



SPRI-TE™
Nucleic Acid Extractor



Operator's Manual

SPRI-TE™ Nucleic Acid Extractor Operator's Manual

For *In Vitro* Diagnostic Use

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- If the product is a reagent or the like, it is warranted only to conform to the quantity and content and for the period (but not in excess of one year) stated on the label at the time of delivery.

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Parts replaced during the warranty period are warranted to the end of the instrument warranty.

Safety Information

Safety Overview

All Warnings and Cautions in this document include an exclamation point, a lightning bolt, or a light burst symbol framed within a triangle. Please pay special attention to the specific safety information associated with these symbols.

 **WARNING**

If the equipment is used in a manner not specified by Beckman Coulter, Inc., the protection provided by the equipment may be impaired.

Warning and Caution Definitions

All Warnings and Cautions in this document include an exclamation point, a lightning bolt, or a light burst symbol framed within a triangle. The exclamation point symbol is an international symbol which serves as a reminder that all safety instructions should be read and understood before installation, use, maintenance, and servicing is attempted.

 **WARNING**

A WARNING calls attention to a condition or possible situation that could cause injury to the operator.

 **CAUTION**

A CAUTION calls attention to a condition or possible situation that could damage or destroy the product or the operator's work.

When this symbol is displayed in this manual, pay special attention to the specific safety information associated with the symbol.

Electrical Safety



To prevent electrically related injuries and property damage, properly inspect all electrical equipment prior to use and immediately report any electrical deficiencies. Contact a Beckman Coulter Service Engineer for any servicing of equipment requiring the removal of covers or panels.

Ensure that the SPRI-TE instrument is installed in a location where other laboratory equipment or instruments may not affect the connection and disconnection of the SPRI-TE to its power source.

Installation requires clearance behind and to the sides of the instrument of at least 6 in. (15.25 cm) from the wall or other obstructions to allow for easy access to the power switch, power cord, and fuses. A distance of 15 in. (38.1 cm) is required above the instrument for the access door and avoidance of obstructions.

High Voltage

This symbol indicates the potential of an electrical shock hazard existing from a high voltage source and that all safety instructions should be read and understood before proceeding with the installation, maintenance, and servicing of all modules.

Do not remove system covers. To avoid electrical shock, use supplied power cords only and connect to properly grounded (three-holed) wall outlets. Use only multi-plug power strips provided by the manufacturer.

Disposal of Electronic Equipment



It is important to understand and follow all laws regarding the safe and proper disposal of electrical instrumentation. The symbol of a crossed-out wheeled bin on the product is required in accordance with the Waste Electrical and Electronic Equipment (WEEE) Directive of the European Union. The presence of this marking on the product indicates that:

- the device was put on the European Market after August 13, 2005.
- the device is not to be disposed via the municipal waste collection system of any member state of the European Union.

For products under the requirement of WEEE directive, please contact your dealer or local Beckman Coulter office for the proper decontamination information and take back program, which will facilitate the proper collection, treatment, recovery, recycling, and safe disposal of the device.

Chemical and Biological Safety

Normal operation of the instrument may involve the use of materials that are toxic, flammable, or otherwise biologically harmful. When using such materials, observe the following precautions:

- Handle infectious samples according to good laboratory procedures and methods to prevent the spread of disease.
- Observe all cautionary information printed on the original solutions containers prior to their use.
- Dispose of all waste solutions according to your facility's waste disposal procedures.
- Operate the instrument in accordance with the instructions outlined in this manual, and take all the necessary precautions when using pathological, toxic, or radioactive materials.
- Splashing of liquids may occur; therefore, take appropriate safety precautions, such as using safety glasses and wearing protective clothing, when working with potentially hazardous liquids.
- Use an appropriately contained environment when using hazardous materials.
- Observe the appropriate cautionary procedures when using flammable solvents in or near a powered-up instrument.
- Observe the appropriate cautionary procedures when using toxic, pathological, or radioactive materials.

**NOTE**

Decontaminate the instrument prior to performing any general maintenance or service functions or before moving the instrument.

**NOTE**

Observe all warnings and cautions listed for any external devices attached to or used during operation of the SPRI-TE instrument. Refer to external device user's manuals for operating procedures of these devices.

Biological Safety and Waste Disposal

Samples and reagents should be treated as biohazardous material. Use safe laboratory procedures as outlined in publications such as Biosafety in Microbiological and Biomedical Laboratories, HHS (www.cdc.gov/od/ohs/biosfty/biosfty.htm).

Used consumables, such as reagent cartridges and pipetting tips, may contain hazardous chemicals or infectious agents from the extraction process. Such wastes must be collected and disposed of properly in accordance with local safety regulations and laboratory procedures.

Moving Parts

To avoid injury due to moving parts, observe the following:

- Never attempt to exchange labware, reagents, or tools while the instrument is operating.
- Never attempt to physically restrict any of the moving components of the instrument.
- Keep the instrument work area clear to prevent obstruction of the movement.

Cleaning

Observe the instrument cleaning procedures outlined in this manual. Prior to cleaning equipment that has been exposed to hazardous material:

- Review the chemical and biological safety information in this manual.
- Contact your laboratory safety officer or the appropriate personnel at your site.

Maintenance

Perform only the maintenance described in this manual. Maintenance other than that specified in this manual should be performed only by Beckman Coulter service engineers.

It is your responsibility to decontaminate components of the instrument before requesting service by a Beckman Coulter Service Engineer or returning parts to Beckman Coulter for repair. Beckman Coulter will NOT accept any items that have not been decontaminated where it is appropriate to do so. If any parts are returned, they must be enclosed in a sealed plastic bag stating that the contents are safe to handle and are not contaminated.

Deinstallation

Deinstallation of a SPRI-TE instrument is done by Beckman Coulter service engineers, in accordance with deinstallation and decontamination protocols.

General Warnings and Cautions



- Ensure that water and chemicals remain localized to the SPRI-TE extraction chamber, the reagent rack, tip rack, and splash pan. Water or chemicals may damage electrical components.



- In an emergency, immediately turn the power switch to the off position (O), and unplug the instrument from the wall outlet.



- The UV bulb in the instrument contains mercury. Do not put in the trash. Recycle or dispose of according to local, state, or federal laws.



- Unplug the SPRI-TE instrument when not in use.



- Do not touch the surface of the heat block without proper protection. Doing so may cause burns.



- Wear proper protection around any areas marked with the biohazard materials symbol.



- Keep hands away from areas marked with this crush warning symbol.



- When using the instrument, follow quality control and methods development procedures and guidelines.

Description

System Purpose and Function

Intended Use

The SPRI-TE™ Nucleic Acid Extractor is a fully automated system capable of extracting nucleic acids from a variety of sample types including plasma, serum, viral transport media, formalin fixed paraffin embedded tissue (FFPE), and whole blood for *in vitro* diagnostic use. The instrument is equipped with MAGTRATION® magnetic filtration technology, developed by Precision System Science Co. Ltd.

The SPRI-TE system has been optimized for use with Beckman Coulter SPRI-TE reagents. Each kit contains enough pipette tips, screw-cap tubes and reagents in pre-filled, sealed cartridges to process fifty samples. The instrument features hands-free automation, providing laboratory personnel a fast and safe means of extracting up to ten samples in a single run.

The SPRI-TE system (see Figure 1.1 and Figure 1.2) is intended for general laboratory use by trained personnel. It is capable of running a number of different extraction protocols and requires a minimum amount of laboratory space. The system has a self-contained enclosure area that reduces the risk of operator exposure during the extraction process, and minimizes the potential for cross-contamination from sample to sample. A UV light is located inside the enclosure for decontamination of the system.

Figure 1.1 SPRI-TE Nucleic Acid Extractor



Figure 1.2 Instrument with Door Open and Racks Loaded



①	Housing
②	Access Door
③	Control Panel
④	Method Card Slot
⑤	Method Card Drawer
⑥	Extraction Chamber

Instrument Overview

Housing

- Ventilation Slats

Ventilation slats are located on the side and rear instrument panels to prevent excessive heat build-up during the extraction process.



Keep fingers, hands, and fluids away from the ventilation slats during operation.

- Power Switch

The power switch (see Figure 1.3) is located on the instrument left side panel. This two-position rocker switch (I, on; O, off) controls electrical power to the instrument.

Figure 1.3 Power Switch



The instrument is equipped with a universal power supply (see Figure 1.4) allowing operation in the voltage range 100–240 VAC ($\pm 10\%$), 50–60 Hz, 336 VA, and a nine-pin RS 232 (CN1) serial port allowing the instrument to be directly connected to a PC. A fail-safe fuse incorporated in the power supply panel protects the instrument from electrical surges or malfunction.



NOTE

The nine-pin RS232 (CN1) serial port is for Beckman Coulter service use only.

Figure 1.4 Rear Instrument Panel



Description

System Purpose and Function

Access Door

The access door (see Figure 1.5) opens upward to provide access to the extraction chamber. The door must be closed in order for the system to operate. A magnetic mechanism ensures that the door stays closed during operation. If the door is opened during a run, the extraction process will stop. The door is equipped with a clear-acrylic, UV-protected window, allowing laboratory personnel to view the extraction process.

Figure 1.5 Access Door



CAUTION

Keep fingers away from the edges of the access door when opening and closing the door. These edges are potential pinch areas.

Control Panel

The control panel (see Figure 1.6) consists of indicator lights, a key pad, and a command screen. Table 1-1 describes the features of the control panel.

Figure 1.6 Control Panel



Table 1-1. Control Panel Buttons and Functions

Callout Number	Description
①	POWER INDICATOR LIGHT — Green light indicates that instrument power is on
②	ERROR INDICATOR LIGHT — Blinking red light indicates that a system error has occurred
③	WINDOW — Displays system functions, options, and operator inputs
④	NUMBERED BUTTONS — Pressed to enter values
⑤	ESCAPE — When pressed, returns to the previous screen
⑥	BKSP (BACKSPACE) — Pressed to erase an incorrect entry
⑦	UP ARROW — Pressed to increase values
⑧	DOWN ARROW — Pressed to decrease values
⑨	ENTER — Pressed to confirm run settings

Table 1-1. Control Panel Buttons and Functions (*continued*)

Callout Number	Description
⑩	SHIFT — Not used
⑪	STOP — Pressed to stop or pause method execution
⑫	START — Pressed to initiate the method currently loaded
⑬	PLUS/MINUS — Not used

Method Card Slot

The method card slot (see Figure 1.7) is located on the lower left front corner of the instrument. The method card, which contains automated extraction protocol information used by the instrument during operation, is inserted into the slot before the instrument is powered on.

Figure 1.7 Method Card Slot



 **NOTE**

Ensure that the instrument is powered off before inserting a method card. Do not remove the method card while the instrument is powered on.

Method Card Drawer

The method card drawer (see Figure 1.8) is a stainless-steel drawer located beneath the instrument. Method cards can be stored in this drawer when not in use.

Figure 1.8 Method Card Drawer



Extraction Chamber

The extraction chamber (see Figure 1.9) consists of the staging area for the reagent rack and tip/tube rack, the pipettor module, and magnet. The chamber is available to the operator when the access door is open.

Figure 1.9 Extraction Chamber



①	Pipettor module
②	Magnet
③	Reagent rack
④	Tip/tube rack

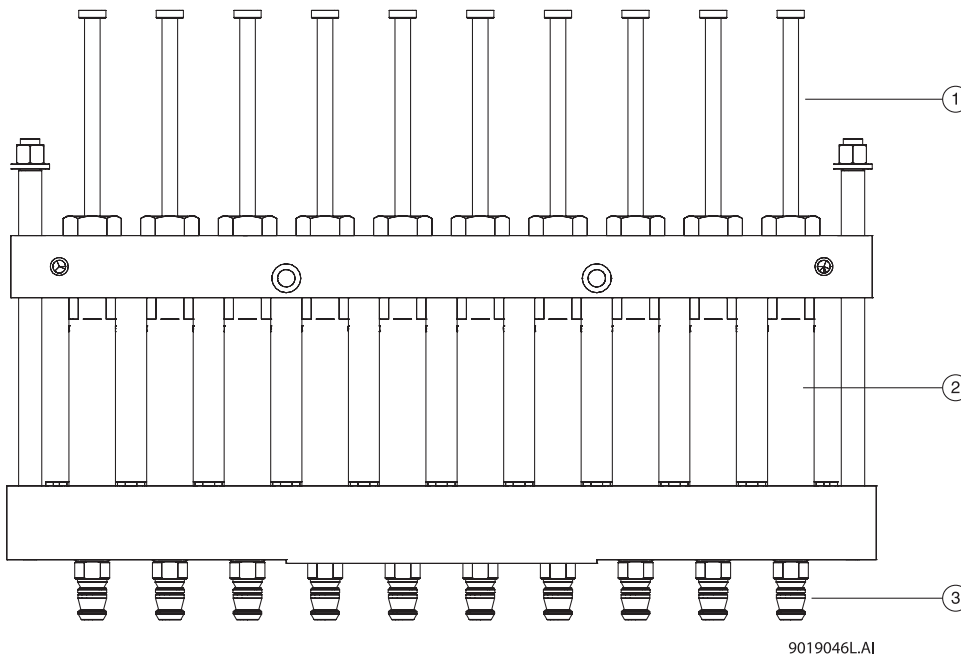
CAUTION

The extraction chamber is labeled with a biohazard materials symbol; wear proper protection when working in and around the extraction chamber if samples are loaded or have been processed since the last decontamination cycle.

- Pipettor Module

The pipettor module (see Figure 1.10) consists of a bank of ten plungers, pistons, and nozzles fitted with D-rings. During operation, the staging mechanism supporting the tip/tube rack and the reagent rack moves into position beneath the pipettor module. This enables the pipettor module to load the appropriate pipette tip onto the pipettor nozzle to aspirate and dispense liquids during the extraction process. Mixing of solutions is accomplished by repetitively aspirating and dispensing the solution in a well. The maximum aspirate/dispense speed is 1.5 mL/second.

Figure 1.10 Pipettor Module



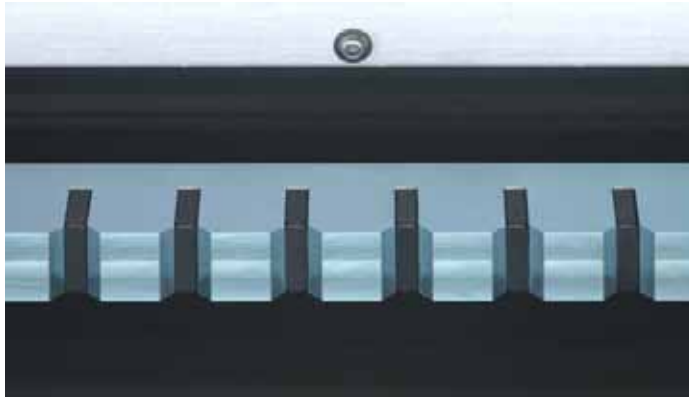
①	Plungers
②	Pistons
③	Nozzles

CAUTION

The pipettor module is labeled with a crush warning symbol. Do not place your hands near the pipettor module while in use; doing so may result in injury.

- Magnet
During the extraction process, the magnet (see Figure 1.11) extends to engage the pipette tips. The magnet, with a strength of at least 3500 Gauss, is used to capture and retain the SPRI[®] particles during the separation phases of the extraction process.

Figure 1.11 Magnet



- Reagent Rack
The reagent rack (see Figure 1.12) has lanes that hold up to ten pre-filled reagent cartridges. The rack is loaded into the extraction chamber and secured in place relative to the pipettor module. At the back of the extraction chamber are two heated zones that heat the sample tube and a common well in the reagent cartridge. The heated zones are controlled from room temperature +10°C, to 85°C, depending on the extraction protocol being executed. The staging mechanism moves the reagent rack in the Y axis relative to the pipettor module. Refer to Chapter 2, [Loading the Reagent Rack](#), for details on setting up the reagent rack for operation.

Figure 1.12 Reagent Rack



Description

System Purpose and Function

- Tip/Tube Rack

The tip/tube rack (see Figure 1.13) holds the pipette tips with sheaths and the 2.0 mL tubes used during the extraction process. The rack also holds a special piercing tip with sheath that is used to pierce the reagent cartridge seal prior to any pipetting steps. The rack can hold up to two tubes per lane; one is used to hold the final eluate, and the other is used to hold an internal control (post-lysis) for some protocols. The staging mechanism moves the tip/tube rack in the Y axis relative to the pipettor module. The tip/tube rack is removable to facilitate loading and cleaning.

Figure 1.13 Tip/Tube Rack



Heat Block

The heat block assembly (see Figure 1.14) provides two separate heating zones for precise temperature control, ranging from room temperature +10°C to 85°C (185°F). The forward heat block is used to heat the sample; the rear heat block is used to heat the extraction reagents. The two heat-block elements ensure effective and reliable heat transfer.

Figure 1.14 Heat Block Assembly



 **WARNING**

The heat block can reach 85°C (185°F). The heat block is labeled with a heat source warning label. Do not touch the surface of the heat block without proper protection. Doing so may result in burns.

UV Light

A 6.6-watt UV bulb (see Figure 1.15) is mounted inside the extraction chamber to illuminate the interior with 260-nm wavelength light for decontamination of the system surfaces. UV radiation disrupts DNA and RNA structures, thus inactivating virus particles and killing bacteria, fungi and mycoplasma in the air as well as on surfaces. The acrylic window on the access door protects the user during UV irradiation.

 **WARNING**

The UV bulb in the instrument contains mercury. Recycle or dispose of the bulb according to local, state, or federal laws.

Figure 1.15 UV Light



 **NOTE**

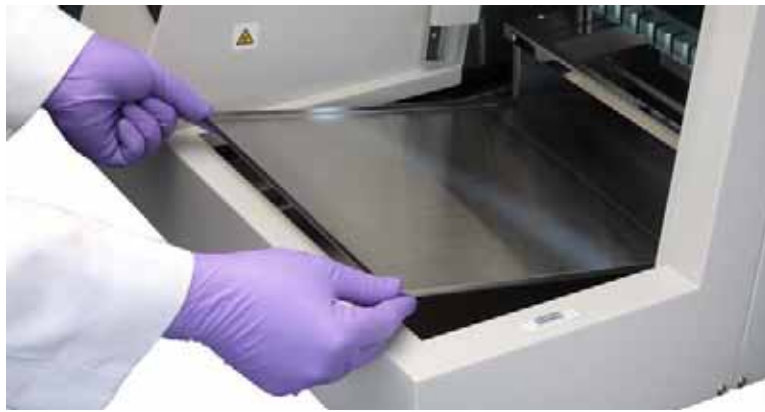
The UV bulb is not operator accessible. For replacement of the UV bulb, contact Beckman Coulter customer support.

Removable Components

Splash Pan

A stainless-steel, removable splash pan (see Figure 1.16) is located at the base of the extraction chamber. In the unlikely event of a spill, the splash pan traps and localizes the spill, preventing biohazardous material from contaminating system components. The splash pan is accessed by pushing the staging mechanism back, after which the pan can be lifted out of the extraction chamber for cleaning and decontamination.

Figure 1.16 Splash Pan



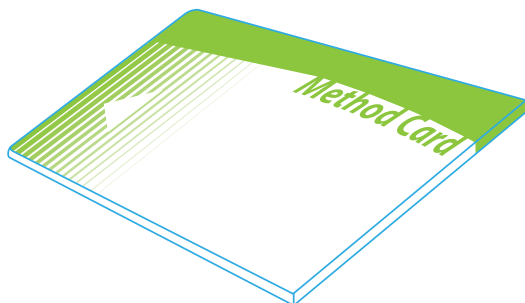
 **CAUTION**

The splash pan may be contaminated with biohazardous material. Do not touch this area without gloves or other biohazard protection. Power off instrument before pushing the staging mechanism to the rear of the instrument to expose the splash pan.

Method Card

Method cards (see Figure 1.17) contain the information needed by the instrument to perform each extraction protocol. Method cards must be inserted or removed when the instrument power is off. When not in use, method cards can be stored in the drawer located at the base of the instrument (see Figure 1.4).

Figure 1.17 Method Card



Reagent Kit Contents

The SPRI-TE instrument is designed for use with Beckman Coulter SPRI-TE extraction kits. Several kits are available for extracting nucleic acids from a variety of sample types, including plasma, serum, viral transport, formalin fixed paraffin embedded tissue (FFPE), and whole blood. Each kit contains the supplies needed to process fifty samples. Contact your Beckman Coulter sales representative to order additional extraction kits.

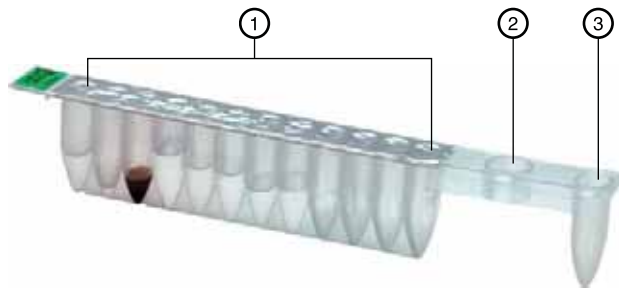
Reagent Cartridges

All reagents required for extraction are contained in sealed, plastic reagent cartridges (see Figure 1.18). Each cartridge has thirteen molded wells that hold reagents and solutions in the instrument so they can be accessed by the pipettor module. Each cartridge is used for one extraction only. Cartridge contents vary by kit type, but typical contents include:

- Lysis solution
- Binding reagent
- Wash buffer
- Elution buffer

Each reagent cartridge also has one open hole that is used to hold the sample tube at the start of a run; this hole lines up with a heated location.

Figure 1.18 Reagent Cartridge



①	Wells 1–12; foil-sealed wells for lysis, elution, wash buffer, SPRI particles, waste, mixing
②	Circular opening for 2.0 mL sample tube
③	Mixing and heating well



NOTE

Refer to the extraction kit instructions for use found in the start-up kit for the specific location and quantity of the solutions in the reagent cartridge.

Tips

Each kit comes with a supply of disposable pipette tips and piercing tips (see Figure 1.19). The pipette tips include a filter that provides a protective barrier between the solution being transferred and the pipettor module. The 1.0 mL pipette tips are used to transfer large volumes of buffers, wash solution, and sample solution from one location to another; the 200 μ L pipette tips are used to transfer smaller volumes. The piercing tips are used to puncture the foil seals on the reagent cartridge before pipetting begins.

 **NOTE**

The 1.0 mL pipette tip, the 200 μ L pipette tip, and piercing tip are placed in a tip sheath prior to being loaded into the tip/tube rack.

Figure 1.19 Examples of Tips and Sheath



①	Piercing tip
②	200 μ L pipette tip
③	1.0 mL pipette tip
④	Tip sheath

 **NOTE**

The SPRI-TE nucleic acid extraction process was developed using Beckman Coulter tips. Use of tips and tubes from other manufacturers is not permitted, and may affect pipettor accuracy and nucleic acid yield.

Sample, Elution, or Internal Control Tubes

Each kit comes with a supply of 2.0 mL screw-cap sample, elution, or internal control tubes (see Figure 1.20). One set of tubes is used to introduce the sample into the extraction process. A second set of tubes is used to collect the final eluate containing the extracted nucleic acids. In some kits, a third set of tubes is used to introduce post-lysis internal controls into the extraction process. The tubes feature smooth conical bottoms, visible graduation markings, and frosted side surface areas that can be written on.

All 2.0 mL tubes are loaded into the instrument uncapped. After the extraction process, elution tubes should be removed from the instrument and capped immediately. The 2.0 mL tubes are suitable for sample storage at room temperature, or in a refrigerator or freezer.

Figure 1.20 Sample, Elution, or Internal Control Tube and Screw Cap



①	Sample, Elution, or Internal Control tube screw cap
②	Sample, Elution, or Internal Control tube

System Specifications

Table 1-2. System Specifications

Item	Description
Environment	Indoor use only
Power Requirements	100–240 VAC ($\pm 10\%$), 50–60 Hz, 336 VA
Electrical Supply	Class 1
Dimensions	19.7 in. (W) x 24.1 in. (D) x 25.4 in (H) 500 mm (W) x 612 mm (D) x 645 mm (H)
Weight	123 lb (56 kg)
Ambient operating temperature	15–30°C
Clearances Rear and sides Top	6 in. (15.25 cm) 15 in. (38.1 cm)
Relative Humidity	10%–80%
Altitude	6562 ft (2000 m)
Sound pressure level	< 65 decibels (db)
Installation Category	II
Fuses	4.0 A, 250 V
Heat Block	Room temperature +10°C to 85°C. Accuracy: $\pm 3^\circ\text{C}$

Table 1-2. System Specifications (continued)

Item	Description
Pipettor Module	<p><i>200 μL Tip</i></p> <p>Precision:</p> <ul style="list-style-type: none"> $\leq 10\%$ at volumes from 5 μL–50 μL $\leq 2\%$ at volumes greater than 50 μL <p>Accuracy:</p> <ul style="list-style-type: none"> $\pm 10\%$ at volumes from 5 μL–50 μL $\pm 5\%$ at volumes greater than 50 μL <p><i>1.0 mL Tip</i></p> <p>Precision:</p> <ul style="list-style-type: none"> $\leq 5\%$ at volumes from 50 μL–100 μL $\leq 2\%$ at volumes greater than 100 μL <p>Accuracy:</p> <ul style="list-style-type: none"> $\pm 5\%$ at volumes from 50 μL–100 μL $\pm 3\%$ at volumes greater than 100 μL
Magnet	3500 Gauss

Description

System Purpose and Function

Operation

Overview

The SPRI-TE™ Nucleic Acid Extractor fully automates the extraction of nucleic acids from a variety of sample types including plasma, serum, viral transport media, formalin fixed paraffin embedded tissue, and whole blood. An overview of the extraction process is shown in Figure 2.1.

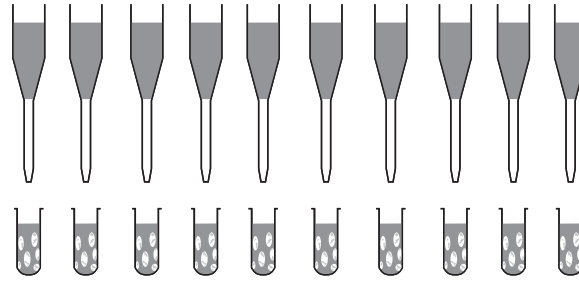
The following section describes how a single operator can set up the instrument, run an extraction protocol, and collect the extracted samples for the downstream assay. System operation comprises six basic steps:

- Loading the reagent rack
- Loading the tip/tube rack
- Loading the method card
- Starting the extraction protocol
- Retrieving the extracted sample
- Decontaminating the instrument

Figure 2.1 Overview of Nucleic Acid Extraction Process

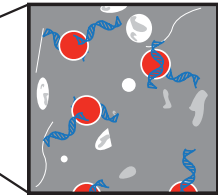
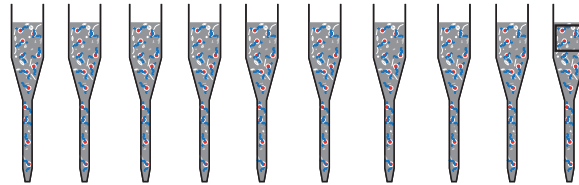
Lysis

Lysis buffer and
Proteinase K added



Binding

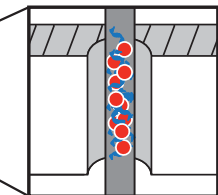
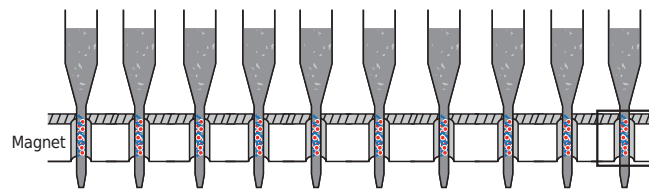
Binding buffer and
SPRI particles added



Nucleic Acids bind to
SPRI particles

Magnetic Separation & Wash

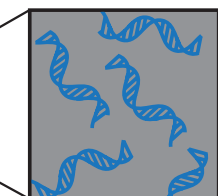
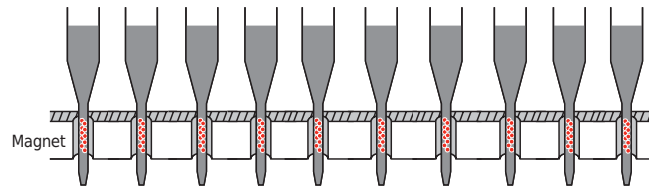
Wash with
Wash Buffer 1
and
Wash Buffer 2



Magnetic separation of purified
Nucleic Acid / SPRI particle complex

Elution & Sample Recovery

Elute with
elution buffer



Recovery of purified
(unbound) Nucleic Acids

System Setup and Operation

Loading the Reagent Rack

 **WARNING**

Use appropriate safety and personal protective equipment (PPE) procedures when working with biohazardous materials.

1. Open the access door.
2. Remove the reagent rack from the instrument. The tip/tube rack must be removed before the reagent rack can be removed.
3. Place the reagent rack on a laboratory workbench.
4. Obtain reagent cartridges from the appropriate reagent kit and place them on the laboratory bench. One reagent cartridge is required for each sample.
5. Visually inspect the cartridges for any damage or leakage. Do not use a reagent cartridge if the aluminum seal has been compromised.

 **NOTE**

The wells of each reagent cartridge (see Figure 2.2) are pre-filled with all the solutions necessary to complete a single nucleic acid extraction, including lysis solution, SPRI particles, wash buffer, and elution buffer.

Figure 2.2 Reagent Cartridge




6. Gently tap the cartridge on the laboratory bench to ensure that none of the solution or SPRI particles are clinging to the inside walls of the well or to the foil seal. This action is especially important for the SPRI particle solution in the third well position (see Figure 2.3).

Figure 2.3 Tap Gently to Move Solutions to Bottom of Well



7. Slide the reagent cartridge into an open lane of the reagent rack.

 **NOTE**

The reagent cartridge has a small tab on one end that, when the cartridge is properly inserted, drops into a notch on the front of the rack to secure the cartridge in position (see Figure 2.4).

Figure 2.4 Reagent Cartridge Positioned in Reagent Rack



8. Repeat steps 4 to 7 for each sample to be processed.
9. Place the reagent rack into the instrument (see Figure 2.5).
10. Load an uncapped 2.0 mL tube containing sample to be extracted into the open hole of the reagent cartridge. Refer to the reagent extraction kit for details on sample quantity. If required, the uncapped 2.0 mL tube may also contain the pre-lysis internal control.

Figure 2.5 Loading the Reagent Rack Into the Extraction Chamber



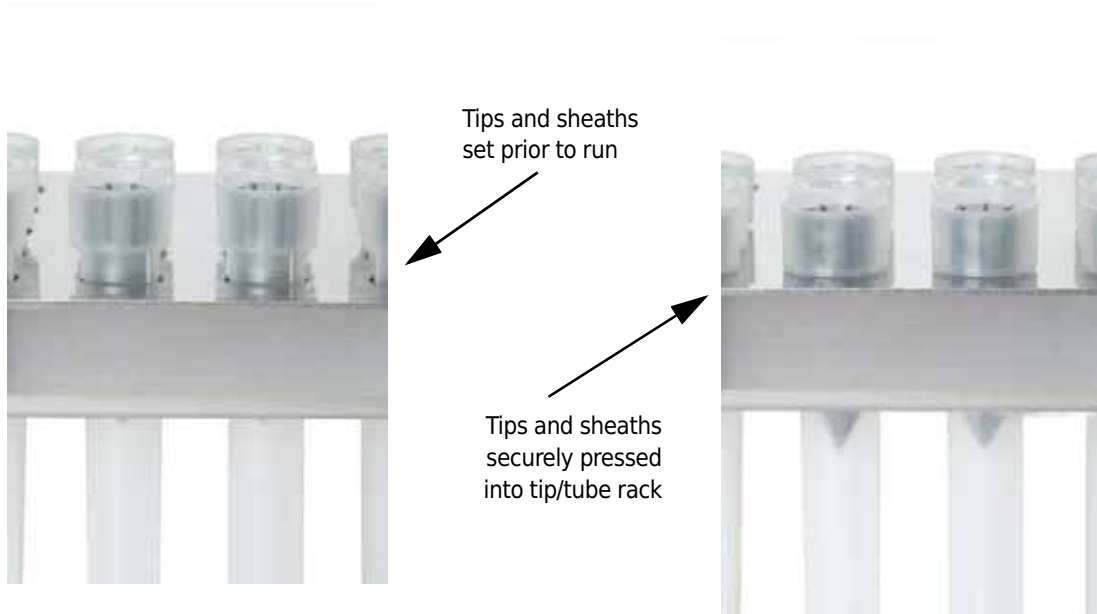
Loading the Tip/Tube Rack

1. Open the access door.
2. Remove the tip/tube rack from the instrument.
3. Place the rack on the laboratory bench.
4. Insert a piercing tip and sheath in row 1 of the tip/tube rack for each sample to be processed. Make sure the tips match up with the lanes being used in the reagent rack.
5. Insert a 1.0 mL tip and sheath in row 2 of the tip/tube rack for each sample to be processed. Make sure the tips match up with the lanes being used in the reagent rack.
6. If required, based on the extraction kit being used, insert a 200 μ L tip and sheath in row 3 of the tip/tube rack for each sample to be processed. Make sure that the tips match up with the lanes being used in the reagent rack.

IMPORTANT

When loading tips and sheaths in the tip/tube rack, do not force the sheaths down into the rack. The underside of the sheath has a set of small ribs that are pressed into the rack by the pipettor module when the tip is loaded. These ribs are designed to secure the sheath in the rack to prevent it from being lifted out of the rack when the tip is removed (see Figure 2.6).

Figure 2.6 Tips and Sheaths Set in Tip/Tube Rack



7. If required, based on the extraction kit being used, insert an uncapped 2.0 mL tube containing post-lysis internal control into row 4 of the tip/tube rack for each sample to be processed. Make sure that the tubes match up with the lanes being used in the reagent rack.

 **NOTE**

If a pre-lysis internal control is required, it may be added directly to the sample tube inserted in the reagent rack. Refer to the downstream assay kit or local operating protocols, and your company's internal control procedures for details.

8. Insert an empty, uncapped 2.0 mL tube into row 5 of the tip/tube rack for each sample to be processed. Make sure that the tubes match up with the lanes being used in the reagent rack. These tubes will contain sample eluate at the end of the extraction process.
9. Load the tip/tube rack into the instrument (see Figure 2.7).

 **IMPORTANT**

Load the reagent rack into the extraction chamber first, followed by the tip/tube rack. The rear edge of the tip/tube rack is designed to be placed over the reagent rack to secure it in place during operation. When removing racks from the instrument, remove the tip/tube rack first so that the reagent rack can be removed without impedance.

Figure 2.7 Loading the Tip/Tube Rack Into the Extraction Chamber



NOTE

When the tip/tube rack is properly loaded in the instrument, the elution tubes in row 5 should be closest to the instrument access door.

Loading the Method Card

1. Verify that the power switch is in the off (O) position.
2. Obtain the appropriate method card for the reagent kit being used.
3. Open the method card slot cover, located on the front, lower-left corner of the instrument.
4. Install the method card into the opening, following the instructions printed on the card label (see Figure 2.8).
5. Close the slot cover.

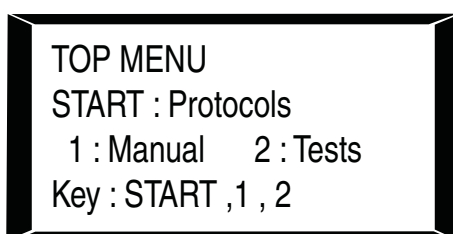
Figure 2.8 Loading a Method Card Into the Instrument



Starting the Extraction Protocol

1. Verify that the correct method card is loaded.
2. With the access door open, ensure that the tip/tube and reagent racks are loaded and secured properly in place.
3. Close the access door.
4. Power on the instrument using the power switch on the instrument left side panel. The instrument will perform an initialization sequence and home the motion axes. Once the instrument is homed, do not manually move the staging mechanism. Any operator intervention can result in tip damage or an instrument malfunction.
5. Confirm that the control panel illuminates and displays the **TOP MENU** (see Figure 2.9).

Figure 2.9 Top Menu Screen



6. Press **START** to activate the extraction protocol. The reagent kit extraction protocol parameters stored on the method card are read and operational prompts are displayed on the control panel. User prompts include sample type, sample volume, elution volume, and internal control (if necessary).
7. Using the keypad, enter values in response to the prompts. Press **ENTER** to confirm the inputs. When the required values have been entered, the extraction process starts automatically.



NOTE

Removing the method card or opening the door causes the instrument to stop the extraction process, without option to recover. Press **STOP** once to pause the instrument. While paused, the access door can be opened. Press **START** to resume the method from where it was paused.

8. At the end of the run, **Run Complete** is displayed and the instrument emits three quick audible beeps.

Retrieving the Extracted Sample

1. Verify that the message **Run Complete** is displayed.
2. Open the access door.
3. Retrieve and cap the elution tubes from row 5 of the tip/tube rack.
4. Store the extracted sample according to your laboratory's operating procedures. A sample storage guideline is shown below:
 - Short-term storage (less than 1 day): 2°C (36°F) to 8°C (45°F)
 - Long-term storage (more than 1 day): -20°C (-4°F) to -80°C (-112°F)

Post-Run Cleanup and Decontamination

When the run is complete, follow the steps below to power down and decontaminate the instrument. These steps must be performed after each run. The recommended decontamination process consists of chemical disinfection of instrument surfaces, followed by use of the optional UV decontamination feature.

Removing, Disassembling, and Cleaning Components

1. Press the instrument power switch to the off (O) position.
2. Open the access door.
3. Remove the tip/tube rack and the reagent rack from the instrument and place them on the laboratory bench.

**NOTE**

When the tip/tube rack is placed on a flat surface, it may appear unbalanced. This is due to the tip sheaths being slightly longer than the tip/tube rack supports, and the sheaths being pressed securely into the rack by the pipettor module when the tip is loaded. To release the sheaths and tips from the rack, hold the rack with both hands and press down slowly and evenly (see Figure 2.10).

Figure 2.10 Operator Releasing Sheaths, Tips, and Tubes from Tip/Tube Rack



4. Remove all used tips, tubes, and reagent cartridges from the racks and dispose of according to your laboratory's operating procedures. Typically this would involve disposal into a biohazard waste container.
5. Wipe off the reagent rack, tip/tube rack, and any exposed surfaces inside the extraction chamber with a laboratory-approved disinfectant, followed by a 70:30 ethanol:deionized water solution.

 **WARNING**

Disinfectants may cause eye, skin and respiratory tract burns. They are harmful if swallowed, and represent a possible developmental and reproductive hazard. Use only with proper ventilation. Avoid breathing vapor. Do not allow contact with eyes or skin. Do not taste or swallow. Wear appropriate eyewear, clothing and gloves.

 **CAUTION**

Use of bleach-based disinfectants is not recommended, because long-term use may cause deterioration and discoloration of the instrument surfaces. If a bleach-based disinfectant must be used, a small amount should be sprayed onto a dust-free cloth, applied to the instrument, immediately followed by a 70:30 ethanol:deionized water solution rinse.

6. Load the tip/tube rack and reagent rack into the instrument.

Setting Up and Initiating UV Decontamination

An optional UV decontamination cycle is recommended. See *Chapter 3, [UV \(Ultraviolet\) Decontamination](#)*, for instructions on setting up and initiating the UV decontamination cycle.

Using Manual Operation and Testing Functions

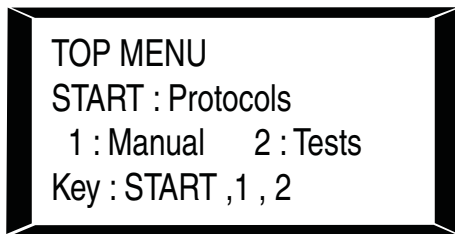
The following sections address manual operation and testing functions that are used, as necessary, in conjunction with normal operation. These functions are available from the control panel

TOP MENU screen (see Figure 2.11), and include:

- Manual system operation,
- Ultraviolet decontamination,
- System testing functions, and
- Software version and error code display.

Each screen has a screen title, one or more numbered functions, and a list of keys that can be pressed to select one of the functions, or to exit back to the previous menu (ESC). Numbers and functions are accessed on the system keypad.

Figure 2.11 Top Menu Screen

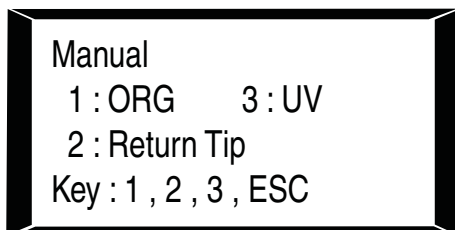


Manual Operation Functions

Certain system operations can be initiated manually by pressing **1** on the **TOP MENU** screen (see Figure 2.12). These functions are:

- **1: ORG** (origin), used to home one or more axes
- **2: Return Tip**, used to return a pipette tip to its rack location if the operator stops the instrument during an extraction, and
- **3: UV**, used to activate the UV decontamination function.

Figure 2.12 Manual Screen

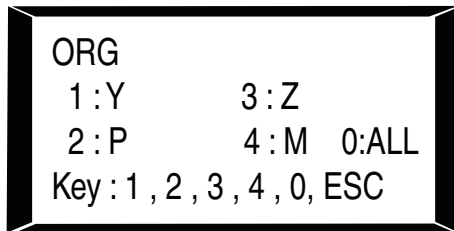


Homing the Axes

Homing an axis is the act of verifying the position of an axis and moving it to its point of origin. The ORG (origin) function enables the operator to initiate homing of one or more of the instrument axes. If any components inside the extraction chamber are touched, the operator should initiate the ORG function to ensure that the axes are properly homed before initiating a protocol.

1. Press the **1** key to select the ORG (origin) function. Selections on the ORG screen (see Figure 2.13) are described below.

Figure 2.13 ORG (Origin) Screen



- Press **0** to home all axes.
- Press **1** to home the Y axis (the staging mechanism).
- Press **2** to home the P axis (the pipette plunger axis).
- Press **3** to home the Z axis (the pipettor module height axis).
- Press **4** to home the M axis (the magnet axis).
- Press **ESC** to return to the previous menu.

Returning a Pipette Tip to Original Position

If the operator manually stops a run, the operator can use the Return Tip function to return tips to their original locations in the tip/tube rack.

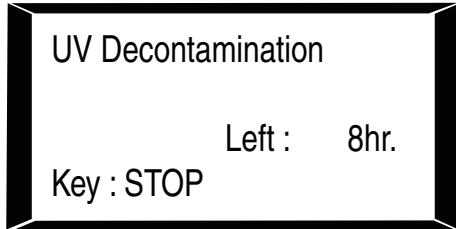
1. Press the **2** key to select the Return Tip function (see Figure 2.12, Manual Screen).
 - The pipettor module retracts upward from the reagent cartridge or rack, and homes all axes. The pipettor module then returns tips to their original positions.

Initiating UV (Ultraviolet) Decontamination

The UV decontamination function is used to inactivate viruses, bacteria, and fungi, and minimize the transfer of microbes to the operator or the laboratory environment. UV decontamination is optional, but recommended.

1. Press the **3** key from the **MANUAL** screen (refer to Figure 2.12, Manual Screen) to select the UV decontamination function.
2. Set the UV decontamination for the desired time. Eight hours is recommended for total system decontamination (see [Chapter 3, UV \(Ultraviolet\) Decontamination](#)).
3. Press **START** and visually confirm the UV light has turned on. The **UV Decontamination** screen is displayed, showing the decontamination time remaining (see Figure 2.14). Press **STOP** to stop the decontamination process before the set time has elapsed.

Figure 2.14 UV Decontamination Screen

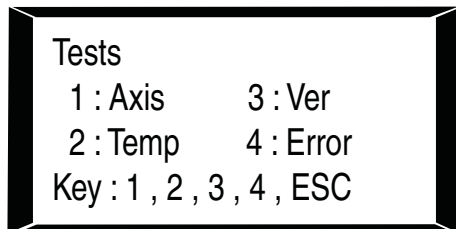


4. Once the UV decontamination period is complete, wipe down the visible surfaces with a 70:30 ethanol:deionized water solution.

Testing Functions

The Testing screen (see Figure 2.15) provides access to the Axis and Temperature Verification tests, as well as to informational screens displaying the current system software version, and active error code, if applicable.

Figure 2.15 Testing Screen



Verifying Proper Axis (M, P, Y, Z) Operation

The purpose of the axis test is to verify that the motors positioning the axes are working properly and that the axes are aligned correctly during a simulated protocol. If the instrument displays an axis error during normal operation, the operator should initiate the axis test.

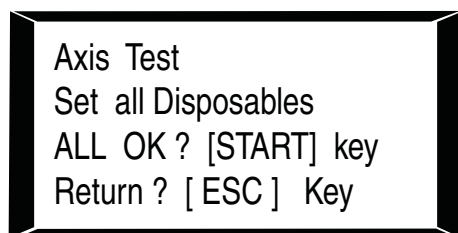
The test exercises each axis through a series of motions, including loading and unloading pipette tips, and accessing the reagent cartridges with the pipettor module. To properly execute the test, it is necessary to load labware onto the system in the correct positions.

Consumables required to perform the axis test are:

- Ten piercing tips and sheaths
- Ten 200 µL tips and sheaths
- Ten 1.0 mL tips and sheaths
- Ten uncapped 2.0 mL tubes
- Ten empty reagent cartridges

1. Insert ten empty reagent cartridges into the reagent rack.
2. Load the reagent rack into the instrument.
3. Insert ten piercing tips with sheaths in row 1 of the tip/tube rack.
4. Insert ten 1.0 mL tips with sheaths in row 2 of the tip/tube rack.
5. Insert ten 200 µL tips with sheaths in row 3 of the tip/tube rack.
6. Insert ten uncapped 2.0 mL tubes in row 5 of the tip/tube rack.
7. Load the tip/tube rack into the instrument.
8. Confirm that all labware is correctly loaded, then close the access door.
9. Verify that a method card is inserted into the method card slot.
10. Power on the instrument using the power switch on the instrument side panel.
11. Press 2 on the **TOP MENU** screen to enter the TESTS menu.
12. Press 1 to run the axis test. The **Axis Test** screen appears (see Figure 2.16).

Figure 2.16 Axis Test Screen



13. Select **START**. The instrument executes all motions performed by the axes during the course of a typical extraction protocol.

14. Observe the following actions:
 - The pipettor module picked up and released all tips,
 - The staging mechanism moved each reagent cartridge well under the pipettor module,
 - The magnet positioned itself properly in relation to the pipettor module.
15. If the reagent cartridges or any tips are improperly loaded, an error may occur, and the test is interrupted.
16. Upon successful completion, **ALL OK** is displayed in the control panel window.
17. Press **ESC** to return to the **MANUAL** screen.

Verifying Heater Operation

The purpose of the heat block test is used to verify that system heaters are working properly. If the eluate is cloudy or if samples indicate a low nucleic acid yield, the operator should initiate the heat block test.

1. Press **2** on the **Tests** screen to verify that the heat blocks (see Figure 2.17) are functioning correctly. There are two heat blocks in the instrument. The forward heat block heats the sample, and the rear heat block heats the reagents.

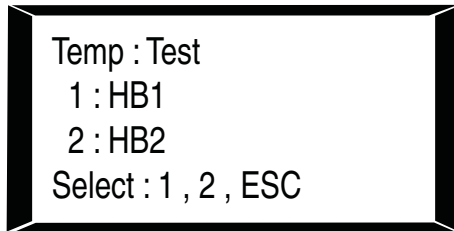
Figure 2.17 Heat Block



①	Heat Block 1
②	Heat Block 2

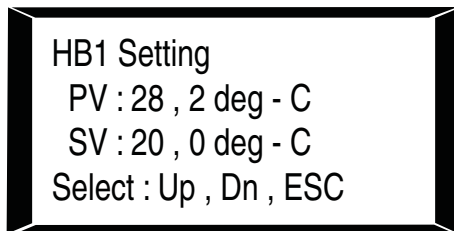
2. In the heat block test screen (see Figure 2.18), press **1** to test heat block 1 (HB1).
3. Press **2** to test heat block 2 (HB2).

Figure 2.18 Heat Block Test Screen



4. Press **ESC** to return to the previous screen.
5. Once the heat block is chosen, use the up arrow and down arrow buttons on the control panel to select the desired heat block temperature set point, from 20°C to 85°C, in 0.1°C units. The display (see Figure 2.18) shows the present temperature (PV) and the set point (SV). Default temperatures are in Celsius.
6. Observe the present value to confirm that it reaches and maintains the set point temperature.
7. Choose **ESC** to exit the test and return to the previous screen.

Figure 2.19 Heat Block 1 (HB1) Values Screen



Displaying the Current Instrument Software Version

The purpose of the VER (version) function is to display the current instrument software version.

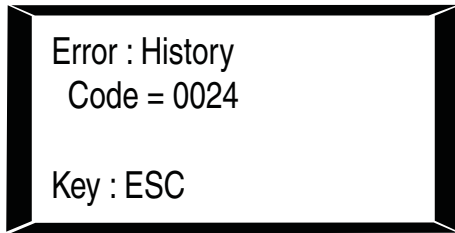
1. Press **3** on the **Tests** screen to display the current software version.
2. Press **ESC** to return to the previous screen.

Displaying the Last Error Code

The purpose of the ERROR function is to display the last active error code.

1. Press **4** on the **Tests** screen to display the last error code (see Figure 2.20). Refer to Table 4-1, [Error Code Troubleshooting](#), for further details.
2. Press **ESC** to return to the previous screen.

Figure 2.20 Error: History Screen



Care and Maintenance

General Maintenance

The following section describes actions an operator takes to clean and decontaminate the instrument, replace and grease D-rings, and replace the fuse. Also included is a list of parts and accessories, and reorder information.

**NOTE**

Decontaminate the instrument prior to performing any general maintenance or service functions or before moving the instrument.

Perform the following procedures regularly to ensure satisfactory performance and long service life of the SPRI-TE Nucleic Acid Extractor. For maintenance not covered in this section, contact Beckman Coulter field service.

**WARNING**

Any maintenance procedure or servicing of this instrument that requires removal of any panels can expose components that involve the risk of electric shock or personal injury. Make sure that the power switch is in the off (O) position and the instrument is disconnected from the main power source.

Cleaning

At least weekly (depending on usage), take the following actions to ensure the cleanliness and the performance of the instrument.

1. Verify that the power switch is in the off (O) position.
2. Inspect the exterior of the instrument for contamination from sample and dust.
3. Check the vent panels for obstructions.
4. Wipe off the exterior of the instrument with a laboratory-approved disinfectant, followed by a 70:30 ethanol:deionized water solution.
5. Open the access door.

6. Conduct a general inspection of the interior of the instrument for contaminate from sample or reagent.
7. Remove the tip/tube rack and the reagent rack from the instrument and place them on the laboratory bench.
8. Remove the splash pan from the instrument. The splash pan is accessed by pushing the staging mechanism back, after which the pan can be lifted out.

 **CAUTION**

The splash pan may be contaminated with biohazardous material. Do not touch this area without gloves or other biohazard protection. Ensure that the instrument is powered off before pushing the staging mechanism.

9. Wipe off all accessible areas of the extraction chamber with a laboratory-approved disinfectant, followed by a 70:30 ethanol:deionized water solution.

 **CAUTION**

Use of bleach-based disinfectants is not recommended, because long-term use may cause deterioration and discoloration of the instrument surfaces. If a bleach-based disinfectant must be used, it should be sprayed onto a dust-free cloth, applied to the instrument, then followed by a 70:30 ethanol:deionized water solution rinse.

10. Wipe off the tip/tube rack, reagent rack, and splash pan with a laboratory-approved disinfectant, followed by a 70:30 ethanol:deionized water solution.
11. Reinsert the splash pan.
12. Load the reagent rack and tip/tube rack into the extraction chamber.

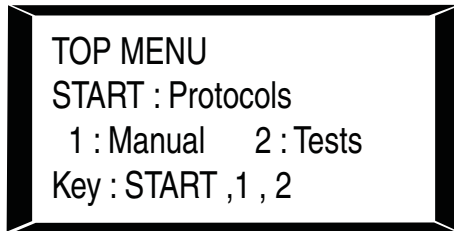
UV (Ultraviolet) Decontamination

The UV decontamination function is used to inactivate viruses, bacteria, and fungi, and minimize the transfer of microbes to the operator or the laboratory environment.

Take the following steps to run the UV decontamination function:

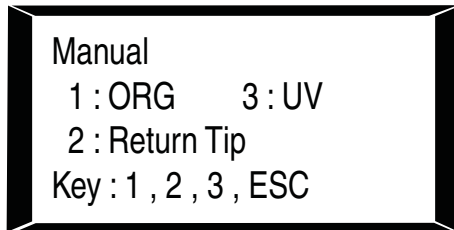
1. Verify that a method card is properly loaded.
2. Open the access door, and ensure that the tip/tube and reagent racks are loaded and secured properly in place.
3. Wipe down visible surfaces of the extraction chamber with a laboratory-approved disinfectant.
4. Close the access door.
5. Press the power switch on the instrument left side panel to the on (I) position. Confirm that the control panel illuminates and displays the **TOP MENU** (see Figure 3.1).

Figure 3.1 Top Menu Screen




6. Press the **1** key to select the manual function (see Figure 3.2).

Figure 3.2 Manual Screen



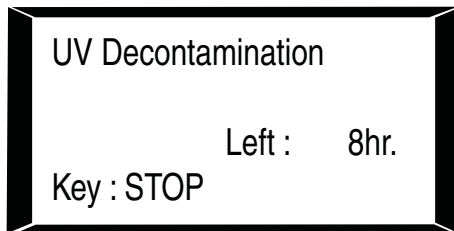
7. Press the **3** key to select the UV decontamination function.
8. Set the UV decontamination for the desired time. Eight hours is recommended for total system decontamination.

 **NOTE**

Exposure time for the UV decontamination can be set from 1 to 99 hours. Due to the inability of UV light to penetrate instrument surfaces and components this decontamination method is limited to those surfaces that are exposed to the UV radiation.

9. Press **START** and visually confirm the UV light has turned on. The **UV Decontamination** screen is displayed, showing the decontamination time remaining (see Figure 3.3).

Figure 3.3 UV Decontamination Screen



10. Upon completion of the UV decontamination, **COMPLETED** is displayed on the control panel screen. Wipe down the visible surfaces with a 70:30 ethanol:deionized water solution.

D-ring Maintenance

The D-rings on the pipettor nozzles should be inspected and greased regularly. The tools for removing and installing D-rings (see Figure 3.4) are provided with your SPRI-TE instrument, with the exception of the D-ring side cutters. The following sections provide instructions for removing, greasing, and replacing the D-rings.

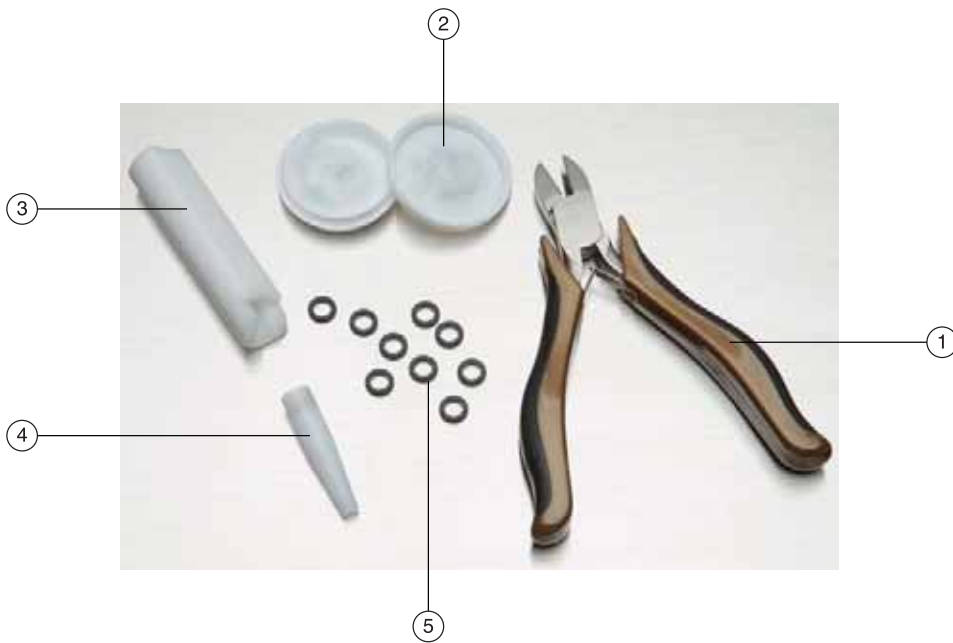
D-rings should be greased after every 50 to 200 runs, and replaced after every 1500 to 2000 runs.

IMPORTANT

D-rings must be replaced:

- if inspection shows that a D-ring is torn or damaged,
- if the pipettor nozzles are leaking, or
- if incorrect aspiration or dispensing volumes are noticed.

Figure 3.4 D-ring Tools

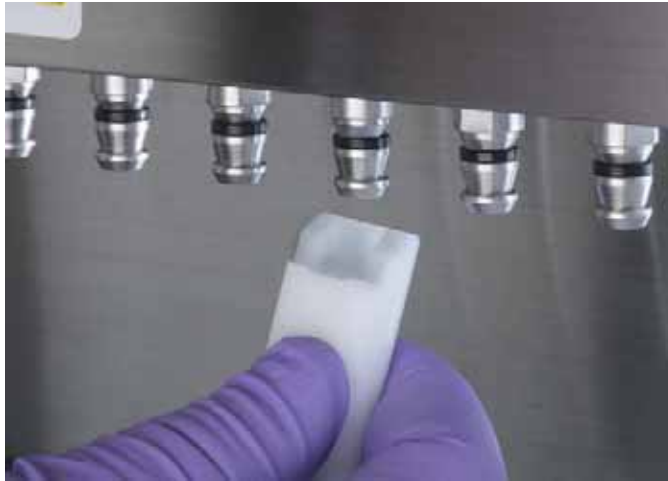


①	D-ring side cutters (required but not provided)
②	Silicone grease
③	D-ring removal tool
④	D-ring replacement cone tool
⑤	D-rings

Removing D-rings

1. Grasp the tool in one hand.
2. Position the tool toward the back of the pipettor module (see Figure 3.5), behind one of the pipettor nozzles containing a D-ring.

Figure 3.5 Positioning D-ring Tool



3. Pull the tool forward so that it circles and grasps the D-ring (see Figure 3.6).



NOTE

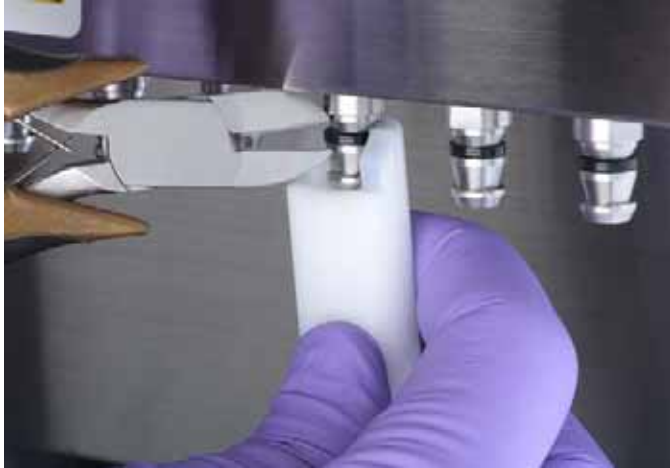
This action squeezes the D-ring forward, causing the D-ring to loop outward.

Figure 3.6 Grasping Pipettor Nozzle with D-ring Tool



4. Using a side cutter (see Figure 3.7), cut the looped portion of the D-ring, being careful not to scratch the pipettor nozzle.

Figure 3.7 Cutting D-ring with Side Cutter

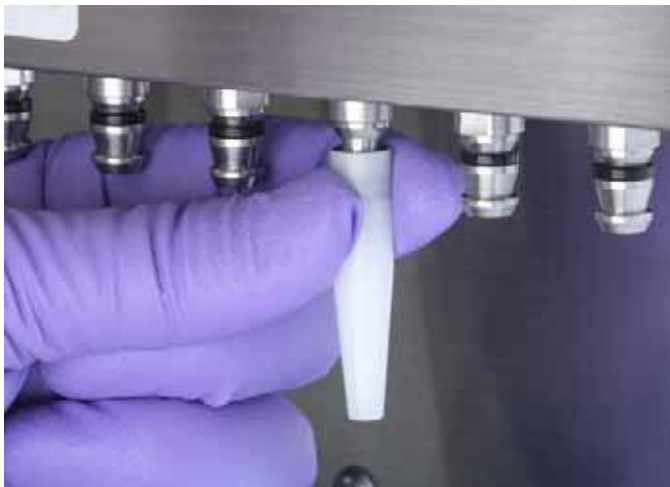


5. Remove the tool by pushing it away from the pipettor nozzle toward the back of the instrument.
6. Remove the ring from the instrument and discard it in a biohazard waste container.
7. Repeat steps 1 through 6 for the remaining pipettor nozzle D-rings.

Replacing D-rings

1. Position the cone over the pipettor nozzle (see Figure 3.8).

Figure 3.8 Positioning Insertion Cone onto Pipettor Nozzle



2. Slide the D-ring up the cone onto the pipettor nozzle (see Figure 3.9).

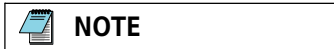
Figure 3.9 Replacing the D-ring



3. Remove the cone and repeat steps 1 and 2 for the remaining pipettor nozzles.

Greasing D-rings

1. Take a small amount of silicone grease on finger (see Figure 3.10).



NOTE

Always wear rubber gloves when lubricating D-rings.

Figure 3.10 Silicone Grease on Finger



2. Apply a thin film of silicone grease to the surface of the D-ring (see Figure 3.11).

 **NOTE**

The cone can be used to cover the pipettor nozzle when greasing the D-ring to ensure that grease does not contact or enter the pipettor nozzle.

 **CAUTION**

Use silicone grease sparingly. Excessive amounts can affect system operation, pipettor accuracy, and nucleic acid yield.

Figure 3.11 Applying Silicone Grease to D-ring



3. Using lint-free paper, wipe off any excess silicone grease on the edges of the pipettor nozzles.

Replacing the Fuse

1. Power off the instrument.
2. Unplug the power cable from the wall socket.
3. Remove the power cable from the rear panel of the instrument; this action allows easy access to the fuse holder.
4. Using a flat-blade screwdriver, remove the fuse holder (see Figure 3.12).

Figure 3.12 Removing the Fuse Holder



5. Replace the blown fuse.



NOTE

The instrument is equipped with an automatic-switching power supply. There is no need to replace the fuse when changing between different input voltages.

6. Reinsert the fuse holder into its slot on the rear panel.
7. Reattach the power cable to the rear panel.
8. Plug the power cable into the wall socket.

Parts and Accessories

Table 3-1 lists replacement parts, accessories, and consumables by name, part number, description, and reorder quantity.

Table 3-1. Parts, Accessories, and Consumables

Part	Part No.	Description	Quantity
SPRI-TE Start-up Kit	A50094	Kit contains manuals, method cards, and supplies for system set up.	1
SPRI-TE FFPE NA Extraction Kit	A50091	FFPE NA extraction from formalin fixed, paraffin embedded tissue. Kit contains all pre-packaged ready-to-use reagents and supplies for 50 FFPE NA extractions.	1
SPRI-TE FFPE NA Method Card	A50092	Method card containing the extraction protocol for FFPE NA.	1
SPRI-TE FFPE NA Lysis Buffer Kit	A50093	Kit contains both lysis buffer solution and Proteinase-K solution. For use with the FFPE NA extraction kit.	1
SPRI-TE gDNA Extraction Kit	A50087	Genomic DNA extraction from whole blood. Kit contains all pre-packaged ready-to-use reagents and supplies for 50 gDNA extractions.	1
SPRI-TE gDNA Method Card	A50088	Method card containing the extraction protocol for gDNA.	1
SPRI-TE Viral NA Extraction Kit	A50089	Viral NA (nucleic acid) extraction from whole blood, plasma, serum, and viral transport media. Kit contains all pre-packaged ready-to-use reagents and supplies, including 2.0 mL tubes for post lysis internal control, for 50 Viral NA extractions.	1
SPRI-TE Viral NA Method Card	A50090	Method card containing the extraction protocol for Viral NA.	1
SPRI-TE 2.0 mL screw-cap sample, elution, and internal control tubes	A59856	2.0 mL screw-cap tubes for sample, elution and internal control (post-lysis).	50
SPRI-TE 1.0 mL Pipette Tips and Sheaths	A50098	Pre-assembled tips ready for use with the SPRI-TE Nucleic Acid Extractor.	50
SPRI-TE 200 µL Pipette Tips and Sheaths	A59857	Pre-assembled tips ready for use with the SPRI-TE Nucleic Acid Extractor.	50
SPRI-TE Piercing Tips and Sheaths	A50102	Pre-assembled tips ready for use with the SPRI-TE Nucleic Acid Extractor.	50

Table 3-1. Parts, Accessories, and Consumables (*continued*)

Part	Part No.	Description	Quantity
SPRI-TE Reagent Rack	A50096	Spare reagent rack capable of holding up to 10 SPRI-TE extraction reagent cartridges.	1
SPRI-TE Tip/Tube Rack	A50095	Spare tip/tube rack capable of holding up to 10 sets of elution tubes, 1.0 mL pipette tips with sheaths, 200 µL pipette tips with sheaths, piercing tips with sheaths, and internal control tubes.	1
SPRI-TE Utility Card	A60866	Method card containing the utility test protocols.	1
SPRI-TE UV light	A50108	Replacement UV Light (Note: requires Beckman Coulter Field Engineer to replace.)	1
Power cord	A50109	Replacement power cord.	1
SPRI-TE Operator's Manual	A50101	Manual to assist the operator in instrument operation, maintenance, and troubleshooting.	1
SPRI-TE gDNA Extraction Kit booklet	A57496	Instructions to perform the gDNA extraction using the SPRI-TE instrument.	1
SPRI-TE Viral NA Extraction kit booklet	A57497	Instructions to perform the Viral NA extraction using the SPRI-TE instrument.	1
SPRI-TE FFPE NA Extraction Kit booklet	A57495	Instructions to perform the FFPE NA extraction using the SPRI-TE instrument.	1

Troubleshooting

Overview

Occasionally, an instrument malfunction or an unanticipated event occurs, interrupting operation of the SPRI-TE system or corrupting the extraction process. This section describes potential system errors, their possible causes, and steps to take to resolve the problems. Also included are the descriptions and procedures for the utility tests.

Detecting a System Error

When the extraction process is interrupted by a system error, the system stops operating and displays error codes numbered from 10 to 312 on the control panel. In addition, a red LED on the control panel flashes, and an alarm sounds.

If any error code is displayed, the operator should attempt to resolve the issue with the information provided in Table 4-1.

Error Code Troubleshooting

For any error code displayed on the control panel, review the possible causes for the error in Table 4-1, and follow the potential resolutions in sequence.

Table 4-1. Error Code Troubleshooting

Error Code	Possible Cause(s)	Resolution
10	<ul style="list-style-type: none"> Origin sensor time out error 	<ul style="list-style-type: none"> Check if the main menu axis test works. Try a new or different method card. Contact Beckman Coulter customer support.
11	<ul style="list-style-type: none"> Limit sensor error message at main menu 	<ul style="list-style-type: none"> Try a new method card. Contact Beckman Coulter customer support.
12	<ul style="list-style-type: none"> The tip might not have been picked up or dropped off Z axis origin error in protocol 	<ul style="list-style-type: none"> Remove excess grease. Refer to <i>Chapter 3, D-ring Maintenance</i>. Check that the tip/tube rack and reagent rack are loaded properly. Run the ORG test for the Z axis. Run the Axis test. Verify Z-axis alignments with utility card. Contact Beckman Coulter customer support.
13	<ul style="list-style-type: none"> The tip could not have been picked up or dropped off P axis origin error in protocol 	<ul style="list-style-type: none"> Run the Axis test. Contact Beckman Coulter customer support.
14	<ul style="list-style-type: none"> M axis origin error 	<ul style="list-style-type: none"> Run the ORG test for the M axis. Run the Axis test. Contact Beckman Coulter customer support.
15	<ul style="list-style-type: none"> The tip might not have been picked up or dropped off Y axis origin error in protocol 	<ul style="list-style-type: none"> Remove excess grease. Refer to <i>Chapter 3, D-ring Maintenance</i>. Check that the tip/tube rack and reagent rack are loaded properly. Run the ORG test for the Y axis. Run the Axis test. Verify Y-axis alignments with utility card. Contact Beckman Coulter customer support.

Table 4-1. Error Code Troubleshooting (*continued*)

Error Code	Possible Cause(s)	Resolution
16	<ul style="list-style-type: none"> • The tip might not have been picked up or dropped off • Z axis limit sensor error message during protocol run 	<ul style="list-style-type: none"> • Check that the tip/tube rack and reagent rack are loaded properly. • Remove excess grease. • Refer to <i>Chapter 3, D-ring Maintenance</i>. • Run the ORG test for the Z axis. • Run the Axis test. • Verify Z-axis alignments with utility card. • Contact Beckman Coulter customer support.
19	<ul style="list-style-type: none"> • The tip might not have been picked up or dropped off • Y axis limit sensor error message 	<ul style="list-style-type: none"> • Check that the tip/tube rack and reagent rack are loaded properly. • Run the ORG test for the Y axis. • Run the Axis test. • Verify Y-axis alignments with utility card. • Contact Beckman Coulter customer support.
20	<ul style="list-style-type: none"> • The tip might not have been picked up or dropped off • Z-axis error 	<ul style="list-style-type: none"> • Check that the tip/tube rack and reagent rack are loaded properly. • Remove excess grease. • Refer to <i>Chapter 3, D-ring Maintenance</i>. • Run the ORG test for the Z axis. • Run the Axis test. • Verify Z-axis alignments with utility card. • Contact Beckman Coulter customer support.
21	<ul style="list-style-type: none"> • P-axis error during protocol run 	<ul style="list-style-type: none"> • Run the ORG test for the P axis. • Run the Axis test. • Contact Beckman Coulter customer support.
22	<ul style="list-style-type: none"> • M axis origin error during protocol run 	<ul style="list-style-type: none"> • Run the ORG test for the M axis. • Run the Axis test. • Contact Beckman Coulter customer support.
23	<ul style="list-style-type: none"> • Y-axis error during protocol run 	<ul style="list-style-type: none"> • Run the ORG test for the Y axis. • Run the Axis test. • Verify Y-axis alignments with utility card. • Contact Beckman Coulter customer support.
24	<ul style="list-style-type: none"> • Protocol stops after initial start because door is opened 	<ul style="list-style-type: none"> • Instrument cannot recover if the door is opened during a run. • If door is closed, and error code 24 occurs, contact Beckman Coulter customer support.

Table 4-1. Error Code Troubleshooting (*continued*)

Error Code	Possible Cause(s)	Resolution
25	<ul style="list-style-type: none"> Crash sensor triggered 	<ul style="list-style-type: none"> Turn the power switch to the off (O) position, open access door, clear obstacles on the extraction chamber, then restart run. Contact Beckman Coulter customer support.
26	<ul style="list-style-type: none"> Heater temperature does not rise 	<ul style="list-style-type: none"> Check fuse on rear of instrument. Refer to <i>Chapter 3, Replacing the Fuse</i>. Contact Beckman Coulter customer support.
27	<ul style="list-style-type: none"> Motion PCB error message 	<ul style="list-style-type: none"> Contact Beckman Coulter customer support.
29	<ul style="list-style-type: none"> Memory error when power on 	<ul style="list-style-type: none"> Contact Beckman Coulter customer support.
110–233	<ul style="list-style-type: none"> Protocol error 	<ul style="list-style-type: none"> Replace method card. Contact Beckman Coulter customer support.
300	<ul style="list-style-type: none"> Failed to pick up tips Z axis origin error Protocol stops after an initial start 	<ul style="list-style-type: none"> Check that the tip/tube rack and reagent rack are loaded properly. Run the ORG test for the Z axis. Run the Axis test. Verify Z-axis alignments with utility card. Replace method card. Contact Beckman Coulter customer support.
301	<ul style="list-style-type: none"> The tip might not have been dropped off 	<ul style="list-style-type: none"> Remove excess grease. Refer to <i>Chapter 3, D-ring Maintenance</i>. Check that the tip/tube rack and reagent rack are loaded properly. Contact Beckman Coulter customer support.
302–303	<ul style="list-style-type: none"> The system could not aspirate or dispense at the first aspiration or dispensing in the protocol Method card was removed while power is on. 	<ul style="list-style-type: none"> Run the Axis test. Turn instrument off. Insert method card. Turn instrument on. Run the protocol again. Try a different method card. Contact Beckman Coulter customer support.
304–305	<ul style="list-style-type: none"> Heater temperature does not rise 	<ul style="list-style-type: none"> Check fuse at rear of instrument. Refer to <i>Chapter 3, Replacing the Fuse</i>. Contact Beckman Coulter customer support.
306–312	<ul style="list-style-type: none"> Protocol error 	<ul style="list-style-type: none"> Replace method card. Contact Beckman Coulter customer support.

Application Troubleshooting

For any application issue, review the probable causes as stated in Table 4-2, and follow the potential resolutions in sequence.

Table 4-2. Application Troubleshooting

Issue	Possible Cause	Resolution
<p>Instrument does not aspirate and/or dispense accurately; one or more of the following symptoms may be present:</p> <ul style="list-style-type: none"> • Noisy operation of P axis • Intermittent delays before aspiration begins • Aspirate volume differs from pipette tip to pipette tip 	<ul style="list-style-type: none"> • D-rings require greasing or replacement • Alignments out of range 	<ul style="list-style-type: none"> • Refer to <i>Chapter 3, D-ring Maintenance</i>. • Run the ORG test for the Z axis. • Run the ORG test for the P axis. • Run the Axis test. • Verify Z-axis alignments with utility card. • Run the Leak test with utility card. • Run the Visual Accuracy test with utility card. • Contact Beckman Coulter customer support.
<p>Heater temperature does not rise; no error code is displayed.</p>	<ul style="list-style-type: none"> • Blown fuse • Failed heating element • Failed heat block controller 	<ul style="list-style-type: none"> • Replace fuse on rear of instrument. Refer to <i>Chapter 3, Replacing the Fuse</i>. • Run heat block test. • Contact Beckman Coulter customer support.
<p>Instrument does not power on.</p>	<ul style="list-style-type: none"> • Method card improperly loaded 	<ul style="list-style-type: none"> • Verify that method card is properly loaded. • Connect power cable to wall outlet. • Contact site manager or notify appropriate facilities personnel if no power at outlet. • Replace fuse on rear of instrument. Refer to <i>Chapter 3, Replacing the Fuse</i>. • Contact Beckman Coulter customer support.
<p>Control panel display is blank with no fans running</p>	<p>N/A</p>	<ul style="list-style-type: none"> • Connect power cable to wall outlet. • Contact site manager or notify appropriate facilities personnel if no power at outlet. • Replace fuse on rear of instrument. Refer to <i>Chapter 3, Replacing the Fuse</i>. • Contact Beckman Coulter customer support.

Table 4-2. Application Troubleshooting (*continued*)

Issue	Possible Cause	Resolution
Control panel display is blank with fans running	N/A	<ul style="list-style-type: none"> • Turn power switch off and insert method card.
Low nucleic acid yield	<ul style="list-style-type: none"> • Incomplete lysis 	<ul style="list-style-type: none"> • Decrease the amount of starting material used. • Ensure that Proteinase-K is used during lysis, if included in the protocol. • Ensure that sample is completely immersed in the Lysis buffer.
	<ul style="list-style-type: none"> • Poor quality of starting sample. The yield and quality of nucleic acid isolation depends on the quality of the starting material. 	<ul style="list-style-type: none"> • Ensure that sample is processed immediately after collection, or store the sample at the appropriate temperature.
	<ul style="list-style-type: none"> • Insufficient amount of SPRI particles added 	<ul style="list-style-type: none"> • During shipping, some SPRI particle solution may adhere to the sealing foil of the cartridge. • To collect any SPRI particle solution from the foil, tap the cartridge to move the SPRI particle solution to the bottom of the tube.
	<ul style="list-style-type: none"> • Clogged tips resulting in nucleic acid loss 	<ul style="list-style-type: none"> • Ensure that the lysate does not contain any particulate matter that can clog the tips. • If needed, centrifuge the sample before purification.
No nucleic acid recovered	<ul style="list-style-type: none"> • SPRI particles stored or handled improperly 	<ul style="list-style-type: none"> • Store the cartridge containing the SPRI particles at room temperature. • Do not freeze the cartridge as the SPRI particles may be irreparably damaged.
	<ul style="list-style-type: none"> • Accidentally missed adding tubes or tips 	<ul style="list-style-type: none"> • Be sure to add the sample and elution tubes before starting the protocol. • If you are loading fewer than ten cartridges, load the remaining consumables in the same order as the cartridges to avoid any sample loss.

Table 4-2. Application Troubleshooting (*continued*)

Issue	Possible Cause	Resolution
Nucleic acid is sheared or degraded	<ul style="list-style-type: none"> Bubbles formed during mixing steps 	<ul style="list-style-type: none"> To prevent bubble formation during mixing, make sure to use the recommended sample volume listed in the manual supplied with the reagent kit(s).
	<ul style="list-style-type: none"> Nucleic acid is contaminated 	<ul style="list-style-type: none"> Maintain a sterile environment while working (i.e., wear gloves and appropriate PPE).
	<ul style="list-style-type: none"> Purified nucleic acid repeatedly frozen and thawed 	<ul style="list-style-type: none"> Aliquot purified nucleic acid and store at 2°C -8°C (less than one day) or -20°C to -80°C (more than one day). Note: Avoid repeated freezing and thawing.
Tip filters are wet following extraction	<ul style="list-style-type: none"> Samples are clotted or coagulated Alignments out of range 	<ul style="list-style-type: none"> Use fresh blood to which anticoagulants were added. Run the ORG test for the Z axis. Run the ORG test for the Y axis. Run the Axis test. Verify Y-axis and Z-axis alignments with the utility card.
Elution has a brownish color	<ul style="list-style-type: none"> SPRI particles in elution 	<ul style="list-style-type: none"> The SPRI particles have no effect on downstream applications. They can be removed by brief centrifugation (>3000 x g for 1 minute).
Elution volume lower than expected	<ul style="list-style-type: none"> Tip/tube rack or reagent rack configuration is not correct Alignments out of range D-ring maintenance required D-rings leaking 	<ul style="list-style-type: none"> Check that the tip/tube rack and reagent rack are loaded properly. Run the ORG test for the P axis. Run the ORG test for the Z axis. Run the Axis test. Verify Y-axis and Z-axis alignments with the utility card. Refer to <i>Chapter 3, D-ring Maintenance</i>. Perform leak test.

Table 4-2. Application Troubleshooting (*continued*)

Issue	Possible Cause	Resolution
Elution volume higher than expected	<ul style="list-style-type: none"> • Tip/tube rack or reagent rack configuration is not correct • Alignments out of range 	<ul style="list-style-type: none"> • Check that the tip/tube rack and reagent rack are loaded properly. • Run the ORG test for the P axis. • Verify Y-axis and Z-axis alignments with the utility card.
Sample remaining in sample tube	<ul style="list-style-type: none"> • Incorrect sample input volume selected • Tip/tube rack or reagent rack configuration is not correct • Alignments out of range • D-ring maintenance required • D-rings leaking 	<ul style="list-style-type: none"> • Re-extract samples using correct sample input volume settings. • Check that the tip/tube rack and reagent rack are loaded properly. • Run the ORG test for the P axis. • Verify Y-axis and Z-axis alignments with the utility card. • Refer to <i>Chapter 3, D-ring Maintenance</i>. • Perform leak test.

Viral NA Troubleshooting

Table 4-3 lists two troubleshooting issues associated with use of the Viral NA Extraction Kit. For either issue, review the possible causes, and follow the potential resolutions in sequence.

Table 4-3. Viral NA Troubleshooting

Issue	Possible Cause	Resolution
Low or no detection of viral nucleic acids; internal controls are positive	<ul style="list-style-type: none"> • Viral load in samples below detectable limits of assay • Samples are clotted or coagulated • Samples stored at incorrect temperature; nucleic acid has degraded • Reagent cartridge temperature is too low • Reagent cartridges have expired 	<ul style="list-style-type: none"> • Optimize assay. • Use fresh sample (plasma, serum, or blood) to which anticoagulants were added. • Store samples at 2°C to 8°C. Always observe nuclease-free conditions when handling samples. • Equilibrate reagent cartridges to room temperature before use. • Check expiration date on cartridge. Replace if expired.
Low or no detection of viral nucleic acids, internal controls are negative.	<ul style="list-style-type: none"> • Assay reagents/ detection failure 	<ul style="list-style-type: none"> • Test reagents and detection with positive control. • Replace if necessary.

FFPE NA Troubleshooting

Table 4-4 lists general troubleshooting issues associated with use of the FFPE NA Extraction Kit. For any issue, review the possible causes, and follow the potential resolutions in sequence.

Table 4-4. FFPE NA Troubleshooting

Issue	Possible Cause	Resolution
Low yield (elution volume is normal)	<ul style="list-style-type: none"> Yield as determined by nucleic acid concentrations is below required amount 	<ul style="list-style-type: none"> Ensure that solutions in reagent cartridge has been tapped down to the bottom of the well before use. Increase sample input by adding one additional 10-micron section.
Low RNA yield	<ul style="list-style-type: none"> Prolonged incubation time used during pre-instrument sample preparation steps with elevated temperatures 	<ul style="list-style-type: none"> Incubate tubes at 70° to 72°C in a water bath or thermocycler for 60 minutes.
Elution has a cloudy or milky color	<ul style="list-style-type: none"> Too much tissue was used in the extraction 	<ul style="list-style-type: none"> Dilute cloudy eluate at a ratio of 1:1 with nuclease-free water; use in downstream application. Reduce the amount of input material.

gDNA Troubleshooting

Table 4-5 lists one possible troubleshooting issue associated with use of the gDNA Extraction Kit. Review the possible cause, and follow the potential resolution.

Table 4-5. gDNA Troubleshooting

Issue	Possible Cause	Resolution
Salts in the lysis solution precipitate	<ul style="list-style-type: none"> Salts in the lysis solution precipitate if reagents are stored in a refrigerator or frozen during shipping 	<ul style="list-style-type: none"> Store at room temperature; do not store reagents in refrigerator.

Utility Card and Tests

The utility card contains troubleshooting, maintenance, and instrument verification protocols. This card is supplied with the instrument and is utilized by the operator or Beckman Coulter service engineer to execute the following tests:

- Leak test
- Visual accuracy test
- Pipettor alignment test (Y axis and Z axis)

Leak Test

The purpose of this test is to ensure that the system is capable of pipetting properly, and that individual pipettor nozzle assemblies do not leak. Evidence of worn or damaged D-rings is an example of when an operator should perform the leak test.

Consumables required to perform the leak test are:

- Ten 1.0 mL tips and sheaths
- Twenty uncapped 2.0 mL tubes

For each pipettor nozzle to be tested, perform the following steps:

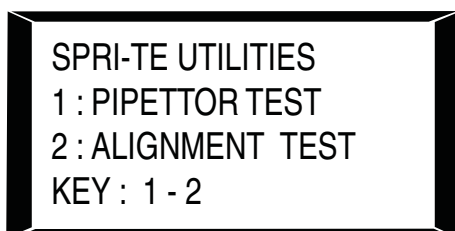
1. Insert a 1.0 mL tip with sheath in row 2 of the tip/tube rack.



The operator has the option to perform the leak test with 200 µL pipette tips. In this case, insert a 200 µL tip with sheath in row 3 of the tip/tube rack for each pipettor nozzle to be tested.

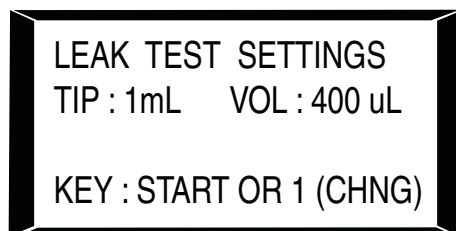
2. Insert an uncapped 2.0 mL tube in row 4 of the tip/tube rack.
3. Insert an uncapped 2.0 mL tubes in row 5 of the tip/tube rack, filled with 1.0 mL of deionized water.
4. Load the tip/tube rack into the extraction chamber.
5. Close the access door.
6. Load the utility card into the method card slot.
7. Power on the instrument using the power switch on the instrument side panel. The **SPRI-TE UTILITIES** screen is displayed, as shown in Figure 4.1.

Figure 4.1 SPRI-TE Utilities Screen



8. Select **1: PIPETTOR TEST** from the **SPRI-TE UTILITIES** screen.
9. Select **1: LEAK PROTOCOL** and then press any key to forward to the **LEAK TEST SETTINGS** screen (see Figure 4.2).

Figure 4.2 Leak Test Settings Screen



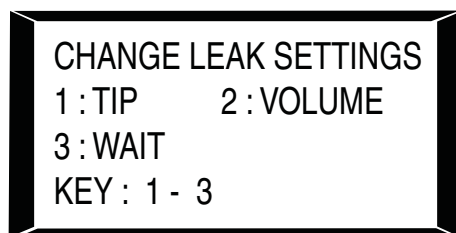
10. Select **START** to begin the leak test. The system loads the 1.0 mL tip from row 2, aspirates the deionized water from the 2.0 mL tube in row 5, then pauses for 60 seconds.
11. Visually observe the bottom of the 1.0 mL tip when the instrument pauses. A droplet that falls from the bottom of the 1.0 mL tip signifies a leak in the pipettor nozzle assembly. See [Chapter 3, D-ring Maintenance](#), for instructions on replacing D-rings.
12. After 60 seconds, the system dispenses the deionized water into the 2.0 mL tube in row 4.



NOTE

If necessary, from the **LEAK TEST SETTINGS** screen, select **1: (CHNG)** to enter the change menu and modify the default settings (see Figure 4.3). Options are available to change the tip type, volume aspirated, and wait time.

Figure 4.3 Change Leak Settings Screen



Visual Accuracy Test

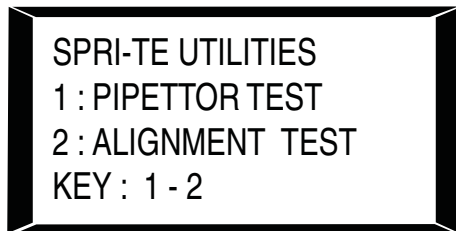
The purpose of this test is to ensure that the individual pipettor nozzle assemblies aspirate and dispense accurately. The visual accuracy test should be performed if results indicate inconsistent transfer volumes, or low elution volumes.

Consumables required to perform the visual accuracy test are:

- Ten 200 μ L tips and sheaths
- Ten 1.0 mL tips and sheaths
- Ten uncapped 2.0 mL tubes

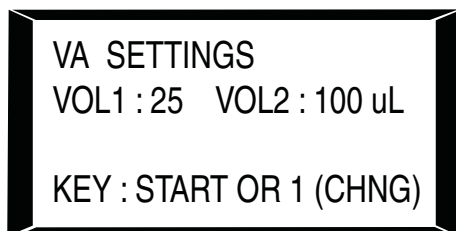
1. Insert ten empty reagent cartridges into the reagent rack.
2. Load the reagent rack into the extraction chamber.
3. Insert ten 1.0 mL tips with sheaths in row 2 of the tip/tube rack.
4. Insert ten 200 μ L tips with sheaths in row 3 of the tip/tube rack.
5. Insert ten uncapped 2.0 mL tubes (filled with 1.8 mL deionized water) in row 5 of the tip/tube rack.
6. Load the tip/tube rack into the extraction chamber.
7. Close the access door.
8. Load the utility card into the method card slot.
9. Power on the instrument using the power switch on the instrument side panel. The **SPRI-TE UTILITIES** screen is displayed, as shown in Figure 4.4.

Figure 4.4 SPRI-TE Utilities Screen



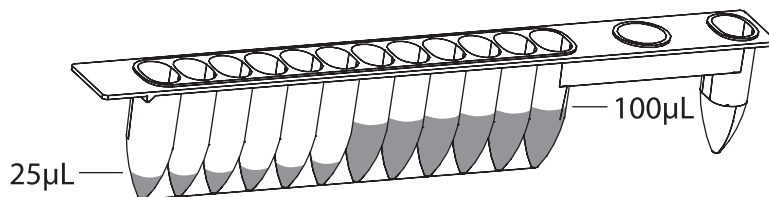
10. Select **1: PIPETTOR TEST**.
11. Select **2: VISUAL ACCURACY** and then press any key to forward to the **VA SETTINGS** screen (see Figure 4.5). The screen displays the low (VOL1) and high (VOL2) volumes for the visual accuracy test.

Figure 4.5 Visual Accuracy Settings Screen



12. Select **START** to begin the visual accuracy test. The system performs the following actions:
 - Loads the 200 μL tip from row 3.
 - Aspirates 25 μL from the 2.0 mL tube, and dispenses the entire 25 μL volume into reagent cartridge well 1. This system repeats this step for wells 2 and 3.
 - Aspirates 100 μL from the 2.0 mL tube, and dispenses the entire 100 μL volume into reagent cartridge well 7. The system repeats this step for wells 8 and 9.
 - Returns the 200 μL tip to row 3, and loads the 1.0 mL tip from row 2.
 - Aspirates 25 μL from the 2.0 mL tube, and dispenses the entire 25 μL volume into reagent cartridge well 4. The system repeats this step for wells 5 and 6.
 - Aspirates 100 μL from the 2.0 mL tube, and dispenses the entire 100 μL volume into reagent cartridge well 10. The system repeats this step for wells 11 and 12.
 - Returns the 1.0 mL tip to row 2, and pauses.
13. Open the access door, remove the reagent rack, and visually check the consistency of the volumes across the reagent cartridge wells (see Figure 4.6) for each cartridge.

Figure 4.6 Reagent Cartridge Post-Dispense



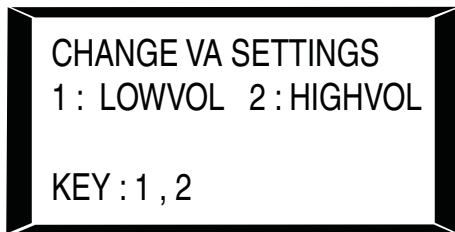
14. Reinsert the reagent rack into the instrument, and close the access door.
15. Select any key to continue the visual accuracy test. The system aspirates the water from the wells in the reagent cartridges and dispenses it back into the 2.0 mL elution tube.
16. When the test concludes, open the access door, remove the reagent rack, and visually check that the reagent cartridge wells have less than 10 μL of water remaining. If greater than 10 μL of water remains, a potential problem exists with the pipettor module or with the Z-axis height. Refer to the following sections to resolve this issue:
 - *Chapter 2, [Homing the Axes](#)*, for instructions on running the ORG (origin) function
 - *Chapter 2, [Verifying Proper Axis \(M, P, Y, Z\) Operation](#)*, for instructions on running the Axis test
 - *Chapter 3, [D-ring Maintenance](#)*, for instructions on replacing D-rings
 - Refer to *[Alignment Test \(Y axis and Z axis\)](#)* in this chapter for instructions on performing a Z axis alignment test



NOTE

If necessary, from the **VA SETTINGS** screen, select **1: (CHNG)** to enter the change menu and modify the default settings (see Figure 4.7. Options are available to change the low and high volume settings.

Figure 4.7 Change VA Settings Screen



Alignment Test (Y axis and Z axis)

The purpose of this test is to verify alignments. Pipette tips hitting the bottom of the reagent cartridge well during the extraction protocol is an example of when an operator should perform the alignment test.

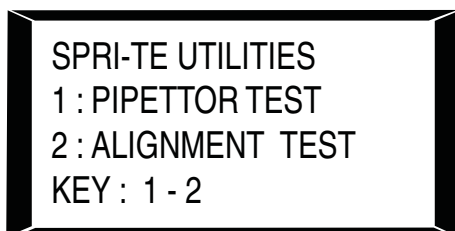
Consumables required to perform the alignment test are:

- Ten piercing tips and sheaths
- Ten uncapped 2.0 mL tubes

Y axis

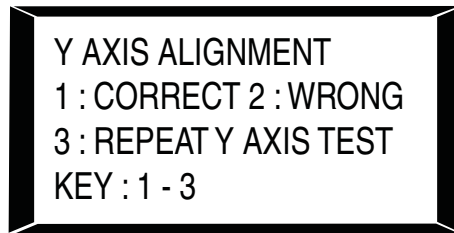
1. Insert ten piercing tips with sheaths in row 1 of the tip/tube rack.
2. Insert ten uncapped 2.0 mL tubes with sheaths in row 5 of the tip/tube rack.
3. Load the tip/tube rack into the extraction chamber.
4. Close the access door.
5. Load the utility card into the method card slot.
6. Power on the instrument using the power switch on the instrument side panel. The **SPRI-TE UTILITIES** screen is displayed, as shown in Figure 4.8.

Figure 4.8 SPRI-TE Utilities Screen



7. Select **2: ALIGNMENT TEST**.
8. Select **1: TEST Y AXIS**.
9. Select **ENTER**. The instrument picks up the piercing tips, moves the tips into the 2.0 mL tubes, and pauses.
10. The **Y AXIS ALIGNMENT** screen displays, prompting the operator to confirm test results (see Figure 4.9).

Figure 4.9 Y Axis Alignment Screen

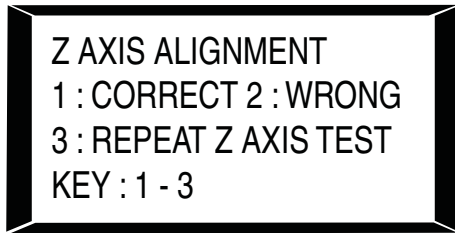


11. Visually verify that the piercing tips are centered in the 2.0 mL tubes.
12. Select option **1: CORRECT**, **2: WRONG**, or **3: REPEAT Y AXIS TEST**.
13. At the conclusion of the test, the system returns the piercing tips to their original position in the tip/tube rack.

Z axis

1. Insert ten piercing tips with sheaths in row 1 of the tip/tube rack.
2. Load the tip/tube rack into extraction chamber.
3. Close the access door.
4. Load the utility card into the method card slot.
5. Power on the instrument using the power switch on the instrument side panel. The **SPRI-TE UTILITIES** screen is displayed.
6. Select **2: ALIGNMENT TEST**.
7. Select **2: TEST Z AXIS**.
8. Select **ENTER**. The instrument picks up the piercing tips, moves the tips to the top of the tip/tube rack, and pauses.
9. The **Z AXIS ALIGNMENT** screen displays, prompting the operator to confirm test results (see Figure 4.10).

Figure 4.10 Z Axis Alignment Screen



10. Verify that the distance from the top of the tip/tube rack to the point of the piercing tips is 1.0 mm (± 0.2 mm) using the alignment tool provided in the start-up kit.
11. Select option **1: CORRECT**, **2: WRONG**, or **3: REPEAT Z AXIS TEST**.
12. At the conclusion of the test, the system returns the piercing tips to their original position in the tip/tube rack.

Customer Support

Contact Information

For questions, service, or parts ordering for your SPRI-TE, contact Beckman Coulter customer support.

NORTH AMERICA

- Toll Free: (800) 854-3633. Be prepared to provide your system model and serial numbers.
- Beckman Coulter Customer Support web site:

<http://www.beckmancoulter.com/customersupport/support/>

Online registration is required.

WORLDWIDE CONTACTS

- Beckman Coulter Contact Us web site:
http://www.beckmancoulter.com/hr/contactus/Contact_Us_main.asp

**SPRI-TE™ Nucleic Acid Extractor
Operator's Manual**

For *In Vitro* Diagnostic Use

PN A50101 AC (July 2008)

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