

*Fast and
efficient*

Apostle MagTouch 1000



Nucleic Acids Extraction Automation System



USER MANUAL

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Who We Are

Apostle Inc is a biotechnology company located in San Jose, CA, providing cutting-edge technologies and services for public health and life sciences. Apostle develops innovative technologies in the space of liquid biopsy - the sampling and analysis of non-solid biological tissue, primarily blood, often utilizing circulating free DNA (cfDNA) as a biomarker. Apostle's innovations include Apostle MiniMax, a new scalable and automatable method to efficiently capture cfDNA from a standard blood draw; Apostle MagTouch, a nucleic acids isolation automation system, and Apostle MiniEnrich, a high-resolution DNA size enrichment technology using a magnetic nano-platform. Apostle responds to the COVID-19 pandemic to help our community fight together with a high quality, low cost, fast, automated, Apostle COVID-19 Viral RNA Isolation System that has been clinically validated and has processed over 1 million clinical samples. Apostle is a Stanford University StartX Company, and a 2018 BioSpace Top 20 Life Sciences Startup Company.

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Installation



Do **NOT** connect power before removing the transportation fixing screw.

1. Select an area for your MagTouch that is clean, stable and has an electrical outlet nearby. Remove your MagTouch and power cord from the shipping box and place on the designated area.

2. Remove and keep all the tapes and foam cushions used for transportation. **(Figure 1)**

3. The chamber of the MagTouch can be accessed by sliding up the right-side window. Turn the knob on the bottom right of the window to stabilize the window in place. **(Figure 2)**

4. Use a 2.5 hex screwdriver to remove the transportation fixing screw. Keep the transportation fixing screw. **(Figure 3)**

5. After removing the transportation fixing screw, connect the power cord to the electricity and turn on the machine.

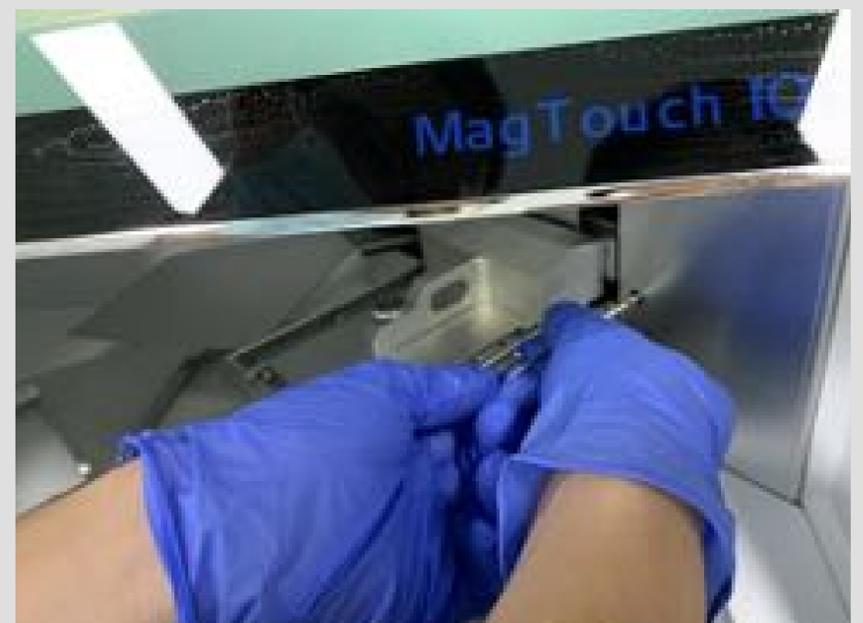
6. Once powered on, the Apostle MagTouch system will automatically go through the initialization process and examine the hardware and software. Wait for the machine to pass the initialization self-test. If any part of the self-test fails, fix it according to the information shown on the screen. **(Figure 4)**



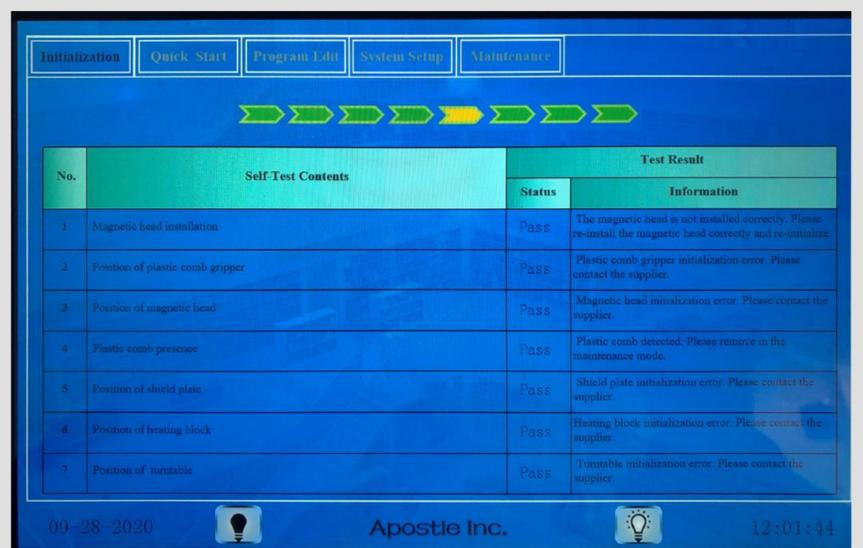
> Figure 1



> Figure 2



> Figure 3



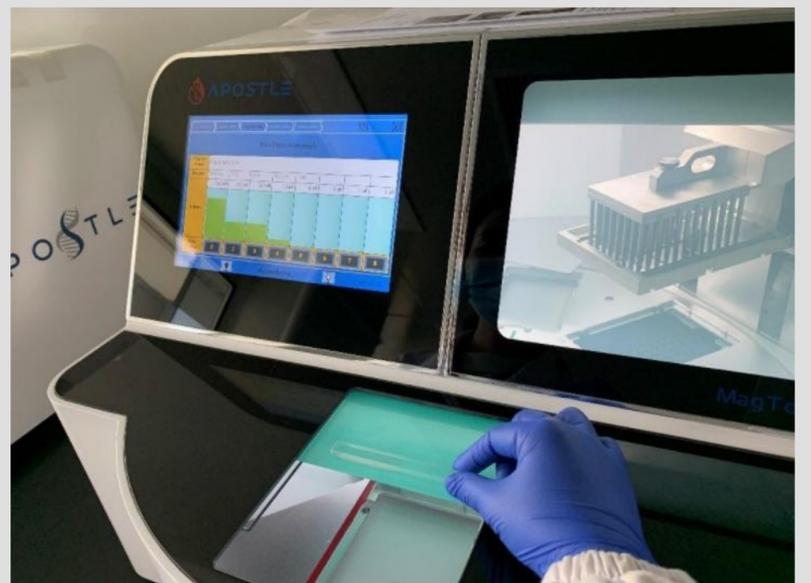
> Figure 4

Operation

1. Before each run, fill in the Log book with information including sample plate ID, time of sample plate received, time of machine run and machine number.
2. Get the prepared plates in hand and be ready to start the program. (Sample Plate, two 80% EtOH Plates, Elution Plate, Empty Plate with Comb)
3. Press **[Initialization]** button on the top left corner to initialize the machine.
4. Press **[YES]** button to perform the initialization.
5. Wait for the machine to pass the initialization self-test. If any part fails, contact the lab director.
6. Press the **[Start]** button for **[viral RNA 2.0]** program on the screen. **(Figure 1)**
7. Press the next step button **▶▶** on the top right corner.
8. Open the plate-loading window gently. **(Figure 2)**
9. Press the **[Plate position 1]** button on the screen. **(Figure 3)**
10. Make sure all the wells of Sample Plate (also referred to as Lysis/Binding plate) are wide open and no aluminum foil pieces are stuck out. If not wide open, use pipette tip to open the wells. **(Figure 4)** [refer to operation checkpoint 1]



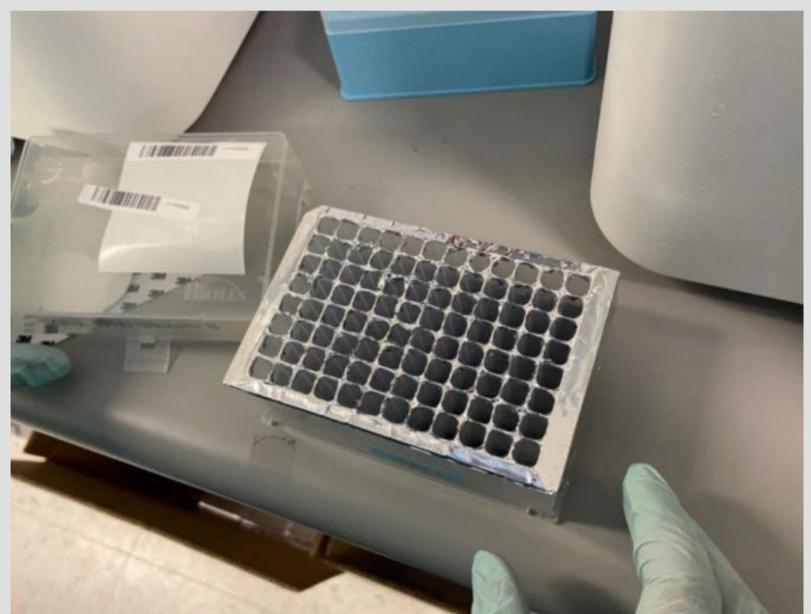
> Figure 1



> Figure 2



> Figure 3



> Figure 4

11. Place the Sample Plate on the **plate holder 1** in the instrument through the plate-loading window. Make sure that the plate is placed steadily in the correct orientation. **Ensure that the A1 well is in the upper right corner of the plate holder on turntable. (Figure 5)**

12. Press the **[Plate position 2]** button on the screen.

13. Take out two Apostle EtOH plates.

14. Peel off the protection film on one Apostle EtOH Plate. **(Figure 6)**

15. Place one Apostle EtOH Plate on **plate holder 2** in the instrument through the plate-loading window. **Ensure A1 well is in the upper right corner.**

16. Press the **[Plate position 3]** button on the screen.

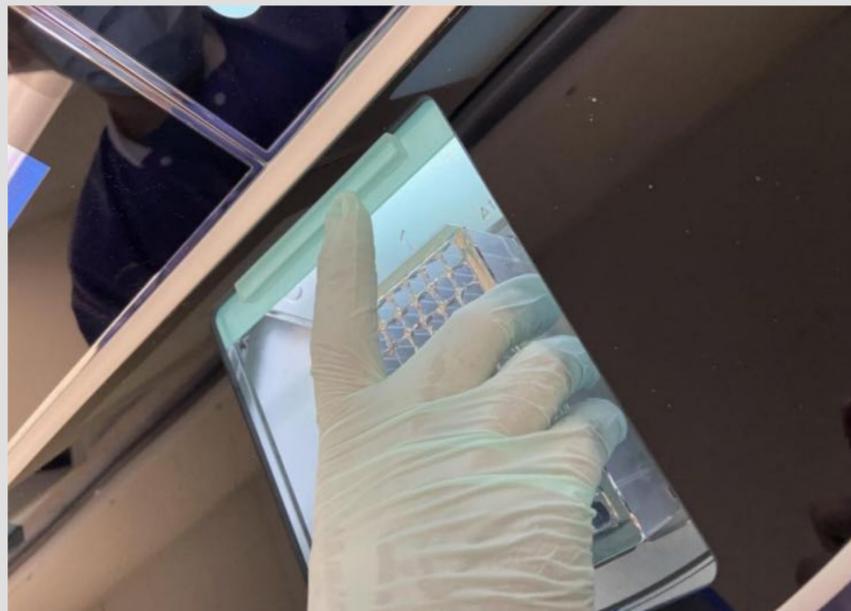
17. Peel off the protection film on the other Apostle EtOH Plate.

18. Place the Apostle EtOH Plate on **plate holder 3** in the instrument through the plate-loading window. **Ensure A1 well is in the upper right corner.**

19. Press the **[Plate position 4]** button on the screen.

20. Take out the Apostle Elution Plate.

21. Stick the sample barcode onto the Elution Plate. **(Figure 7)**



> Figure 5



> Figure 6



> Figure 7

22. Peel off the protection film on the Apostle Elution Plate.

23. Place the Apostle Elution Plate on **plate holder 4** in the instrument through the plate-loading window. **Ensure A1 well is in the upper right corner.**

24. Press the **[Plate position 5]** button on the screen.

25. Take out one Apostle Comb and an empty plate. **Don't touch the bottom columns of the comb, grab the edge of the comb. (Figure 8)**

26. Place the comb into the empty plate carefully. **Ensure the comb is fully incorporated into the plate. (Figure 9)**

27. Place the comb and empty plate on the **plate holder 5** in the instrument through the plate-loading window. **Ensure A1 well is in the upper right corner.**

28. Close the plate-loading window gently.

29. Press the next step button **▶▶** on the top right corner.

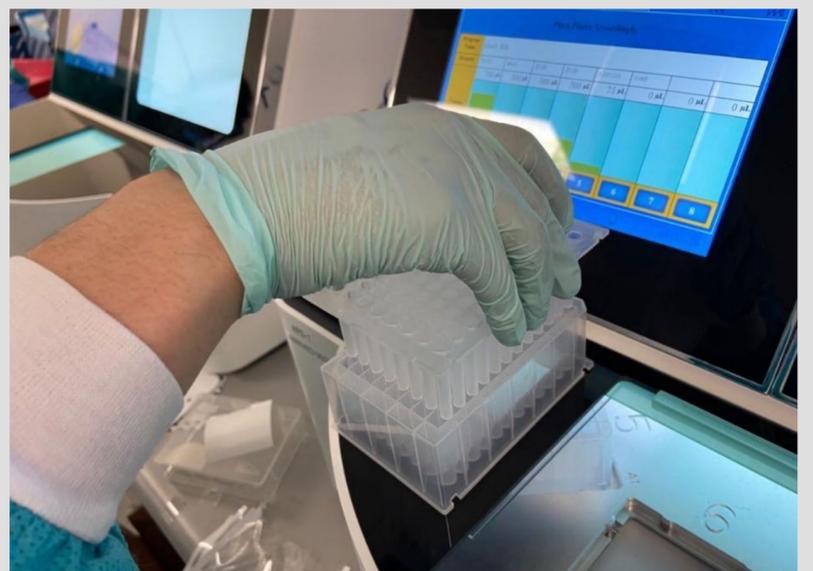
30. Press the **[YES]** button to start the program.

31. After starting the program, check if the comb gripper successfully grips the comb during [Grip Comb] process on **position 5**. If gripping fails, press the pause button **||** on the screen and immediately contact the lab director for hardware adjustment. **(Figure 10) [refer to operation checkpoint 2]**

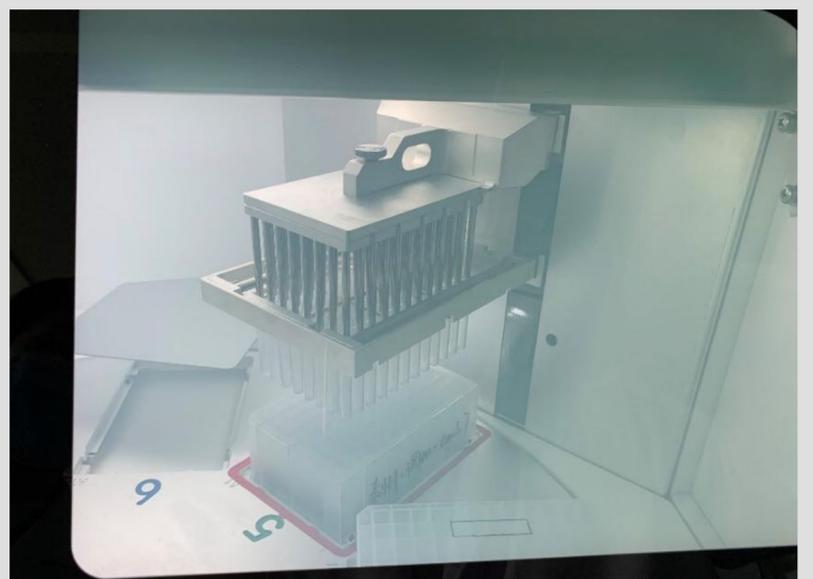
32. Once the turntable moves to **position 1**, observe if the comb smoothly inserts into the plates and mixes the solution without moving together with the plate. **(Figure 11) [refer to operation checkpoint 2]**



> Figure 8



> Figure 9



> Figure 10



> Figure 11

33. If the program begins successfully, let the instrument run the remaining steps. It will take approximately **40 minutes** to finish the whole program. **If any issues, refer to the "Operation Checkpoints" section of this manual.**

34. After approximately 40 minutes, the program will end and display **[Running status: Finish]** on the screen and play a prompt tone.

35. Press the next step button **▶▶** on the top right corner.

36. Press the **[Plate position 4]** button on the screen. **(Figure 12)**

37. Open the plate-loading window gently.

38. Take out the Elution Plate from the plate-loading window.

39. Seal the Elution Plate with protection film. **(Figure 13)**

40. If you forget to stick the sample barcode on the Elution Plate before running the program, stick the sample barcode on now.

41. Check the Elution Plate with its sample information sheet.

42. Place the Elution Plate together with its sample information sheet into the **4°C** refrigerator. **(Figure 14)**

43. Go back to the instrument and press the **[Plate position 1]** button on the screen.

44. Take out the Sample Plate from the plate-loading window. **(Figure 15)**

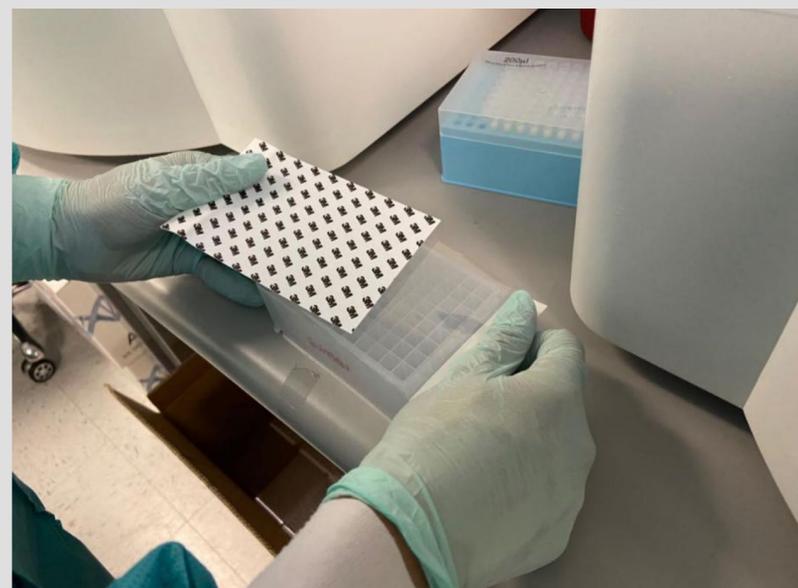
45. Repeat step 43-44 to take out all other plates and comb from the instrument.

46. Dump all the used plates and comb into the biohazard trash bin.

47. Press the next button **▶▶** on the top right corner. The instrument will go back to the initial interface and is ready for the next run.



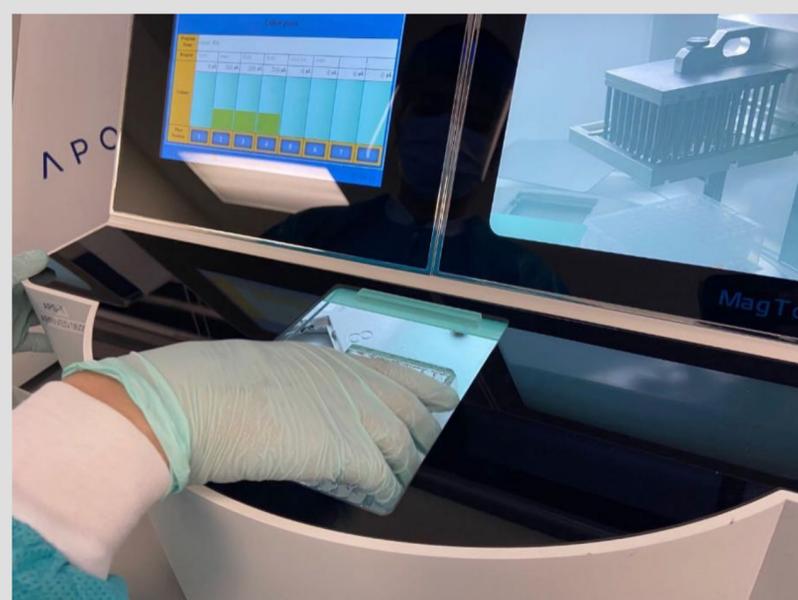
> Figure 12



> Figure 13



> Figure 14



> Figure 15

Operation Checkpoints

Checkpoint 1

When loading sample plate, examine if all the **wells are wide open and no aluminum foil pieces are stuck out**. If it is not wide open as shown (**Figure 1**), use pipette tip to make sure the wells are wide open.

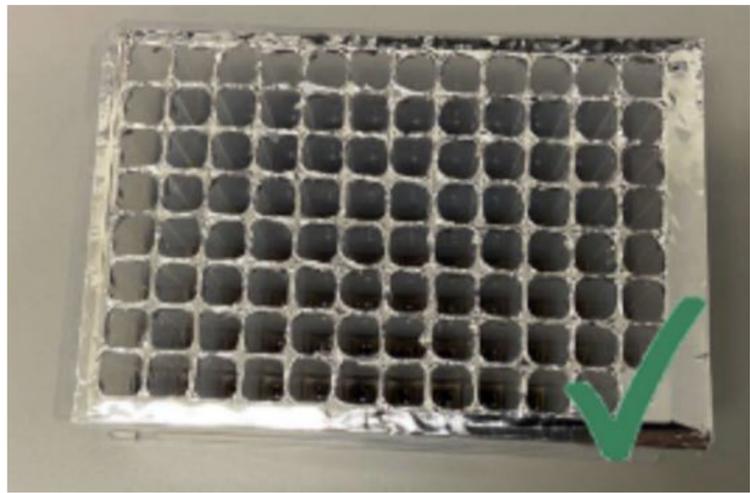


Figure 1

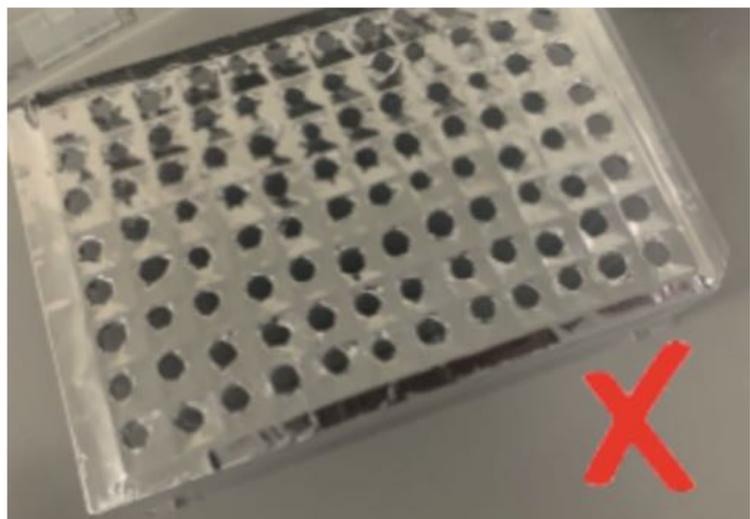


Figure 2

Checkpoint 2

After the start of the program, check if the comb gripper **successfully grips comb** during [Grip Comb] process on position 6. (**Figure 3**) If the gripping fails, please pause the program and immediately contact lab director for hardware adjustment.



Figure 3

Operation Checkpoints

Checkpoint 3

Once the turntable moves to position 1, observe if the comb smoothly inserts into the plates and **mixes the solution without moving together with the plates** as shown in (Figure 4). If the comb and the plate move together (plate lifted up by the comb), during [Binding] process when the plate is gripped by the comb and lifted from the turntable (usually within 2 minutes into the program) as shown in (Figure 5), pause the program.

Once the plate is in the lifted position, open the window and move the plate forward, backward, left and right, so that the comb can make the wells open. Then, carefully separate the plate from the comb and place the plate back to position 1 (Figure 6). Close the window, and resume the program. If the plate is still gripped by the comb and lifted from the turntable, repeat this adjustment process. Note, if the comb and plate are stuck together and not lifted, manual movement of the plate will be limited and does not open up the wells. **Only adjust the plate when it is lifted up from the turntable. Otherwise the turntable may be damaged.**

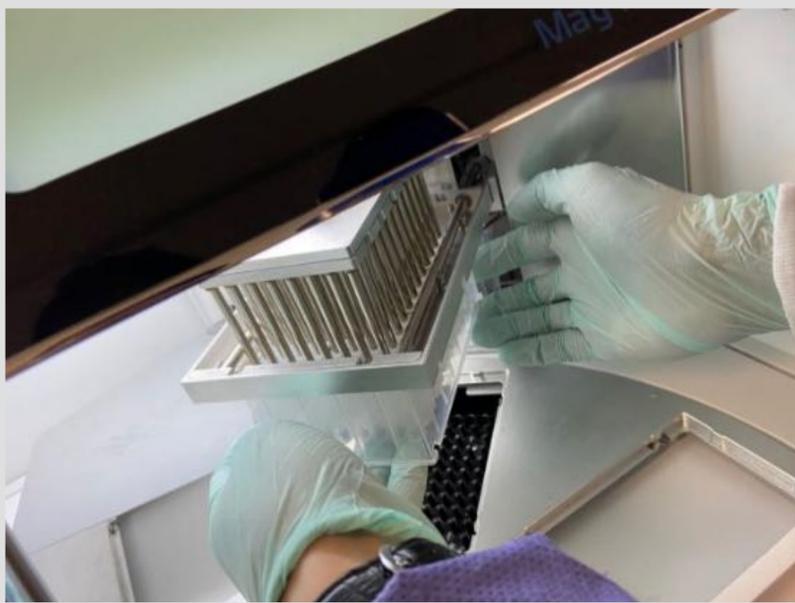


Figure 4



Figure 5



Figure 6

Operation Checkpoints

If **Checkpoints 1-3** are missed, it may lead to a situation where the comb grips the plate during [Binding] process and moves together to position 2. If this happens, immediately turn off the MagTouch 1000 and contact the lab director.

To rescue the samples in this situation:

1. Open the window and take out plates on position 3-6.
2. Lift the comb gripper and lysis/binding plate manually to give space for wash plate, then take out wash plate on position 2.
3. Hold the lysis/binding plate and manually open the gripper to release the comb and plate from the gripper.
4. Take out the lysis/binding plate and comb, then move the plate forward, backward, to the left and right, so that the comb can make the wells wide open.
5. Move the comb up and down several times and gently mix with the solution in the sample plate to resuspend the beads back into the solution. Then, carefully discard the comb without cross-contaminating the wells.
6. Close the window and turn on the MagTouch, and check if the initialization has passed successfully. If not, contact the lab director immediately.
7. After initialization has completed, restart the program using the retrieved plates and a new comb.
8. Make a note on the worksheet to notify other parties in case re-run is needed.

Reagent Preparation

*For Apostle MiniGenomics
Viral Total NA Isolation
Automation protocol*

Apostle MiniGenomics Viral Total NA Isolation Fast Kit Content (64 x 96 preps)

Reagent	Volume
Lysis/Binding Solution*	4 x 367 mL
Elution Solution	1 x 800 mL

Store both reagents at room temperature, in the dark.

*Add EtOH according to the bottle instruction before use.

Required Materials

Apostle MagTouch 1000

Apostle 96-well plates and 96-tip comb

Adjustable single and multi channel
micropipettes (1 mL, 200 µL, 20 µL) & tips

DNase/RNase free water

Liquid reservoirs

Ethanol, 200 proof

Vortex or shaker

Procedure

A. Prepare Reagents Before Use

1. Prepare Lysis/Binding Solution: Add 500 mL pure ethanol to 367 mL Lysis/Binding Solution according to the bottle instruction.
2. Prepare 80% Ethanol.

B. Set up Processing Plates

1. Mix well the prepared Lysis/Binding Solution and 80% Ethanol before use.
2. Set up the 96 well plates according to the table below, outside of the instrument.*

Plate Position	Plate Type	Plate ID	Content	Reagent volume for each well
1	96 well plate	Bind	Lysis/Binding Solution (EtOH added)**	520 µL
			Sample	200 µL
2	96 well plate	EtOH	80% Ethanol	500 µL
3	96 well plate	EtOH	80% Ethanol	500 µL
4	96 well plate	Elution	Elution Solution	85 µL
5	96 well plate with comb	Comb	-	-

*Check 96 well plate integrity before loading reagents, to avoid leakage of certain wells.

**Always mix the bottle of Lysis/Binding Solution well right before pouring into reagent reservoir, which is used to load plates, as the magnetic beads can precipitate and compromise results. Also vortex the reagent reservoir for Lysis/Binding Solution before adding more Lysis/Binding Solution.

C. Automated viral Total NA isolation on Apostle MagTouch 1000 Automation Platform

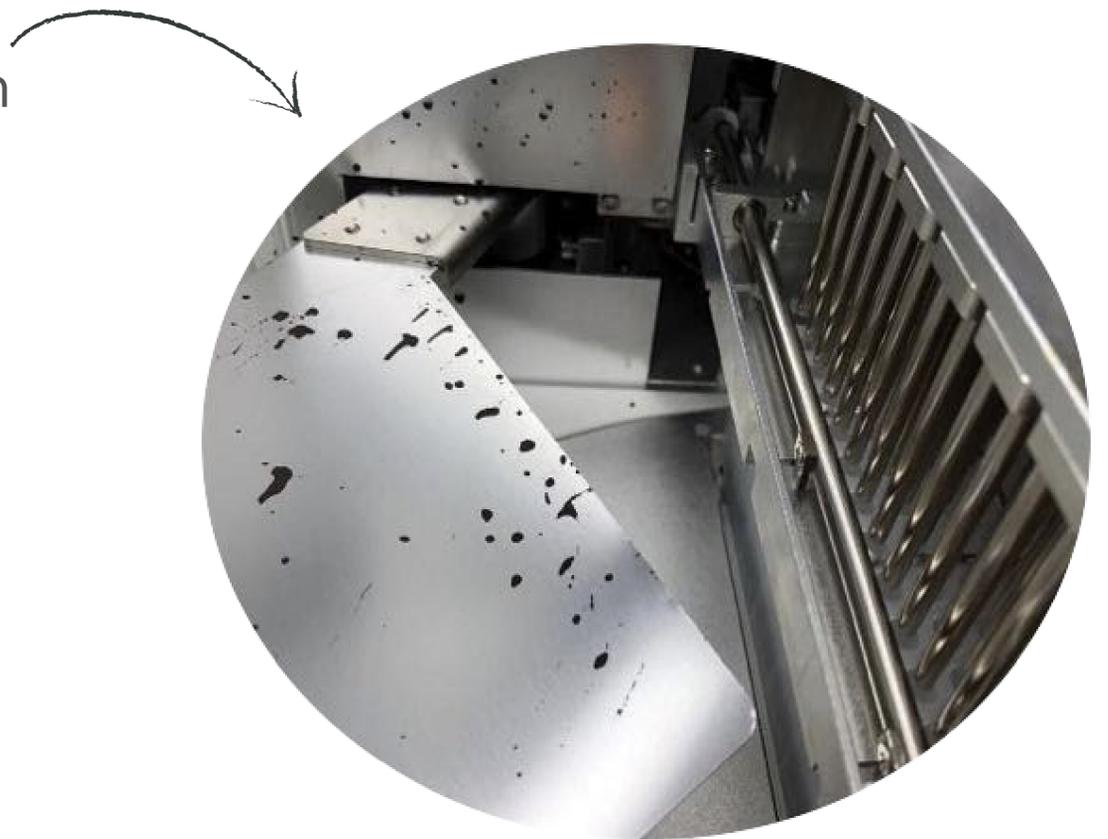
1. Initialize the instrument, then press the **[Quick Start]** button.
2. Select the built-in **[viral RNA 2.0]** program and place the plates into the Apostle MagTouch 1000 as indicated on the instrument display. Make sure that the plate is placed steadily in the correct orientation. **Ensure that the A1 well is in the upper right corner of the plate holder on turntable.**
3. After placing all the plates, press the **▶▶** icon on the interface to start the program.
4. When the program is complete, collect the purified viral RNA from the elution plate.
5. For long term storage, store the samples at -80°C.

Maintenance

| Cleaning

When reagents have been spilled onto the magnet head, shield plate, turntable or inside the machine, immediately clean the area with a dustless cloth dampened into 80% ethanol.

(Frequency - when needed)



| Fasten Screws

Check whether the magnet head screw, turntable screws and screws of the fixation springs on plate holder 1 are tightly fastened, if not, fasten the screws.

(Frequency - every month)



Maintenance

| Initialization

Press the **[Initialization]** button on the top left corner of the touchscreen to initialize the machine.

(Frequency - before every run)

| Turn off the machine

Turn off the machine for at least 15 minutes between each shift.

(Frequency - between each shift)

| Sterilization

Close the monitor window and the plate-loading window, then turn on the UV light for longer than 5 minutes.

(Frequency - when needed)

Safety Precautions for UV Lamp:



- The instrument has a UV disinfection device inside. Please follow the following safety precautions when using the UV lamp:



- When the UV lamp is lit, do not look directly with the naked eye. Do not let the ultraviolet radiation get directly on the skin.



- The glass door of the instrument can block UV leakage. Please keep the door closed when using the UV lamp.



- If the door or glass of the door is damaged, please contact the manufacturer for repair. Do not continue to use.



- It is recommended to turn off the UV lamp at least five minutes after turning it on, otherwise the life of the UV lamp will decay faster.



- Do not touch the UV lamp by hand, which will damage or reduce the life of the UV lamp.

Troubleshooting

Problem

The instrument cannot detect the grabbing of plastic comb normally. (Magnetic head will grab comb, but show error message. Or will not grab comb, but run normally.)



Solution

| **Temporary solution**- Disable [Initialize Self-Test] (old UI version) or [p-comb test] (new UI version) in the Maintenance-Hardware Adjustment to turn off the plastic comb detecting function.

| **Final solution**- After disassembling the machine, adjust the height of the sensors of plastic comb hook, so that it can detect the grabbing of plastic comb normally, then fasten the sensors.

The plastic comb is not grasped firmly and hits the shield plate, knocking off the comb grabbing hook



Reagent spill in the machine should be cleaned up immediately, otherwise the surface of the machine will corrode. Clean the spill area with a dustless cloth dampened in 80% ethanol.

Install the comb grabbing hook back again.

1. Power on the machine, press Maintenance, then Replace Magnet Head.
2. The position of the magnet head will rise, and the comb grabbing hook will open. Turn off the machine at this time.
3. Unscrew the magnet head, and install the comb grabbing hook and the corresponding screw back to the hole.
4. For easier operation, to install the hook on the left, may need to open the back cover of the instrument.
5. After installing the hook, reinstall the magnet head. Turn on the machine and check whether the initialization self-tests are passed. Verify whether the plastic comb grabbing is normal.

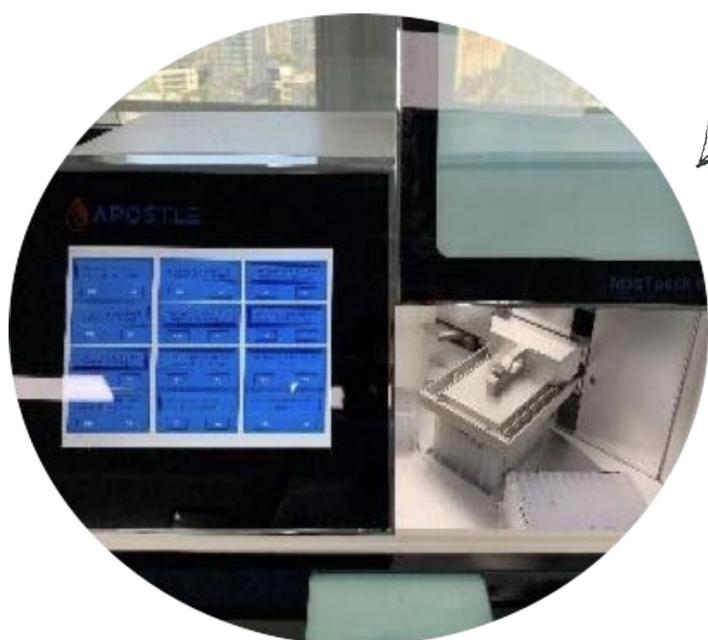
Problem

The height of the instrument shield plate is too low, it will hit the plastic comb on the turntable when the turntable rotates.

Solution

First, check whether it is caused by the deformation of the shield plate, manually press or straighten the shield plate. If it still cannot be solved, you need to disassemble the machine to adjust the height of the shield plate and the position of the coupling.

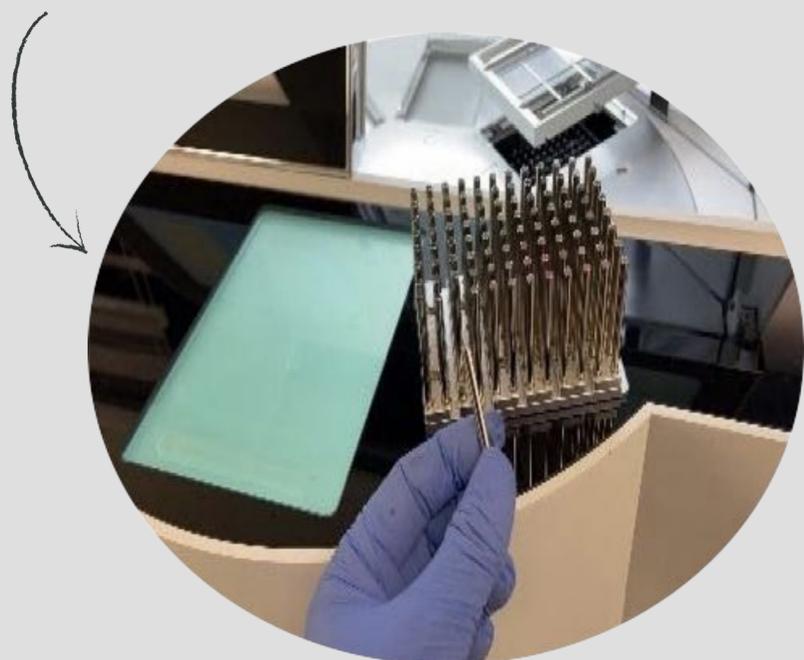
The screen displays other pictures while the program is running, and the machine is still running. It should return to normal after a few minutes.



| **Temporary solution:** For the old software version, this situation may occur randomly after the instrument runs for a long time. Shut down the machine for a period of time and then restart.

| **Final solution:** Upgrade the instrument software to the latest version. No need to disassemble the machine. Connect the machine to a computer through the port on the back of the instrument and import the latest version of the software.

Some magnet rods of the magnet head have broken.



| **Temporary solution:** Do not add samples and reagents to the corresponding well positions of the broken magnet rods, and continue to use other well positions to run the program.

| **Final solution:** Buy a new 96 magnet head and replace it.

Problem

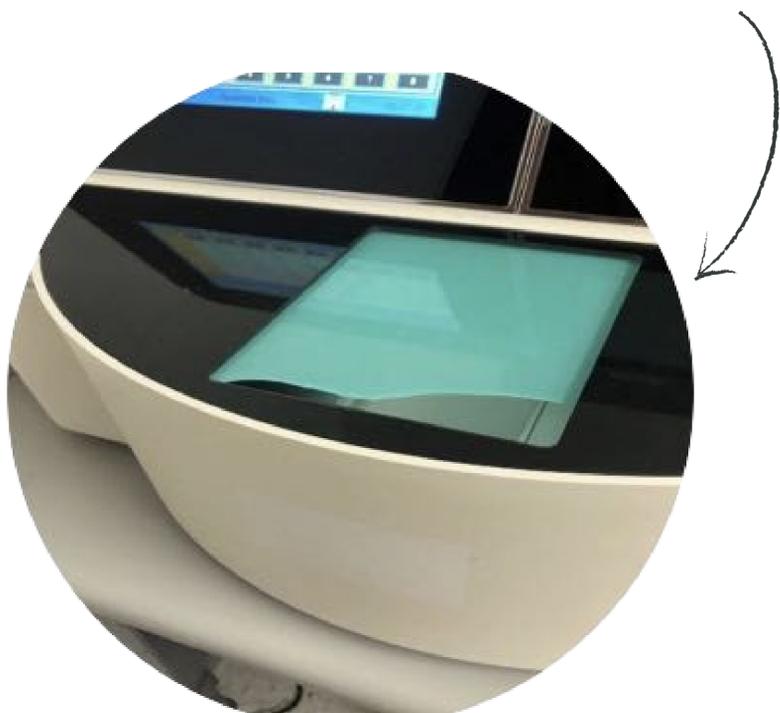
The rotating sound of the turntable is noisy and harsh.

Solution

Check whether the two thumb screws on the turntable are loose. If so, fasten the screws.

The machine turntable is supported by some nylon balls. If the nylon balls are not lubricated, it will make a certain noise. Apply some grease on the supporting nylon balls to reduce the noise.

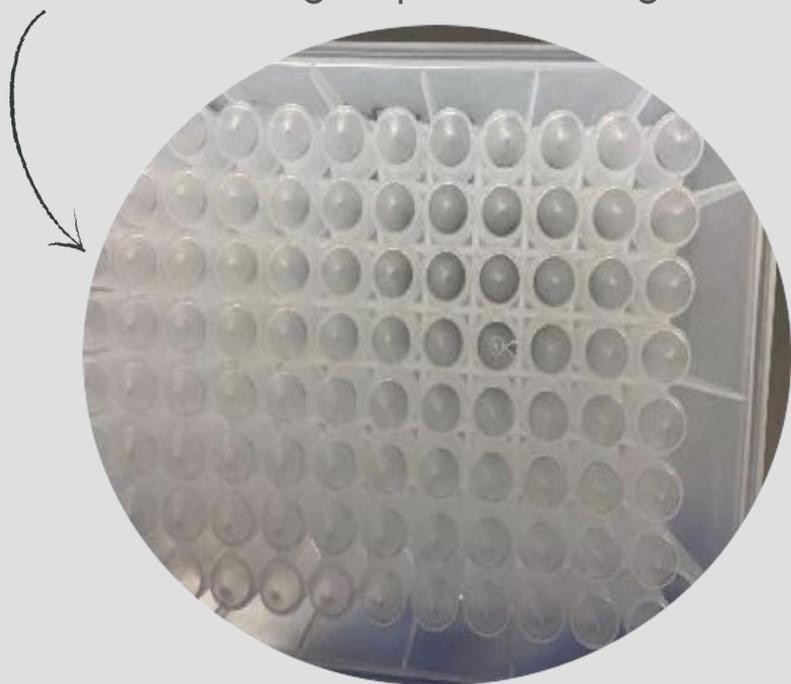
The plate-loading window has broken.



| **Temporary solution:** The glass window will usually be broken into several complete pieces, which can be simply stuck together with tape first, and then continue to use.

| **Final solution:** Replace the plate-loading window, which will require disassembling the machine.

There are holes in some wells of the plate, causing liquid leakage.



| **Temporary solution:** Users should pay attention before use. Before adding liquid, observe whether there are obvious holes at the bottom of the plate, and observe whether there is liquid leakage at the bottom after adding liquid. Discard the leaking plate, replace the plate and add liquid again.

| **Final solution:** Replace with new consumables.

Problem

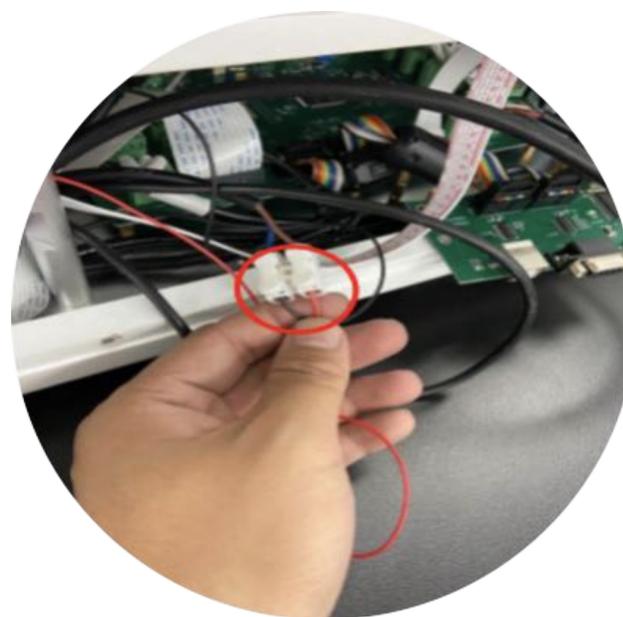
There is abnormal noise when the instrument is turned on or initialized, and there is no such noise during protocol running. The possible cause is that the heating block vibrates during initialization and its position is too low.

Solution

Contact the supplier to confirm whether it is caused by the heating block. If so, turn off the machine and manually turn the turntable to expose the screw rod next to the heating block. Turn the screw rod clockwise a little, and then restart the machine to initialize and confirm whether the noise disappears.

There is no sound from the speaker of the instrument, and no sound when turning on and pressing keys.

Turn off the instrument, open the back cover of the instrument. Confirm whether the two power cords (one red wire and one black wire) of the instrument speaker are connected. Reinstall the two power cords, and then turn on the instrument to confirm whether the speaker is normal.



The magnet head gets stuck and cannot lift up again after it moves down into the plastic comb. The magnet head vibrates at the bottom.

After shutting down the machine, disassemble and confirm whether the screw rod above the magnet head motor is normal. If the screw rod is crooked, the up and down movement of the magnet head will be blocked. Straighten the screw rod and then turn on the machine to confirm whether the problem is solved.

Problem

During the running of the instrument protocol, the magnet head and the plastic comb gripper are stuck when moving down (not moving down smoothly, but step by step) and there is an abnormal noise.

Solution

Contact the supplier to determine the problem and replace the coupling if necessary.

The angles of the turntable plate positions are misaligned. After plate position 1 is aligned, the positions of the other plates are deviated.

Contact the supplier.

After the machine has been running for long periods of time, the position of the parts is misaligned. The technician hits or touches the parts during operation, causing the misalignment.

The technicians should be careful when operating and initialize the instrument before each run.

Breakage of the instrument motor coupling.



| **Temporary solution:** Buy new rigid coupling and replace it after disassembling the machine.

| **Final solution:** The new instruments uniformly use the new rigid coupling to increase the service life.