



**Autoinjector  
for Microdialysis-HPLC Online Analysis  
(ESA-20)**

**Eicom Corporation**  
2008

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Thank you for your purchase of the Autoinjector for Eicom Microsyringe EAS-20.  
Please read and understand this instruction manual prior to operation.

## 1. WARNINGS

- Do not use the EAS-20 for the purpose of human application.
- Never get the EAS-20 wet.
- Turn off the power when not in use.
- Please make sure the EAS-20 is located in a cool, dry, place where it will not be disturbed by repeated bumping, drafts, or humidity.
- Do not attempt to repair any part of the EAS-20 without first contacting an EICOM service engineer. Doing so will void any warranty or service agreement on the product.
- This instruction guide is meant to be a supplemental tool in using your EAS-20. This is not meant to replace the expert instruction of an Eicom service engineer. Please contact them if you need professional training, instruction, or installation.

## 2. Parts List

The EAS-20 consists of an operation panel and a valve driving part.

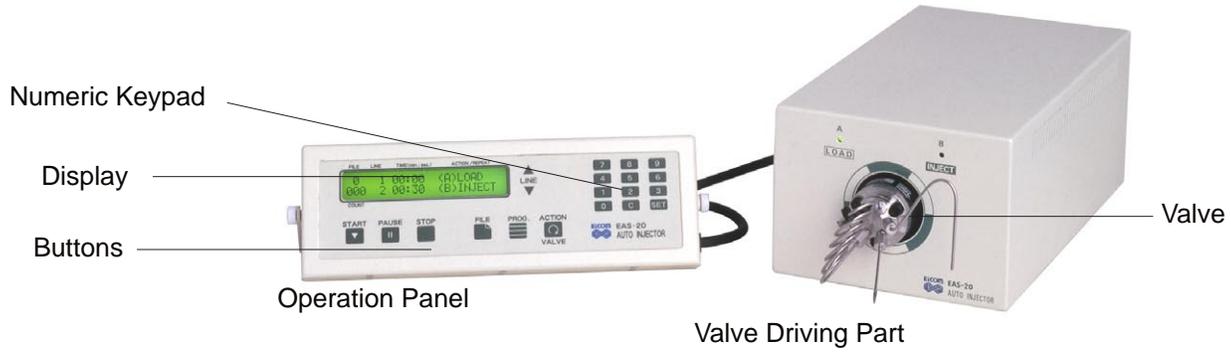


Fig. 1 Operation Panel and Valve Driving Part

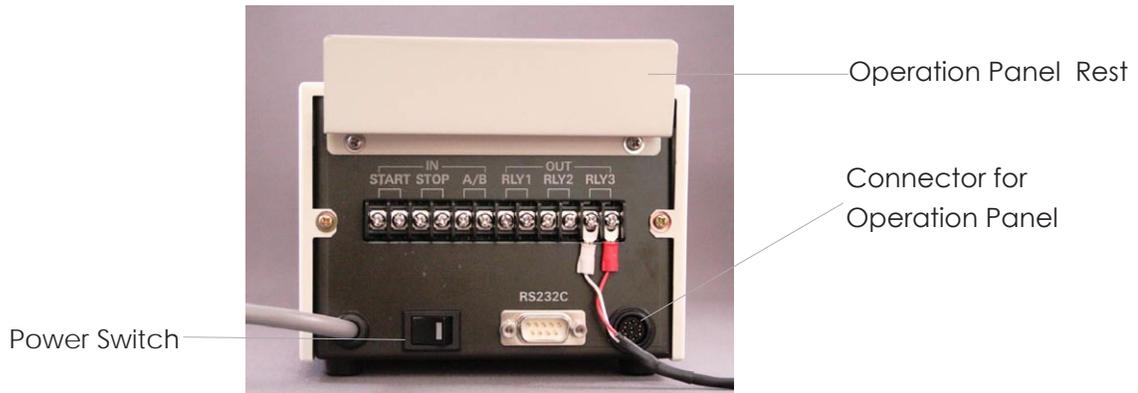
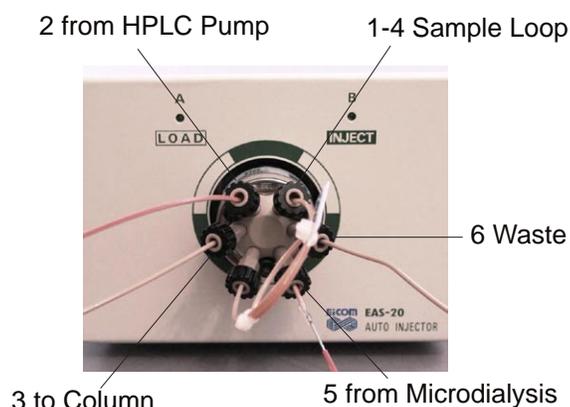


Fig. 2 Back Panel of Valve Driving Part

### 3. Setup

- Please make sure the EAS-20 is located in a cool, dry, place where it will not be disturbed by repeated bumping, drafts, or humidity.
- Plug the display screen into the back of the EAS-20. Be sure that the notch in the cord aligns with the notch in the port.
- Plug the EAS-20 into an 80-240V outlet.
- On the back of the EAS-20, there are several connections, which relay information from the Autoinjector to the HPLC system. These will be connected for you, by an Eicom service engineer upon installation. If these for some reason become disconnected, please contact an Eicom service engineer for detailed instructions on how to reconnect. If you use with model HTEC-500, connect "signal in" terminal on the HTEC-500 to the "RLY 1" at OUT on the EAS-20. There is no polarity for these contact closure signals.
- The valve driving part on the front of the EAS-20 has 6 ports, which are used for specific purposes.
  - Port 1 is connected to Port 4 with the sample loop. Standard sample loop size is 50  $\mu$ l which is initially included in the EAS-20 package.
  - Port 2 is a line connected to the HPLC pump.
  - Port 3 is a line connected to the column.
  - Port 5 is the inlet from the microdialysis probe. Please connect the inlet needle to port 5.
  - Port 6 is the outlet used for waste and generally feeds into a vial attached to the side of the EAS-20.



**Fig. 3 Tubing Connection**

- Each valve port is connected to the tubing using a nut and ferrule. Take a piece of tubing and run it through the nut. Once the tubing is through the nut, place a ferrule on the end of the tubing, the larger end facing the threads of the screw (fig. 4). When properly done, the tubing will stick out a few millimeters from the end of the ferrule.
- When inserting or removing the sample loop (port 1 and 4 connected), make sure the EAS-20 is in the LOAD position by pressing the ACTION button. Then you do not need to stop the HPLC pump.
- If the sample loop contains unknown solution or air, please set the EAS-20 at the INJECT position and disconnect the tubing coming from port 3 before any column. Then run the HPLC pump and wash the loop with mobile phase for a few minutes.



**Fig. 4 Nut and Ferrule Configuration**

## 4. Understanding Valve Position and Flow Pattern

Understanding the function of the valve is important. Please take a moment to read this chapter and understand how the samples are collected and injected to the HPLC column.

There are three arch shaped grooves on the rotor seal and the grooves connect two juxtapositioning ports on the stator. (Picture of rotor seal and stator are shown in Fig. 5 on page 7.) The rotor seal rotates 60° and connects two ports that are next each other always. Ports 1 and 4 are connected by a sample loop.

During **load** position, the sample from microdialysis line will be loaded to the sample loop by the power of the microdialysis syringe pump. Then the rotor seal rotates 60° to the **inject** position and the sample loop will be washed with HPLC mobile phase and the loaded sample in the loop will be injected to the HPLC column. At this time, the microdialysis sample goes to the waste line directly. Because the mobile phase flow is so fast that the sample goes to the column in several seconds, duration of Inject can be short (at 500 µl/min of mobile phase flow rate, 50 µl loop can be washed for 0.1 min = 6 sec). To ensure the sample loop wash, please allow at least three times longer duration for Inject duration. After the injection, the valve switches back to the **load** position and collects the sample in the sample loop. The sample loop contains initially mobile phase and then it is replaced with the sample. Thus the mobile phase contained in the loop will be pushed into the drain line of port 6.

Volume of sample manually loaded into the loop using a syringe in short time can be less than the one loaded by a syringe pump during microdialysis experiment at lower speed. Due to laminar flow effect, higher accuracy of loaded sample volume into the loop can be obtained from the sample volume of no more than half a loop volume at different sample velocities or viscosities, when the inside of the loop is not fully replaced with the sample (which is called partial loop method). See fig. 7.

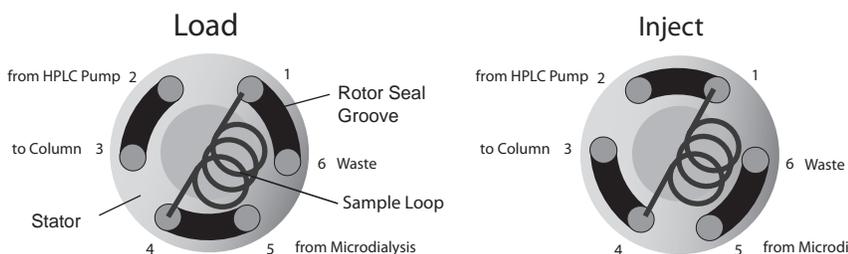


Fig. 6 Flow Diagram of Injector Positions

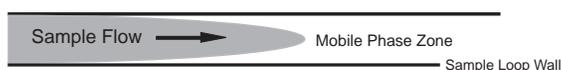


Fig. 7 Luminal Flow Effect

## 5. Programming

The EAS-20 needs to be programmed based on the type of application being performed. Please be sure to allow enough time for proper analysis of the compound. If the sample load time is shorter than the chromatogram analysis of the HPLC system, then the sample will be injected at an inadequate time and the results will be disrupted.

1. Press the FILE button
2. Choose a number (1-9). You cannot choose "0"
3. Press SET to assign the file number
4. Press CLEAR (C) to clear out an old program if necessary
5. Press PROGRAM. The Action/Repeat column will start to blink.
6. Press the ACTION button until the desired action is reached. LOAD will be the first action.
7. Press SET to assign "load" to the first action at 00:00 time
8. the TIME column will begin to blink at LINE 2. Enter the desired time for the next action, which will be injecting the sample into the HPLC system. The type of compound being analyzed will determine the time.
9. Once time is entered, press SET.
10. The Action/Repeat column will blink again. Choose second action (INJECT)
11. press SET
12. the time on line 3 will begin to blink. We want Relay 1 to happen at the same time as INJECT, so leave the same time as the inject time- press SET until the Action/Repeat column begins to blink, and choose RELAY 1 by pressing the ACTION button. Press SET.
13. If you would like to restart the process, add one minute(or more) to the time on LINE 4. press SET until the Action/Repeat column in blinking. Then press the ACTION button until GOTO01/00 is reached.
14. Press SET. The "01" will begin to blink. This is where you tell the program what line to navigate back to. In this case, it will be line 1, so we keep it at line 1. Press SET
15. The "00" will begin to blink. This is where you tell the program how many trials will be involved in this process. It can be as many times as necessary. If you leave the numbers at "00," it will continue to repeat the program until it is manually stopped.
16. To finalize the setup process, press PROGRAM
17. Press START to begin collection

at any time during the collection process, the PAUSE button can be pressed. To start collection after pausing, just press the PAUSE button to resume collection. If you press STOP, the program will restart at LINE 1, time 00:00.

## 6. Example of Operation

Make sure the back of the valve driving part is connected with the operation connector RELAY1. correctly. The first and second lines of the file used last time are displayed on the screen when you turn on the power switch. For example, the following shows the programming for the condition of 19 minutes chromatogram time setting. This is an initial screen display when the power switch is turned on.

Typical Time-program for a 20 min chromatogram time.

LINE	Time (min : sec)	Action/Repeat	(Description)
1	00:00	(A)LOAD	(The sample will begin loading)
2	19:00	(B)Inject	(Inject sample to column)
3	19:00	Output from RELAY1	(Generate contact closure for Inject signal)
4	20:00	GOTO 01/00	

(going back to Line 1, Enter the total number of repeat these sequence in "/00". If you enter 00 in 01/"00", the analysis will be repeated to infinity.)

## 7. Troubleshooting

Please contact an Eicom service engineer if there are any troubles with the EAS-20. They will be able to correctly diagnose the issue with a phone or email consultation. Please do not attempt to repair the EAS-20 without first contacting an Eicom service engineer. This can void any warranty that may be on the product at the time.

If the LOAD or INJECT light on the EAS-20 begins to flash, this means that there may be a torque error, and the actuator (motor) of the valve is not moving correctly inside the machine. Please contact an Eicom service engineer. In a case such as this error, the EAS-20 will need to be sent to Eicom for repair.

## 8. MAINTENANCE and CLEANING

When cleaning or removing tubes from the EAS-20, make sure the machine is in the LOAD position.

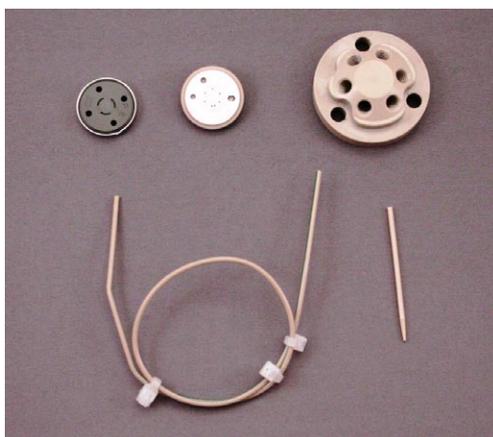
Before use of the EAS-20, flush the system with ultra-pure water to clean out any cleaning solution from the prior day.

After every use, flush the EAS-20 with ultra-pure water to remove salts that will crystallize and scratch the seals of the valve, damaging it permanently. Make sure the EAS-20 is in the LOAD position.

### **Bacteria growth in the tubing and parts will decompose the analyte. Please maintain the EAS-20 as follows:**

**Every week**, remove the inlet tubing (Port#5) and the sample loop (Port#1 and 4), and flush these tubing with chlorine-type bleach, 100x diluted. Leave this solution inside the tubing for more than one hour, overnight is best. Then, flush with enough amount of ultra-pure water before the next use. Remaining chlorine will decompose the analyte and disturb HPLC analysis at a high degree.

**Every month**, remove the rotor seal, stator face assembly, stator, sample needle and sample loop from the EAS-20 (parts shown in Fig. 8) and put in a plastic wear containing 100x diluted chlorine-type bleach. Sonicate the parts in the plastic wear for more than 10 min, then keep the parts in the bleach for one hour. Thoroughly wash the plastic container and the parts with running water then sonicate the all parts in pure water for more than 10 min. Replace ultra-pure water a few times and sonicate each time for 10 min. The details of the disassembling process is shown on the next page.



From left top to right down,  
rotor seal, stator face assembly, stator,  
sample loop, inlet needle.

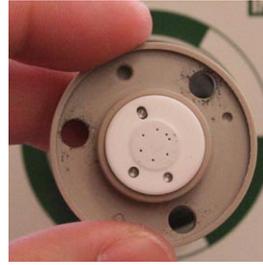
**Fig. 8 Parts to Wash**

All parts shown need to be washed, weekly or monthly.

**Annual maintenance:** Please ship back the unit of EAS-20 to Eicom facility to replace the rotor seal once per year. Rotor seal wears after intensive use. To adjust the right compressing pressure of the seal, the EAS-20 cover needs to be opened. This procedure requires experience and skill, and needs to be done by Eicom engineers. Please contact your Eicom representative before shipping.



1. Unplug the power cable first.  
Remove screws. After this never moves the valve actuator.  
When assembling the valve, please fasten the screws gradually and evenly (like an automotive tire).



2. Remove the stator. The stator face assembly may or may not come off with the stator.



3. Remove the stator ring around rotor seal.



4. Remove the stator .



Rotor Pin

Notch

These two parts have to face same direction.

5. When assembling the parts, please insert the rotor seal so its notch faces the same direction of the rotor pin.  
After setting back all parts, please fasten the screw with equal torque and tightly . Then power on. Never turn on the actuator before setting back all parts and fastening the screws.

**Fig. 9** Assembling and Disassembling of Valve

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