



Parr Instrument Company

4878 **Automated Liquid Sampler** Operating Instruction Manual



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Customer Service

Questions concerning the installation or operation of this instrument can be answered by the Parr Customer Service Department:

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Product Registration & Customer Satisfaction

Parr's Product Registration and Customer Satisfaction Survey can be found by visiting our website at:

www.parrinst.com/support/product-registration

Register your equipment with us so you can receive:

- Notification of Product Updates
- Free Software Upgrades
- New Product Information

Please complete our Customer Satisfaction Survey so that we may better serve you. Your feedback helps us improve our products and customer service.

PREFACE

Scope

These instructions cover the installation and operation of the Parr 4878 Automated Liquid Sampler as used with Parr Laboratory Reactors and Pressure Vessels. The users should study the instructions carefully before using these instruments so that they will fully understand the capabilities of this equipment and the safety precautions to be observed in its operation.

Applications

The Parr 4878 Automated Liquid Sampler is designed specifically for use with Parr reactors and pressure vessels. The sampler system can be used with reactors from any manufacturer provided the vessel is equipped with a dip tube arrangement as is provided as a standard feature in reactors from Parr. This dip tube extends down to nearly the inside bottom of the vessel and typically connects to two valves on the top of the head. The upper valve is used as a gas inlet valve, and the lower of the two valves is used as the liquid sampling valve.

To ensure that the second and subsequent samples are fresh and indicative of current reactor contents, it is prudent to first allow some gas to enter the reactor pushing the liquid remaining in the dip tube from the previous sampling back into the reactor. As you will see shortly, this Liquid Sampler has features that allow this function to be automated.

Intended Usage

This instrument has been designed, built, and tested to strict physical and electrical standards. However, it is the user's responsibility to install and operate it in conformance with local pressure and electrical codes.

If the instrument is used in a manner not specified by Parr Instrument Company, the protection provided by the equipment may be impaired. Establish training procedures to ensure that any person handling the equipment knows how to use it properly.

Related Instructions

The following Parr publications are also included to further your understanding of this instrument and its component parts:

No.	Description
201M	Limited Warranty

Explanation of Symbols

I	On position
O	Off Position
~	Alternating Current (AC)
	This CAUTION symbol may be present on the Product Instrumentation and literature. If present on the product, the user must consult the appropriate part of the accompanying product literature for more information.
	Protective Earth (PE) terminal. Provided for connection of the protective earth (green or green/yellow) supply system conductor.

Safety Information

To avoid electrical shock, always:

1. Use a properly grounded electrical outlet of correct voltage and current handling capability.
2. Ensure that the equipment is connected to electrical service according to local national electrical codes. Failure to properly connect may create a fire or shock hazard.
3. For continued protection against possible hazard, replace fuses with same type and rating of fuse.
4. Disconnect from the power supply before maintenance or servicing.

To avoid personal injury:

1. Do not use in the presence of flammable or combustible materials; fire or explosion may result. This device contains components which may ignite such material.
2. Refer servicing to qualified personnel.

Unpack Carefully

Unpack the equipment carefully and check all the parts against the packing list. Examine the components closely for any loose parts or shipping damage and be sure to check all layers of packing materials thoroughly so as not to overlook any parts which might otherwise be discarded. If shipping damage is discovered, report it immediately to the delivering carriers.

Cleaning & Maintenance

Periodic cleaning may be performed on the exterior surfaces of the instrument with a lightly dampened cloth containing mild soap solution. All power should be disconnected and the power cord should be unplugged when cleaning the 4878 Automated Liquid Sampler.

There are no user serviceable parts inside the product other than what is specifically called out and discussed in this manual. Advanced troubleshooting instructions beyond the scope of this manual can be obtained by calling Parr Instrument Company in order to determine which part(s) may be replaced or serviced.

Provisions for Lifting and Carrying

Before moving the instrument, disconnect all connections from apparatus. Use proper and safe lifting techniques when installing or moving the 4878 Automated Liquid Sampler and/or its components.

General Specifications

Electrical Ratings

115/230VAC, 3.0 Amps max, 50/60 Hz

Before connecting this instrument to an electrical outlet, the user must be certain that the electrical outlet has an earth ground connection and that the line, load and other characteristics of the installation do not exceed the following limits:

Voltage: Fluctuations in the line voltage should not exceed 10% of the rated nominal voltage shown on the data plate.

Frequency: Controllers can be operated from either a 50 or 60 Hertz power supply without affecting their operation or calibration.

Current: The total current drawn should not exceed the rating shown on the data plate on the controller by more than 10 percent.

Pressure Rating: 3000 psi maximum.

Environmental Conditions

This instrument is intended to be used indoors.

Operating: 15 °C to 40 °C; maximum relative humidity of 80% non-condensing.

Installation Category II (over voltage) in accordance with IEC 664.

Pollution degree 2 in accordance with IEC 664.

Altitude Limit: 2,000 meters.

Storage: -25 °C to 65 °C; 10% to 85% relative humidity.



CAUTION!

Do not use in hazardous atmospheres.

INSTALLATION

General Instructions

Set the controller near the reactor on a sturdy bench or table where there is convenient access to an electrical outlet capable of carrying the appropriate current. Leave a space of at least twelve inches between the controller and the reactor so that the controller will not be affected by radiant heat.

Attach the supplied power cord to the **POWER INPUT** connector located on the rear panel of the 4878 Automated Liquid Sampler.

Plug the power cord into a properly grounded electrical supply outlet.

Main Power Switch

This switch will cut off power to the controller.

Protective Fuses

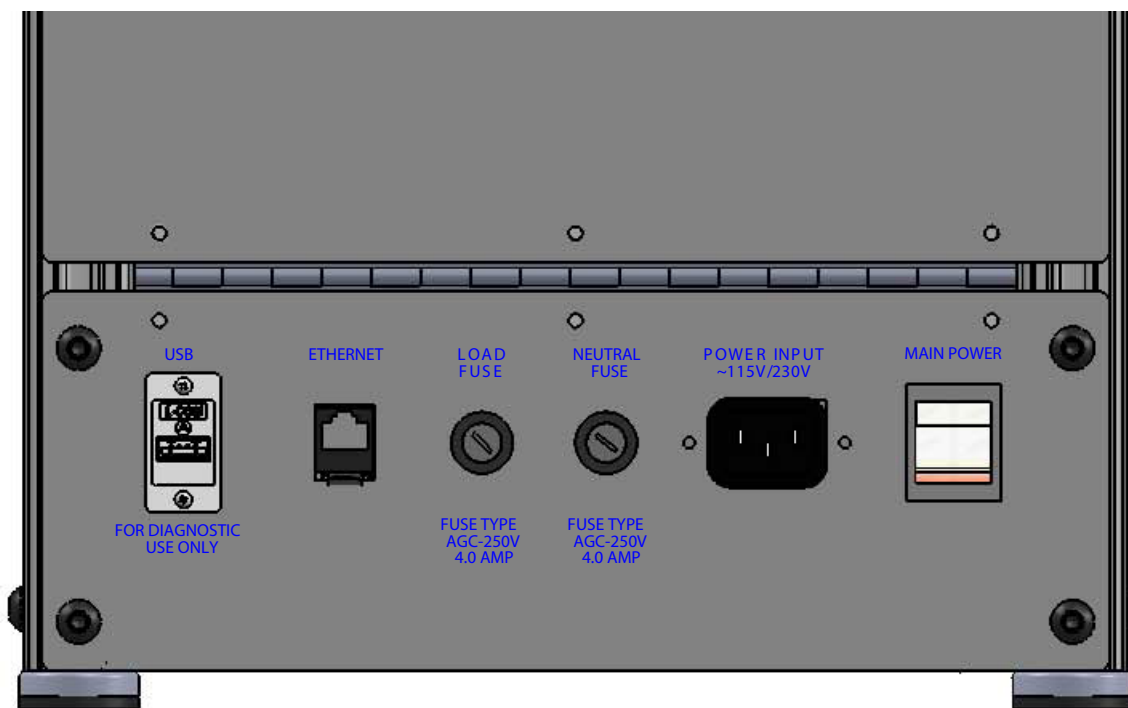
Main fuses are mounted on the back panel of the sampler system. These fast acting, 250VAC, 4 amp fuses are intended to protect the sampler system and supply in case of a fault condition.



CAUTION! Unplug unit before servicing.
For continued protection against possible hazard, replace fuses with same type and rating of fuse.

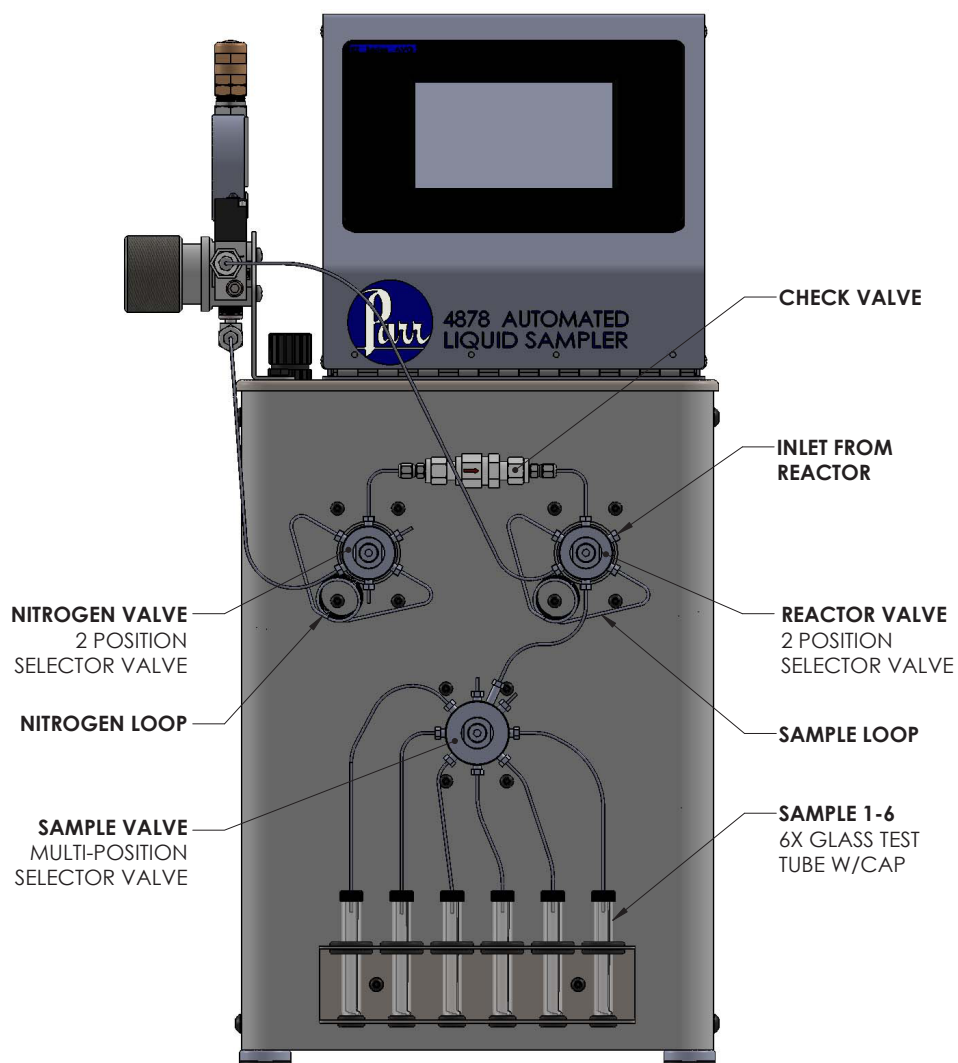
The following are 4878 Automated Liquid Sampler fuses which are intended to be field serviceable.

Part No.	Rating
139E27	Fast acting, 4 Amp, 250VAC

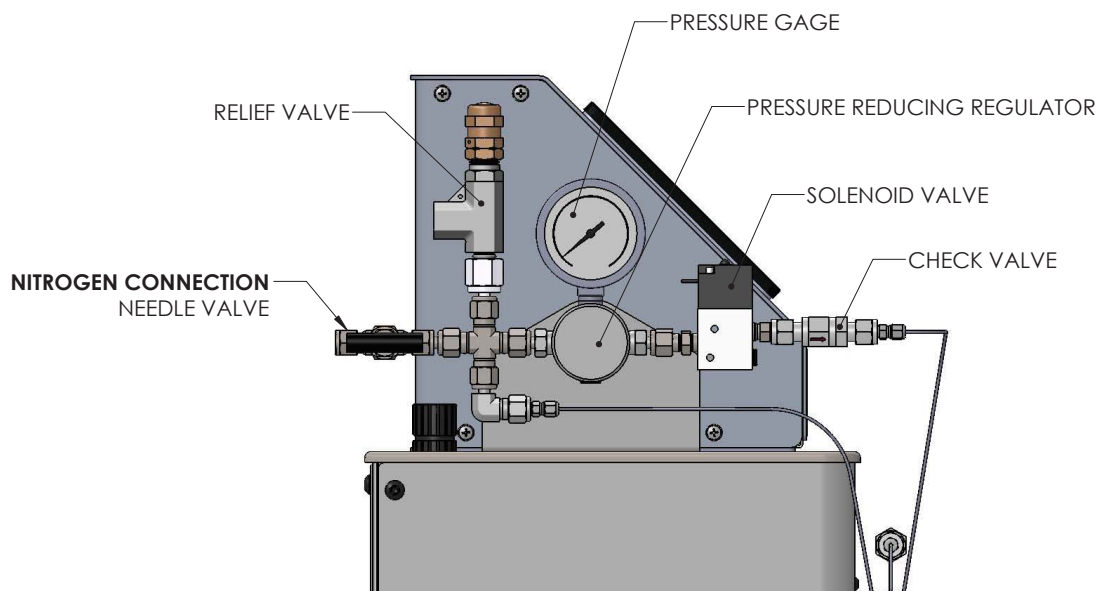


4878 Rear Panel

OPERATION



4878 Automated Liquid Sampler Front View



4878 Automated Liquid Sampler Side View - Nitrogen Connections

Sampling System

The sampling system consists of two 2-position high pressure selector valves, one multi-position high pressure selector valve, a normally-closed solenoid valve and a controller with a touch-screen interface. An overview of the valve and tubing arrangement can be seen in diagram 1.

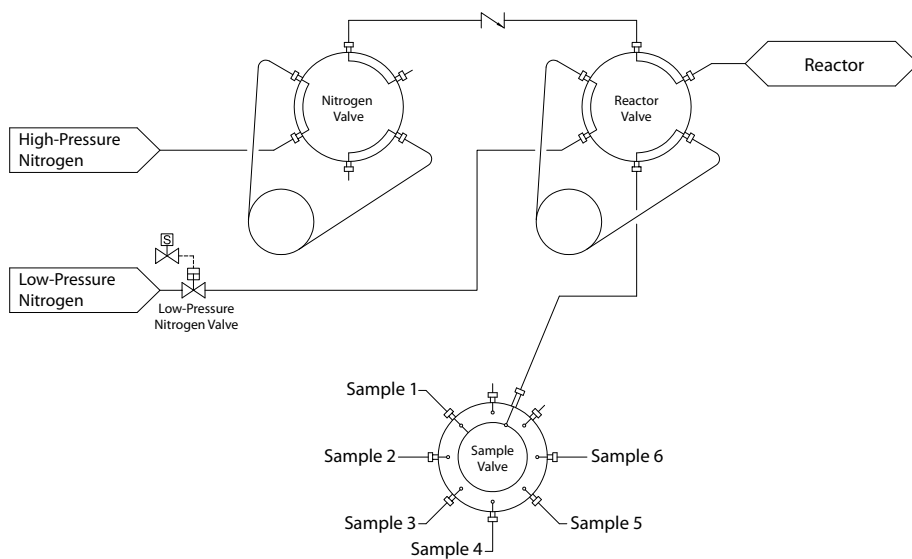


Diagram 1

For proper operation of the sampling system, a supply of nitrogen with a pressure of at least 200 psig higher than the pressure of the reactor being sampled is required. The nitrogen supply should be connected to the tubing connection on the top of the sampling system (see side view on page 6). With the high-pressure source connected, the needle valve should be opened and the pressure to the low-pressure nitrogen valve adjusted to approximately 20 psig to clear the tubing once the sample has been taken. Open the valve to the high-pressure nitrogen supply only when ready to pressurize the sample loop on the nitrogen valve. Once these connections have been made, the nitrogen loop on the nitrogen valve will be pressurized and ready to clear the contents of the dip tube as can be seen in diagram 2.

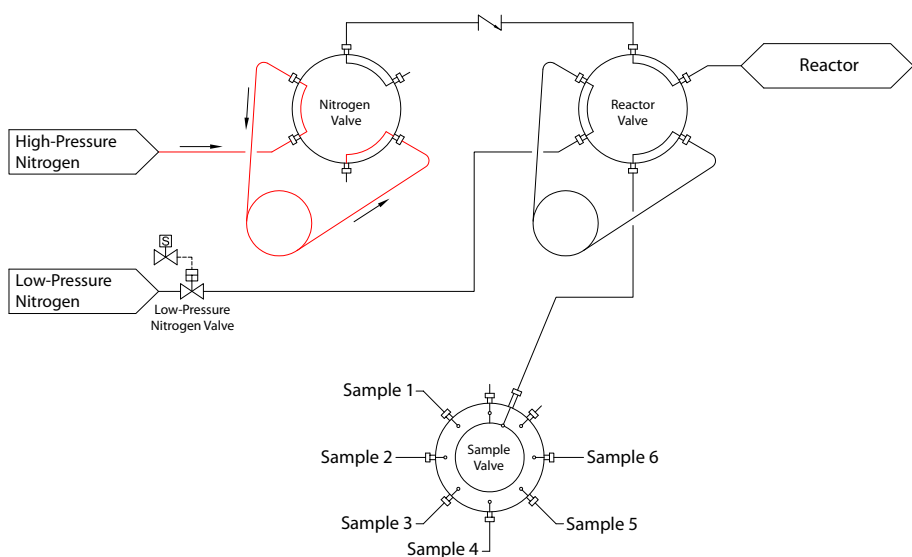


Diagram 2

The next step in the sampling sequence switches the nitrogen valve to position A which causes the higher pressure nitrogen in the Nitrogen Loop to clear the contents of the dip tube.

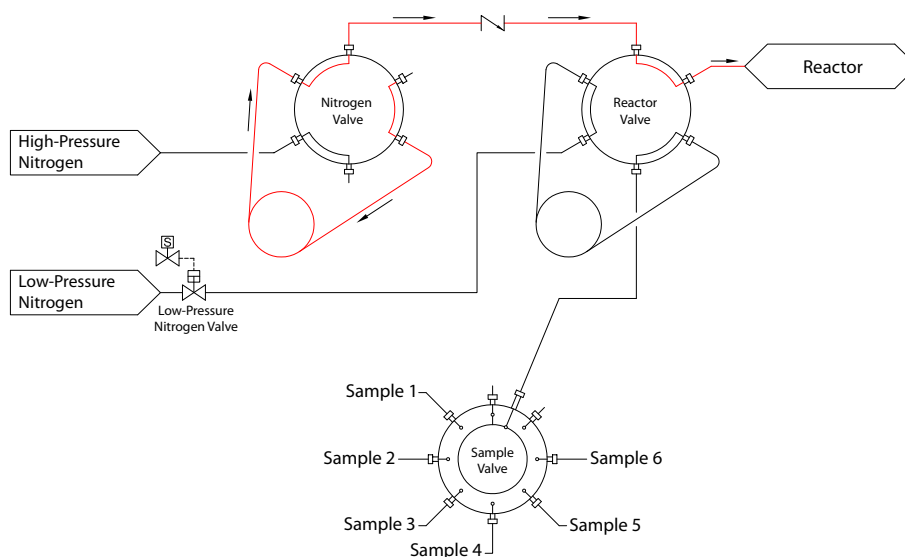


Diagram 3

After the user-settable time has expired, the nitrogen valve returns to position B and the Nitrogen Loop is re-pressurized. This pressurization step and blowout step can be repeated several times as set by the operator. The number of cycles required is dependent on many factors including the pressure differential between the high-pressure nitrogen supply and the reactor pressure, the viscosity of the fluid and the length of the tubing between the sampling system and the reactor.

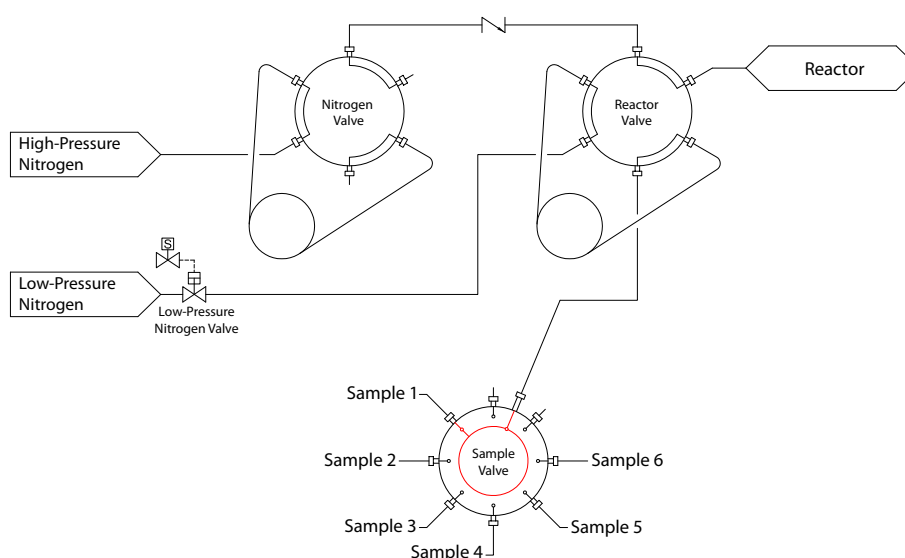


Diagram 4

Once the nitrogen blowout sequence has completed, the multi-position selector valve switches to the next position. In diagram 5, the selector valve has switched from the home position to sample 1 position.

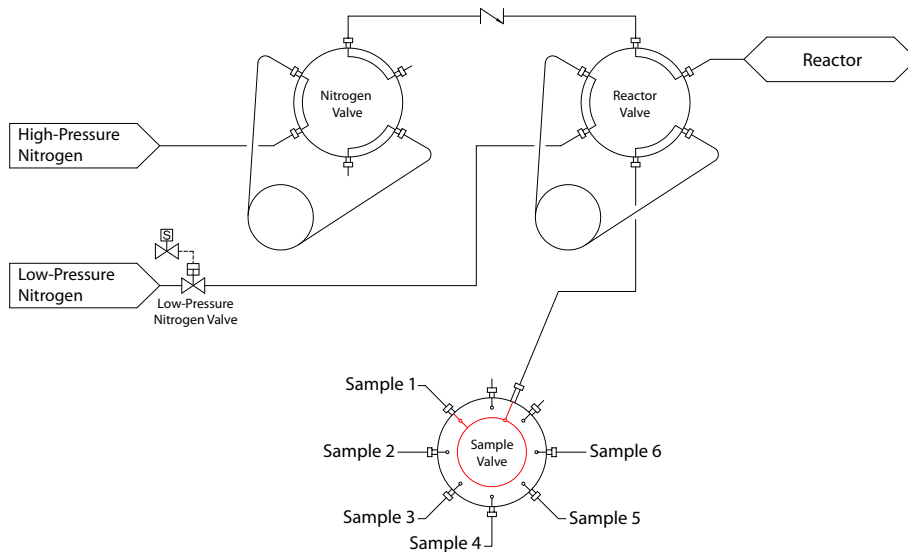


Diagram 5

Once the nitrogen blowout sequence has been performed, the contents of the dip tube have been cleared, and the sample selector valve has moved to the next position, the reactor valve switches to position A so that the sample loop is filled from the reactor.

Note: The sample valve moving to the next position is described in Diagram 9.

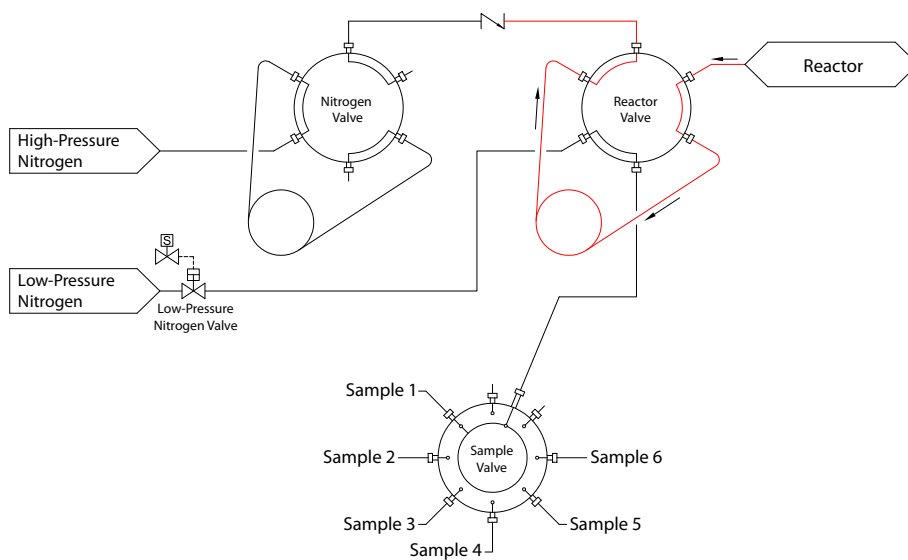


Diagram 6

As with the nitrogen valve, the reactor valve also has a user-settable timer to allow the sample loop to fill. Once the time has expired, the reactor valve switches to position B and the contents of the sample loop are transferred to the test tube corresponding to the current sample position.

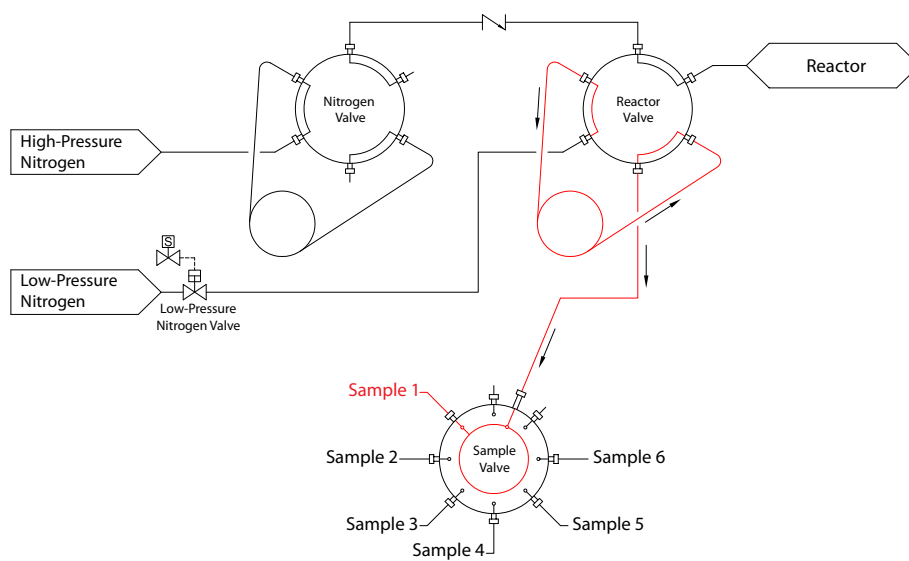


Diagram 7

The reactor valve may need to be cycled a number of times to first vent the gas contents of the dip tube and associated tubing and then to achieve the desired sample size. The time required and the number of sampling cycles are settable on the settings screen of the controller. In order to minimize the volume and maintain a safe discharge pressure into the test tube, it is recommended that the sample loop on the reactor valve have a volume ≤ 1 mL. Once the desired number of sample cycles has been completed, the low-pressure nitrogen valve is opened to clear the liquid contents of the sample loop into the test tube.

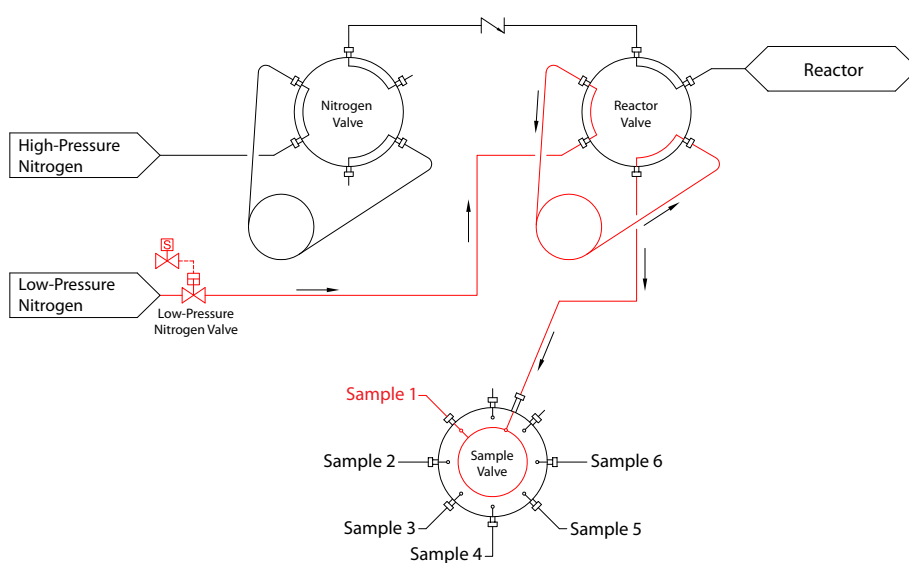


Diagram 8

Once the blowout time has expired and the contents of the sample loop have been cleared, the low-pressure nitrogen valve closes and the sampling sequence is completed. The nitrogen valve loop will remain pressurized until the next sampling sequence is initiated.

The valve sequencing will continue in the same manner with the sample valve incrementing to the next position until the desired number of samples has been collected.

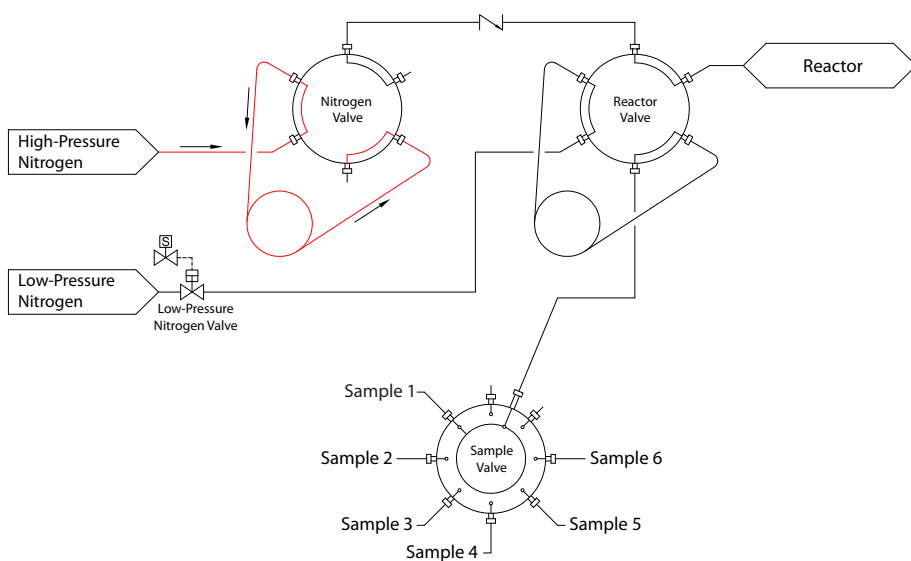


Diagram 9



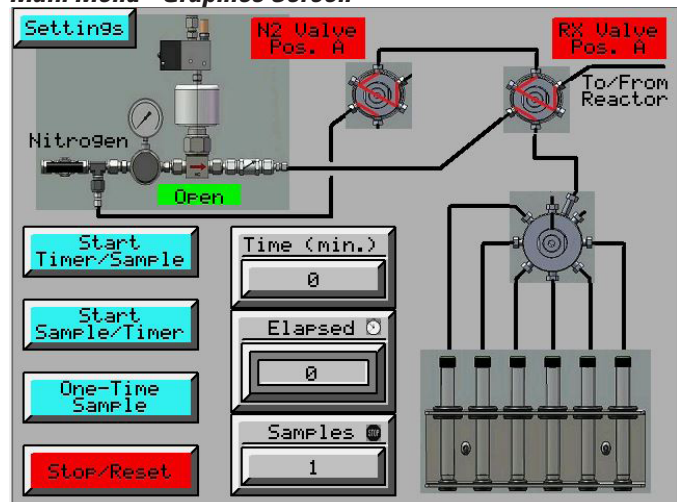
CAUTION!

After power interruption the sampler will continue the current sampling sequence.

Controller Menu Navigation

The control functions of the automated sampling system are performed by a programmable logic controller with an integrated touch screen interface. Upon powering the controller, the initial screen is a graphical representation of the sampling system with indications for the current state of the valves as well as buttons to access control settings and initiate or stop the automatic sampling.

Main Menu - Graphics Screen

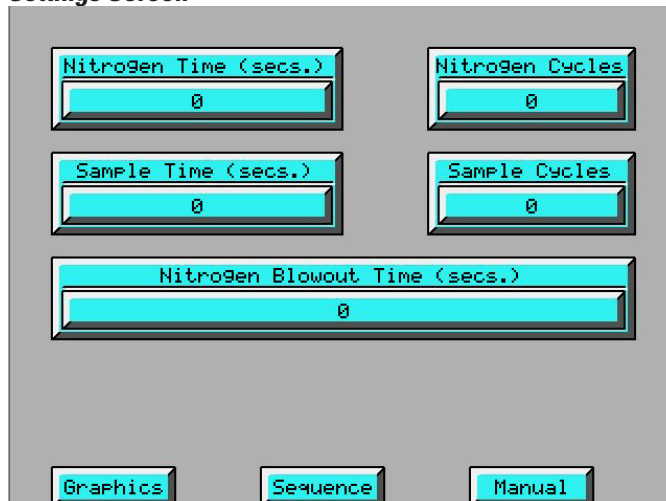


Before an automated sampling sequence is initiated, there are a number of variables which need to be set by the operator. The time (min.) setting is the time between samples. The time can be set by touching the numeric entry box on the screen and entering a time in minutes. As an example, if it is desired to take a sample every three hours, 180 minutes should be entered into the time numeric entry box.

The number of desired samples should be set in a similar manner. The controller can be set up to take a maximum of 6 samples. The elapsed time display will indicate the number of minutes elapsed since the last sample.

As was discussed in the previous section, the time and count of nitrogen cycles, the time and count of sample cycles and the length of the nitrogen blowout time should be considered for each sample scenario. Many variables can have a significant impact on the quality of the sample taken.

Settings Screen



The Settings Screen displays five numeric entry boxes for configuration: 'Nitrogen Time (secs.)' (0), 'Nitrogen Cycles' (0), 'Sample Time (secs.)' (0), 'Sample Cycles' (0), and 'Nitrogen Blowout Time (secs.)' (0). At the bottom, there are three buttons: 'Graphics', 'Sequence', and 'Manual'.

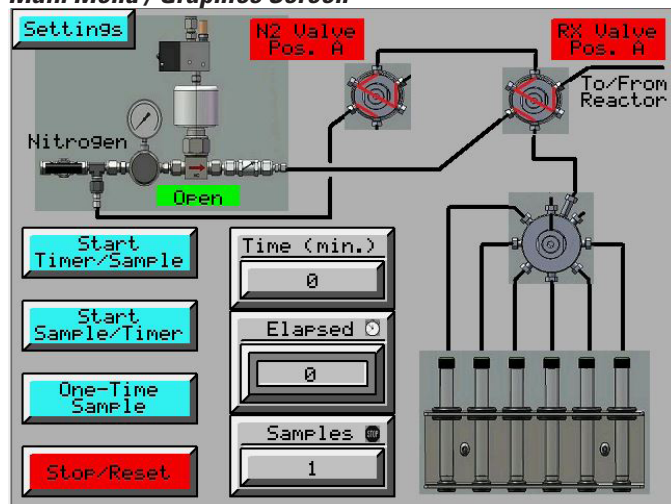
By clicking the Settings button on the **Main Menu** screen, the **Settings Screen** is accessed to set or modify these variables.

As a reference, the following settings were tested and used to consistently take a 1 mL sample from a 300 mL reactor:

Test Settings

Contents of Reactor	Isopropyl Alcohol
Nitrogen loop	5 mL
Sample loop	1 mL
Reactor pressure	800 psig
Blowout nitrogen pressure	30 psig
High-pressure nitrogen pressure	1000 psig

Main Menu / Graphics Screen



Once the initial variables have been set, several sampling sequence options are shown on the **Main Menu / Graphics Screen**. By clicking on the **Start Timer/Sample** button, the timer will begin immediately and when the desired time has elapsed, the sample sequence will commence. Alternatively, if the **Start Sample/Timer** button is pressed, the first sample will be taken immediately with the programmed settings. Upon completion of the first sample, the timer will begin. If it is only desired to take a single sample, the **One-Time Sample** button should be pressed to initiate a single sample sequence. The **Stop/Reset** button is used to stop the timer sequence. It should be noted that once the sample sequence has been initiated and a sample is currently being taken, the **Stop/Reset** button will have no effect.

The **Main Menu / Graphics Screen** can be used as a visual indication of the status of the sampling sequence. When the timer between samples is running, the elapsed time (minutes) is displayed as well as a small clock icon in the top of the elapsed time box. The number of samples taken can be seen by the number of filled test tubes on the **Main Menu / Graphics Screen**. When the desired number of samples has been taken, a small stop sign icon is displayed in the samples box indicating that sampling is complete.

The status of the nitrogen selector valve and the reactor selector valve are displayed graphically and with "A" or "B" displayed to show which position the valves are in. The status of the sample selector valve is shown by highlighting the current flow path through the valve. The status of the low-pressure nitrogen valve is displayed by either a closed or open indication.

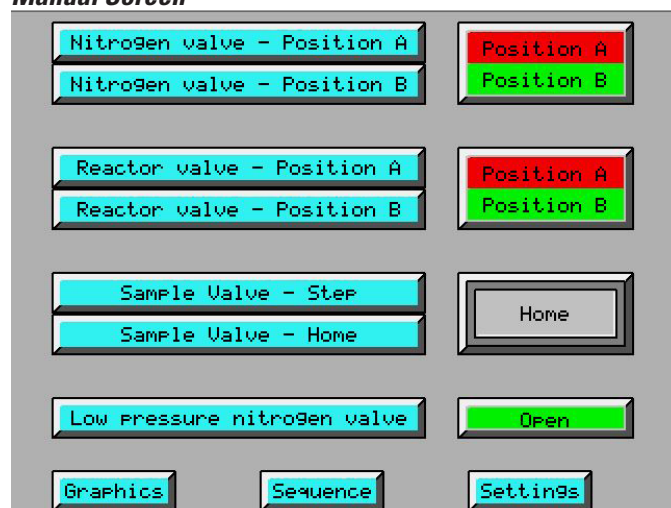
Two additional screens can be accessed from the **Settings Screen**.

Sequence Screen



The **Sequence Screen** can be used to initiate the sampling functions and set the time and total samples in the same manner as the **Main Menu / Graphics Screen**.

Manual Screen

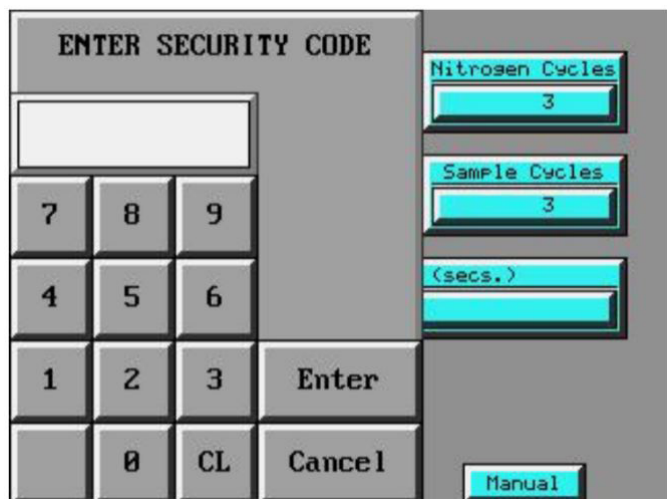


The **Manual Screen** can be used to manually manipulate the valves.

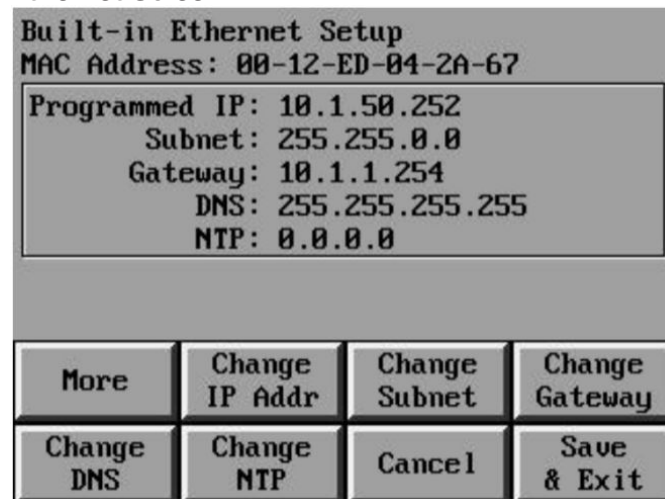
Either the nitrogen selector valve or reactor valve can be switched from position A to position B by touching the corresponding button. The sample valve can be stepped through the various positions by touching the step button. The sample valve can be immediately returned to the home position from any other position by clicking on the home button. The low-pressure nitrogen valve can be opened or closed by touching the button.

Ethernet Setup

The default IP address assigned to the 4878 controller is 10.1.50.252. The Ethernet Setup screen can be accessed by pressing in the lower-right corner of the Settings Screen and entering a security code of 123 when prompted.



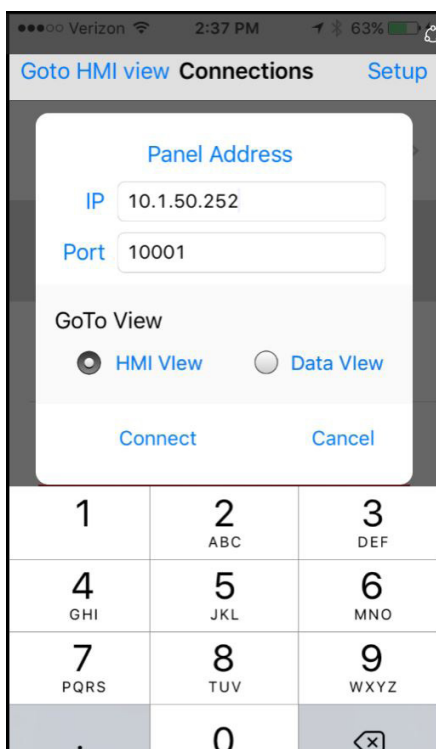
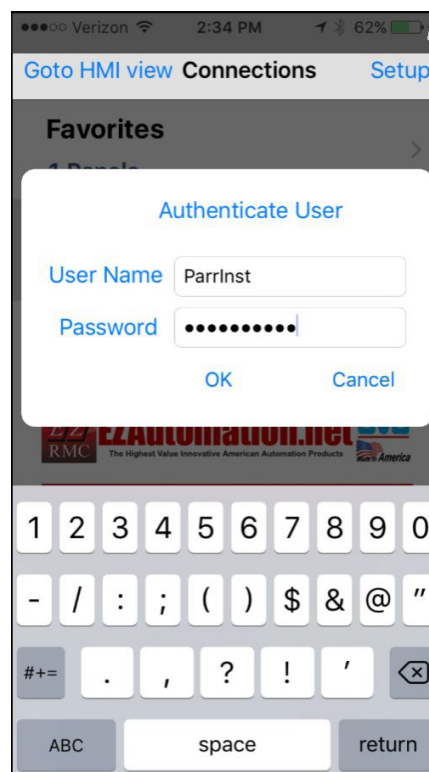
Ethernet Screen



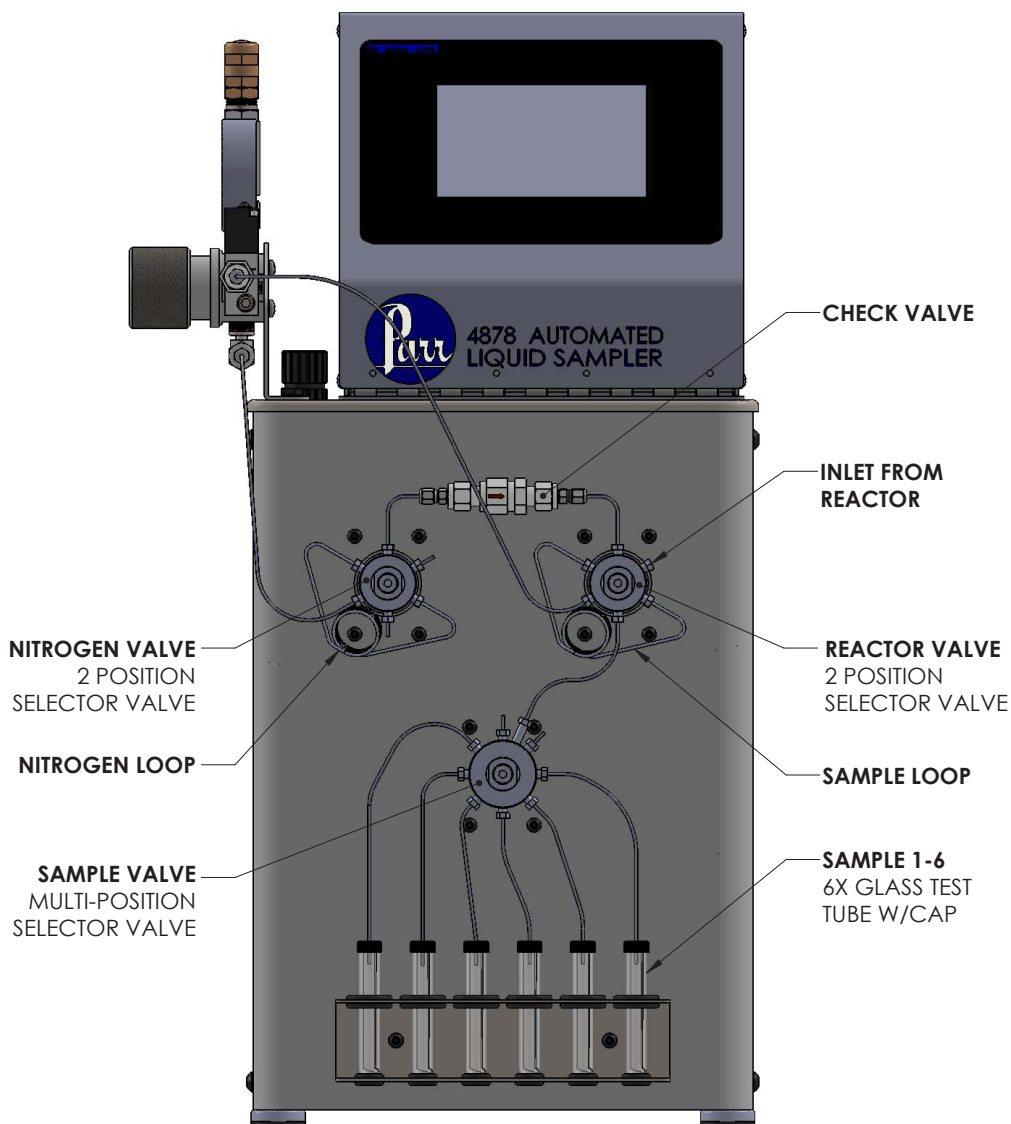
From the Ethernet Setup screen, several parameters can be altered including the IP address and the subnet.

Remote Interface

The 4878 Automated Liquid Sampler is configured to interface remotely through the EZ Automation EZ-RMC app which is available for both iOS and Android platforms. The default User Name for remote access is ParrInst with a default Password of ParrInst01.

PARTS LISTS



4878 Automated Liquid Sampler Front View

Part No.	Description
A3941HC	Glass test tubes with caps (pkg of 10)
A3942HC	Tubing Kit to include: – 1/16" tubing, 3 ft w/ A3943HC nut and ferrule set (preattached) – Connector for 1/8NPT-M threads
A3943HC	1/16T nut and ferrule set (For connection to selector valve)
3889HC	Sample loop, 1 mL 1/16T
3889HC3	Nitrogen loop, 5 mL 1/16T



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