P98II
PUMP
MANUAL

BEIJING WENFEN ANALYTICAL INSTRUMENT
DEVELOPMENT CO., LTD.

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SECTION 1 INTRODUCTION

1.1 General

The Model P98II is a microprocessor-controlled, double-piston, low residual pulsation, reciprocating pump of the high-performance liquid chromatograph. It delivers the solvent to the column, via a pressure transducer and pulse damper. The available injectors are a manual loop injector.

The keyboard allows the user to control completely the operating conditions of the instrument. The keyboard includes keys to select flow rate, The LCD displays the status of all instrument and shows all parameters of the instrument.

For most chromatographers fits most useful part of the manual will be Section 4, which explains in detail the LCD display and the keyboard，and outlines the operating procedures for the instrument. All users should read Section 4 thoroughly before operating the Model P98II.

Section 2 provides installation instructions for the Model P98II, hence will be most useful to users whose instrument is not installed by WENFEN Service personnel.

Section 3 includes a brief description of the hydraulic components of the instrument and a discussion of the software.

Finally, Section 5 is devoted mainly to nonroutine maintenance and service procedures. and to a troubleshooting guide.

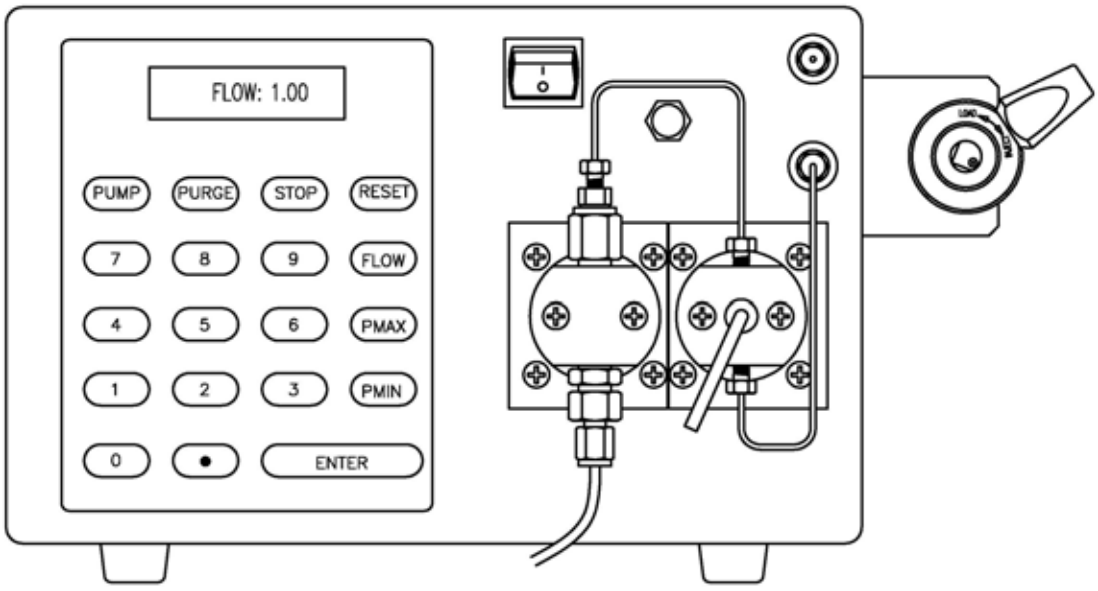


Figure 1-1 Frontal panel

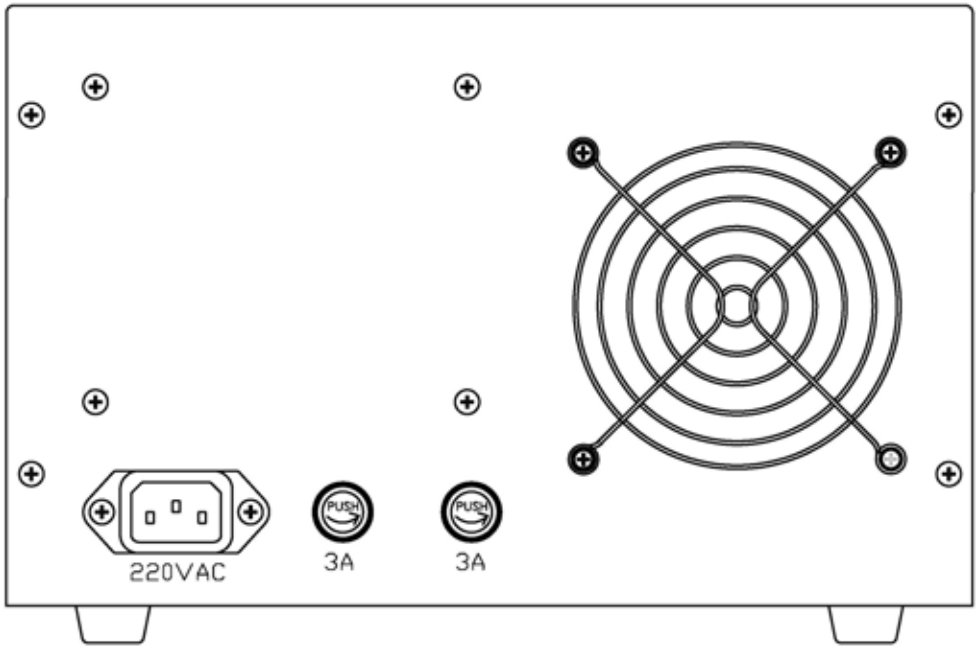


Figure 1-2 Rear panel

1.2 Specification

a. Operating pressure: 0～42MPa (6000 psi) maximum.

b. Flow rate range: 0.01～9.99ml/min；

c. Flow rate precision: ±1%；

d. Flow rate accuracy: ±3%；

e. Pressure solution: 0.1MPa；

f. Over pressure protection: pump shuts off if pressure exceeds limit specified by user or 42.0MPa(6000 psi) maximum.

1.3 General Parameters

a. Power Supply: 300W；

b. Dimensions: 450mm(D)×260mm(W)×150mm(H)；

c. Weight: 15kg；

1.4 Packing List

a. Pump

b. Power supply cable

c. Repair tool

d. Spare parts and accessories

e. Operation manual

2. INSTALLATION

2.1 Unpacking

After unpacking, please check the device and accessories thoroughly for any damage that may have occurred during transport. If necessary, put forward any claim for damages to the carrier.

Use the packing list and check if the instrument delivery is complete. Please contact our service department if you are missing something or if you need support.

2.2 Environment Requirements

a. Temperature requirements: ambient temperature range 5 to 35℃

b. Operates in relative humidity from 5% to 80%;

c. Power requirements: AC 220V±5%,

d. Power frequency: 50±0.5Hz (voltage and frequency specified on the tag attached to the power cord)

e. The instrument should be apart from the following place: Directly sunshine place, Dust place, Vibrant place, Corrosive gas source, Strong electric field.

2.3 Electrical Installation

2.3.1 Power Requirements

Each Model P98II has been wired at the factory for operation at the voltage and line frequency specified on the tag attached to the power cord. The instrument requires a single-phase power source capable of delivering 300W at the indicated ac voltage (±5%) and line frequency (50 or 60Hz). The power cord is provided with a 3-prong plug.

2.3.2 Circuit Protection

The Model P98II is protected by 2 fuses: F1-F2 are on the rear panel of the instrument; Table 2-1 describes the fuse ratings and the circuits protected.

Table 2-1 Fuses

	Ratings	Circuit Protected	Result of Failure
F1	3 A(220V)	Main Power	Complete shutdown
F2	3 A(35V)	Pump Power	Pump failure

WARNING

Before any fuse is removed the instrument must be disconnected from line power.

2.4 Installing the Solvent Lines

The lines that deliver solvent from the reservoirs to the proportioning valves must be installed, For each lire follow the procedure below, using

components included in the standard accessory kit.

(1)Remove the stainless-steel compression nut and Teflon ferrule from the base of the proportioning valve.

(2)Over the end of the solvent line above the reservoir cap, slip first the nut, then the Teflon ferrule, flat end first, The tapered end of the ferrule now faces the fitting on the proportioning valve.

(3)Insert the solvent line, as far as it will go, into the fitting at the base of the check-valve. Screw the compression nut onto the fitting, tightening it only finger-tight. Using one wrench on the hex nut at the base of the inlet-valve head and a second on the compression nut, tighten the compression nut an additional 1/4-turn. **Overtightening this nut can constrict the solvent line.**

2.5 Variable-Backpressure Terminator

The variable-backpressure terminator is included in the standard accessory kit, along with the fittings necessary to attach it to the exit of the detector. The terminator- should be used with all detectors, except the refractive-index detector, to eliminate bubbles in the sample flow cell. Attach the restrictor to the 1/16” OD tubing of the detector exit and to a waste collector as shown in Figure 2-1. The stainless-steel compression fittings should be tightened moderately.

The backpressure terminator is adjusted at the factory to about 10 atm (approx. 160 psi). However, if it becomes misadjusted, or if it is necessary to adjust it to a different pressure, the following procedure can be used.

(1) Remove the terminator assembly from the detector exit.

(2) Remove the side panel from the column enclosure, then remove the 1/16” tubing from the exit of the pressure transducer. Attach a short piece of 1/16” stainless-steel tubing to the transducer using a 1/16” stainless-steel ferrule and zero-dead-volume nut.

(3) Set the flow rate to 10 ml/min, then start the pump, taking care to provide a waste container for the solvent flowing from the transducer. Check the pressure indicated on the LCD. It should be stable at 0 atm. Stop the pump.

(4) Using a 1/16” ferrule and 1/16” nut, attach the variable restrictor to the tubing from the pressure transducer.

(5) Slowly rotate the knurled nut on the terminator back and forth until the desired pressure is obtained as displayed on the LCD.

CAUTION

Solvent will likely come in contact with the skin during adjustment

of the restrictor; therefore, wear protective gloves.

(6) Replumb the pressure transducer, and reattach the variable terminator assembly to the detector.

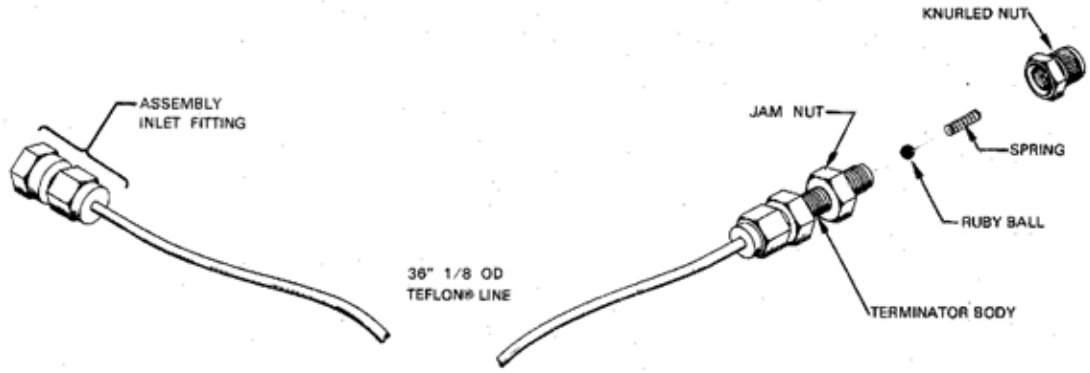


FIGURE 2-1 VARIABLE-BACKPRESSURE TERMINATOR ASSEMBLY

2.6 Cutting and Cleaning Stainless-Steel Tubing

If additional pieces of 0.009" ID tubing are needed for the column configuration being used, care should be taken that it is properly cut, deburred, and cleaned before it is installed in the instrument.

(1) Place the tubing on a clean, flat surface. Place a knife blade at the point to be cut, then while pressing down firmly on the knife rotate the tubing until a single line can be seen all the way around the tubing.

(2) Grasp the tubing on each side of the score with smooth-jawed pliers, then flex the tubing back and forth through a small arc until it breaks at the score.

(3) If necessary, use a whetstone or a fine-tooth file to remove any burrs from the newly cut end of the tubing.

(4) Clean the tubing by flushing it with the following solvents in the order listed: acetone, isooctane or hexane, isopropanol, distilled water, concentrated nitric acid, distilled water, acetone. Finally, dry the tubing by flushing it with a clean, dry gas.

WARNING

POSSIBLE CHEMICAL REACTION

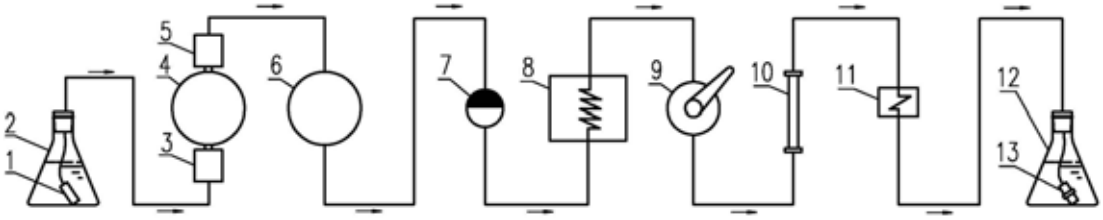
Do not discard the nitric sold and organic solvents into the same container.

3. HYDRAULIC COMPONENTS AND SOFTWARE

This section provides a brief description of the major components of the Model P98II. It emphasizes the operating principles of the hydraulic components and the available injectors, and roughly sketches the design of the software package.

3.1 Hydraulic Components

The components of the hydraulics system (which are illustrated schematically in Figure 3-1) provide an accurately metered mixture of solvents to the column head in a well-regulated, pulseless flow. The components include a pump, a pulse damper to eliminate flow pulsations, and a pressure transducer to measure the pressure at the head of the column. These are described below.

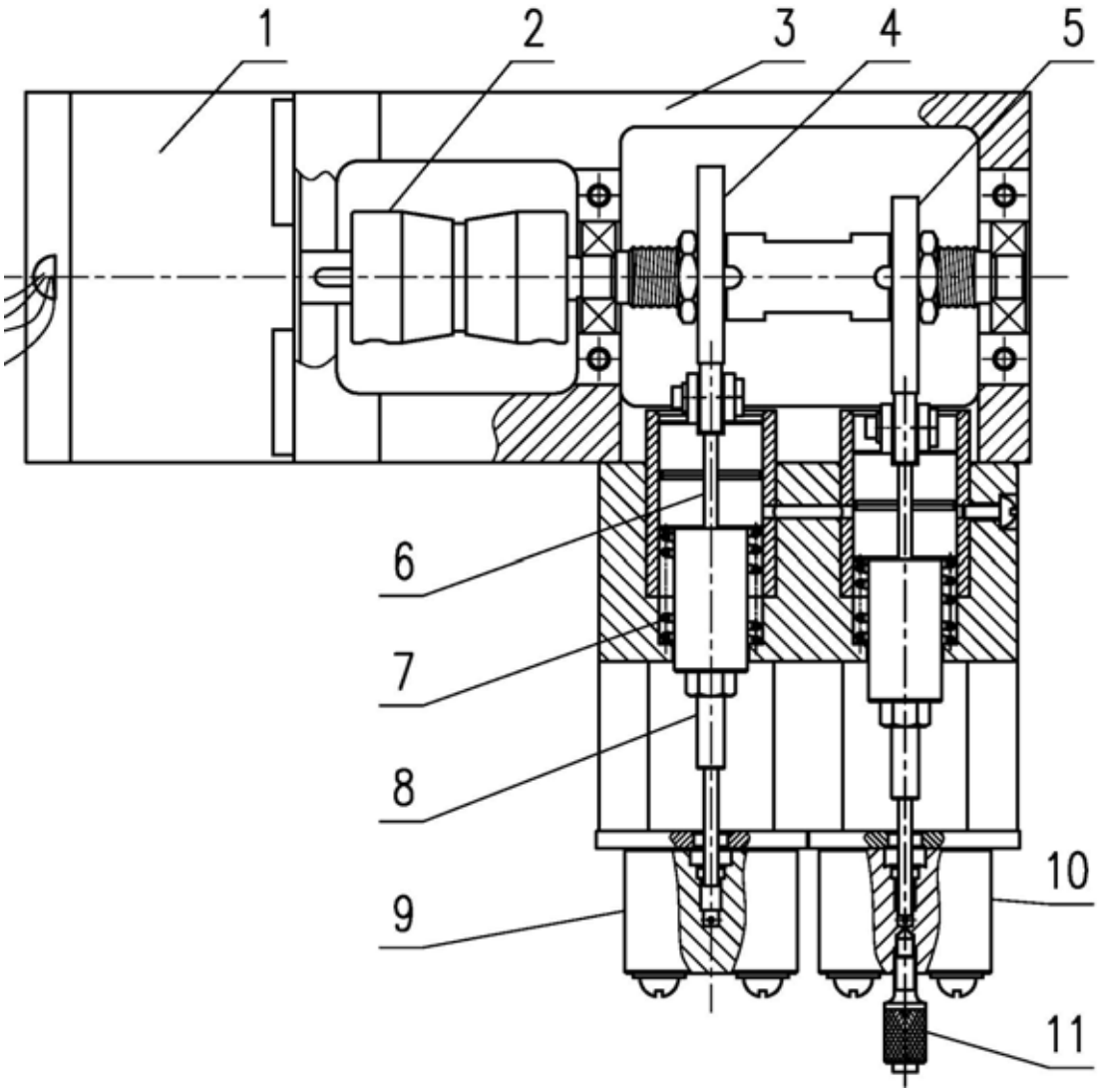


1.Solvent filter 2.Solvent reservoir 3.Bottom check-valve
4. Main pump head 5.Top check-valve 6.Slavery pump head
7. Pressure transducer 8. Pulse damper 9. Injector
10.Column 11.Flow cell 12.Waste solvent reservoir
13. Variable-backpressure terminator

FIGURE 3-1 MODEL P98II HYDRAULICS SYSTEM

3.1.2 Pump (Figure 3-2)

The double-piston, reciprocating pump is driven by a 20000-pulse/revolution stepper motor. The motor is coupled to the camshaft through a flexible coupling. The camshaft includes two eccentric lobes: one drives the main pump piston, the second opens and closes the inlet valve through which solvent is admitted to the main pump chamber from the proportioning valves. Since the solvent is drawn from the reservoirs by the fill stroke of the pump, the solvent-delivery system depends upon neither gravity nor pressurized reservoirs.

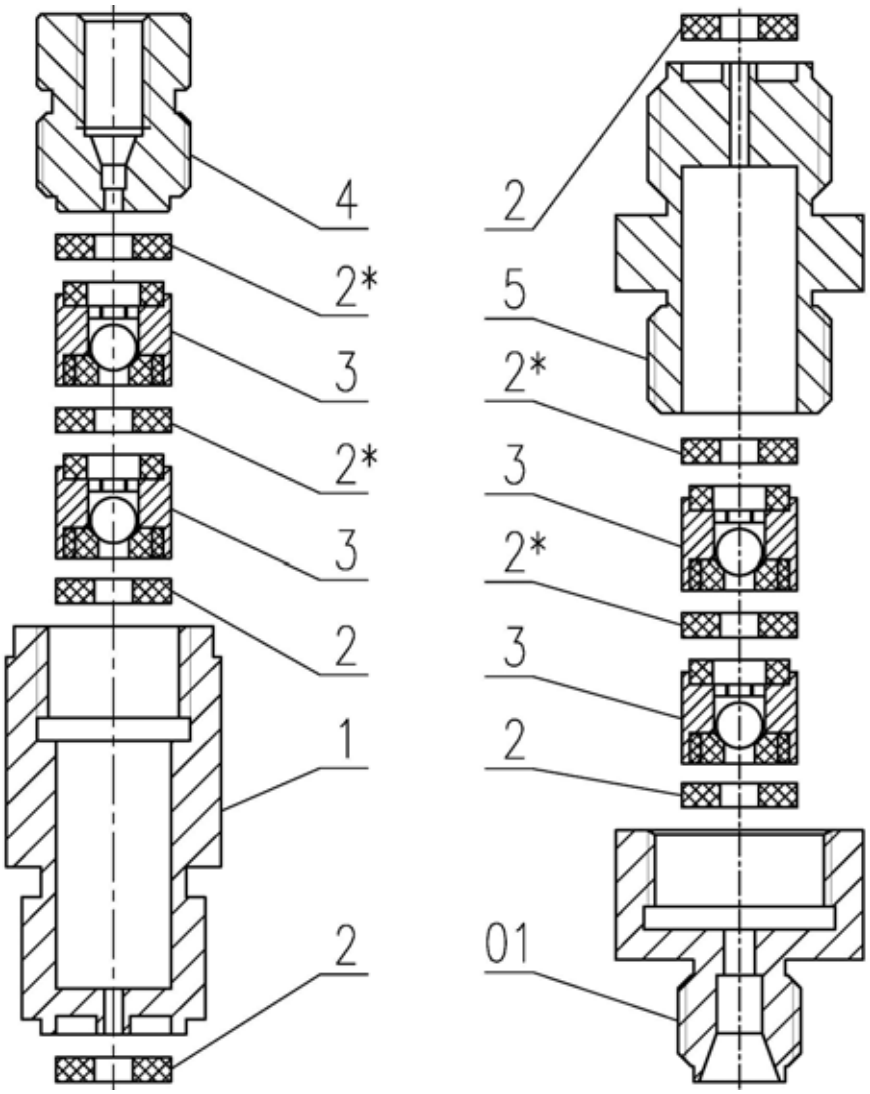


1.Stepping motor 2.Flexible coupling 3.Pump assembly
4. Main camshaft 5.Slavary camshaft 6.Piston slider
7. Piston slider spring 8.Piston assembly 9.Main pump head
10.Slavery pump head 11.Bleed valve

FIGURE 3-2 CUTAWAY VIEW OF PUMP

3.1.3 Check-Valve Assembly (Figure 3-3)

The top check-valve assembly, mounted on top of the main pump head, closes the outlet line during the fill stroke of the pump, The bottom check-valve assembly, mounted on bottom of the main pump head, opens the outlet line during the fill stroke of the pump. Everyone comprises two ruby-ball/sapphire-seat check valves.



Top check-valve left)

1.Check-valve lower body 2.Seal 2*.Seal(Optional according to height)
3.Ball and seat body 4. Check-valve upper body

Bottom check-valve (right)

01.Check-valve lower body 2.Seal 2*.Seal(Optional according to height)
3.Ball and seat body 5. Check-valve upper body

FIGURE 3-3 CHECK-VALVE ASSEMBLY

3.1.4 Pulse Damper

The in-line pulse damper ensures that any pressure and flow surges are isolated from the head of the column. The flexibility of the tubing and the compressibility of the fluid thus absorb any pressure fluctuations in the solvent stream. The total solvent volume in the pulse damper is less than 1.5 ml.

3.1.5 Pressure Transducer

The pressure at the head of the column is measured by a strain-sensitive semiconductor crystal whose resistance varies with the

applied pressure. The pressure is continuously displayed on the LCD screen. During each pump stroke the central processor checks the pressure and compares it to the high- and low-pressure limits set by the operator.

3.1.6 Injector

A standard injector is available for use with the Model P98II: a manual 6-port (RHEODYNE 7725i).

3.2 Software

A central microprocessor is responsible for the logical and computational functions of the Model P98II. To ensure that the microprocessor attends to the most important of these responsibilities first, the software designates a strict priority among them. The processor therefore responds to an input request by providing immediate service only if it is not currently processing a higher priority routine.

4. OPERATION

4.1 LCD Display and Keyboard

To operate the Model P98II PUMP little more is necessary than learning to read the LCD display and becoming familiar with the keyboard. The LCD screen displays all important current conditions of the instrument. The keyboard comprises all operating controls for the instrument, keys to manipulate the LCD display. This section describes the LCD display, and discusses in detail the keyboard, and describes how to operate the instrument.

4.1.1 LCD Display

The LCD screen displays all important current conditions of the instrument. When entries are being made by the operator, each key will produce an entry in an entry field on the page that is currently displayed.

4.1.2 Keyboard Description

The keyboard of the Model P98II PUMP combines the operating controls of the instrument with keys to manipulate the LCD display and to build and run a variety of operating programs. As shown in Figure 4-1 the operating controls comprise a row of four keys at the top of the panel; the parameters including FLOW, PMAX, PMIN keys are controlled by a second group of keys; and a third group includes the numeric keys and ENTER keys. The paragraphs below describe in detail how the remaining keys are used to set parameters.

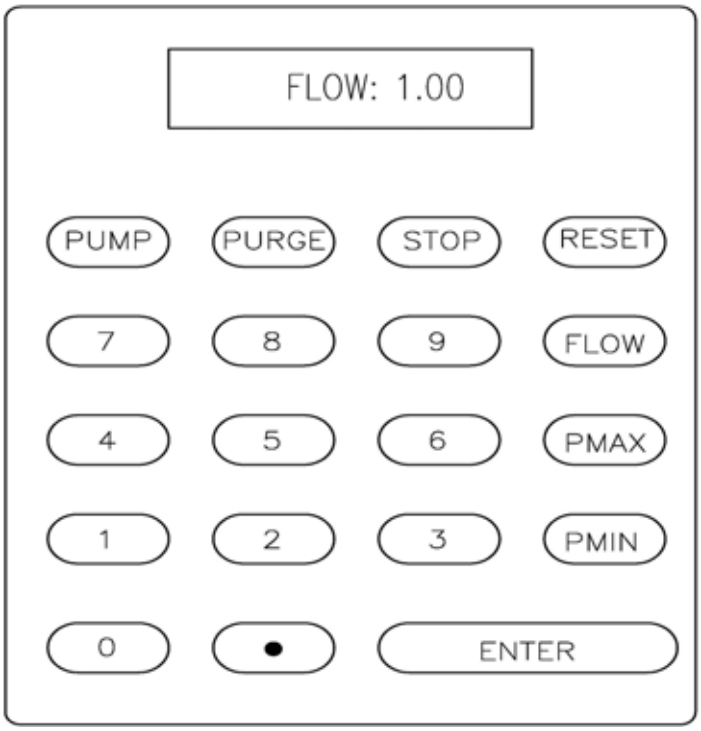


FIGURE 4-1 KEYBOARD

4.1.3 Set Parameters

This paragraph explains how to enter or change these values. The allowed values for the instrument are tabulated in Table 4-1.

TABLE 4-1 ALLOWED VALUES

PARAMETERS	ALLOWED VALUES
FLOW	0.01－9.99 ml/min，0.01 ml/min
Pmax，Pmin	0－420Kgf/cm^2，2Kgf/cm^2

(1) Operating Conditions

PUMP status: **RUNNING, PURGING** or **STOPPED**

FLOW RATE: the flow rate of the solvent in milliliters per minute. If the pump is stopped the display will show the rate at which the solvent will be pumped when operation resumes.

PRESSURE: the current column-head pressure.

(2) Parameter Keys (FLOW, PMAX, PMIN)

Entering FLOW

parameter key + new value. +ENTER key

The parameter can be changed; the new value take effects immediately even if the instrument is stopped.

Entering PMAX, PMIN

parameter key + new value. +ENTER key

The parameters can be changed at any time; the new values take effect immediately even if the instrument is running.

PMAX: used to specify the maximum allowable column-head pressure. the maximum allowable value for the column-head pressure in atmospheres. If pressure is exceeded PMAX , the pump will stop.

PMIN: used to specify the minimum allowable column-head pressure. the minimum allowable value for the column-head pressure in atmospheres. If the pressure drops below PMIN after the pump, the pump will stop.

(3)Numeric Keys

These keys are used to specify time and parameter values.

(4)Operating Controls

PUMP: starts the pump. The flow rate must be specified.

RESET: the instrument must be restarted.

PURGE; starts the pump at a flow rate of 5 ml/min. **Note: open the bleed valve**

STOP: halts the pump.

ENTER: firstly used to process the contents of the entry field; thus all instructions involving the parameter keys are implemented only after the

ENTER key is struck.

4.2 Routine Operation

This paragraph describes the operating procedures and precautions applicable to all chromatography systems that include a Model P98II.

CAUTION

Components made from stainless steel are subject to attack from halide salts and strong oxidizing agents (including aqueous solutions of manganese, chromium, nickel, copper, iron, and molybdenum). Such solutions should be avoided as mobile phases. If corrosive salts must be used, the corrosion resistance of the stainless-steel components can be improved by passivating them with nitric acid.

Also, cyclohexane should be avoided as a solvent since it freezes under high pressure, even at room temperature.

Finally, make sure that an adequate waste container is provided during routine operation. The detector exit, the purge exit of the injector. and the waste exit of the loop valve (if installed) must all be routed to an appropriate container to avoid solvent spills.

4.2.1 Changing Solvents

If you are changing solvents it is necessary to purge the system of the old solvent and to reequilibrate the column with the new solvent. If the old and new solvent mixtures are miscible, the following instructions (Paragraph 4.2.2 and 4.2.3) provide adequate insurance that the system is reequilibrated with the new solvent. If the old and new solvents are immiscible, however, it may be necessary to purge the entire system with a series of solvents. For example, when changing from a water/methanol mixture to a hexane/methylene chloride mixture, all hydraulic components, including both solvent inlet lines, should be thoroughly purged (see paragraph 4.2.3) with isopropanol, then with methylene chloride. If it is necessary to take a similar precaution with the detector, it should be disconnected from the system and purged separately.

4.2.2 Priming the Pump

If the instrument is in continuous use, the pump should never lose prime; however, if the solvent reservoir is changed or if the pump has been stopped for a prolonged period, it may be necessary to prime it before beginning an. analysis.

(1) Fill the solvent reservoirs with the solvents to be used. With the variable-backpressure restrictor installed downstream of the detector, it is usually unnecessary to degas the solvents. Nonetheless degassing is often a

useful precaution. A 10μ particulate filter should be at the inlet end of each solvent line. Recap each reservoir.

(2) Open the bleed valve on the front of the pump by turning it counterclockwise one-half to one full turn until the tip points down-ward. Place a small beaker beneath the valve exit to catch the effluent.

(3) Attach the priming bulb to the cap of the reservoir.

(4) Push PURGE, then pressurize the solvent reservoir by squeezing the priming bulb. (With the optional 1000-ml Erlenmeyer flasks it may be necessary to hold the reservoir cap in place so that it seals securely.) When solvent begins to flow freely from the bleed valve with each pump stroke, stop the pump by pushing STOP.

(5) Close the bleed valve.

4.2.3 Purging the System

The following steps purge the components of the system upstream of the injector with the new solvent mixture.

(1)Enter the appropriate initial flow rate to be run.

(2)After making sure that the purge exit drains into a waste container, open the tube of the column-head.

(3)Push PURGE and allow the pump to run for 1-3minutes; this will purge the hydraulic components upstream of the injector with 10-30 ml of the initial solvent mixture. Press STOP and close the purge exit.

(4)Ensure that the correct initial flow rate has been set, then press PUMP. Allow the entire system to stabilize at the initial conditions of the program.

4.2.4 Manual Loop Injector

Note especially the orientation of the sample loop and, the cutout in the valve collar. Manual Loop Injector includes two sets of instructions, one for injecting a full loop of sample (the standard loop volume is 20μl) and a second for injecting less than 20μl of sample (optional).

CAUTION

Only square-ended flushing and sample syringes should be inserted into the loop injector. Standard syringes can penetrate into the valve core, scratching the sealing surfaces.

4.2.5 Standby Conditions

When the instrument is not being used, it is usually safe to turn off the main power switch. If aqueous buffers(especially those containing corrosive salts such as halides) are being used. The pump should be left running during standby periods. If these corrosive solutions are left immobile in the system, they can significantly reduce the life of stainless-steel components.

SECTION 5 MAINTENANCE AND SERVICE

5.1 Introduction

Except for paragraph 5.2 on routine maintenance this section deals with procedures you should expect to follow only when your instrument needs repair. This should be an infrequent occurrence, but you can expect some of the wetted components, especially in the pump, to wear during the life of the instrument. Before replacing any part you should use the troubleshooting guide to isolate the source of the problem. As an additional aid each repair procedure is prefaced with the symptoms the procedure is aimed at eliminating.

The hydraulic-system components are designed so that they can be easily replaced by the customer, and replacement parts are included in the standard accessory kit. The Paragraph describes additional repair and parts-replacement procedures that should rarefy be necessary, but that are easy enough for most customers to undertake. For additional parts or assistance in servicing the instrument, contact your nearest WENFEN district office.

NOTE

Several of the procedures in the following paragraphs include torque specifications for replacing nuts and fittings. For customers without access to torque wrenches, the following guidelines should be adequate.

●In general, nuts should be tightened only enough to prevent leaks. Nuts can therefore be made tight enough to teat the components of the fitting, then tightened further only it leaks appear.

●The torque specifications can serve as useful guides if you keep in mind that 12 in.-lb is equivalent to a pound of farce on a 12-inch wrench (or two pounds on a six-inch wrench). Most fittings require less than 35 in.-lb of torque.

5.2 Routine Maintenance

The only routine maintenance necessary for the Model P98II is monthly lubrication of the pump. The oil wick (in the top of the pump casting) and the felt sleeve that surrounds the Belleville washers should be saturated with lubricating oil (supplied in the accessory kit) once each month.

CAUTION

Failure to perform this routine lubrication may cause serious damage to the pump. Such damage is not covered under the WENFEN Warranty.

5.3 Troubleshooting

The troubleshooting chart that appears as Table 5-1 is organized as a flow diagram so that system problems can be more easily isolated. The chart does no, contain references to problems that can be traced to degraded or inappropriate columns, or to chemistry in general. The table does discuss symptoms for system that includes a UV Detector and in many cases the same symptoms arise with other detectors. All references in the table are to sections or paragraphs (#) in this manual, except where the UV Detector manual is specified.

Before using the troubleshooting chart, check obvious sources of problems, such as the main power switch, the UV Detector power switch, the keyboard lock-out switch, and the fuses listed in Table 2-1. To use the chart select the symptom description that best describes your problem, then consider each possible cause, which are marked with targets(●), in the order listed. Statements preceded by a circled letter and number represent branches in the flow chart; statements with the same letter (for example, Al, A2, and A3) should be considered as mutually exclusive alternatives. However, if one branch of the chart does not solve the problem, back up and consider the others. If a problem persists call the nearest WENFEN district office.

TABLE 5-1 TROUBLESHOOTING GUIDE

PUMP WILL NOT PRIME OR IS DIFFICULT TO PRIME

- **●solvent level tee low**
- **●incorrect reservoir selected**
- **●air trapped in 10-μ particulate filter**

When the filter is removed from a volatile solvent, bubbles can form in the interstices of the porous metal. When the filter is returned to the solvent, it is sometimes difficult to prime the pump. Remove the, bubbles in an ultrasonic bath, and keep filters stored under solvent.

If the symptoms are caused by none of the above problems, remove the solvent line from the proportioning valve. Try to force solvent through the solvent line by squeezing the priming bulb.

A1 Solvent flows freely through the line.

●tubing pinched at bottom check-valve inlet

Remake the connection between the solvent line and the bottom check-valve.

A2 Solvent does not flow or flows with difficulty.

●tubing pinched at filter

Remake the connection between the tubing and the filter.

●plugged filter

Replace the filter.

PUMP LOSES PRIME

●solvent level too low

●gas dissolved in solvent

When using volatile solvents at low flow rates it is sometimes necessary to degas the solvent.

If the symptoms are caused by neither of the above, remove the solvent line from the proportioning valve. Try to force solvent through the solvent line by squeezing the priming bulb. Then consider alternatives A1 and A2 under PUMP WILL NOT PRIME OR IS DIFFICULT TO PRIME above.

PUMP STOPS OR STALLS

A1 Pump stalls: LCD shows PUMP RUNNING and pump tries to pump against excessive backpressure.

●flow rate exceeds specifications

Check specifications in Section 1. The flow rate should be within specifications

B1 The backpressure is below 6000 psi.

●plugged frit in check-valve assembly

●other obstruction upstream of pressure transducer

It may be necessary to check each section of tubing separately for internal obstructions. A cleaning procedure for stainless-steel tubing is included in #2.6. First, however, check for obvious crimps and twists.

A2 Pump stops: LCD shows PUMP RUNNING.

●fuse F2 blown

A3 Pump stops: LCD shows PUMP STOPPED.

B1 Pressure limit (PMAX) has been exceeded.

●PMAX set too low

●loop injector partially actuated

The loop injector must always be in either the LOAD or INJECT position.

●backpressure restrictor misadjusted or plugged

The backpressure restrictor is at fault if the problem disappears when it is disconnected.

●obstructed column or detector

The detector is at fault if the problem disappears when it is disconnected from the column exit. Clean the detector as described in the UV Detector

manual. If the problem disappears only when the column is removed, replace it. Check also for other crimps or obstructions downstream of the pressure transducer.

●flow rate too high for column and solvent being used

B2 Pressure has dropped below the low-pressure limit (PMIN).

●PMIN set too high

●pump has lost prime

See remedies under PUMP LOSES PRIME above.

●system leaks

Leaks serious enough to cause a drastic loss of pressure will usually be visible. Check also to ensure that solvent is not being pumped out the purge vent of the injector.

KEYBOARD UNRESPONSIVE

●software execution error

It may be necessary to turn the instrument off, then on, to regain use of the keyboard.

NO SAMPLE PEAKS (BASELINE IS OKAY)

●pump has lost prime

See remedies under PUMP LOSES PRIME above.

●system leaks

Such serious leaks are usually visible see LEAKS ARE VISIBLE.

LEAKS ARE VISIBLE

●leaky fittings

Remake the fittings, using new components if necessary.

●leaky injector

●leaky piston seal

If this seal leeks, solvent will often appear on the rear of the head mounting plate or under the pump head. See Replacing the Piston Seal and Back-up Washer

CHROMATOGRAMS NOT REPRODUCIBLE

A1 Retention times are consistently longer than normal.

B1 Pressure displayed on the LCD screen is about normal or higher than normal.

●a column temperature too low

Check the ambient temperature and the temperature controller.

B2 Pressure is lower than normal.

Solvent leaks are visible. (See LEAKS ARE VISIBLE above.)

A2 Retention times are consistently shorter than normal.

Pressure displayed on the LCD screen is about normal or lower than normal.

●column temperature too high

Check the ambient temperature or the value set on the temperature controller.

A3 Retention times are erratic.

●unstable temperature

Fluctuations in the ambient temperature will produce erratic chromatograms. The column temperature should be controlled.

5.4 Routine Service

5.4.1 10μ Solvent Filter

→ a clogged filter will introduce bubbles into the solvent stream or cause the pump to lose prime.

To replace a solvent filter.

5.4.2 Pump

●Replacing the Piston Seal and Back-up Washer

→a faulty seal will allow leakage around the piston at the head mounting plate or around the base of the pump head; flow rates will be low, thus producing chromatograms with longer retention times

(1) Turn off the main power switch on the Model P98II.

WARNING

Dangerous voltages are exposed in the following steps.

(2)Remove the bleed-valve assembly from the pump head. Disconnect and remove the 1/16” interconnect tube from the top check-valve and pump heads by loosening the small nuts on the compression fittings. Two wrenches are required for the lower fitting, one to hold the larger (1/2”) fitting in place, another to loosen the compression nut.

(3)Remove the 1/16” tubing from the top of the top check-valve assembly, using a second (5/8”) wrench to hold the upper body of the assembly. Remove the check-valve assembly from the pump head by using a 5/8” wrench on the lower body of the assembly.

(4)Rotate the pump motor counterclockwise until the sapphire piston is fully retracted from the pump head.

(5)Refer to Figure 5-1, then remove the two Phillips-head screws from the pump head. Gently slide the pump head forward, removing it from the two mounting studs and the sapphire piston.

CAUTION

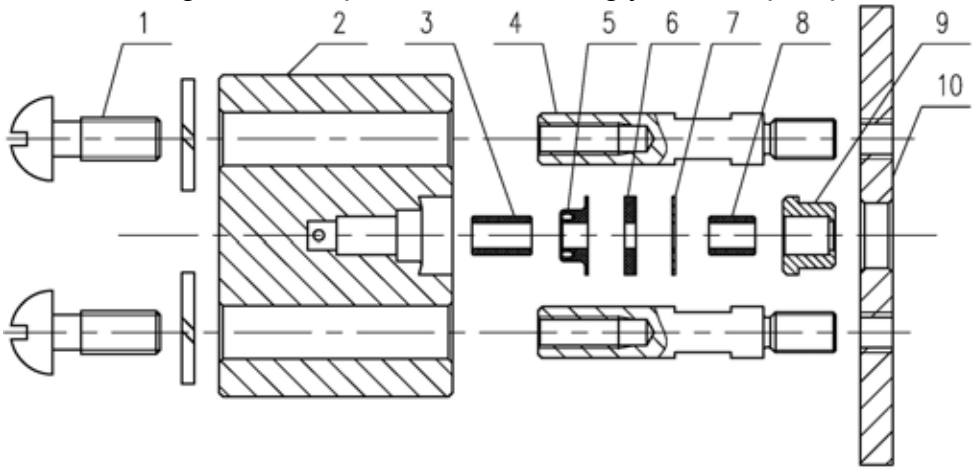
Slide the pump head directly forward. Turning it from side to side

can break the piston.

(6)When the pump head is removed from the piston and the head mounting plate, the locating collar and the outer piston bushing will usually remain on the piston and in the mounting plate. If not, remove them from the pump head and slide them onto the piston. The other components shown in Figure 5-1 will remain in the pump head. To remove the spring-loaded piston seal and the back-up washer from the pump head, use the seat-removal tool which has the same diameter as the sapphire piston. Insert the tool into the piston seal, then withdraw the tool, canting it to one side to remove the seal. There is no need to remove the inner piston bushing from the pump head.

(7)Wipe the cavity in the pump head, from which the seal has just been removed, with a lint-free cloth dampened with alcohol.

(8)The new spring-loaded piston seal must be inserted in the pump head using the Nylon tool provided in the accessory kit. After thoroughly wetting the new seal with isopropanol, place it on a flat, clean surface with the spring facing dawn. Firmly insert the larger end of the Nylon tool in the seal, then with the inner piston bushing in place in the pump head, use the tool as shown in Figure 5-1 to press the seal snugly into the pump head.



1.Screws 2.Pump head 3.Inner piston bushing 4.Locating screw
5. Spring-loaded seal 6.Back-up washer 7.Stainless washer
8.Outer piston bushing 9.Locating collar 10.Head mounting plate

FIGURE 5-1 INSERTING A NEW PISTON SEAL

(9)Place a new washer behind the piston seal.

(10) With the sapphire piston fully retracted, carefully slide the pump-head assembly over the piston and the mounting studs and secure it to the mounting plate with the two Phillips-head screws.

(11) Replace the 1/16” interconnect tube, the bleed-valve assembly.

(12) Before resuming routine operation, it is now necessary to run the

pump briefly with isopropanol to ensure that the piston seal is properly conditioned. Remove as much foreign solvent as possible from the solvent lines, then run the pump for five or ten minutes at 2.0 ml/min with the isopropyl alcohol.

5.4.3 Check-Valve Assembly

●Cleaning the Check-Valve Assembly

→ a clogged or sticky poppet assembly will produce bubbles in the solvent stream and can cause the pump to lose prime; check-valve will be inaccurate, thus producing nonreproducible chromatograms

Internal contamination of the check-valve can usually be removed by cleaning the parts of the valve in acetone. When the valve is reassembled, the O-ring seal must be replaced. Proceed as follows,

(1) Turn off the main power switch on the Model P98II.

(2)Refer to Figure 3-3 during the following steps. Remove the 1/16” tubing from the top check-valve assembly, using a second (5/8”) wrench to hold the assembly body in place. Remove the top check-valve assembly from the main pump head by using a 5/8” wrench on the lower body of the assembly.

(3)Remove the solvent inlet line from the bottom check-valve by loosening the compression fitting at the base of the assembly. Remove the bottom check-valve assembly from the main pump head by using a 5/8” wrench on the upper body of the assembly.

(4)Carefully loosen the valve base using a 1/2” wrench. The remaining components shown in Figure 3-3 fit loosely inside the valve base, so care should be taken when it is removed from the valve.

(5) Carefully separate the parts shown in Figure 3-3.

(6)Clean the ball and seat body. If necessary remove any deposits with a clean, lint-free cloth. Finally, soak the parts again in acetone and dry them thoroughly.

(7) Reassemble the parts of the check-valve assembly, seating a new O-ring in the valve.

(8) Reinstall the 1/18” tubing on the top of the top check-valve assembly. Reinstall the solvent inlet line of the bottom check-valve assembly, After repriming the pump, run it for a short time to ensure that no leaks appear. If a leak appears, tighten the valve body with a 1/2” wrench until the leak is corrected.

5.4.4 Loop Injector

→loose Belleville spring washers will cause cross-port leaks and

nonreproducible chromatograms.

The sealing force for the rotary valve of the loop injector is provided by a stack of 16 Belleville spring washers on the valve shaft behind the ported valve body. Cross-port leaks can often be corrected by increasing the pressure on these Belleville washers as follows.

Loosen the Allen-head cap screw in the locking collar that holds the Belleville washers in place. Using a pair of pliers, tighten the locking collar clockwise 1/6-turn, then retighten the cap screw. If this does not correct the leak, the procedure can be repeated. If after the locking collar is repeatedly tightened the valve handle becomes difficult to turn, the entire valve should be replaced.

5.5 Nonroutine Service

5.5.1 Pump

●Replacing the Bleed-Valve Needle Tip

→ a faulty tip will cause leakage from the bleed-valve port

(1)Turn off the main power switch on the Model P98II.

CAUTION

To prevent the pump from being inadvertently turned during the following steps, the instrument should be turned off.

(2)Remove the bleed-valve needle completely from the pump head. With a pair of pliers pull the needle tip from the needle. Replace it with a new needle tip.

(3) Reinstall the bleed-valve needle in the pump head.

●Replacing the piston

→the piston should need replacement only if it is scratched or broken through mishandling

(1)Turn off the main power switch on the Model P98II.

WARNING

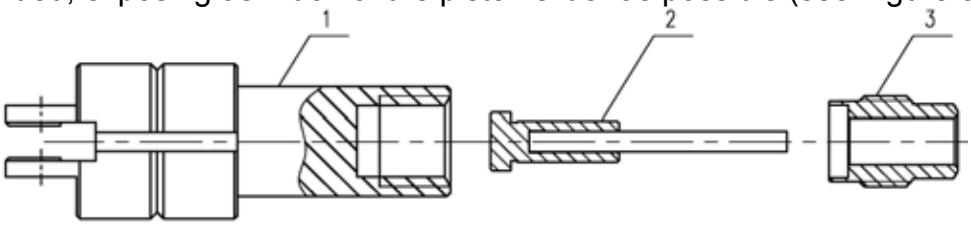
Dangerous voltages are exposed in the following steps. The instrument must be turned off,

(2) **Replacing the piston of the main pump head**: Remove the 1/16” tubing from the top check-valve assembly, using one 1/8” wrench to hold the upper body of top check-valve assembly while loosening the compression fitting. Remove the Teflon tubing from the bottom check-valve assembly, using one 1/8” wrench to hold the lower body of bottom check-valve assembly while loosening the compression fitting.

Replacing the piston of the slavery pump head: Remove the bleed-valve assembly from the pump head. Remove the 1/16” interconnect

tube from the top check-valve of the main pump head by loosening the nuts on the two compression fittings. Remove the 1/16” tubing on the bottom of the slavery pump head.

(3)Turn the pump motor counterclockwise until the pump piston is fully extended, exposing as much of the piston slider as possible (see Figure 5-2).



1.Piston slider 2.Piston assembly 3.Piston mounting nut

FIGURE 5-2 PISTON ASSEMBLY

(4)Using an 11/16” wrench to hold the piston slider securely, loosen the piston mounting nut with a second (5/8”) wrench. **When loosening the mounting nut avoid exerting any torque on tire piston slider.**

(5)Rotate the pump motor 1/2-turn counterclockwise, then remove the two Phillips-head screws from the front of the pump head, Gently slide the pump head forward, removing it from the two mounting studs and the piston.

CAUTION

Slide the pump head directly forward. Turning it from side to side can break the sapphire piston.

(6)The locating collar and outer piston bushing (see Figure 5-2) will probably remain in the mounting plate. To remove them, work them out gently with your fingers while rotating the pump motor counterclockwise. Slide them off the piston.

(7)Return the piston to its fully extended position, continue loosening the piston mounting nut, and remove the piston and the mounting nut from the pump assembly.

(8)Apply grease liberally to the base of the new piston assembly, slide the mounting nut over the piston, then reinstall the assembly in the piston slider, leaving it slightly loose.

(9)Replace the locating collar and outer piston bushing in the head mounting plate, working them into place gently while turning the damper on the pump motor counterclockwise. With the piston fully retracted remount the pump head on the head mounting plate, taking care to slide it gently over the piston. Replace the two Phillips-head screws in the pump head.

(10)Return the piston to its fully extended position. Again using 2 wrenches, tighter the piston mounting nut moderately **while holding the piston slider securely.**

(11) Reinstall the 1/16” tubing to the check-valve assembly, reinstall the interconnect tube, and replace the bleed-valve assembly. Replace the top cover on the main cabinet.

SECTION 6 GUARANTEE STATEMENT

The guarantee period of the instrument is 12 months beginning from the date of dispatch from Beijing. Operation inconsistent with manufacturer's instructions or damage caused by unauthorized service personnel are excluded from guarantee. Damage caused by blockages and wear and tear parts such as fuses and seals are not covered by the guarantee. Claims under this guarantee are valid only if the enclosed guarantee card is returned to us at the address shown below within 14 days of receipt of the instrument. Defective pump should be sent to the manufacturer for repair.

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If we find a defect covered by the guarantee, repair or replacement, at our discretion, will be carried out free of charge. Packing and transport costs are borne by the purchaser.