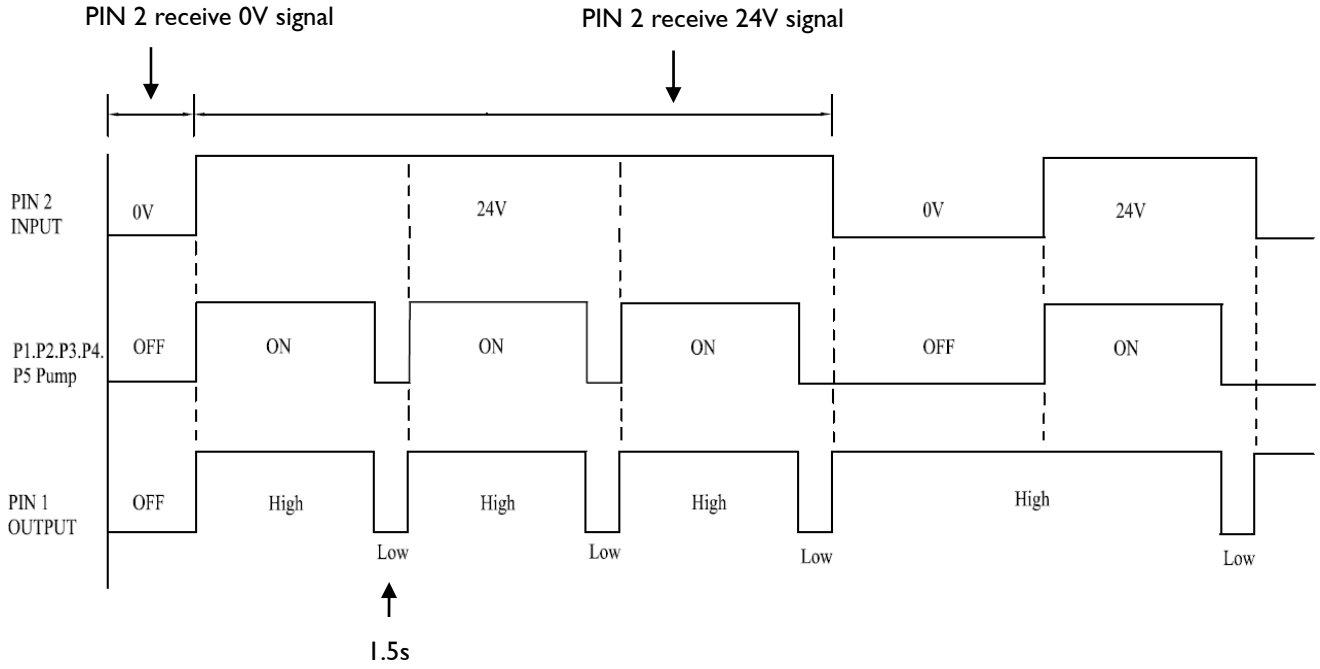


(1) When lubricator detect the malfunction (ex: the tube is block), pump P1, P2, P3 and P4 stop dispense the oil immediately. Meanwhile, PIN 1 will change the signal from HIGH to LOW for inform the malfunction message to user.

(2) After troubleshooting, PIN 1 will change the signal from LOW to HIGH. Simultaneously, pump P1, P2, P3 and P4 restart to dispense the oil. The troubleshooting instruction please refer to page 73.

4.6.2.5 Model LUG-2510

PLC control diagram:



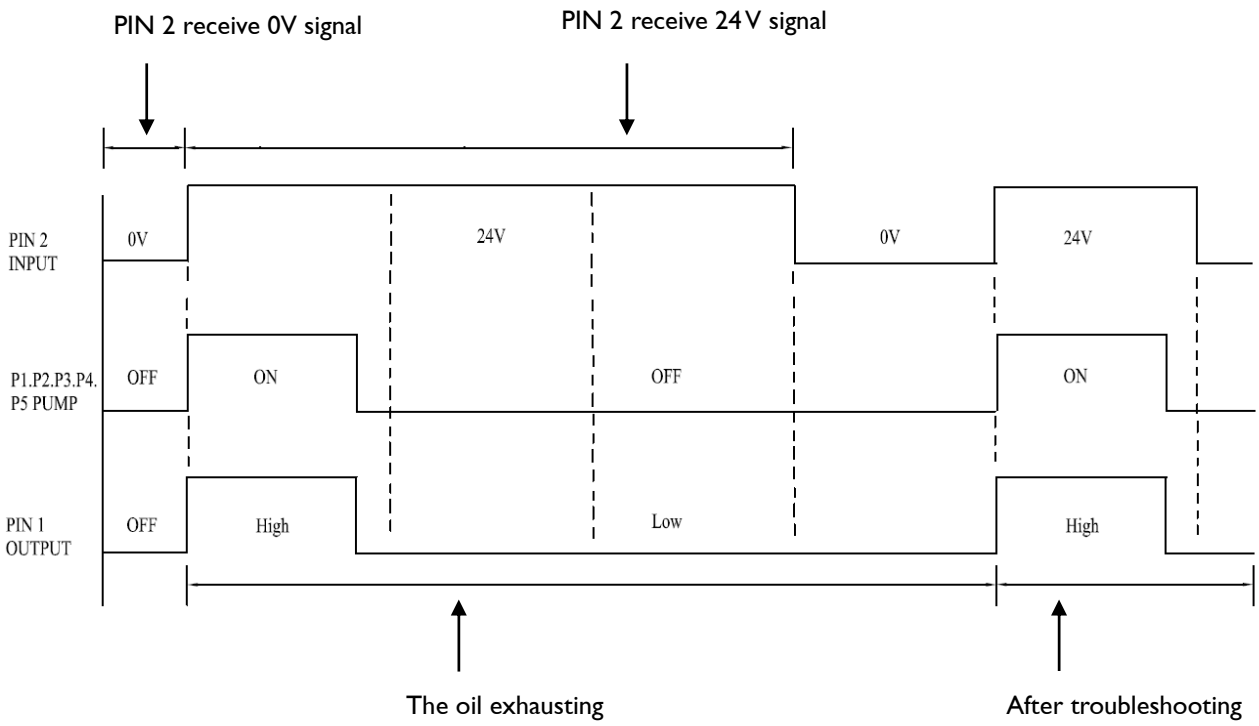
(1) Lubricator power ON, pump P1, P2, P3, P4 and P5 outlet to dispense oil continuously when the PIN 2 receiving 24V signal. One stroke per outlet will dispense oil 0.15cm^3 individually.

(2) When the pump P1、P2、P3、P4 and P5 complete the dispensing 1 time, PIN 1 output signal changed from HIGH to LOW, the signal duration is 1.5s. This function is applied to inform PLC that the Lubricator has been accomplished dispensed 1 cycle time.

(3) When PIN 2 receiving the signal from 24V to 0V, pump P1, P2, P3, P4 and P5 will stop dispensing. Meanwhile, PIN 1 output HIGH signal.

The duration is the same of one stroke per outlet of P1, P2, P3, P4, P5 according to the PLC model 2 control diagram. Hence, we can control the stroke times per outlet for pump P1 and P2 by the duration of 24V signal on PIN 2. The duration of both Pump P1、P2、P3、P4 and P5 are 110s for one stroke.

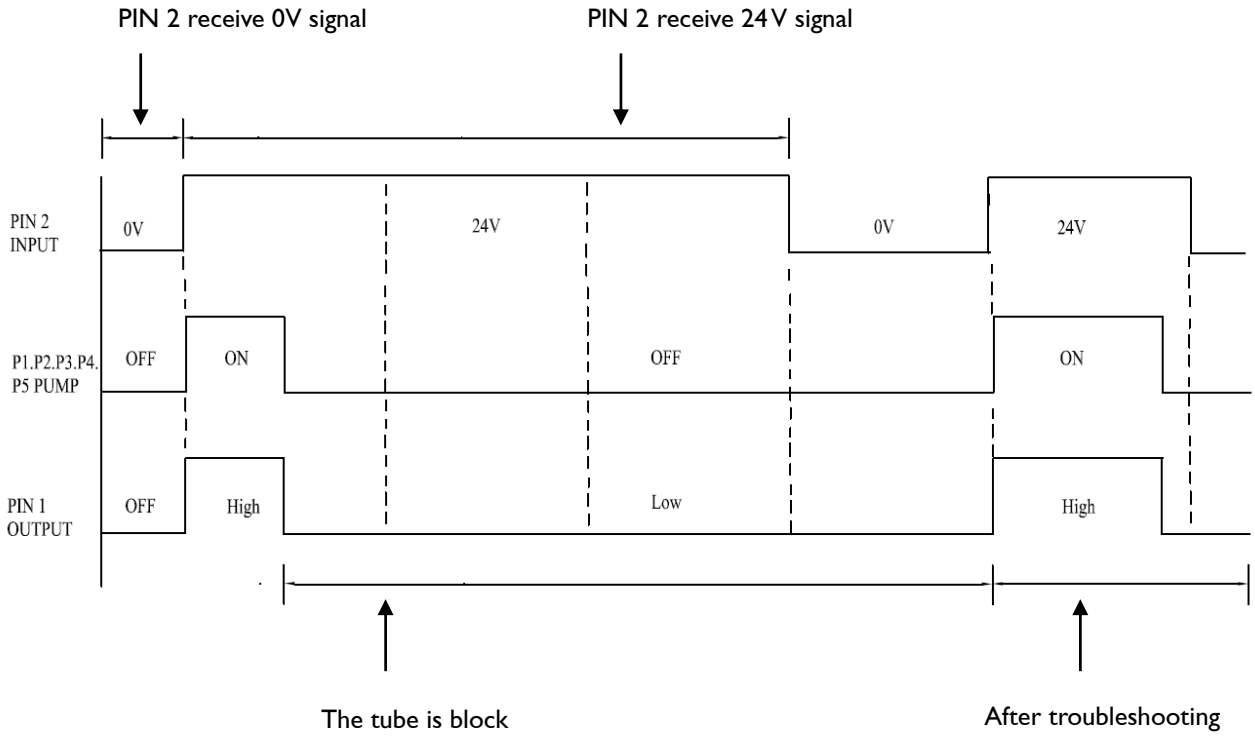
The signal waveform on PIN1 when oil exhausting:



(1) When lubricator detect the exhausting oil, and P1、P2、P3、P4、P5 will stops outlet oil, then PIN 1 will output the signal from HIGH to LOW which inform the user to replenish the oil. During this duration, the pump P1、P2、P3、P4 and P5 can not be dispensed.

(2) After replenish the oil into lubricator, PIN 1 will output the signal from LOW to HIGH. Meanwhile, the pump P1, P2, P3, P4 and P5 can restart to dispense the oil.

The signal waveform on PIN 1 when lubricator can not dispense (The tube is block)



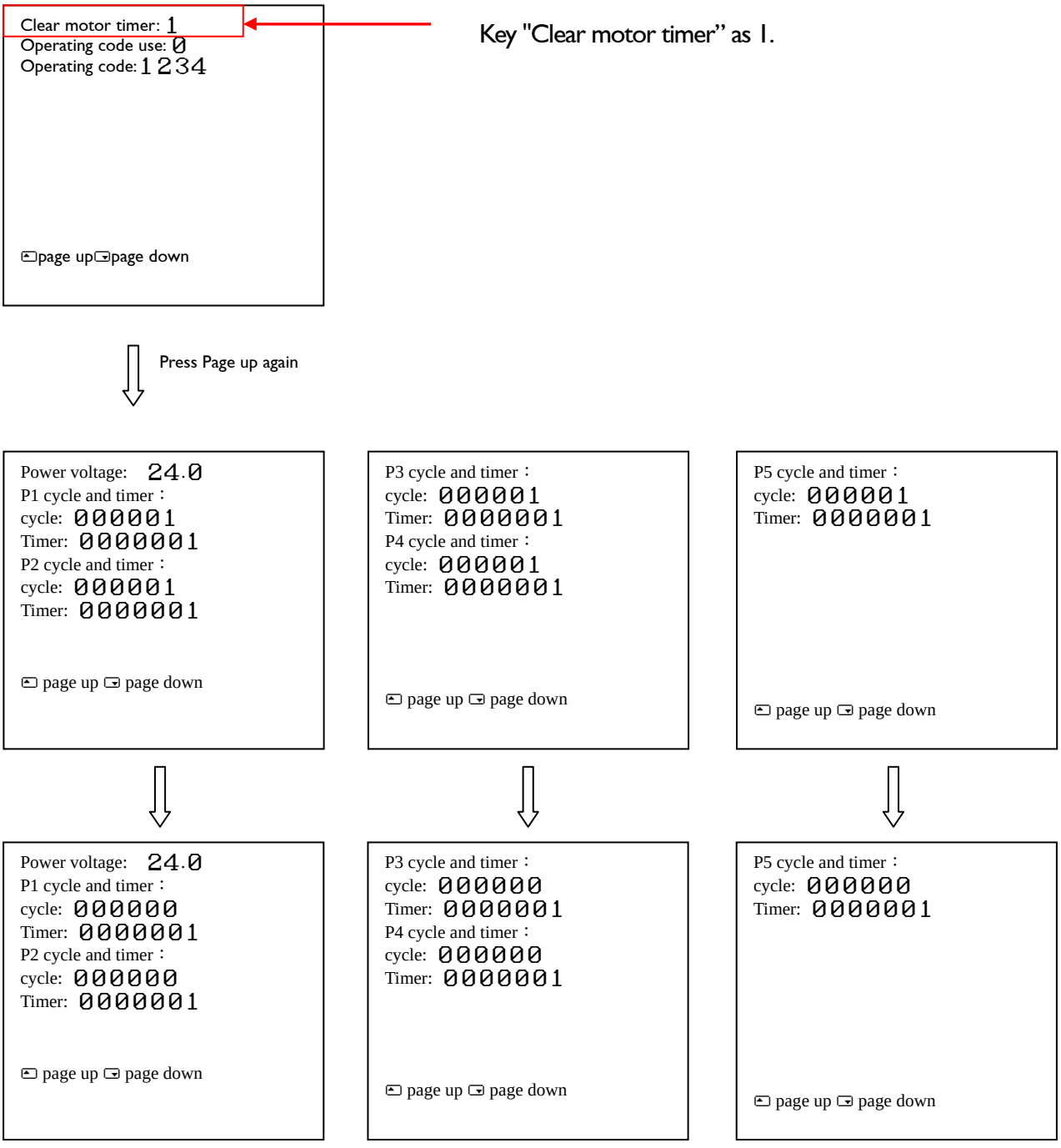
(1) When lubricator detect the malfunction (ex: the tube is block), pump P1, P2, P3, P4 and P5 stop dispense the oil immediately. Meanwhile, PIN 1 will change the signal from HIGH to LOW for inform the malfunction message to user.

(2) After troubleshooting, PIN 1 will change the signal from LOW to HIGH. Simultaneously, pump P1, P2, P3, P4 and P5 restart to dispense the oil. The troubleshooting instruction please refer to page 73.

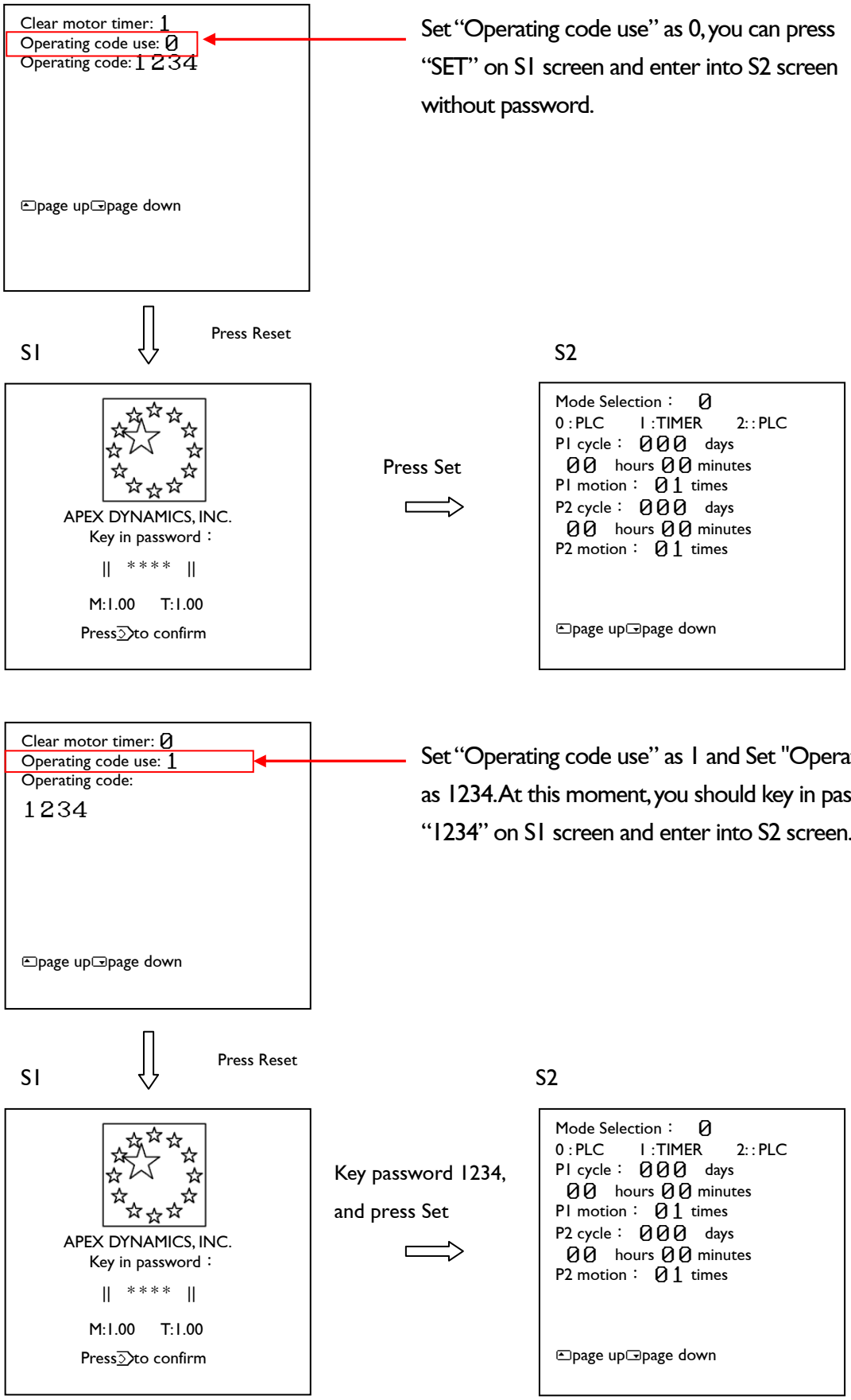
4.6.3 Clear Motor Timer Setting

(1) Clear Motor Timer

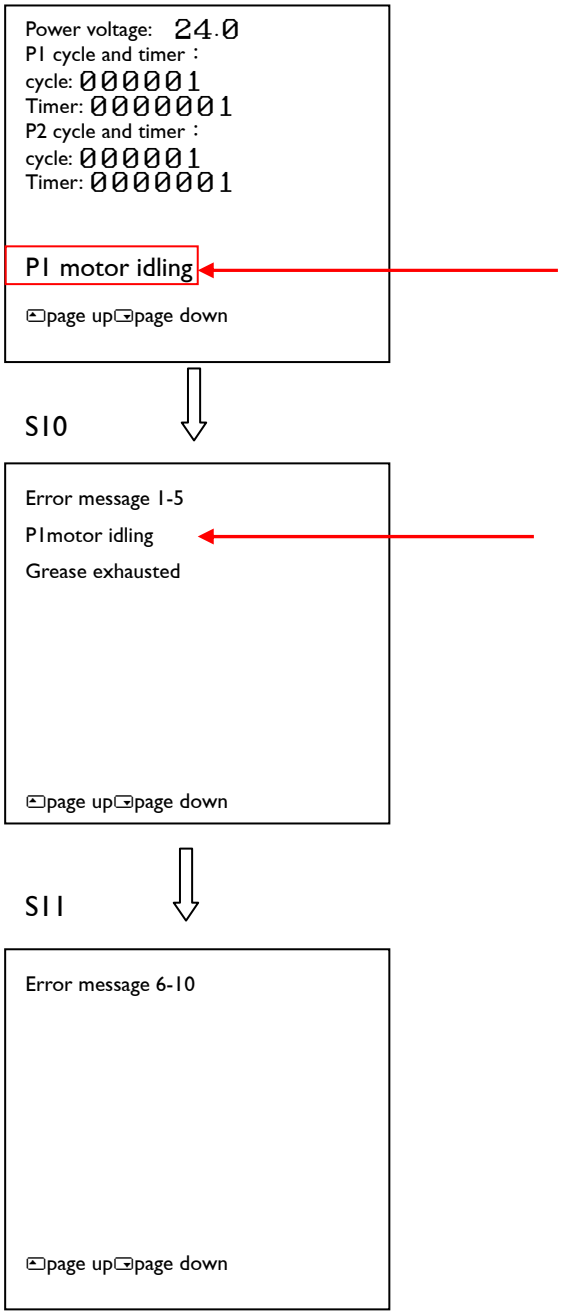
Set 1 to clear existing motor parameters, the system recorded output P1, P2, P3, P4 and P5 cycles are all erased 0. This function allows users to know lubricator total cycles.



(2) Password Setting



4.6.4 Description of Error Message



Error message appears on screen for example P1 motor idling.

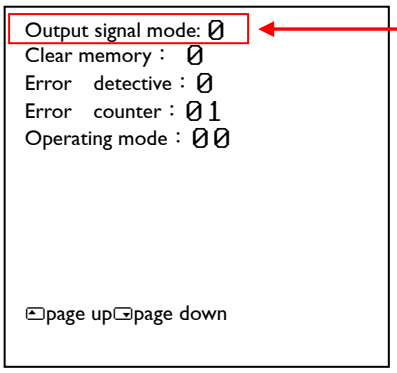
"P1 Motor idling" display in system "Error Message Record", new message is displayed in S10 screen and total 5 error messages and then 6th message will be saved in S11screen.

Error message description:

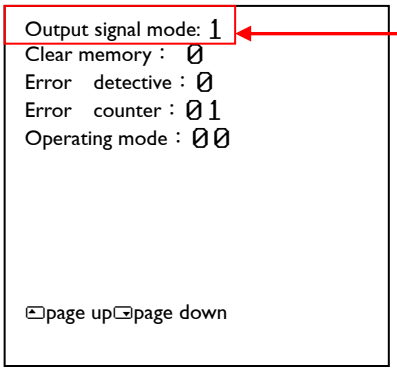
Error message	Description	Troubleshooting
P1 Motor Idle	Lubricator internal P1motor idling.	Please refer Page 73
P2 Motor Idle	Lubricator internal P2motor idling.	Please refer Page 73
P3 Motor Idle	Lubricator internal P3motor idling.	Please refer Page 73
P4 Motor Idle	Lubricator internal P4motor idling.	Please refer Page 73
P5 Motor Idle	Lubricator internal P5motor idling.	Please refer Page 73
P1 motor or pipe block	Lubricator internal P1motor cannot rotate.	Please refer Page 73
P2 motor or pipe block	Lubricator internal P2motor cannot rotate.	Please refer Page 73
P3 motor or pipe block	Lubricator internal P3motor cannot rotate.	Please refer Page 73
P4 motor or pipe block	Lubricator internal P4motor cannot rotate.	Please refer Page 73
P5 motor or pipe block	Lubricator internal P5motor cannot rotate.	Please refer Page 73
Memory reading error, Memory writing error	1. Input voltage can not reach 24V standard 2.Lubricator PCB board malfunction	1.Check the Input Voltage 24V 2.Contact Manufacturer technician

4.6.5 Description of Output Signal Mode

After installing Lubricator Hand-Set, the lubricator output signal can be changed. The Lubricator can be used in PLC control Mode 0 or Timer Mode 1 or PLC Mode 2. Instructions are as follows:



Set "Output Signal Mode" 0 for PLC control Mode 0 and PLC control Mode 2. Refer to Chapter 3.5 for PLC control Mode 0 illustration. And refer 4.6.2 chapter for PLC Mode 2.

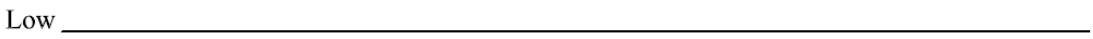


Output Signal Mode, Set 1 as "Timer Mode 1 control" .

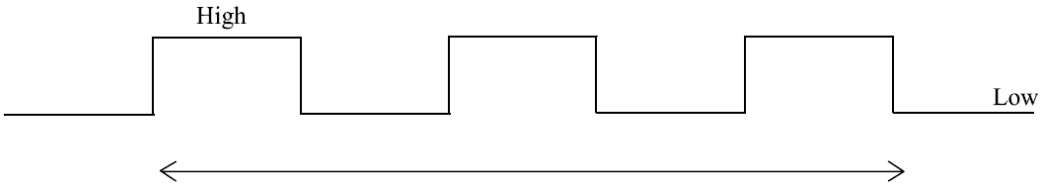
Set "Output Signal Mode" as 1, control mode as TIMER mode 1, power plug PIN 1 output waveform is display as below. This function is used to install additional alarm device to inform the user that the lubricator is malfunction and require troubleshooting.

Lubricator Power OFF

Lubricator Power ON but no occurrence of malfunction



Lubricator power OFF or power ON but no occurrence of malfunction, PIN 1 output signal are LOW.



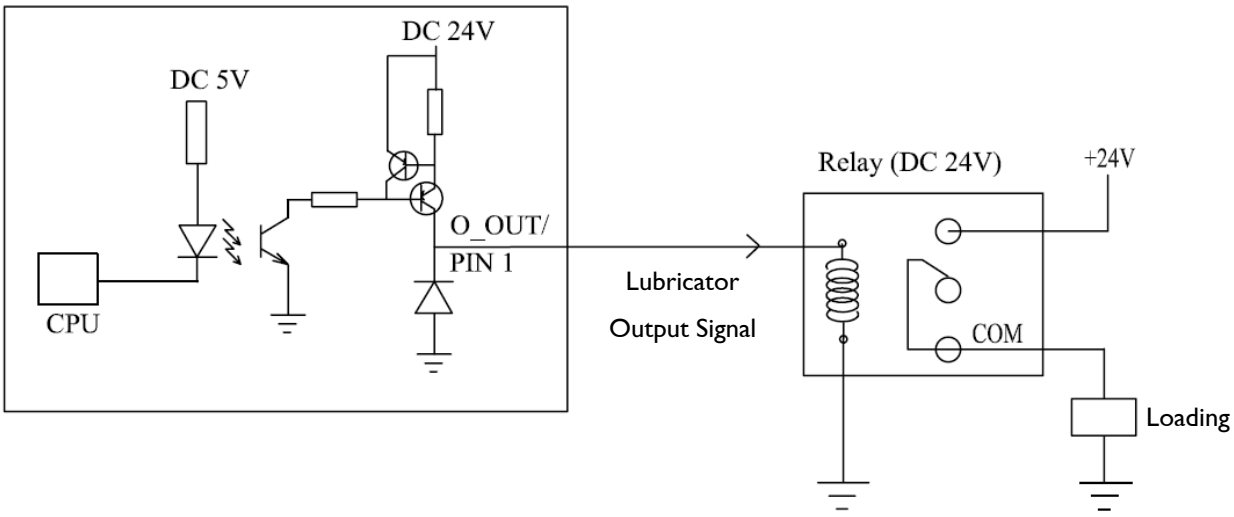
Lubricator Malfunction, output 1 Hz signal

If the Lubricator malfunction, PIN 1 will continue to output 1Hz signal, at this moment, please refer to below table for Lubricator troubleshooting.

Malfunction	Reason	Remedy
Lubricator cannot dispense oil	PA Tube contain trapped air	Refer to chapter 4.8 for troubleshooting.
	Lubricator internal motor blockage, PA Tube Blockage	Check the foreign particles in PA Tube for blockage or PA Tube length is too long.
	Lubricator internal motor idling	Contact APEX Manufacturer
	Sensor plate reaches exhausting oil level detection zone	Refer APPENDIX B to replenish the new oil

4.6.6 TIMER Mode 1 Control Output Wiring Instruction

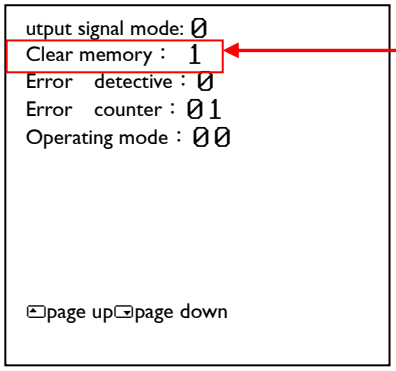
Wiring of Lubricator with alarm device.



Lubricator Output Electrical Specification

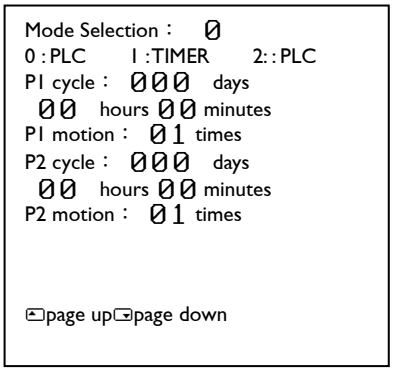
Rated Voltage : DC 24V
Maximum Output Current :100mA

4.6.7 Clear Memory Illustration

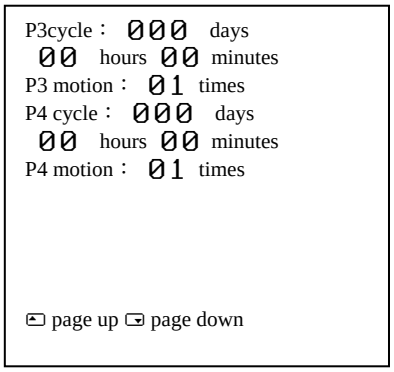


Set "Clear Memory" as 1, system will initialize lubricator parameters returning to its original manufacturer setting as shown below.

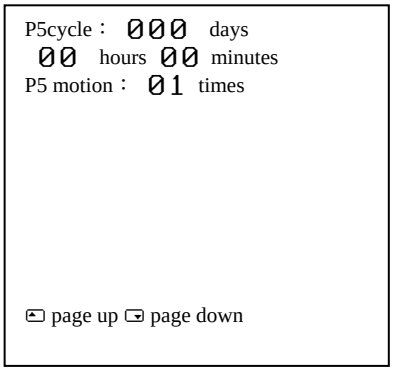
Set "Clear Memory" as 1 , Hand-Set all parameters return to original manufacturer setting.



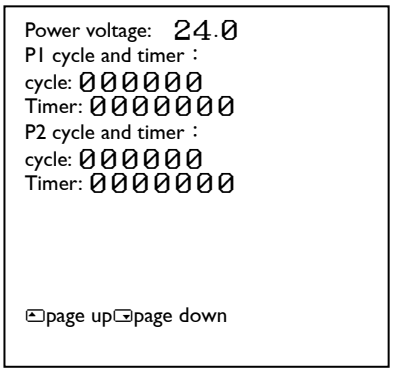
Manufacturer Setting



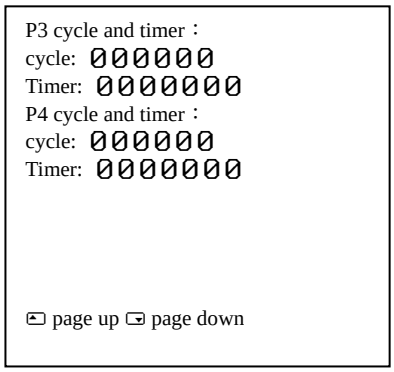
Manufacturer Setting



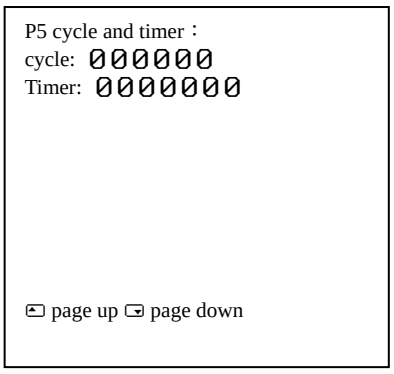
Manufacturer Setting



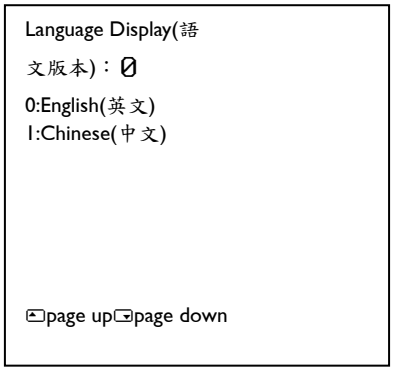
Manufacturer Setting



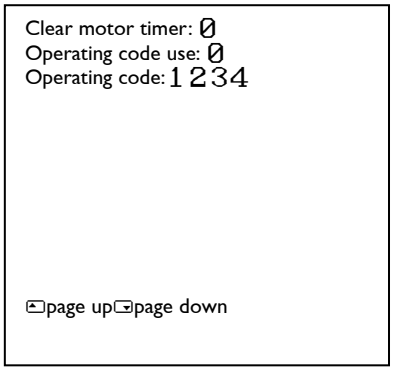
Manufacturer Setting



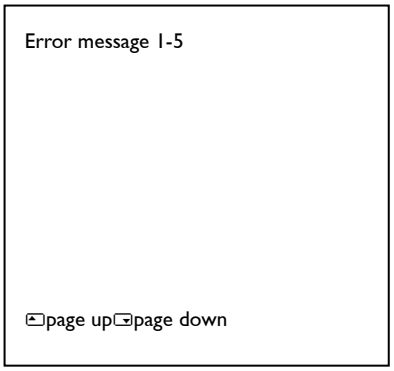
Manufacturer Setting



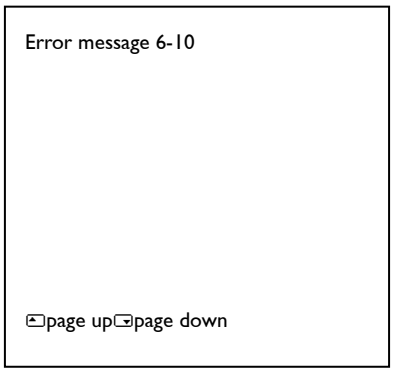
Manufacturer Setting



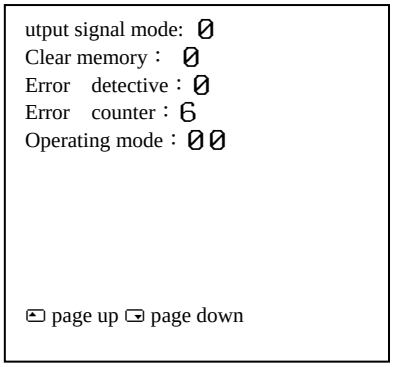
Manufacturer Setting



Manufacturer Setting



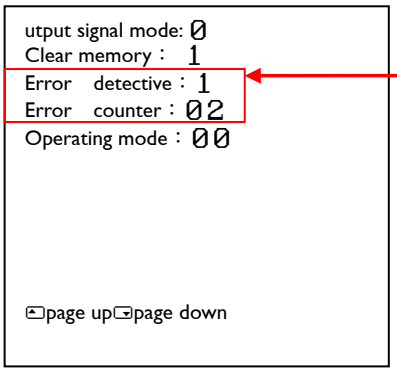
Manufacturer Setting



Manufacturer Setting

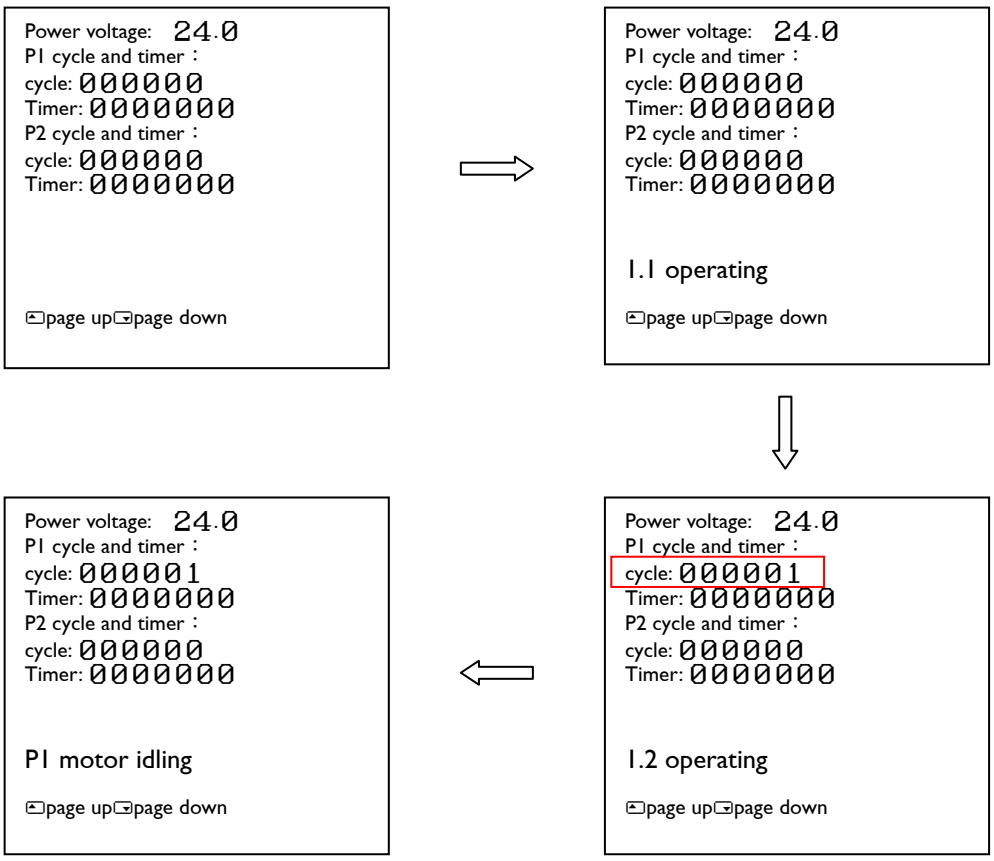
4.6.8 Motor Error Detective and Error Counter

When Lubricator is unable to dispense oil, this may internal motor gear is loosened that making motor idling thus causing lubricator to fail to deliver oil. However, this function can be used to check this malfunction.



Set "Error Detective" as 1, Motor error appears, system will monitor and display on Hand-Set screen. This feature needs to be used together with motor "Error counter".

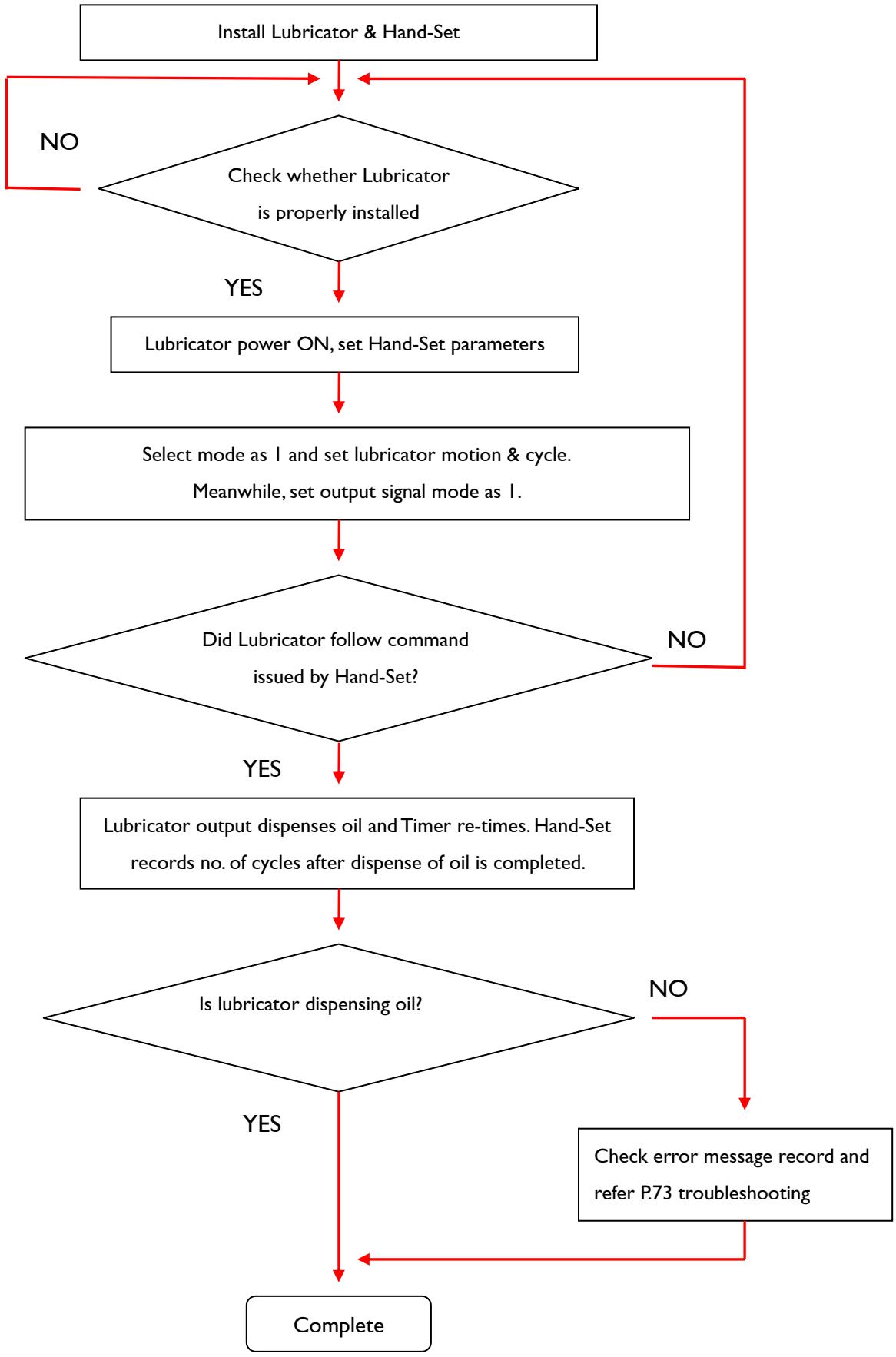
Set motor "error detection" as 2, take P1 motor occurrence error as an example.



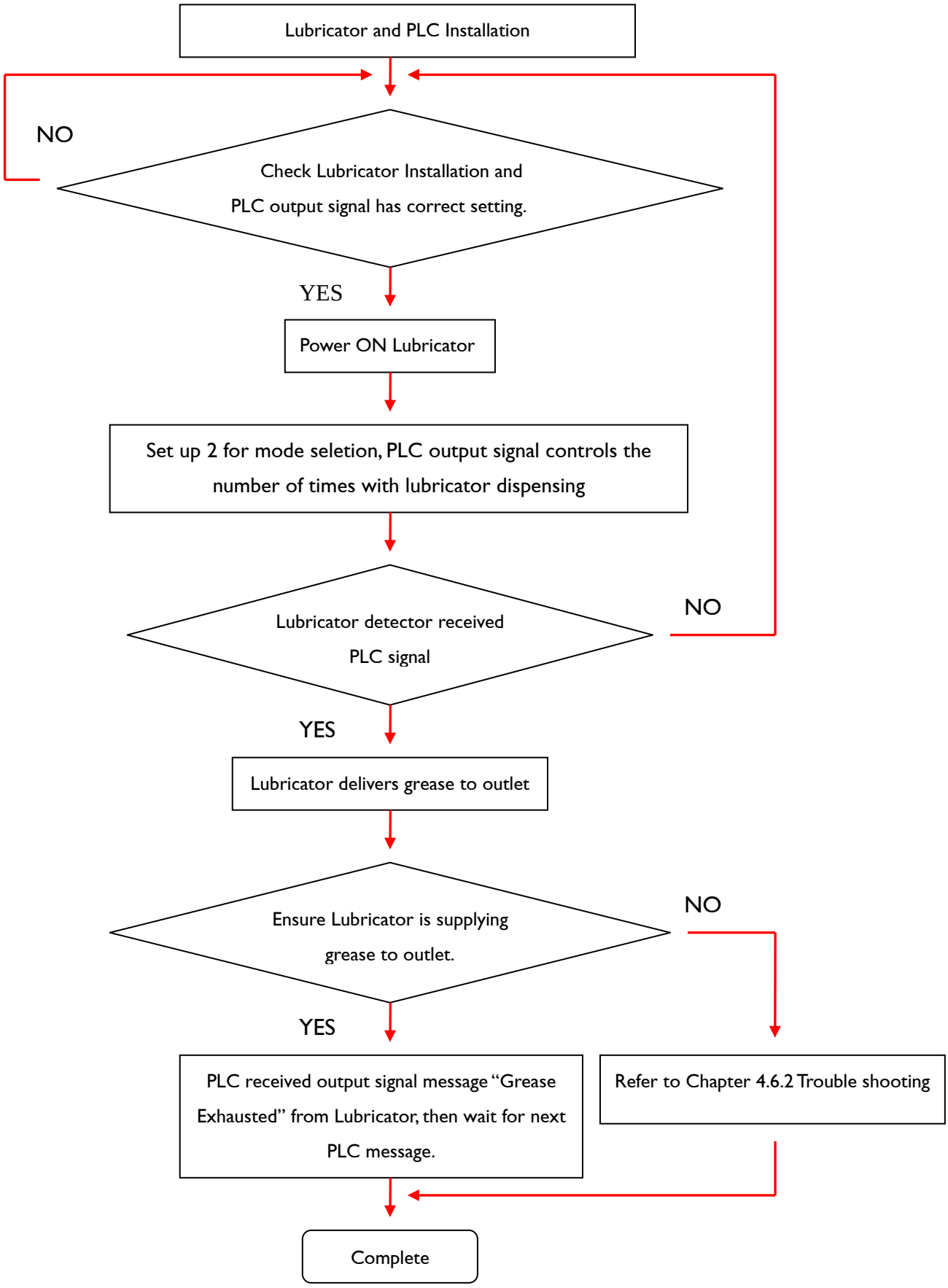
System detected P1 motor idling and no. of motor errors reached 2. Lubricator stopped dispensing oil and system displayed an error message on screen.

System detected P1 motor idling, but no. of motor errors did not reached 2. Lubricator continues dispensing oil and system will not display the error message on screen.

4.7 Lubricator Installation Procedure (TIMER mode 1 Control)



4.8 Lubricator Installation Procedure (PLC mode 2 Control)

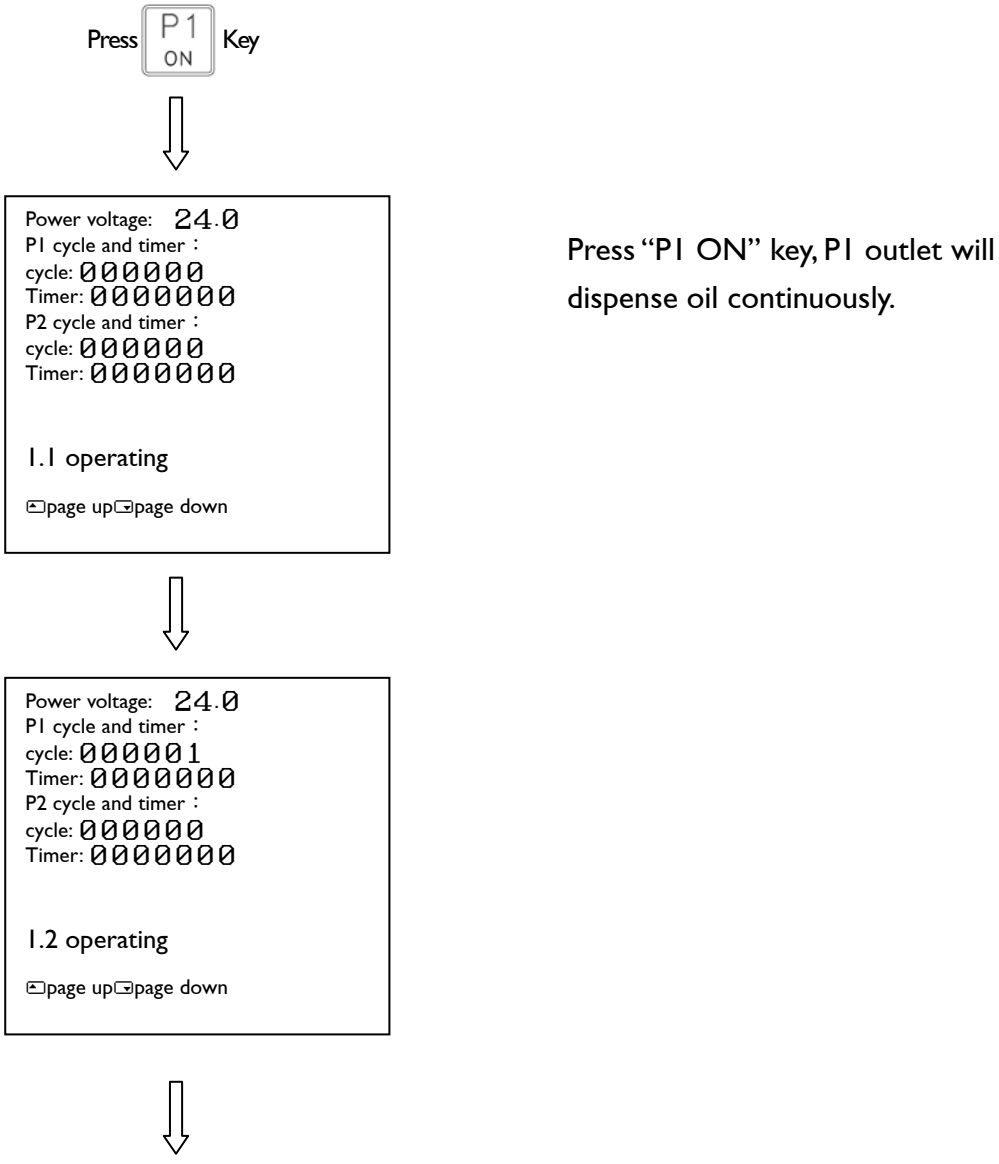


4.9 Instruction of Continuous Oil Dispensing.

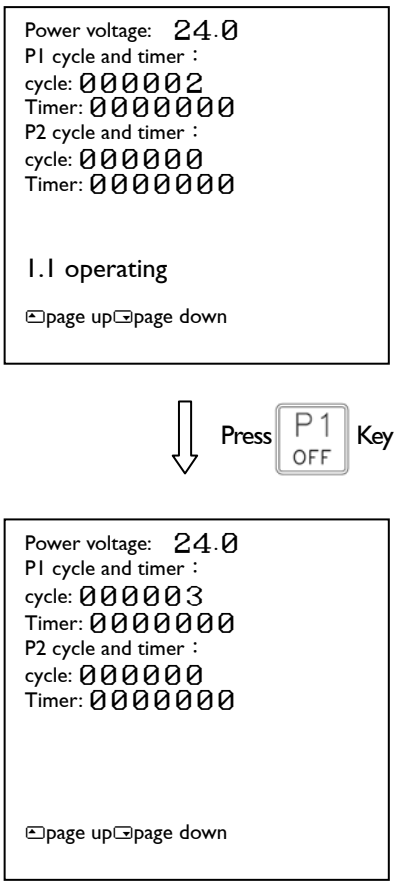
After installing Lubricator PA tubes, user may press "P1 ON" key function to allow lubricator to continuously dispense oil until empty PA tube is completely filled with oil and then press "P1 OFF" key to stop dispensing oil. Lubricator with an excess air inside PA tubes, user may press "P1 ON" key for continuous oil dispensing so as to discharge excess air that trapped inside the tube.

Description of Set-Up Example

(1) Press P1 ON for continuous oil dispensing.

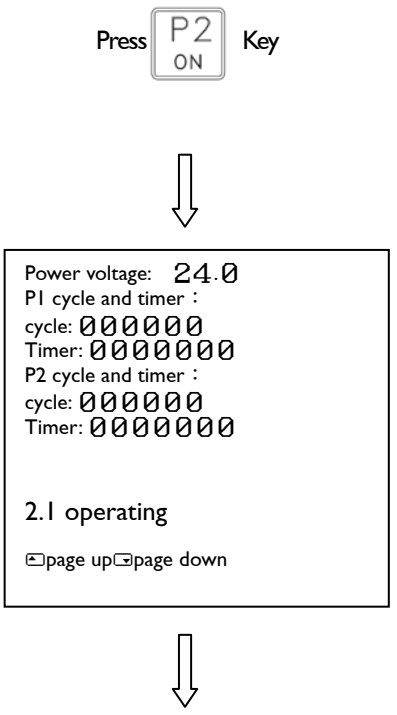


Press "P1 ON" key, P1 outlet will dispense oil continuously.

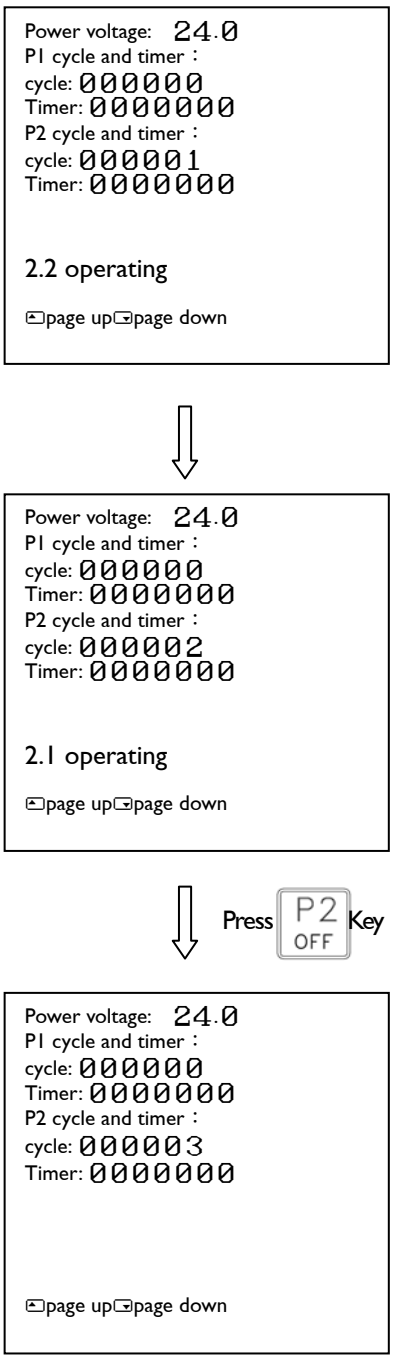


Press "P1 OFF" key, Pump P1 outlet will stop dispensing oil.

(2) Press Pump P2 ON for continuous oil dispensing.

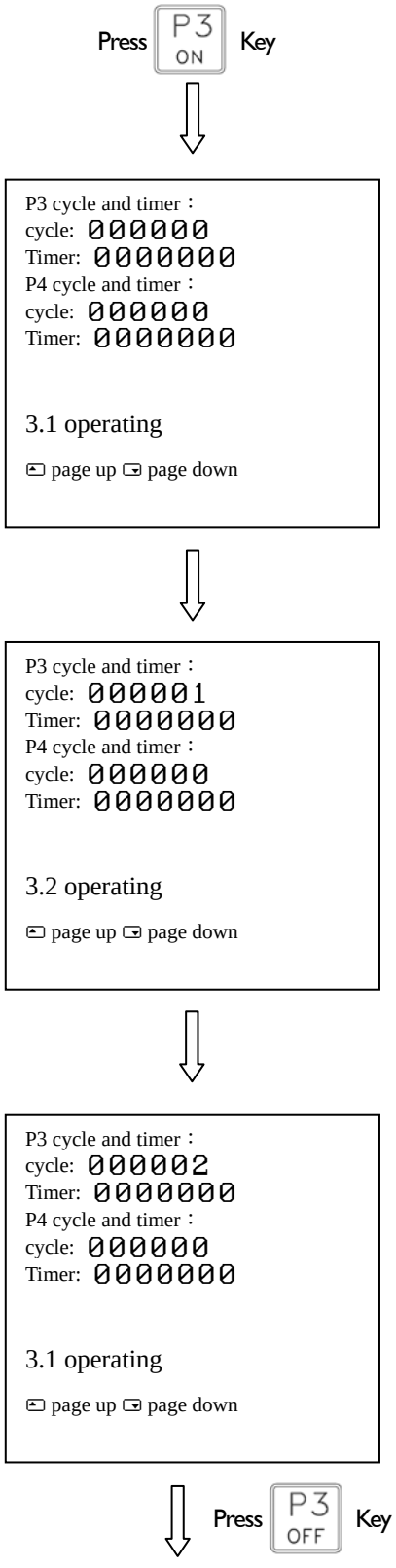


Press "P2 ON" key, Pump P2 outlet will dispense oil continuously.

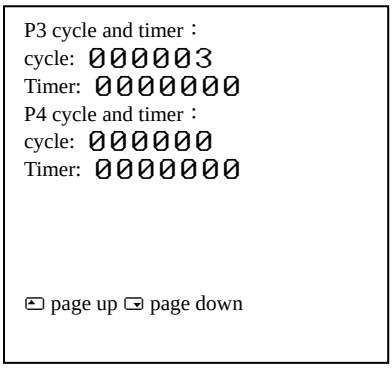


Press "P2 OFF" key, Pump P2 outlet will stop dispensing oil continuously.

(3) Press Pump P3 ON for continuous oil dispensing.



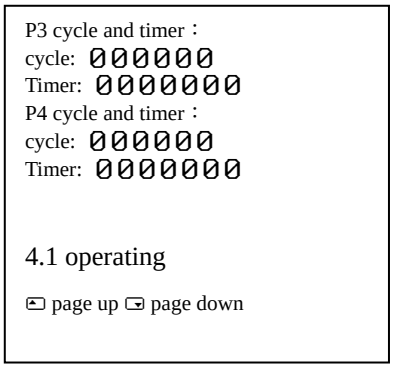
Press "P3 ON" key, Pump P3 outlet will dispense oil continuously.



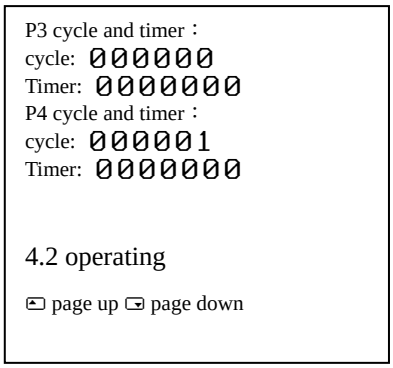
Press "P3OFF" key, Pump P3 outlet will stop dispensing oil continuously.

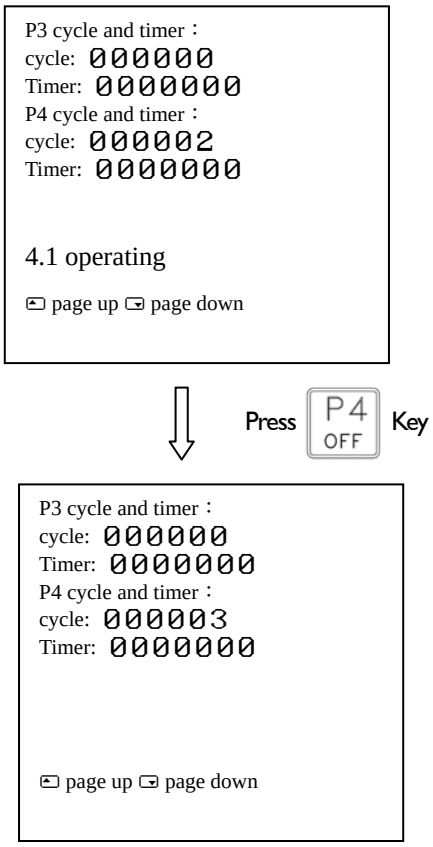
(4) Press Pump P4 ON for continuous oil dispensing.

Press  Key



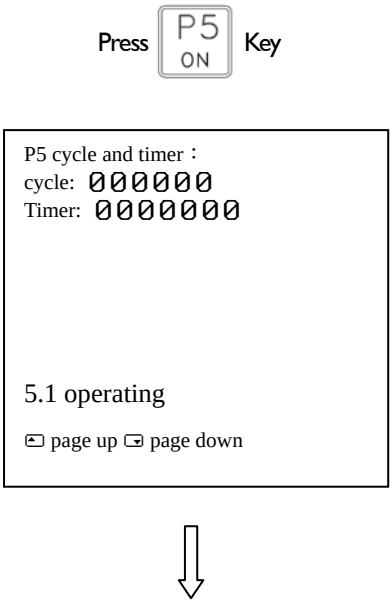
Press "P4 ON" key, Pump P4 Outlet will dispense oil continuously.





Press "P4 OFF" key, Pump P4 outlet will stop dispensing oil continuously.

(5) Press Pump P5 on for continuous grease dispensing.



Press "P5 ON" key, Pump P5 outlet will dispense oil continuously.

P5 cycle and timer：
cycle: 000001
Timer: 0000000

5.2 operating

page up page down

P5 cycle and timer：
cycle: 000002
Timer: 0000000

5.1 operating

page up page down

Press  Key

P5 cycle and timer：
cycle: 000003
Timer: 0000000

page up page down

Press "P5 OFF" key, Pump P5 outlet will stop dispensing oil continuously.

Appendix A Lubrication Setting

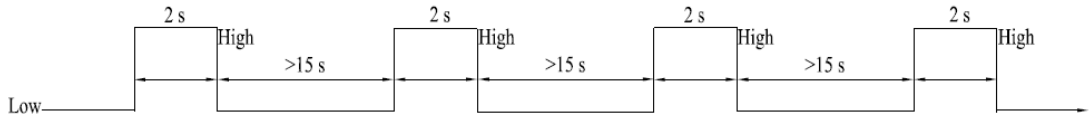
Due to various factors affecting the lubricator dispensing oil volume, APEX recommends the lubrication volume on catalog page 6 and each model lubricator setting method for reference.

Module No.	Average Speed	Output oil dispensing volume
5	1 m/s	0.3 cm^3 / 24h

AppendixA-1 PLC mode 0 Control

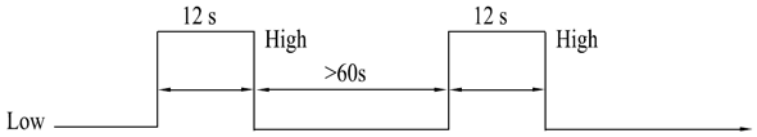
For every 24 hours, PLC outputs the correct control signal to lubricator power plug PIN 2, Lubricator will dispense oil 0.3 cm^3 / 24h at outlet. Each lubricator model's control signal is displayed as below:

AppendixA-1-1 Model LUG-2102



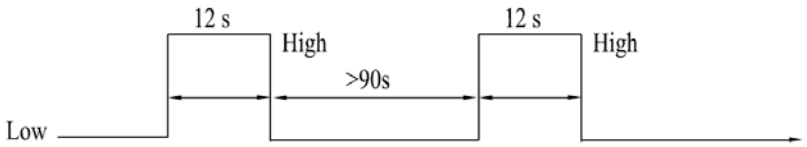
For every 24 hours, Lubricator received the PLC output signal above; outlet 1.1 and 1.2 will dispense two strokes individually with oil 0.3cm^3.

AppendixA-1-2 Model LUG-2204



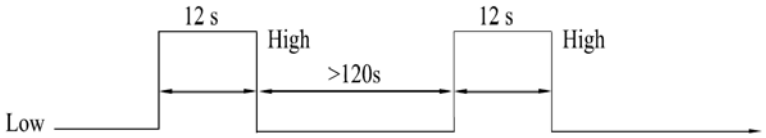
For every 24 hours, Lubricator received the PLC output signal above; outlet 1.1, 1.2, 2.1 and 2.2 will dispense two strokes individually with oil 0.3cm^3.

AppendixA-1-3 Model LUG-2306



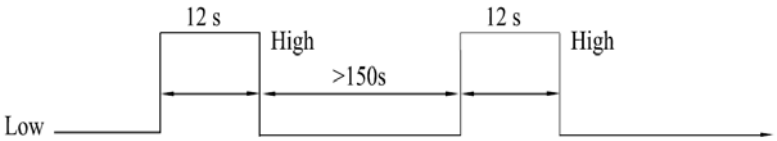
For every 24 hours, Lubricator received the PLC output signal above; outlet 1.1, 1.2, 2.1, 2.2, 3.1 and 3.2 will dispense two strokes individually with oil 0.3cm^3.

AppendixA-1-4 Model LUG-2408



For every 24 hours, Lubricator received the PLC output signal above; outlet 1.1, 1.2, 2.1, 2.2, 3.1,3.2, 4.1 and 4.2 will dispense two strokes individually with oil 0.3cm^3.

AppendixA-1-5 Model LUG-2510



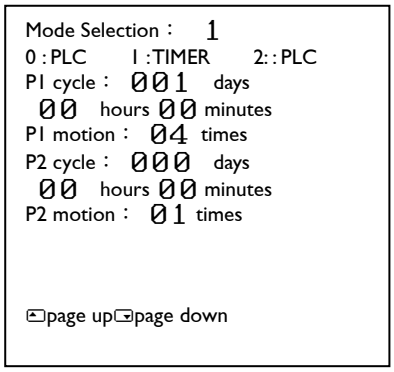
For every 24 hours, Lubricator received the PLC output signal above; outlet 1.1, 1.2, 2.1, 2.2, 3.1,3.2, 4.1, 4.2, 5.1 and 5.2 will dispense two strokes individually with oil 0.3cm^3.

AppendixA-2 TIMER Control

Lubricator control mode can be changed from selecting TIMER Mode in Hand-Set.

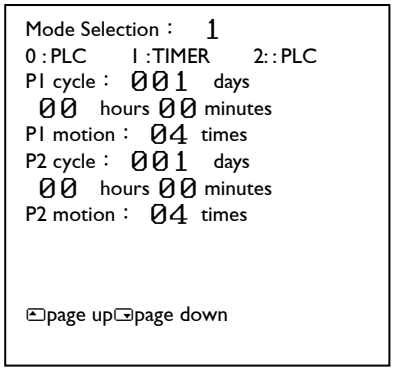
For every 24 hours, Lubricator will dispense oil 0.3 cm^3 / 24h at output. An example illustrated below showing each lubricator model's operation.

AppendixA-2-1 Model LUG-2102



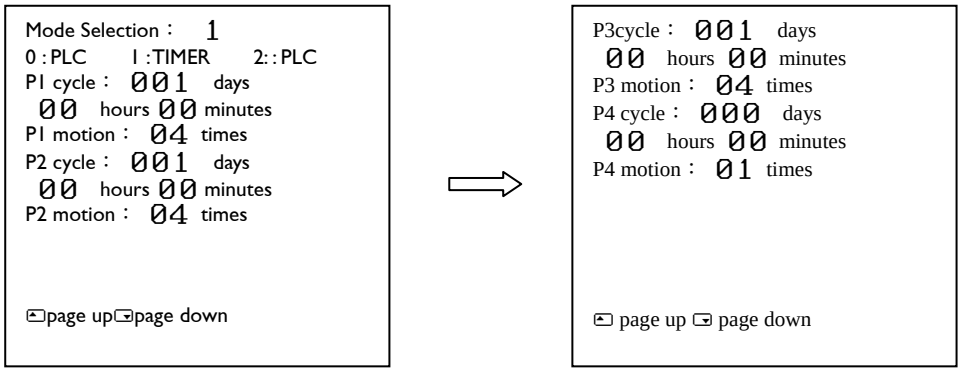
Set 1 in selection mode, Key in P1 cycle 1 day and Key in P1 motion 4 strokes. For every 24 hours, Lubricator outlet 1.1 and 1.2 will dispense 2 strokes with oil 0.3 cm^3.

AppendixA-2-2 Model LUG-2204



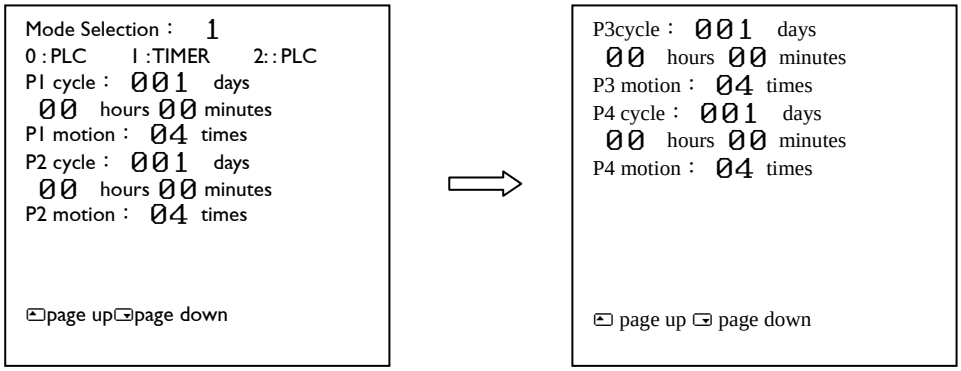
Set 1 in selection mode, Key in P1 and P2 cycle 1 day and Key in P1 and P2 motion 4 strokes. For every 24 hours, Lubricator outlet 1.1, 1.2, 2.1 and 2.2 will dispense 2 strokes with oil 0.3 cm^3.

AppendixA-2-3 Model LUG-2306



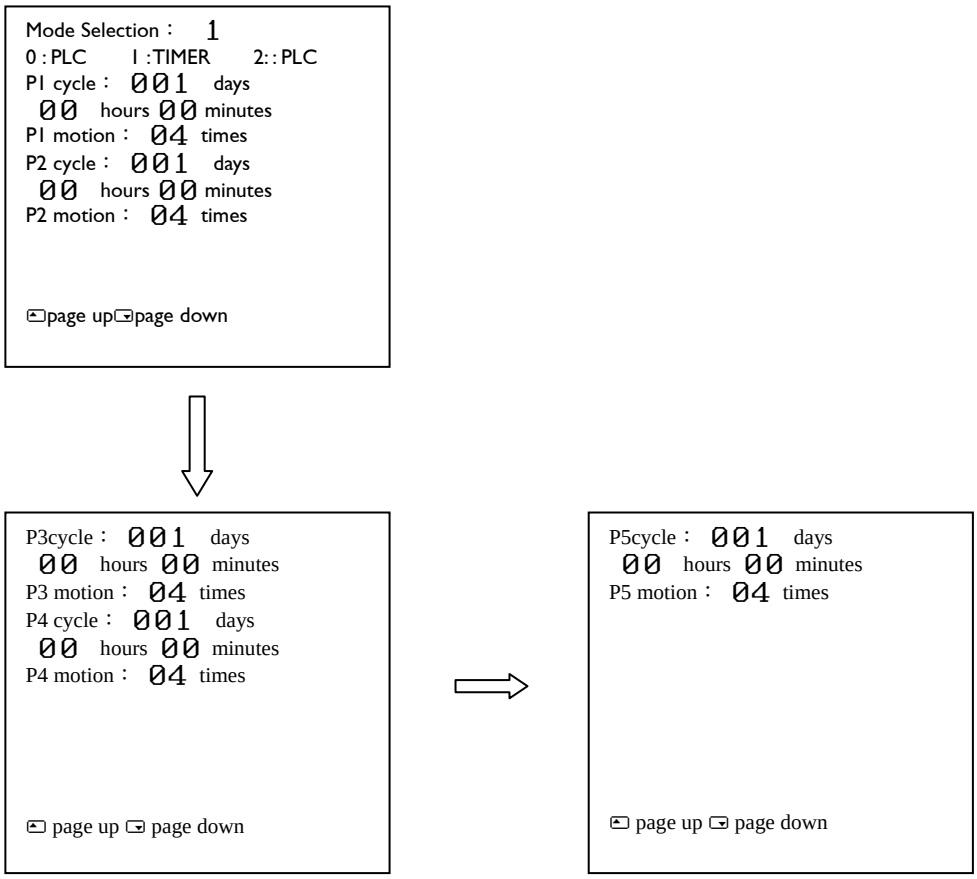
Set 1 in selection mode, Key in P1, P2 and P3 cycle 1 day and Key in P1, P2 and P3 motion 4 strokes. For every 24 hours, Lubricator outlet 1.1, 1.2, 2.1, 2.2, 3.1and 3.2 will dispense 2 strokes with oil 0.3 cm^3.

AppendixA-2-4 Model LUG-2408



Set 1 in selection mode, Key in P1, P2, P3 and P4 cycle 1 day and Key in P1, P2, P3 and P4 motion 4 strokes. For every 24 hours, Lubricator outlet 1.1, 1.2, 2.1, 2.2, 3.1, 3.2, 4.1 and 4.2 will dispense 2 strokes with oil 0.3 cm^3.

AppendixA-2-5 Model LUG-2510

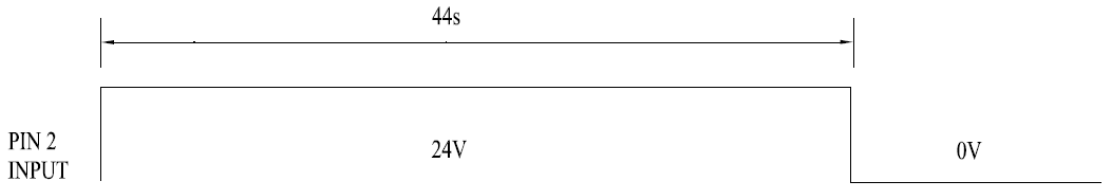


Set 1 in selection mode, Key in P1, P2, P3, P4 and P5 cycle 1 day and Key in P1, P2, P3, P4 and P5 motion 4 strokes. For every 24 hours, Lubricator outlet 1.1, 1.2, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, 5.1 and 5.2 will dispense 2 strokes with oil 0.3 cm^3.

AppendixA-3 PLC mode 2 Control

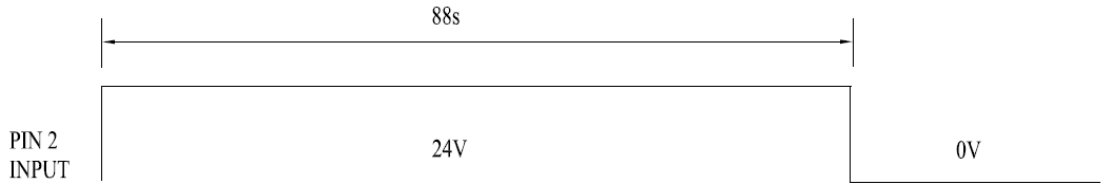
Lubricator can dispense 0.3cm^3/24h oil when PLC output 24V signal to PIN 2 of lubricator for every 24 hours. The following are the signal waveform for each lubricator model:

AppendixA-3-1 Model LUG-2102



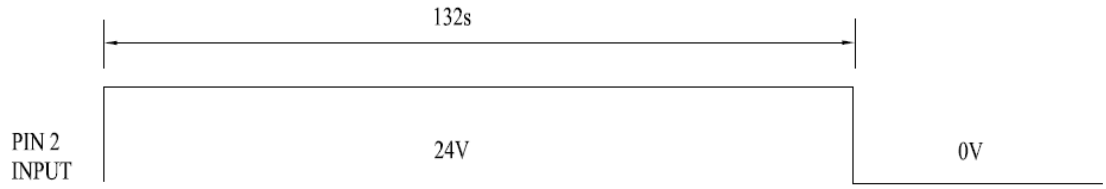
Lubricator outlet 1.1and 1.2, will dispense 2 strokes with oil 0.3 cm^3 when lubricator receive the above signal from PLC for every 24 hours.

AppendixA-3-2 Model LUG-2204



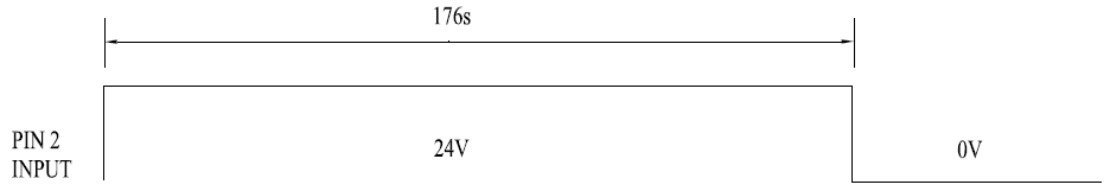
Lubricator outlet 1.1, 1.2, 2.1 and 2.2 will dispense 2 strokes with oil 0.3 cm^3 when lubricator receive the above signal from PLC for every 24 hours.

AppendixA-3-3 Model LUG-2306



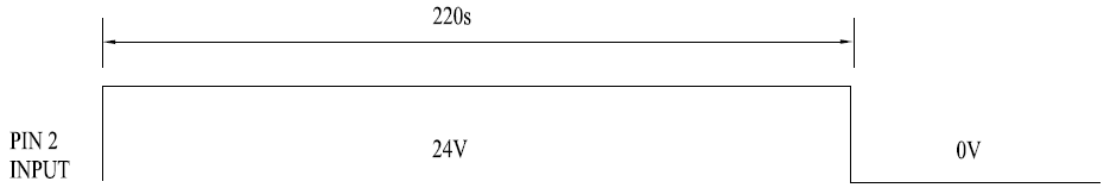
Lubricator outlet 1.1, 1.2, 2.1, 2.2, 3.1 and 3.2 will dispense 2 strokes with oil 0.3 cm^3 when lubricator receive the above signal from PLC for every 24 hours.

AppendixA-3-4 Model LUG-2408



Lubricator outlet 1.1, 1.2, 2.1, 2.2, 3.1, 3.2, 4.1 and 4.2 will dispense 2 strokes with grease 0.3 cm^3 when lubricator receive the above signal from PLC for every 24 hours.

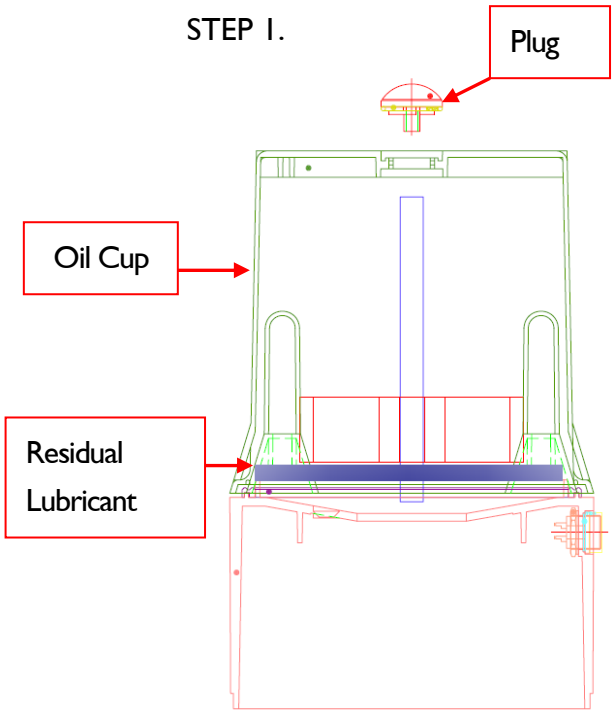
AppendixA-3-5 Model LUG-2510



Lubricator outlet 1.1, 1.2, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, 5.1 and 5.2 will dispense 2 strokes with oil 0.3 cm^3 when lubricator receive the above signal from PLC for every 24 hours.

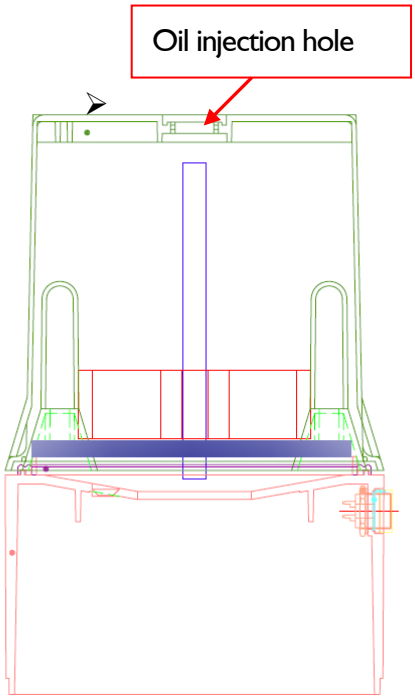
Appendix B – Replenishing the oil to lubricator

STEP 1.



Turn off the power, remove the plug from the above of oil cup.

STEP 2.

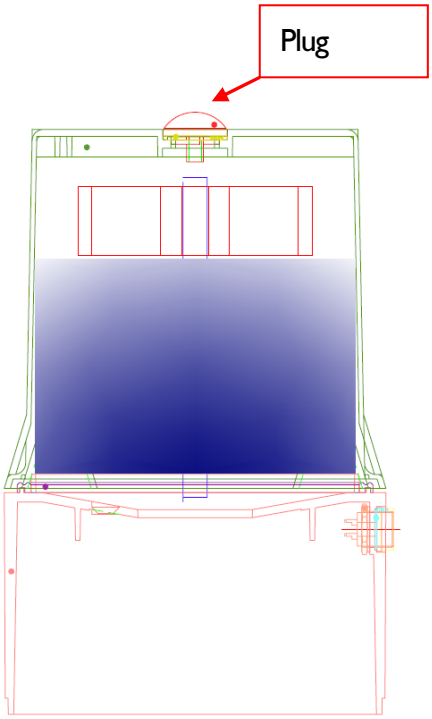


Replenish the oil from the oil injection hole

Caution

	Use the funnel or assistant tool when inject the oil into the lubricator to avoid oil leakage to ground or equipment that cause the accident
	Wear personal protective equipment (Gloves)
	Wear personal protective equipment (Goggles)

STEP 3.



Replenishing completely, setup the plug before turn on the power

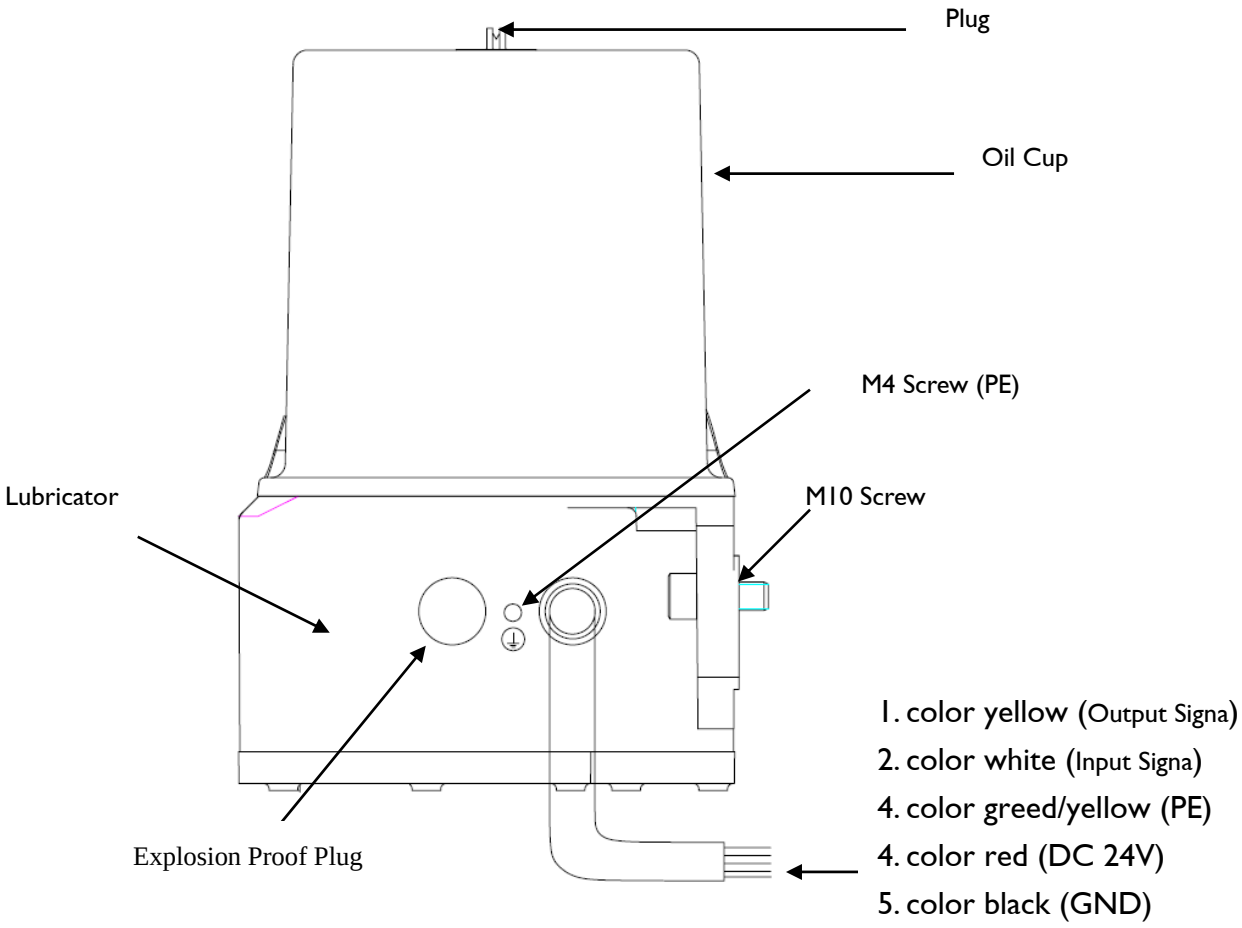
Note

After replenishing of oil, be aware to re-screw the plug on the oil cup to avoid loose the plug

Appendix C- Lubricator Explosion Proof Specification

Lubricator explosion proof is not support to control by manual remote, which from the power cable and mention about all different meaning for each different colored wires. Therefore have to assembly and follow the sequence to process by appendix C-1. Set up for external ground request at least 8 AWG multi cores, to prevent static electricity and appear sparks.

Appendix C-1 side view and power cable wire connect description



Appendix C-2 Maintenance and Storage

- Do not use a dry cloth to clean or maintain the machine body.
- Use extra caution during dry weather. Relative humidity tends to multiply the accumulation of static charges on any surface.
- Use the equipment only for its intended purpose.
- Incorrect or impermissible use or non-compliance with these instructions invalidates explosion protection.
- No changes to the equipment impairing its explosion protection are permitted.
- Excessive tightening of cable glands and stopping plugs can impair the degree of protection.
- Any damage can invalidate the Ex-protection.

Danger

1. WARNING – DO NOT OPEN WHEN AN EXPLOSIVE ATMOSPHERE IS PRESENT.
2. WARNING – POTENTIAL ELECTROSTATIC CHARGING HAZARD – SEE INSTRUCTIONS.
3. WARNING – CABLE GLAND FOR THE CABLES OF POWER CONNECTION OR SYSTEM SETUP SHOULD BE ATEX Ex e tc IP54 CERTIFIED WITH SUITABLE TEMPERATURE RATING.

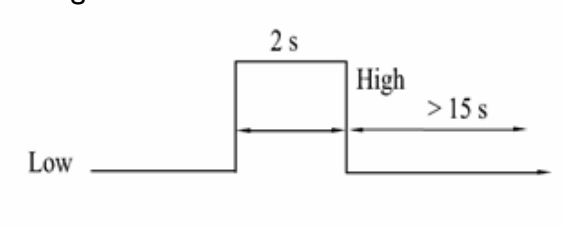
II 3D Ex tc IIIB T80 C Dc IP5X

Appendix D- PLC connection installation and program example instructions

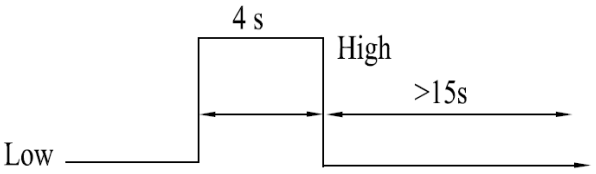
When the customer gets the product, can quickly complete the installation and control between PLC and lubricator of refer to the following examples.

Appendix D-1 Various Control Signal of PLC model 0

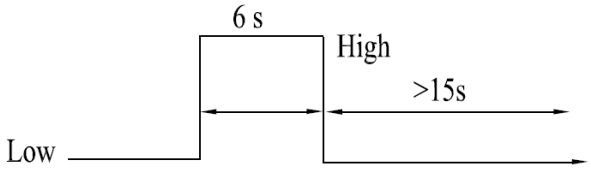
Each Lubrication model has control signal, LOW as 0V Signal and high as 24V Signal.



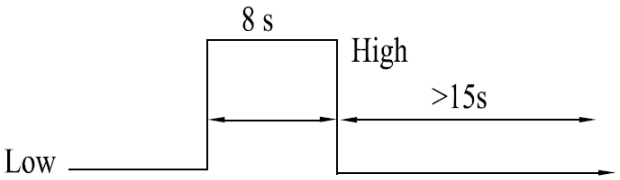
Pushed 1 stroke to outlet 1.1 or 1.2 dispensing 0.15cm^3 of grease when Lubricator received one 2s HIGH signal.



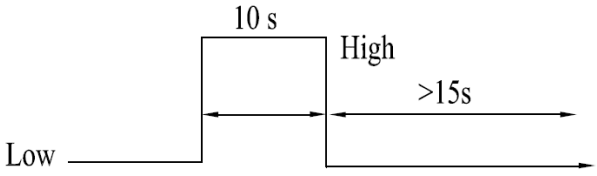
Pushed 1 stroke to outlet 2.1 or 2.2 dispensing 0.15cm^3 of grease when Lubricator received one 4s HIGH signal.



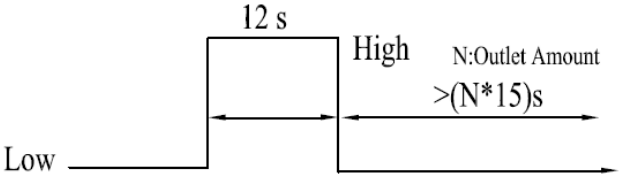
Pushed 1 stroke to outlet 3.1 or 3.2 dispensing 0.15cm^3 of grease when Lubricator received one 6s HIGH signal.



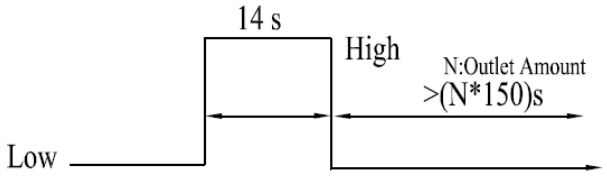
Pushed 1 stroke to outlet 4.1 or 4.2 dispensing 0.15cm^3 of grease when Lubricator received one 8s HIGH signal.



Pushed 1 stroke to outlet 5.1 or 5.2 dispensing 0.15cm^3 of grease when Lubricator received one 10s HIGH signal.



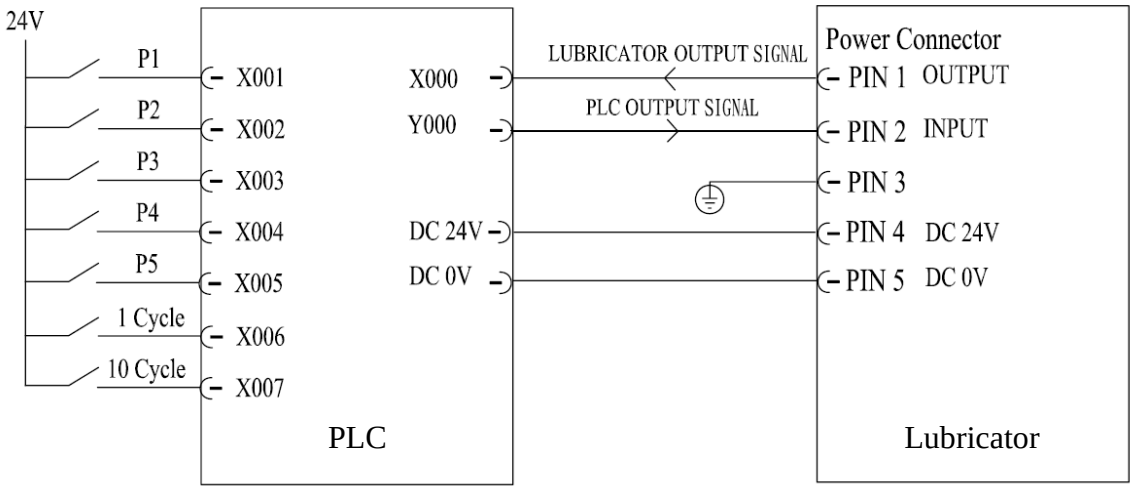
When lubricator receives 12s HIGH signal, each oil outlet will take turns to dispensing oil once, and oil output is 0.15cm^3.



When the lubricator receives 14s HIGH signal, each oil outlet will dispensing oil 10 times continuously, and total output oil of each hole is 1.5cm^3. This mainly function is fill empty oil pipe with lubricating oil.

Appendix D-2 Power System Wire (PLC 0 Control)

Power System Wire



Signal explain

X000: Lubricator Output Signal.

X001: Control Lubricator P1 dispenses once.

X002: Control Lubricator P2 dispenses once.

X003: Control Lubricator P3 dispenses once.

X004: Control Lubricator P4 dispenses once.

X005: Control Lubricator P5 dispenses once.

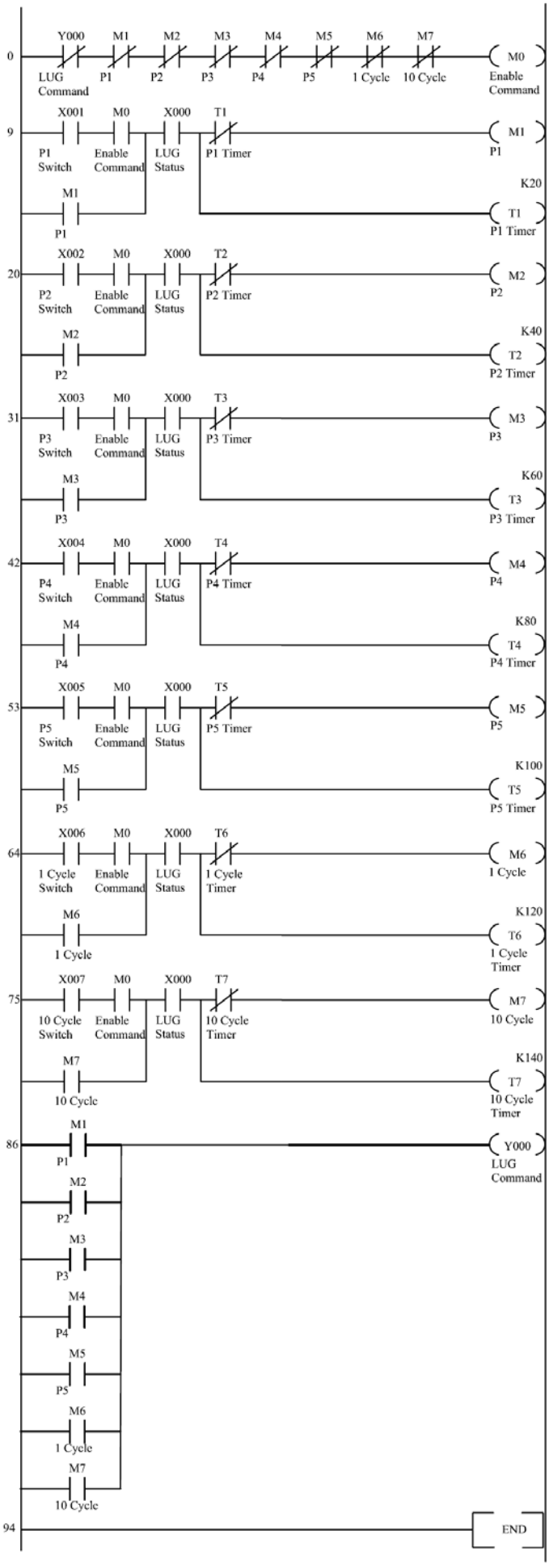
X006: Control Lubricator to circulate dispenses once.

X007: Control Lubricator to circulate dispenses 10 times.

Y000: PLC Output Signal.

Appendix D-3 Compile PLC Program Example

n the program example, P1 dispensing once means that the 1.1 or 1.2 oil outlet will output oil 0.15cm^3, P2 dispensing once means that the 2.1 or 2.2 oil outlet will output oil 0.15cm^3, P3 dispensing once means that the 3.1 or 3.2 oil outlet will output oil 0.15cm^3, P4 dispensing once means that the 4.1 or 4.2 oil outlet will output oil 0.15cm^3, P5 dispensing once means that the 5.1 or 5.2 oil outlet will output oil 0.15cm^3.



Make sure PLC Y000 only sends one kind of oil output signal to the lubricator, to avoid errors from action command signal of lubricator.

When PLC X001 is ON, PLC checks whether the lubricator can receive signals through X000. If yes, PLC Y000 will output a 2s HIGH signal to lubricator. After completion, the P1 oil outlet will dispensing once.

When PLC X002 is ON, PLC checks whether the lubricator can receive signals through X000. If yes, PLC Y000 will output a 4s HIGH signal to lubricator. After completion, the P2 oil outlet will dispensing once.

When PLC X003 is ON, PLC checks whether the lubricator can receive signals through X000. If yes, PLC Y000 will output a 6s HIGH signal to lubricator. After completion, the P3 oil outlet will dispensing once.

When PLC X004 is ON, PLC checks whether the lubricator can receive signals through X000. If yes, PLC Y000 will output a 8s HIGH signal to lubricator. After completion, the P4 oil outlet will dispensing once.

When PLC X005 is ON, PLC checks whether the lubricator can receive signals through X000. If yes, PLC Y000 will output a 10s HIGH signal to lubricator. After completion, the P5 oil outlet will dispensing once.

When PLC X006 is ON, PLC checks whether the lubricator can receive signals through X000. If yes, PLC Y000 will output a 12s HIGH signal to lubricator. After completion, each oil outlet will dispensing once.

When PLC X007 is ON, PLC checks whether the lubricator can receive signals through X000. If yes, PLC Y000 will output a 14s HIGH signal to lubricator. After completion, each oil outlet will circulate dispenses 10 times.

PLC output Y000 is connected with lubricator and which command action signal is controlling dispensing.