AmMag™ SA Plus System

User Manual

Vesrion:1.2

Model: SA-2012

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Instrument model	:
Instrument serial number	:
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Table of Contents

About this User Manual

Intended Users

This manual is prepared for those users who are not familiar with the use of AmMag SA Plus. It will provide basic information and methods of operation for the instrument.

Please read the user manual in its entirety before operating the instrument.

What you can learn from this manual

This user manual is designed to give information to end-user about:

- Understanding the user interface
- Understanding the method of operation
- Performing basic cleaning and maintenance operations
- Troubleshooting the instrument

For more information

- Call: 400-025-8686-(5810/5256/5103) in China.
  732-885-9188, 732-885-9688 in US and EU.
- Email : product@genscript.com
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- Address: No. 28 Yongxi Road, Jiangning District, Nanjing, Jiangsu, China 211100
  or GenScript USA Inc 860 Centennial Ave. Piscataway, NJ 08854

For software version

V1.01010200010 and later

Chapter 1: AmMag™ SA Plus overview

1.1 Introduction

AmMag™ SA Plus system is designed to automate protein or antibody purification using magnetic beads. The instrument is capable of using 50 mL tubes and can purify up to 12 samples simultaneously within one hour. Compared with the traditional resin-based purification systems, it eliminates the need for centrifugation and filtration when treating samples, and results in hours of pre-processing time saved. In combination with GenScript's antibody or recombinant protein binding magnetic beads, the system offers high throughput protein and antibody purification.

1.2 Features

High throughput: 12 channels, each handles up to 50 ml of sample volume
High efficiency: Purification of 12 samples within 48 min
Automation: Automated washing and elution steps
Endotoxin control: Sterilizable environment minimizing the risk of endotoxin contamination
Compatibility: Compatible with standard 50mL conical centrifuge tubes

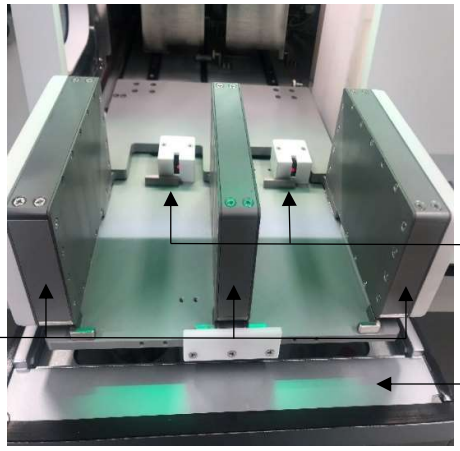
1.3 Instrument Parameters:

Throughput		Up to 12 Samples/run
Beads volume (samples)		0.1 – 2.0 mL settled beads
Sample Volume		1 – 50 mL
Compatibility		50 mL conical centrifuge tubes
Min Elution Volume		0.4 mL
Size (LxWxH)		545x515x545 mm / 21.5x20.3x21.5 in
Weight		65 Kg / 117 lb
Power Parameters		110 ~ 240 VAC, 50/60 Hz
Operating Conditions	Temperature	15 – 35 ˚C / 59 – 95 F
	Humidity	15 – 85%, non-condensing
	Atmosphere Pressure	70 – 106 KPa

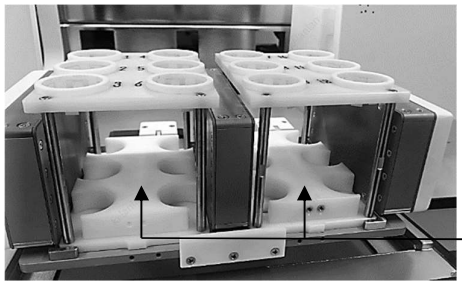
1.4 Know your AmMag SA Plus – Front

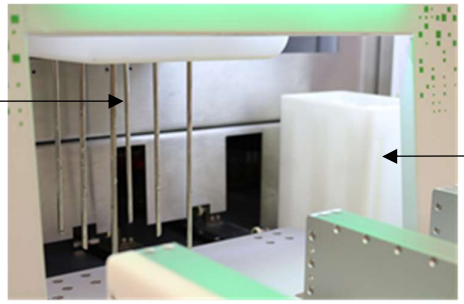
1.5 Know your AmMag SA Plus – Sides

1.6 Know your AmMag SA Plus – Internal



Sample Tray





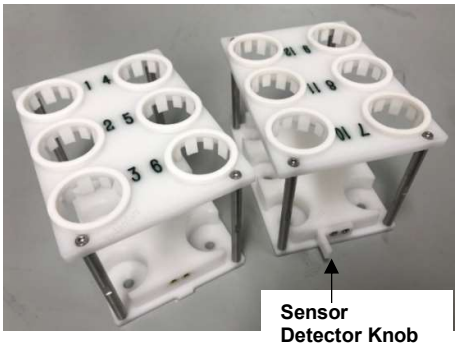
1.7 Power Switch and USB Port

Note: Please note that the USB port can only be used to update the software or to export experiment logs. It cannot be used to connect AmMag SA Plus to other devices.

1.8 Instrument Accessories

Reagent Bottles and Tray

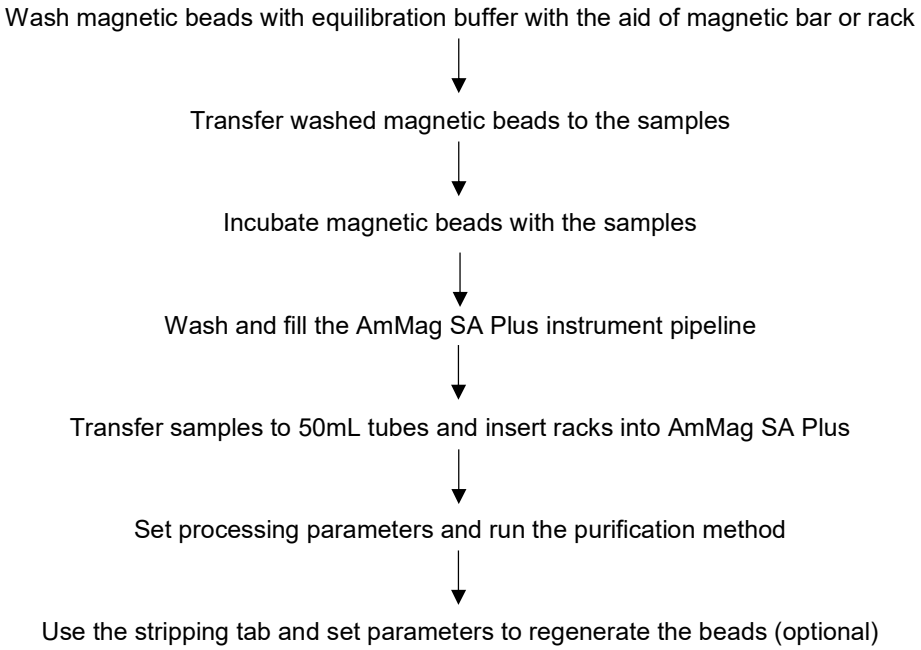
50 ml Tube Rack



Note: When using the 50 mL tube racks, ensure that rack is placed in the correct orientation with the sensor detector knob pointing towards the back of the instrument so that the sensor can detect the loaded rack.

Chapter 2: Purification with AmMag SA Plus

2.1 Purification Process



2.2 Preparation

Check the corresponding AmMag SA Plus protocols on the product page for buffers required for different types of purifications.

Prepare the reagents/buffers required for protein/antibody purification and fill them in the labeled bottles. Be sure to prepare the required amount of buffers based on the purification scale. To estimate the buffer volumes, the user can set up the method in the AmMag SA Plus software, then press the run button and the instrument will display the needed amounts of each buffer. For example, to purify twelve samples using 0.5 mL Magnetic Beads per sample, the typical buffer volumes are shown as below.

Wash1	Wash2	Elution	Cleaning solution	NaOH
930 mL	354 mL	366 mL	486 mL	654 mL

Fig1: The Solution volumes for Elution of Mixing

Wash1	Wash2	Elution	Cleaning solution	NaOH
930 mL	354 mL	486 mL	366mL	486 mL

Fig2: The Solution volumes for Elution of no Mixing

Note: During the purification and regeneration, the cleaning solution is 50 mM HCl (pH ~ 1.5) and should be set up on Port 6; During the purification and regeneration, 100 mM NaOH (pH ~ 12.5) should be prepared and connected to Port 7.

2.3 Pretreatment

The main purpose of pretreatment is to reduce the potential of endotoxin contamination within the AmMag SA Plus system. The following methods can be combined to achieve optimal results.

NaOH soaking: Fill the NaOH reagent bottle with 0.1N NaOH.

1. Take out intake nozzles from other reagent bottles and move them into the NaOH bottle. Press “Fill” to fill the tubing with NaOH.
2. Soak the system with NaOH for at least 30 min.
3. After soaking is complete, rinse the lines thoroughly with water by moving the intake nozzles to a bottle filled with water and pressing the fill button 3-4 times.

UV light: Enter the desired time into the “Time Set”. Press the “Start” button.

2.4 Sample Loading

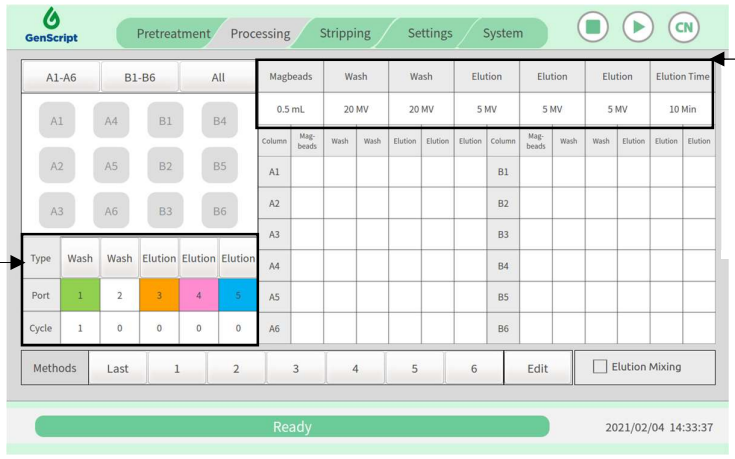
Load the samples by bringing the sample tray out with “Rack out”. After samples are loaded, press “Rack in” to retract the sample tray.

Please place the sensor detection knob in the sensor located on the back of the sample tray.

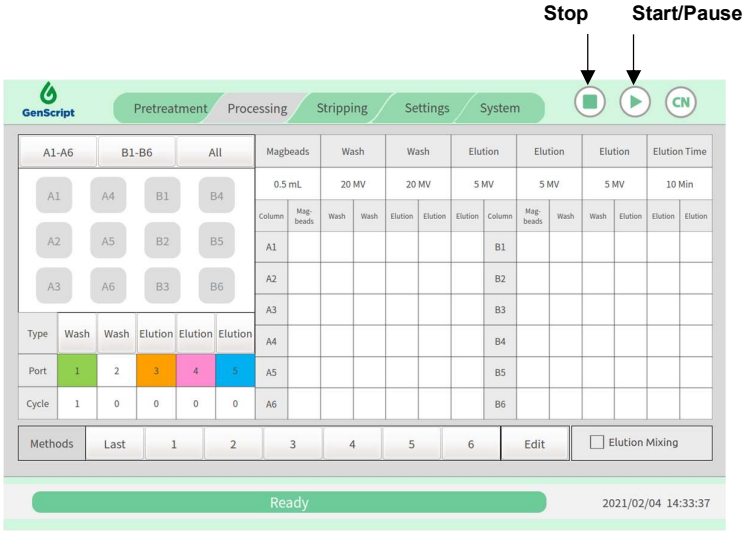
Make sure all tubes are sitting on the bottom of the tray without sticking out.

2.5 Parameter Setting

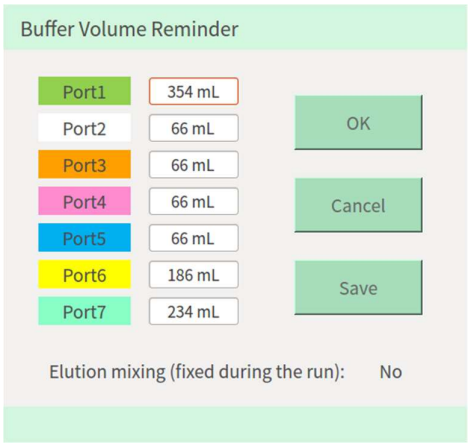
Set parameters for the instrument by selecting cycle time, magnetic bead volume, washing volume, elution volume, etc. For detailed instructions on setting parameters, please refer to the “Software Interface” section.



2.6 Running a Method

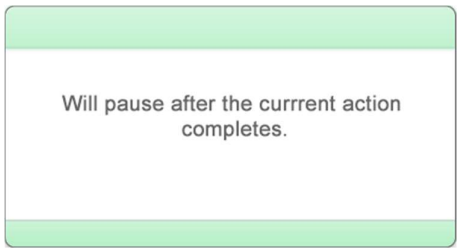


Press the “start” button on the screen to start the method.



Please note that a notification box will pop up once the user presses the start button reminding the user of the minimum volumes of buffers required. Please check the bottles to ensure that there is a sufficient amount of buffers to run the method.

Once the method starts, the status bar will change to blue and display the current step. For example, the instrument might display “Processing| Elution:3 2—1|Remaining Time: 09:51”. “Processing| Elution:3” means the instrument is running a processing method, currently at step 3, Elution. “2—1” means it’s running one of the two cycles. “Remaining Time: 09:51” gives the remaining time, which is only available for the elution cycles.



Note: Users may use the pause button at any time (please note that the start button changes to the pause button). If the instrument is in the middle of an action, it will pause once that action is complete. When paused, one may change the unexecuted steps in the method.

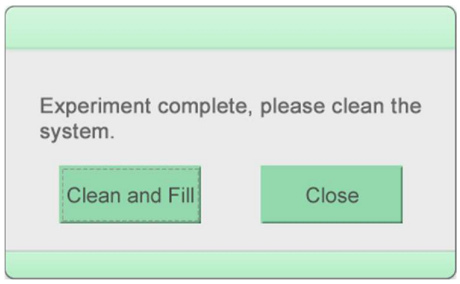
2.7 Sample Collection

Once an elution step is complete, the instrument will buzz and a popup message will be displayed. After the elution is completed, open the safety door and the platform will come out automatically. Collect the eluted samples using a pipette.

If more than one elution cycle has been specified in the method, please press the “OK” button on the screen, close the safety door and the instrument will start the next elution.

2.8 Pipeline Cleaning

After the sample processing is completed, the instrument will prompt you to select the reagent of choice to fill the system tubing.



It is critical to clean the tubing and needles with water after use is completed. Typically, the instrument can be left filled with water. If the system will not be used for more than a week, it's recommended to fill the lines with 20% ethanol.

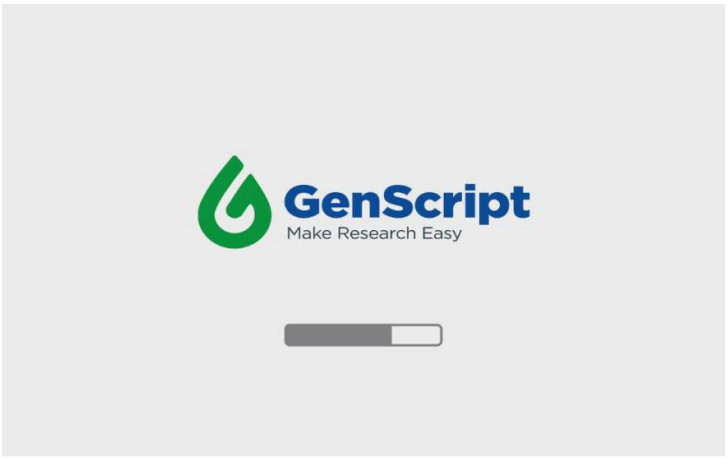
Refer to section 2.3 for endotoxin decontamination.

2.9 Power Off

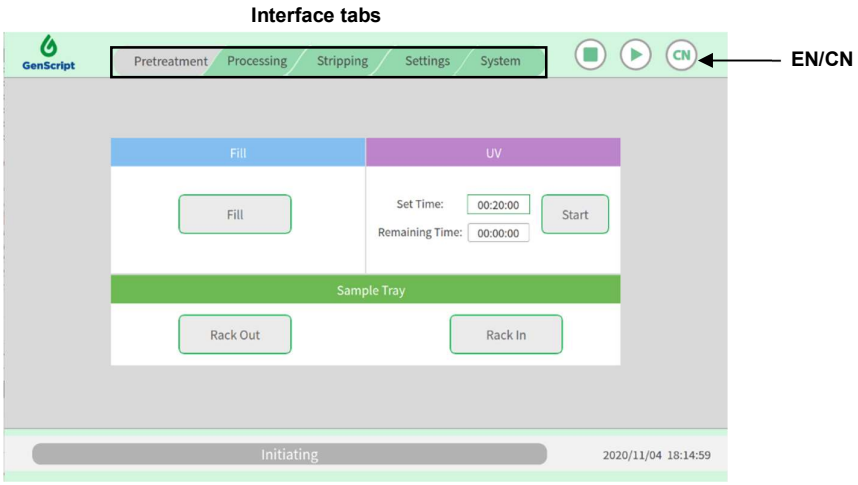
Turn the power switch to off position.

Chapter 3: Software Interface

3.1 Initialization



Once switched on, the instrument will enter the initialization interface.

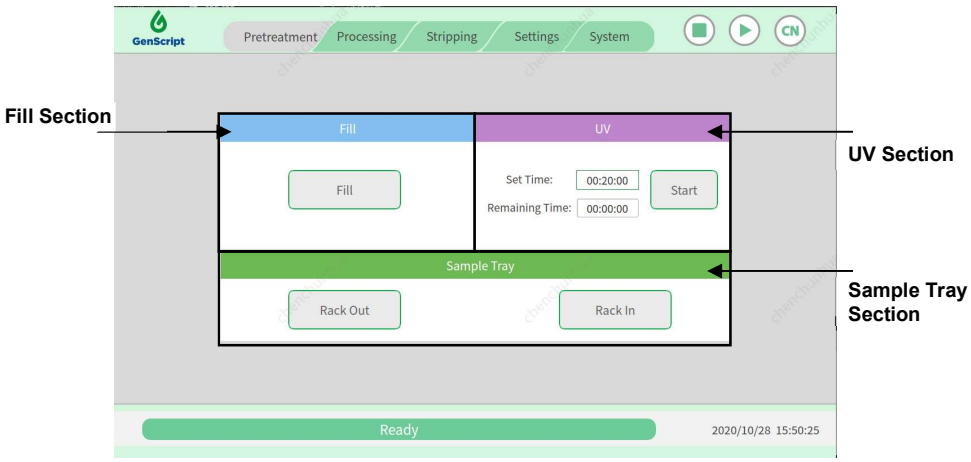


The instrument will continue the initialization step in the pretreatment interface. It may take 30-60 seconds to finish the initialization step.

There are five tabs on the main interface, Pretreatment, Processing, Stripping, Settings, and System. Each can be accessed by pressing the corresponding tab when the instrument is ready.

Note: The interface language can be toggled by press the ”EN/CN” button on the upper right corner.

3.2 Pretreatment Tab



3.2.2 Fill Section:

When the “Fill” button is pressed, the system will fill all pipelines. It’s used to fill the system with desired buffers or for system cleaning. For example, this feature can be used to clean the tubing and nozzle assembly with 0.1 – 0.2N NaOH when concerned about the endotoxin level. Before performing the “Fill” action, the user should check to see if all nozzles are in the desired buffer or solution.

3.2.3 UV Section:

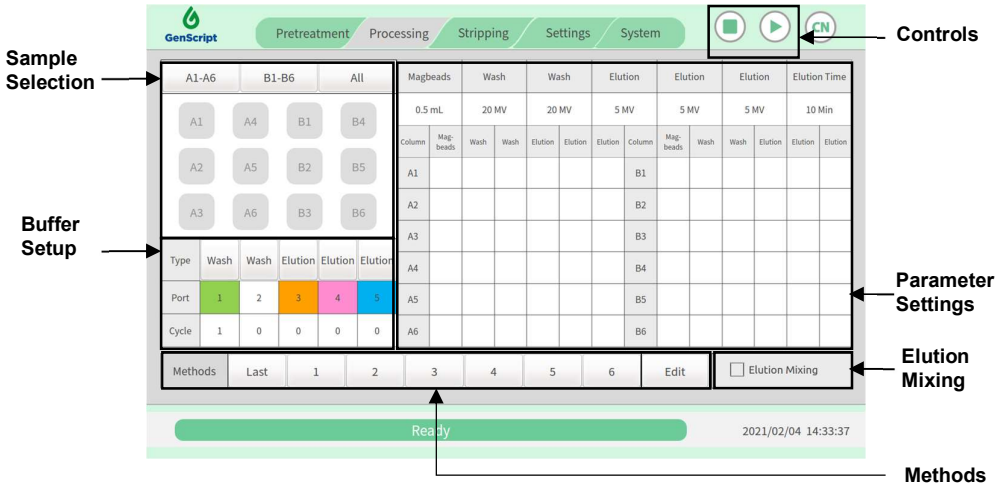
The section controls the UV function. The user can set the timer to the desired UV time and press the “Start” button to switch on the UV light. The typical UV time can range from 20 min to 1 hour. The default setting is 20 minutes. The timer will start the countdown. When it’s finished, the UV light will switch off automatically.

Note: Opening the safety door will interrupt the UV function and the UV lamp will shut off.

3.2.4 Sample Tray Section:

When the safety door is open, the “Rack Out” and “Rack In” buttons control the movement of the sample tray for loading or removing the sample racks.

3.3 Processing Tab

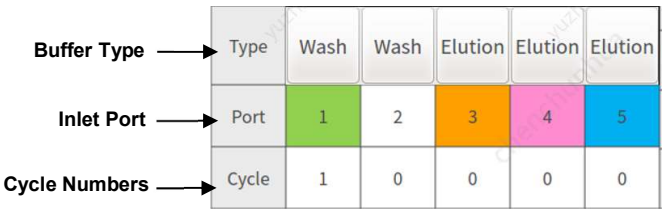


3.3.1 Sample Selection

1. The user can select samples in one or both racks by pressing “A1-A6”, “B1-B6”, or “All” on the top of the sample selection panel.
2. Individual samples can be selected or deselected by pressing an individual label with a position number on the sample rack.

Warning: Before getting started with the experiment, please ensure the sample positions selected are consistent with the actual placement of the samples, or liquid spill may occur.

3.3.2 Buffer Setup



Buffer Type: All types can be toggled between “Wash” and “Elution” except the first that is locked as “Wash”.

Buffer Port: The numbers under each buffer type are the corresponding inlet port which is color-coded as well. The port can be changed if the user press on the number. The first port number can only be from 1-5.

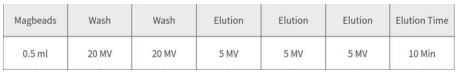
Cycle Number: The cycle number determines how many time wash or elution steps will be repeated. It can be changed if the user press on the number. The maximum number of cycles is 50.

3.3.3 Parameter Settings:

The settings are only effective for the selected sample positions.

There are two ways to set the parameters.

a. Using the global setup tool

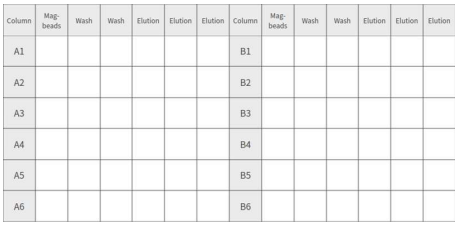


Magbeads	Wash	Wash	Elution	Elution	Elution	Elution Time
0.5 ml	20 MV	20 MV	5 MV	5 MV	5 MV	10 Min

When all samples are to be processed under the same condition. One can use the setup tool on the top of the Parameter Settings section.

1) Select the samples.
2) Under the “Magbeads” column, enter the volume of settled beads (MV).
3) Under each “Wash” or “Elution”, enter the number of MV desired. For example, 5 MV equals 5 mL when 1 mL of magnetic beads is used.
4) Under “Elution Time”, enter the desired incubation time during elution.

b. By changing to desired values individually



Column	Mag-beads	Wash	Wash	Elution	Elution	Elution	Column	Mag-beads	Wash	Wash	Elution	Elution	Elution
A1							B1						
A2							B2						
A3							B3						
A4							B4						
A5							B5						
A6							B6						

If you prefer changing the wash volumes of a particular sample, please tap on that sample and set the parameters according to the volume of settled magnetic beads.

The recommended volume of beads and their corresponding wash/elution volumes are indicated in the table below:

Container	Magnetic Beads volume	Wash	Elution
50 ml Centrifuge tube	0.1 – 2.0 mL	5 – 20 MV	2 – 20 MV

Note: The actual total volume would need to be multiples of 0.2ml. The system will round off the extra if it’s not the case, e.g. 0.4 ml will be pumped when the volume is set at 0.5ml

3.3.4 Methods

The “Methods” section is used to save the experiment setup parameters including buffer settings and purification parameters. The last run method will be automatically saved in “Last”.

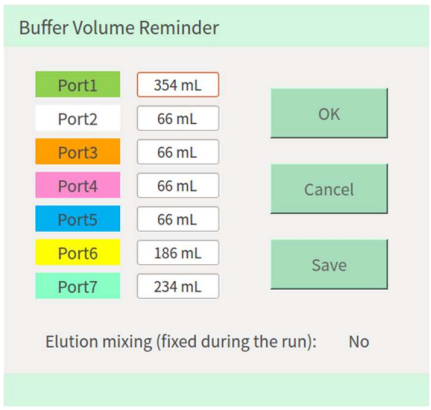
The instrument can store up to 50 different methods. The methods can be renamed by pressing “Edit”.

3.3.5 Elution Mixing

When checked, the instrument will mix the beads with buffer during elution. The default setting is no mixing.

3.3.6 Controls

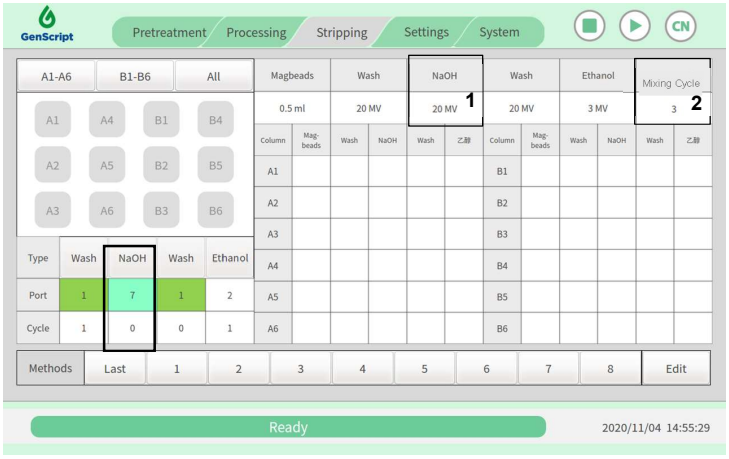
Press the “►” button. The following dialogue box will appear on the screen, indicating the required volume of buffers for the entire process and elution mixing option.



After checking buffer volumes, press “OK” and the instrument will automatically run the experiment based on the set parameters. Press “Cancel” to go back without running the method. Press “Save” to change the log name of the current run.

Warning: When using the “stop” function, all set parameters will be reset to default afterward. The previous method can be loaded using the “Last” button from the method section.

3.4 Stripping Tab



The regeneration interface has similar functions to the processing interface except that there are NaOH between wash 1 and wash 2 and NaOH Cycle instead of elution time. The two new processes in the stripping interface are highlighted in black in the above picture(1 and 2). NaOH solution should always be connected to port 7.

Please note that regeneration should be performed in a clean tube to avoid cross-contamination.

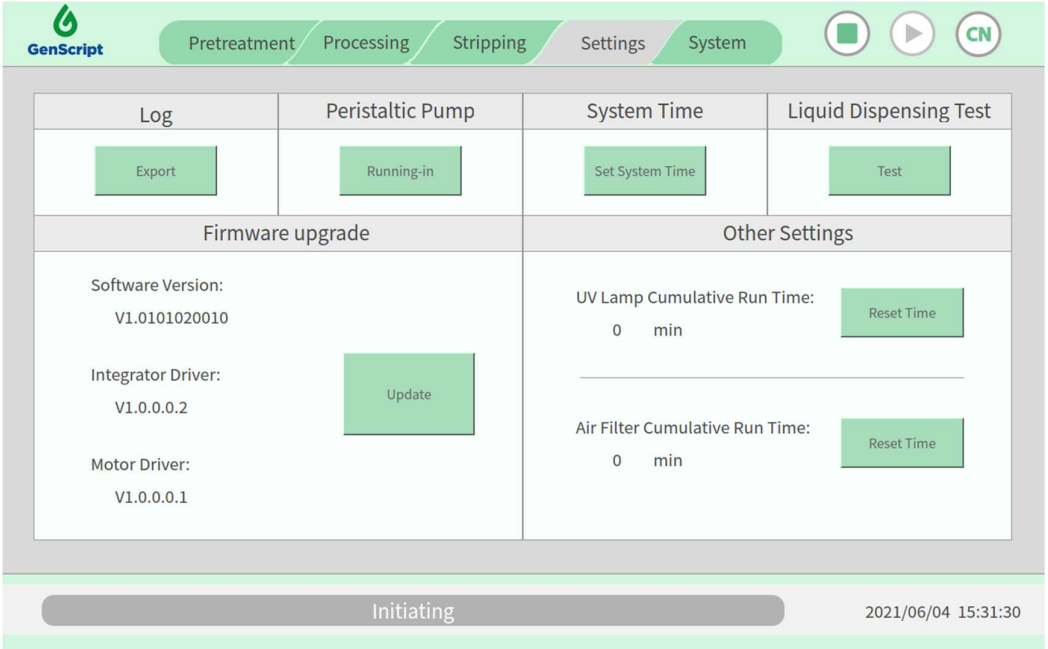
The recommended volume of beads and their corresponding wash/elution volumes are indicated in the table below:

Container	Magnetic Beads volume	Wash	NaOH	Ethanol
50 ml Centrifuge tube	0.1 – 2.0 mL	5 – 20 MV	5 – 30 MV	3 – 20 MV

Please transfer the magnetic beads to be regenerated to the fresh tube and add some buffer. Set up the beads for regeneration and start the regeneration method. It's recommended to add 20% ethanol to create a 25% bead suspension.

3.5 Settings Tab

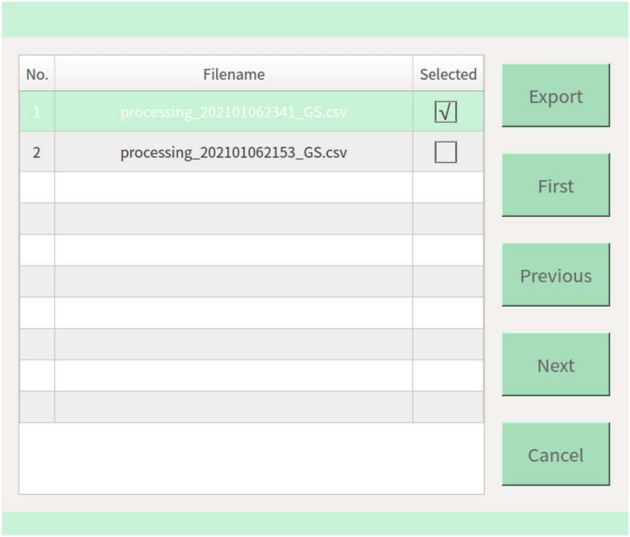
The Settings Tab contains the following parameters.



3.5.1 Log

The experiment log can be exported as the following.

1. Insert a flash drive into the USB port
2. Press the “Export” button
3. In the popup window, select the files to be exported in “Selected” column
4. Press the “Export”
5. Remove the flash drive



3.5.2 Peristaltic Pump

This function is used to run in a peristaltic pump.

1. Press “Running In”
2. Select time in the popup window

3.5.3 System Time

Pressing “Set System Time” will bring up a new window. System time can be set in the popup window.

3.5.4 Liquid Dispensing Test

The “Liquid Dispensing Test” is used to assess the performance of the pump during service.

3.5.5 Firmware Upgrade

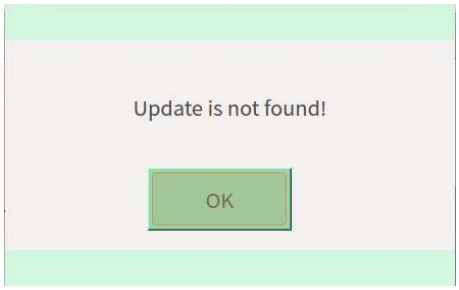
The firmware consists of three modules, namely Software, Integrator Driver, and Motor Driver. Each has its own version number. They can be upgraded altogether or individually.

Insert the flash drive containing the updates into the USB port.

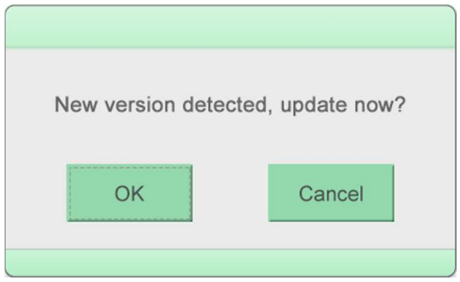
Note: The system only support flash drive in FAT32 format. Please save the directory containing upgrade files directly under root directory.

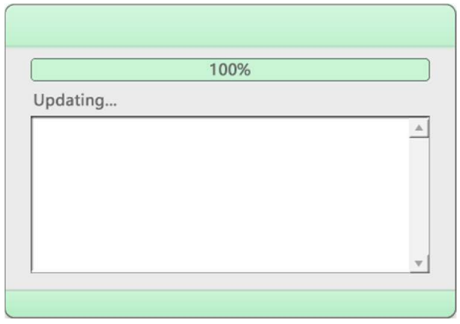
A popup window will confirm the upgrade.

Or, if the file is corrupted or missing, a popup window will show up.

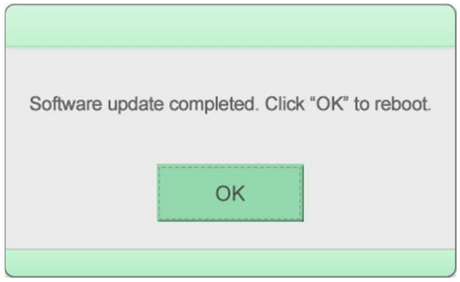


Once confirmed, the instrument firmware will be carried out automatically.



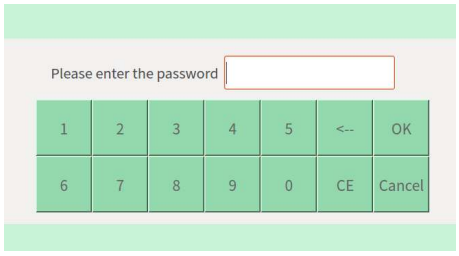


A popup window will confirm the upgrade is successful.

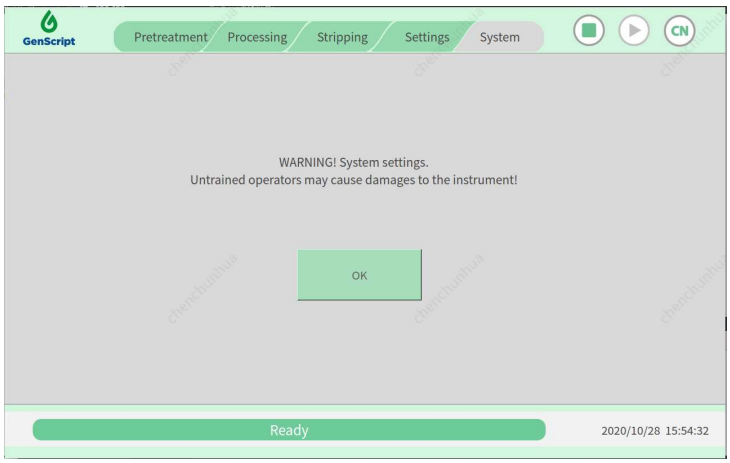


3.5.6 Other Settings

The usage statistics of the UV lamp and the air filter are stored in this section. The reset buttons can set the timer back to 0 during replacement. They are reserved for service use therefore they are password protected.



3.6 System Tab



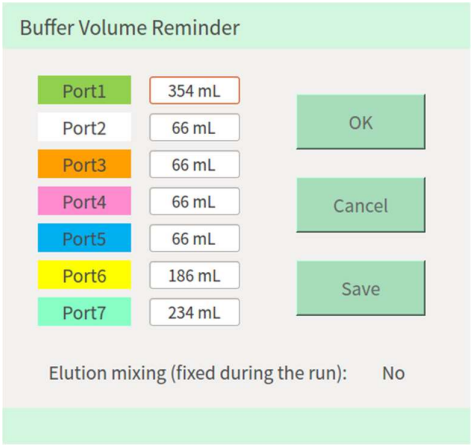
Note: The system interface is designed for trained service personnel. Untrained users should not attempt to operate unless guided by a trained specialist. Unauthorized operation may cause damage to the instrument.

Chapter 4: AmMag SA Plus Messages

4.1 Safety Door Message

If the safety door is opened during an active instrument process, the message will appear and the instrument will automatically stop all its actions. The user needs to close the safety door to continue the interrupted process.

4.2 Reagent Volume Message



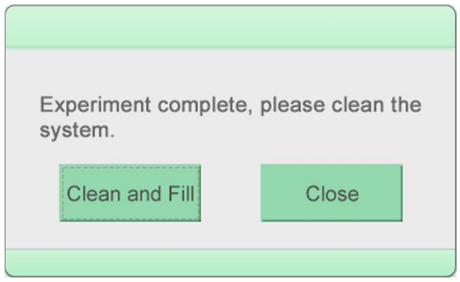
When "►" is pressed, this message appears to remind the user to check buffer volumes in the reagent bottles. Press "OK" to continue; "Cancel" to stop; "Save" to rename the current running log file.

4.3 Elution Completion Message

Once the elution process is complete, the elution completion message window will appear on the screen and the instrument will beep to inform the user that the elution step is complete.

Once the user opens the safety door, the rack platform and magnets will come out automatically and a second message will appear at the same time. The user can remove the sample rack to collect the elution. If the user does multiple elution cycles, they may press OK after transferring the samples. The instrument will continue with the next elution step.

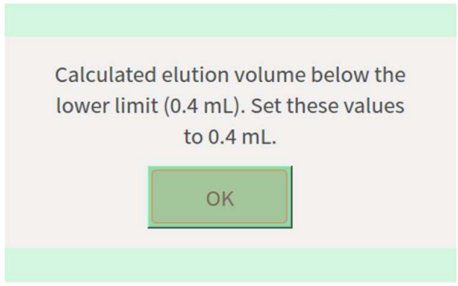
4.4 Run Completion Message

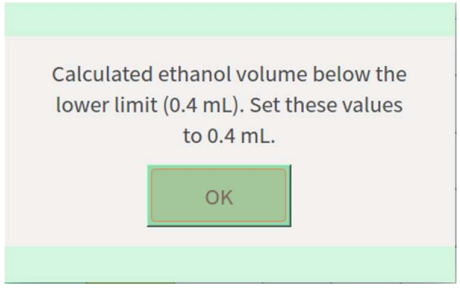


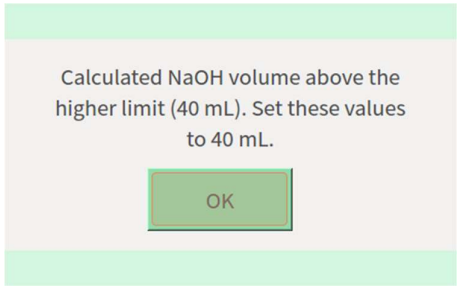
When the instrument finishes the method, the completion message window will appear on the screen to remind the user to clean the instrument and fill the pipelines before starting the next run or shutting off the instrument. The user can skip the step by pressing “Close” if there is another run.

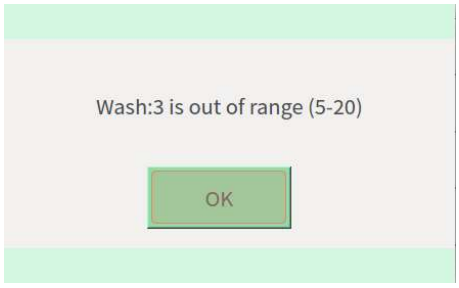
1. It is recommended for the user to fill the pipelines with water if the instrument is used regularly.
   Note: It is not recommended to leave the instrument in water for a long time. Please flush the tubing with 20% ethanol after using water.
2. It is recommended for the user to fill the pipelines with 20% ethanol if they plan not to use the instrument for a long time.

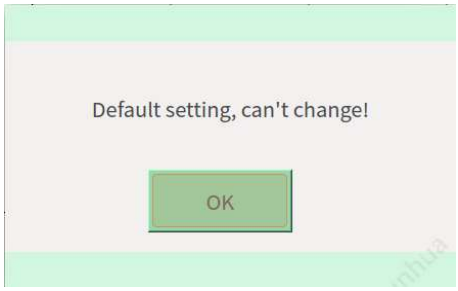
4.5 Input Over-Range Message





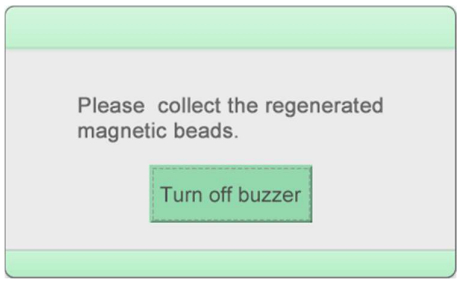






These messages appear when the inputs for the parameter lie outside of the acceptable ranges.

4.6 Stripping Completion Message



The message appears when the regeneration process is complete. The buzzer can be turned off manually.

Chapter 5: AmMag SA Plus – Troubleshooting Guide:

Q1. The alarm light (red) turns on immediately after switching on the instrument.
A1. The safety door is open or has not been closed completely.

Q2. The alarm light (red) turns on after switching on the instrument during the instrument reset.
A2. The resetting time is beyond the limit, restart the instrument for resetting.

Q3. After the parameter setting, the preview value is not consistent with the setting value.
A3. The setting value exceeds the applicable range of the instrument. For example, the max and min of buffer volumes for the instrument are 40 ml and 0.4 ml respectively.

Q4. After clicking the “pause” button, the instrument continues to work.
A4. The instrument will pause after finishing the current procedure/cycle.

Q5. Adjust the parameters during the run.
A5. Parameter adjustment cannot be made to steps that have already started or are currently running. Adjustments can be made only to subsequent steps.
(Note: Please pause the instrument to make changes in parameters)

Q6. The beads are sticky (stick to the walls of the tube).
A6. If you are not concerned about having detergent in your samples, please incubate your samples with 0.1% Tween 80 for 2 hours or overnight, and this will resolve the issue of the stickiness of beads. If you are concerned about having detergent in your samples, instead add it during the equilibration step.
(Note: For Protein A magnetic beads it is recommended to add detergent during the equilibration step. It is not essential to add detergent during the incubation process.)

Q7. The beads are sticky (stick to the walls of the tube) and cannot use detergent in the samples.
A7. If you are not able to use detergent in the first step while incubating the samples with the beads, it is recommended to use 0.1% Tween with an equilibration step of magnetic beads. This will also resolve the issue of the stickiness of beads.

Q8. What should be done when “Error 1” appears?
A8. “Error 1” indicates that there is an internal communication issue with the instrument. Please shutdown and restart the instrument. If it’s unsuccessful, please contact Genscript for further support.

Error codes are listed in the table below.

Error code	Description
Error 1	CAN communication error
Error 2	X axle error
Error 3	Z axle error
Error 4	Y axle error
Error 5	Pump 1 error
Error 6	Pump 2 error
Error 7	Pump 3 error
Error 8	Pump 4 error
Error 9	Pump 5 error
Error 10	Pump 6 error

Appendixes

Appendix I. Related Products

Cat. No.	Product Name
L00273	Protein A MagBeads - 4 ml
L00672-4	Protein A MagBeads MX - 4 ml
L00274	Protein G MagBeads - 2 ml
L00673-4	Protein G MagBeads MX - 4 ml
L00277	Protein A/G MagBeads - 2 ml
L00695-4	AmMag™ Protein A Magnetic Beads - 4 ml
L00295	Ni-charged MagBeads - 8 ml
L00327	Glutathione MagBeads - 8 ml
L00424	Streptavidin MagBeads - 2 ml
L00722	AmMag™ MR-mini magnetic rack - 1 pcs/unit
L00723	AmMag™ MR magnetic rack - 1 pcs/unit
L00743	AmMag™ Box - 1 kit

Appendix II. Standard Warranty

GenScript warrants that AmMag SA Plus-2012 Protein Purification system to be free from defects in materials and workmanship under normal use and service for a period of twelve (12) months from the date of installation by GenScript or its authorized distributor.

This warranty is void if the product is misused, altered, tampered with, or is installed or used in a manner that is inconsistent with GenScript's written recommendations, specifications, and/or instructions. The warranty also excludes failure resulting from accident, abuse, negligence, normal wear and tear, fire, water, lightning, or other acts of nature that are beyond the control of GenScript. All freight, handling, courier, customs, insurance, and other related expenses in getting the instrument to and from GenScript shall be borne by the customer.

Return Policy:

- The customer has thirty (30) calendar days to return the instrument from the date of purchase. The customer will be responsible for shipping the instrument to GenScript at his/her cost.
- For instruments returned unopened, a re-stocking fee of fifteen percent (15%) of the cost of the instrument will be applied. The customer is responsible for shipping the instrument to GenScript at his/her cost.
- For instruments after being used, a re-stocking fee of thirty percent (30%) of the cost of the instrument will be applied. The customer is responsible for shipping the instrument to GenScript at his/her cost.
- All returns must be accompanied by a return material authorization (RMA) that is pre-approved by GenScript's customer care executive. For more information regarding issues with the instrument please contact our customer care team at complaint@genscript.com.

Optional Extended Warranty Plan:

GenScript allows its customers to extend the warranty period for an additional 2 years on top of the standard 1-year warranty. The extended warranty can cover your AmMag instrument for a total of three (3) years from the date of installation. Please contact the customer care service at products@genscript.com for further details.

Warranty Conditions:

GenScript reserves the right to terminate this extended warranty by written notice to the owner in the event that in the opinion of GenScript the product is used for purposes other than it was originally designed for. In this case, GenScript will pay a refund for the unexpired period of the warranty fewer administration expenses. GenScript Standard Terms and Conditions apply.

Appendix III. Health and Safety

The AmMag SA Plus device is equipped with magnetic elements. The magnetic elements are located with warning labels of strong magnetic fields. People who might be sensitive to strong magnetic fields, including but not limited to people with pacemakers, neurostimulators, insulin pumps or similar devices, or with ferromagnetic implants (e.g., surgical stents, artificial heart valves, prosthetics, or metal fragments), should keep away from the AmMag SA Plus device and consult with a medical professional.

The magnetic field intensity is listed below for your reference:

AmMag SA Plus	
Distance from the measuring station to the magnet elements (facing the front of the instrument)	
Distance： mm	Maximum magnetic field strength： GS
50	50
100	24
150	5
200	3
250	2
300	1
Distance between the measuring place and the magnet elements (facing the left or right side of the instrument)	
Distance： mm	Maximum magnetic field strength： GS
50	80
100	25
150	10
200	6
250	2
300	1

The work area around AmMag™ MR shall be free of ferromagnetic particles or objects to avoid them being attracted by the magnetic components which may result in personal injuries or equipment damage.

Magnets are labeled with strong magnetic field warning labels as shown below.