TECHNICAL MANUAL

# RoboSep™-S: The Fully Automated Cell Separator

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# Safety Information and Warnings

RoboSep™-S (Catalog #21000) must be operated by trained professionals and is intended for research use only. Not intended for human or animal diagnostic or therapeutic uses.

RoboSep™-S should be placed on a clean, flat surface free of any foreign objects or debris and insulated from excessive vibration. There should be at least 13 mm of clearance on each side of the instrument to ensure adequate cooling.

Always connect the power supply to a 3-prong, grounded AC outlet rated 2A 100 - 240 V using the AC power cord provided with RoboSep™-S. Do not use an adapter to a two-terminal outlet. Before plugging the instrument in, be sure that two FB 4 A 250 V~ fuses are installed.

All electrical devices pose a risk of electric shock. To reduce this risk, do not open any covers that are fastened with screws. While RoboSep™-S is designed to withstand spills, do not allow fluids to enter the interior of the instrument. In the event of such a spill, switch off RoboSep™-S and disconnect the power cable before cleaning (section 6.2).

Operate RoboSep™-S at 15 - 30°C, in an environment with a relative humidity of 20 - 85%. RoboSep™-S should be used indoors only. RoboSep™-S does not require placement in a biohazard safety cabinet and is not specified for use inside an incubator or cold room. Protect the instrument against dust and moisture. Do not exert excess pressure or use sharp objects on the touchscreen. It is not recommended to use UV light lamps for prolonged periods of time, as exposure to UV light will result in discoloring of external RoboSep™-S components over time.

EasySep™ magnets on the RoboSep™-S carousel generate strong magnetic fields. Keep away from pacemakers, watches, or other objects that respond to magnetic fields. Individuals with implanted medical devices are strongly advised to consult with their physician or medical device manufacturer to verify the safety limits of magnetic field exposure for their specific devices.

RoboSep™-S weighs 22 kg (48.5 lb). Exercise caution when moving RoboSep™-S. Consult your institution's facility management and ensure two people are present to lift the instrument safely.

This device complies with Part 15 of the US Federal Communications Commission (FCC) Rules. Operation is subject to the following two conditions:
(1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

In case of malfunction, call STEMCELL Technologies Inc. for service. Servicing performed by anyone other than an authorized STEMCELL Technologies representative will void the warranty associated with RoboSep™-S. There are no user-serviceable parts inside the instrument; the outer casing should never be removed.

RoboSep™-S is manufactured and distributed by STEMCELL Technologies Inc., 1618 Station Street, Vancouver BC, Canada V6A 1B6. Call 1-604-877-0713 or toll-free 1-800-667-0322 within North America.

STEMCELL Technologies is not responsible for any injury or damage caused by using this instrument for purposes other than those for which it is intended, or by modifications of the instrument or software not performed by an authorized STEMCELL Technologies representative.

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## Overview of Safety Symbols

The safety symbols on the RoboSep™-S instrument are described below.

There is a biohazard sticker on the front right side of the RoboSep™-S instrument:

The BIOHAZARD symbol indicates that special care is required for users to remain protected from biological hazards.

There is a magnetic field warning symbol on each quadrant of the carousel near the EasySep™ magnet.

The STRONG MAGNETIC FIELD symbol indicates areas with potentially hazardous static magnetic fields and forces.

## RoboSep™-S Software

This manual is applicable to RoboSep™-S software version 1.5.X*. For other software versions, contact us at techsupport@stemcell.com for the applicable manual.

*This documentation applies to version 1.5.X where X represents minor updates or patches that do not affect the functionality described herein.

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# 1.0 Introduction

RoboSep™-S is the second generation of RoboSep™, a fully automated cell separator based on column-free EasySep™ technology. EasySep™ is an immunomagnetic cell separation technology that enables both positive and negative selection of desired cells from virtually any species, sample source, or size. Using an integrated color touchscreen, RoboSep™-S can be programmed to separate cells from up to four samples simultaneously and can also sequentially isolate different cell types from the same sample. The user simply loads the cell sample and reagents into the carousel and starts the experiment. RoboSep™-S automatically executes the EasySep™ immunomagnetic labeling and magnetic separation steps using disposable pipette tips, eliminating cross-contamination. After completion of the cell separation cycle, the cells of interest are immediately available for any application.

## 1.1 EasySep™ Magnetic Cell Separation Technology

EasySep™ is a powerful immunomagnetic cell separation procedure that combines the specificity of monoclonal antibodies with the simplicity of a column-free magnetic system. EasySep™ can be used as either a negative or a positive selection approach to purify your cells of interest.

For **EasySep™ negative selection** applications, unwanted cells are targeted for depletion using a cocktail of monoclonal antibodies directed against specific cell surface antigens. The labeled unwanted cells are then cross-linked to EasySep™ magnetic particles. The sample tube containing the cells is placed in a specially designed EasySep™ magnet. The desired (unlabeled) cells are removed either by inversion of the magnet (manual EasySep™) or by pipetting off the supernatant (RoboSep™-S).

With **EasySep™ positive selection**, highly purified cells are obtained by targeting the cells of interest with monoclonal antibodies directed against one or more specific cell surface antigens. These targeted cells are cross-linked to EasySep™ magnetic particles. The sample tube containing the cells is then placed directly in a specially designed EasySep™ magnet. The cells that are not bound to the magnetic particles are removed either by inversion of the magnet (manual EasySep™) or by pipetting off the supernatant (RoboSep™-S). Unlike larger particles used with other cell separation systems, the EasySep™ magnetic particles used in positive selection procedures do not interfere with subsequent flow cytometry and do not need to be removed.

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# 2.0 RoboSep™-S System

## 2.1 Instrument Overview

**1.** Lid

**2.** Access panel

**3.** Power switch

**4.** USB ports

**5.** Robotic arm

**6.** Carousel

**7.** Tip Head Polishing Compound compartment

**8.** RoboSep™ Buffer Bottle compartment

**9.** Touchscreen

**Figure 1. Front View of RoboSep™-S with the Lid Open**

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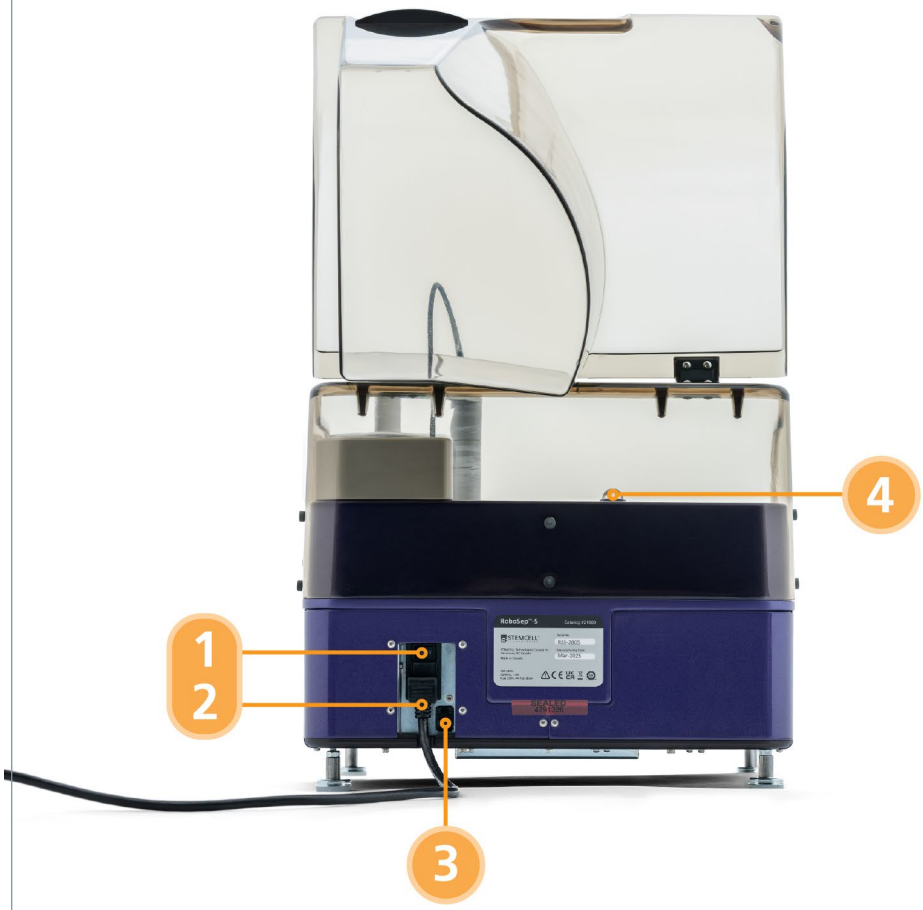


**1.** Main power switch

**2.** Power supply outlet

**3.** Ethernet port

**4.** LED light

**Figure 2. Back View of RoboSep™-S with the Lid Open**

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RoboSep™-S is an instrument that comprises four main mechanical components operated under computer control (Figure 1):

- Robotic Arm
- Carousel
- Tip Stripping Arm (not shown)
- Hydraulic System (behind access panel)

With these systems acting in concert, RoboSep™-S performs the following actions to automate EasySep™ cell separation protocols:

- Accurate dispensing of magnetic labeling reagents into cell samples using disposable 1 mL tips
- Mixing and transfer of the sample between tubes using disposable 5 mL tips
- Transfer of buffer solution from the buffer bottle to tubes on the carousel using disposable 5 mL tips
- Simultaneous tracking of incubation times for all separation protocols

RoboSep™-S automatically executes all actions required to process up to four samples, with the flexibility to simultaneously perform different types of separations.

### 2.1.1 Robotic Arm and Carousel

**Robotic Arm**

The robotic arm (Figure 3A) moves both vertically and rotationally. The stainless-steel tip head at the end of the arm is used to pick up pipette tips from the RoboSep™ Filter Tip Rack (Figure 3B). A custom, single-use RoboSep™ Filter Tip Rack contains all the disposable pipette tips necessary to process a single sample.

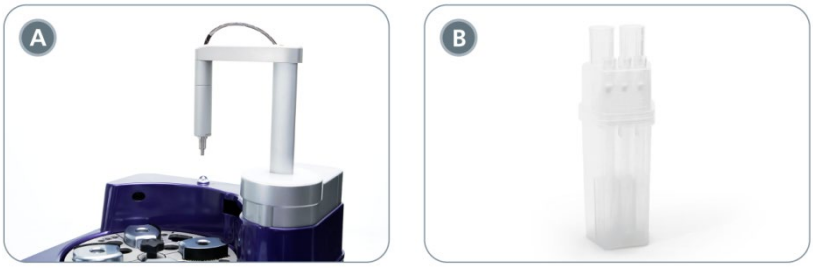


**Figure 3. (A) Robotic Arm and (B) RoboSep™ Filter Tip Rack.** Note that the lid of the RoboSep™ Filter Tip Rack needs to be removed prior to use.

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The robotic arm picks up 1 mL and 5 mL disposable pipette tips from the tip rack using a unique stepped tip head (Figure 4). This dual tip capability enables RoboSep™-S to accurately dispense volumes from 13 µL to 5 mL. Fluids are dispensed below the level of the sample liquid to minimize aerosol contamination.

**Figure 4. Tip Head on the Robotic Arm.** The tip head **(A)** before picking up a tip and after picking up a disposable **(B)** 1 mL tip and **(C)** 5 mL tip.

### Carousel

The carousel is divided into four quadrants, with each quadrant defining the minimum functional area for processing a single sample (Figure 5). Up to four different samples can be processed simultaneously.

Each quadrant is numbered on the carousel and can accommodate the following:

- 1 x 14 mL sample tube
- 1 x "The Big Easy" EasySep™ magnet containing a 14 mL separation tube. Ensure that a magnet shield is placed on "The Big Easy" EasySep™ magnet and that it faces the 14 mL sample tube.
- Up to 3 x EasySep™ reagent vials. Symbols on the carousel (▲, ■, ●) correspond to the symbols found on the EasySep reagent vial labels and are used to guide the placement of reagents into the carousel.
- 1 x RoboSep™ Filter Tip Rack
- 2 x 50 mL tubes

*Note: Falcon® Round-Bottom Tubes, 14 mL (Catalog #38008) and Falcon® Conical Tubes, 50 mL (Catalog #38010) are recommended.*

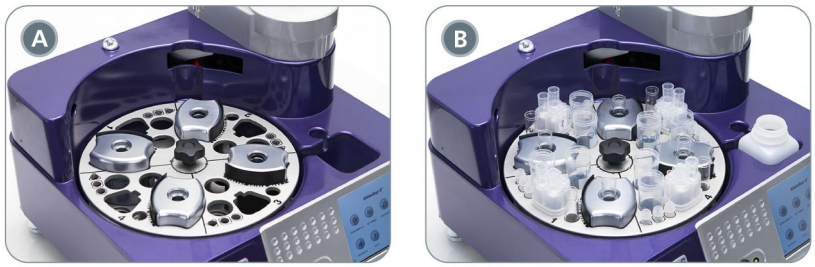


**Figure 5. Carousel Quadrants.** All four quadrants **(A)** empty and **(B)** loaded.

**When loading the RoboSep™-S carousel, ensure all tubes, reagent vials, and the Filter Tip Rack are firmly pushed down into position. Since the reagent vial positions can accommodate multiple sizes of vials using a gasket retention system (Figure 6), ensure that the reagent vials are centered within their respective positions in the carousel.**

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**Figure 6. Carousel Gaskets.** Gaskets at reagent vial and sample tube locations.

### Homing the Robotic Arm and Carousel

RoboSep™-S tracks the position of the robotic arm and carousel relative to physical markers on the carousel called homing flags. A home position is registered when an optical sensor detects a passing homing flag. The carousel homing flag is visible as a black projection on the bottom plate of the carousel (Figure 7). Homing of the carousel and robotic arm is performed automatically at startup, at the beginning of each cell isolation protocol, and after the instrument has been paused during a run.

**Figure 7. Carousel Homing Flag**

To ensure accurate homing, it is essential that the arm and carousel are not obstructed while RoboSep™-S is performing a cell separation protocol. To prevent such disruptions, RoboSep™-S operates with a transparent lid over the arm and carousel. If the lid is opened during operation, the instrument will complete its current action and pause. Once the lid is closed, RoboSep™-S will automatically execute a homing sequence and resume the cell separation protocol where it left off.

## 2.1.2 Tip Stripping Arm

The disposable tips are returned to the same tip rack after each use; this eliminates the need for a separate waste area on the instrument and facilitates easy cleanup after a run by allowing the entire tip rack to be disposed of. RoboSep™-S uses the tip stripping arm to remove (i.e. strip) tips from the tip head once they have been used. Figure 8 illustrates the automated 5 mL pipette tip stripping process.

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**Figure 8. Tip Strip Process. (A)** The robotic arm places the used 5 mL tip partly back into the tip rack. **(B)** The tip stripping arm swings out to engage the tip head just above the 5 mL tip. **(C)** The robotic arm moves up and the tip fully falls into the tip rack.

### Tip Strip Failures

In some cases, RoboSep™-S may be unable to strip a pipette tip from the tip head. If RoboSep™-S detects a tip strip failure, a dialog box will appear, the instrument will beep, and the LED light (Figure 2) will flash. Selecting **Resume** will prompt RoboSep™-S to try stripping the tip again. If RoboSep™-S cannot successfully strip the tip, this step should be done manually.

*Note: If a tip strip failure occurs, the tip head may need to be cleaned as described in section 6.1.*

## 2.1.3 Hydraulic System

The hydraulic system uses sterile deionized water driven by a positive displacement piston pump. The pipette handling tip head is connected to a hydraulic fluid bottle containing sterile deionized water located behind the front access panel of RoboSep™-S (Figure 1). The only visible part of this system is the tubing running from the console to the robotic arm.

The hydraulic fluid does not make contact with samples or reagents; because it is deionized water, it is less damaging to the piston seal than salt solutions or buffers. Therefore, the RoboSep™-S pump has a substantially longer operating life than the seals on syringe pumps used in other instruments and does not require any user maintenance. The use of water as a hydraulic fluid instead of air allows for accurate high-speed dispensing: the water effectively acts as an incompressible extension of the pump piston, allowing the system to operate with a dead air volume similar to that of a manual pipette.

The hydraulic fluid bottle should be refilled periodically (section 3.5). To reduce the chance of the hydraulic tubing becoming clogged with microbial growth, sterile deionized water should be used.

*Note: RoboSep™-S will automatically monitor the volume of deionized water in the hydraulic fluid bottle, and a dialog box will notify you if priming is required (section 3.5).*

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## 2.2 User Interface Overview

### 2.2.1 Screens

The **Home** screen allows you to access six different screens and contains the [Power] button for shutting down the instrument (Figure 9).

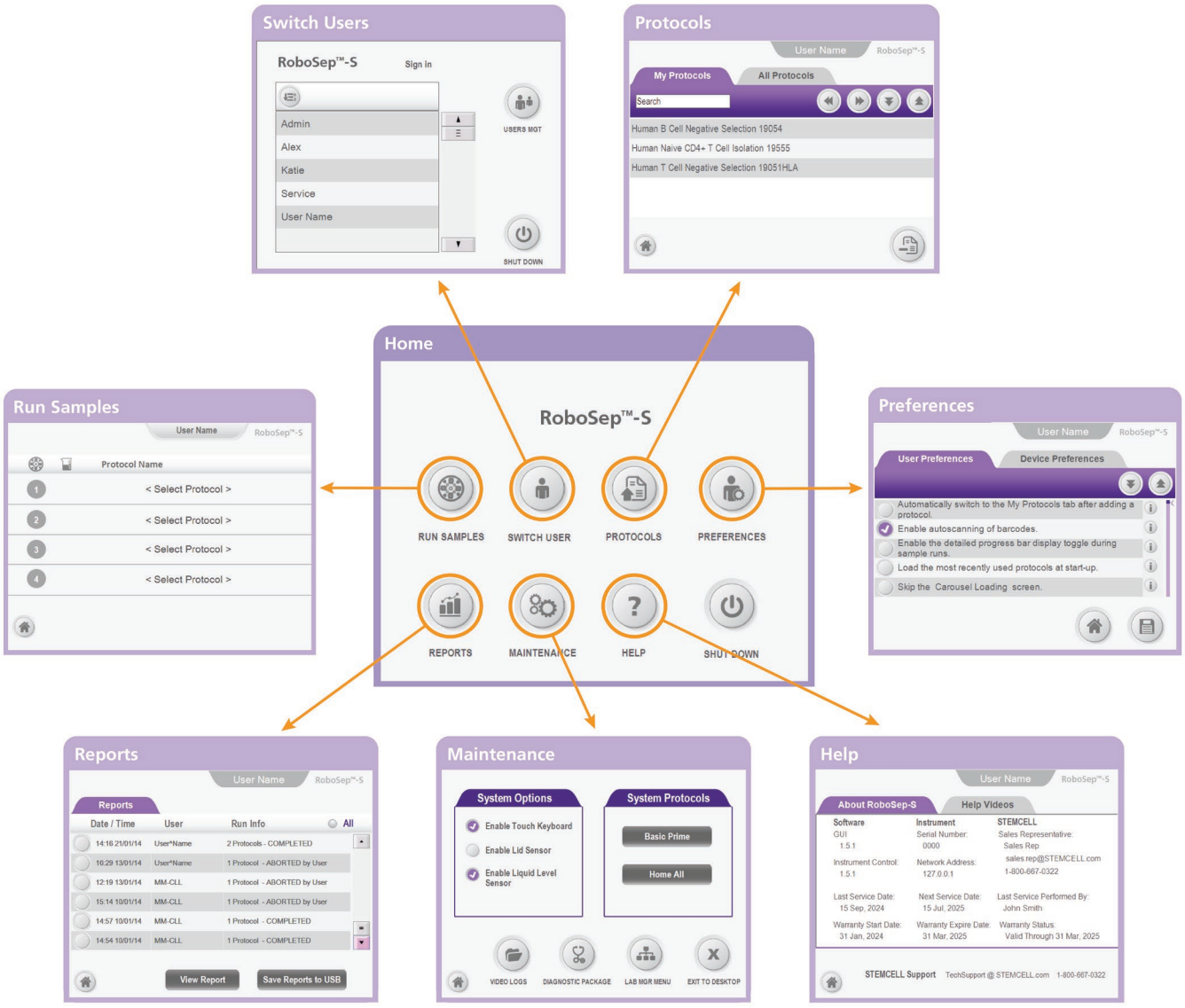


**Figure 9. Screens Accessed from the Home Screen**

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### 2.2.2 Icons

The icons used in RoboSep™-S are described in Table 1.

**Table 1. Icons Used in the RoboSep™-S User Interface**

| ICON | DESCRIPTION |
|---|---|
| | Navigates to the **Home** screen |
| | Carousel/quadrants numbers or navigates to the **Run Samples** screen |
| | Scroll up |
| | Scroll down |
| | Scroll left |
| | Scroll right |
| or | Selected option |
| | Unselected option |
| | Currently saved |
| | To save |
| | Move to next step |
| | Go to previous screen |
| | Navigates to the **Users** screen |
| | Users Management |
| | Add user profile |
| | Copy user profile |
| | Delete user profile |
| | Edit user profile |
| | Navigates to **User Preferences** screen |
| | Sort from A to Z |
| | Sort from Z to A |

| ICON | DESCRIPTION |
|---|---|
| | Delete |
| | Navigates to the **Protocols** screen |
| | Add protocols from the **All Protocols** tab to the **My Protocols** tab |
| | Remove protocols from the **My Protocols** tab |
| | Protocols added from the **All Protocols** tab to the **My Protocols** tab (only visible in the **All Protocols** tab) |
| | Load next quadrant |
| | Run protocols |
| | Barcode scanner |
| | Run in progress |
| | Pause run |
| | Stop protocol |
| | Unload |
| | Add USB drive |
| | Additional information |
| | Navigates to the **Reports** screen |
| | Navigates to the **Help** screen |
| | Diagnostic Package |
| | Service menu |
| | Power |
| | Video Logs |
| | Download Report |

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# 3.0 RoboSep™-S Installation

Successful operation of RoboSep™-S requires correct installation. An authorized STEMCELL Technologies representative will be present to help you unpack, connect, and install the instrument. They will also provide your laboratory's staff with training on the proper operation of RoboSep™-S.

## 3.1 Placement of the Instrument

RoboSep™-S should be placed on a clean, flat surface free of any foreign objects or debris and insulated from excessive vibration. There should be at least 13 mm of clearance on each side of the instrument to ensure adequate cooling. RoboSep™-S is not specified for use inside an incubator or cold room. See section 7.0 for detailed RoboSep™-S specifications.

It is recommended to operate RoboSep™-S with the lid in place to prevent accidental interference with the operation of the robotic arm.

RoboSep™-S is designed to fit in chemical hoods and biohazard safety cabinets. To make operation within such environments easier, the lid can be removed from RoboSep™-S using the following instructions:

1. Place RoboSep™-S so that you are facing the side of the instrument (Figure 10A).
2. Ensure the lid is closed.
3. Remove the six thumb screws holding the lid in place (two on the back and two on each side of the instrument).
4. Slowly remove the lid by lifting it.
5. Replace the thumb screws in their original position (Figure 10B) and store the lid.
6. Select [Maintenance] on the **Home** screen and deselect **Enable Lid Sensor** under the **System Options** tab.

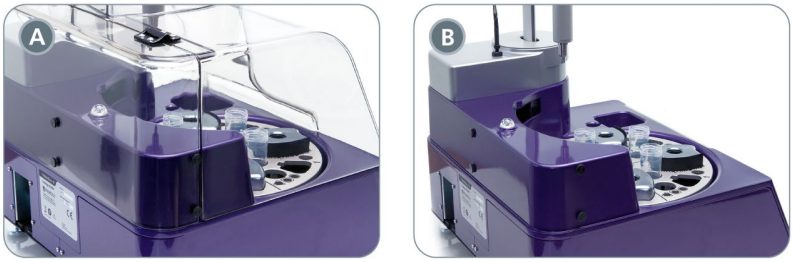


**Figure 10. Removing the Lid.** The lid **(A)** in place and **(B)** removed. Note that only four thumb screws are shown in this diagram.

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## 3.2 Power and Network Connections

Plug in the power cord provided with RoboSep™-S to the power supply outlet located on the back of the instrument (Figure 11), and connect it into a 3-prong, grounded AC outlet rated 2A 100 - 240 V. Do not use an adapter to a two-terminal outlet.

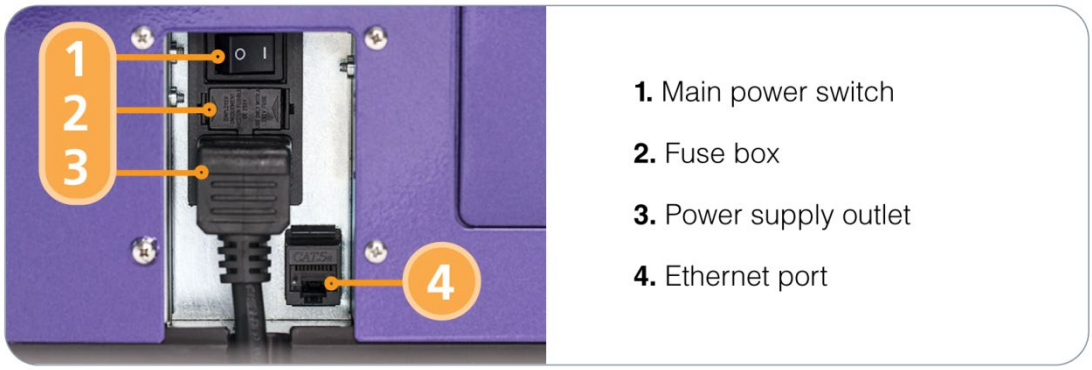


**Figure 11. Power and Network Connections**

Data connections to RoboSep™-S are through:

- An Ethernet port located on the back of the instrument (Figure 11)
- 3 x USB ports located on the front of the instrument (Figure 1)

### 3.2.1 Connecting to a Network

RoboSep™-S can be connected to networks via the Ethernet port. The instrument will automatically assign itself an IP address when connected to a Local Area Network (LAN). Shared documents can then be accessed by all other computers also connected to the LAN.

To access RoboSep™-S shared documents from a separate networked computer:

1. Connect one end of a CAT-5 Ethernet cable (not provided) to the Ethernet port located on the back of RoboSep™-S (Figure 11) and the other end to a networked router. This will connect RoboSep™-S to your LAN.
2. Start up RoboSep™-S (section 3.3) and select [Help] from the **Home** screen.
3. Note the Network address (IP address) that appears on the **Help** screen (Figure 12).
4. On the separate networked computer, go to **Start** > **Run** and then enter two backslashes followed by the Network address (e.g. //192.168.59.127).

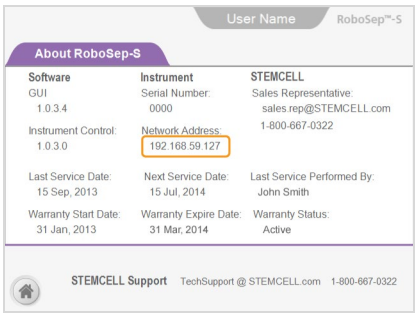


**Figure 12. Help Screen**

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Once connected, the following folders can be accessed:

- **Logs** - Contains the log files (section 8.1)
- **Reports** - Contains the RoboSep™-S End-of-Run Report files (section 5.1)
- **Protocols** - Contains the RoboSep™ protocol files
- **Data** - Allows transfer of files from the instrument to the connected computer

## 3.3 Startup

*Note: The first time RoboSep™-S is used following installation, the STEMCELL Technologies representative will turn on the main power switch located on the back of the instrument (Figure 2) and will also prime the hydraulic system. It is recommended not to attach any USB drives to the instrument at the time of startup.*

1. Turn ON the power switch located on the front of the instrument (Figure 1).

   *Note: A green indicator light on the front of the instrument will light up, indicating that the instrument is turned on.*

2. Wait for RoboSep™-S homing to occur.
3. Once homing is complete, the **User Selection** screen is visible on the touchscreen (Figure 13).
   a. Select one of the user profiles to access **Run Samples** screen (Figure 14) and continue with RoboSep™-S operations.
   b. If creating new user profiles or modifying existing ones, select [ Users Management]. Refer to Section 4.1.

**Figure 13. User Selection Screen**

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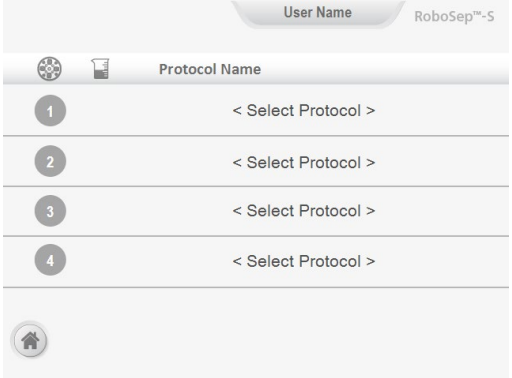


**Figure 14. Run Samples Screen**

## 3.4 Shutdown

1. Select [Power] from the **Home** screen and wait until the touchscreen turns off.
2. Turn OFF the power switch located on the front of the instrument (Figure 1).

   *Note: The indicator light on the front of the instrument will turn off. There is no need to turn off the main power switch at the back of the instrument unless the instrument needs to be unplugged (e.g. when cleaning the instrument; section 6.2).*

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## 3.5 Priming the Hydraulic System

RoboSep™-S performs a priming sequence at the beginning of every cell separation protocol to minimize the effect of air bubbles that naturally accumulate in the hydraulic system. When RoboSep™-S is used for the first time, or if the hydraulic fluid bottle needs to be refilled, use the priming protocol below.

*Note: RoboSep™-S will automatically monitor the volume of deionized water in the hydraulic fluid bottle and notify you if priming is required.*

1. Open the access panel located at the front of the instrument and remove the hydraulic fluid bottle using the white quick connect (Figure 15A).

   *Note: Do NOT touch the black switch behind the access panel. This is to be used only by a STEMCELL Technologies representative for servicing purposes.*
2. Unscrew the cap and fill the bottle with 250 mL of sterile deionized water.
3. Screw the cap back on, reconnect the bottle to the hydraulic system tubing, and place back into the instrument (Figure 15B).
4. If necessary, start up the instrument (section 3.3).
5. Select [Maintenance] on the **Home** screen. Select **Basic Prime** under **System Protocols**.

   *Note: The **Basic Prime** protocol will appear in quadrant #1 of the **Run Samples** screen.*
6. Select [Next] and then **OK** in the **Confirm Run** dialog box.
7. Place an empty 50 mL waste tube in the slot highlighted in purple in quadrant #1 of the **Carousel Loading** screen.
8. Select [Run] to initiate the **Basic Prime** protocol.
9. Wait approximately 2 minutes for the protocol to run. RoboSep™-S will expel water and any air bubbles contained in the hydraulic system into the waste tube.

   *Note: If no water is expelled into the waste tube by the end of the protocol, refer to section 8.0.*

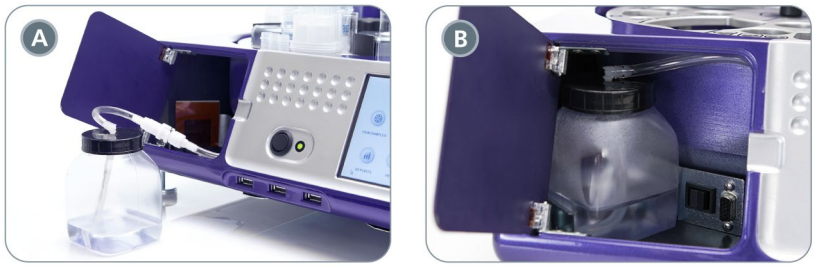


**Figure 15. Hydraulic System.** The hydraulic bottle and quick release **(A)** outside and **(B)** inside of the instrument.

*Note: The hydraulic bottle may discolor over time with exposure to UV light. Discoloring of the bottle does not affect instrument performance.*

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# 4.0 Running RoboSep™-S

Detailed operating instructions are described in this section. For a brief guide to using the RoboSep™-S, the Quick Start Guide (Document #10000031575) is included with RoboSep™-S. For easy access, the Quick Start Guide can be stored in the document tray located underneath RoboSep™-S.

## 4.1 User Profiles

User profiles are used to organize RoboSep™ cell separation protocols (section 4.2) and set preferences (section 4.1.3) for each RoboSep™-S user. Users can create their own custom profile to simplify the run setup and start process. There is no limit to the number of user profiles that can be created, but the creation of over 15 profiles may reduce instrument speed.

To access user profiles, select [Users] on the **Home** screen or simply select the **User Profile** tab at the top of the **Run Samples** screen. All RoboSep™-S user profiles will be listed in the **User Profile** screen (Figure 16).

To choose a user profile, simply scroll through the list and select the desired profile. The user name will appear on the **User Profile** tab in the **Run Samples** screen.

*Note: To edit a user profile name, select [Edit user profile] from the **User Profile** screen. A user profile name cannot exceed 11 characters.*

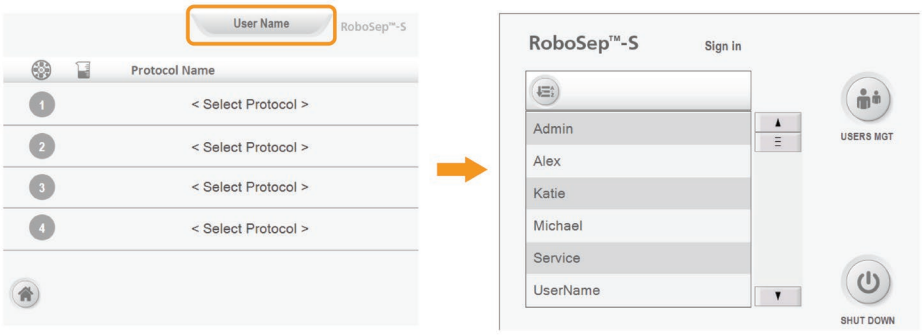


**Figure 16. Accessing the User Profile Screen from the Run Samples Screen**

### 4.1.1 Adding a User Profile

**New User Profile**

1. Select [Add user profile] from the **User Profile** screen (Figure 16).
2. Type the name of the new profile and press **Enter**.

   *Optional: Select [Edit user profile] to access and edit user preferences (section 4.1.3).*
3. Select [Save]. The new user profile will be added to the list of all user profiles.

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**Copying a User Profile**

This allows one user profile to be copied under a new user name.

1. Select [Copy user profile] from the **User Profile** screen (Figure 16).
2. Select the user profile you want to copy and then select [Select].
3. Type the new name for the copied user profile and press **Enter**.

   *Optional: Select [Edit user profile] to access and edit user preferences (section 4.1.3).*
4. Select [Save]. The new copied user profile will be added to the list of all user profiles.

### 4.1.2 Deleting a User Profile

*Note: A user profile cannot be deleted if that user is currently logged into RoboSep™-S (i.e. if the user name is present in the **User Profile** tab). The user must first select another user profile and then delete the unwanted user profile.*

1. Select [Delete user profile] from the **User Profile** screen (Figure 16).
2. Select the user profile to be deleted.
3. Select [Select]. The selected user profile will be deleted from the list of all user profiles.

### 4.1.3 Editing User Profile Preferences

User and device preferences can be changed in the **User Preferences** screen for each user profile (Table 2).

Select [Save] to save changes to preferences.

*Note: The **User Preferences** screen can be accessed directly from the **Home** screen by simply selecting [Edit user profile] once the desired user profile has been selected.*

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**Table 2. User and Device Preferences**

| TAB | PREFERENCE | DESCRIPTION | DEFAULT SETTING |
|---|---|---|---|
| User Preferences | Automatically switch to the **My Protocols** list after adding a protocol | After adding protocols from the **All Protocols** tab, the view automatically switches to the **My Protocols** tab | ○ |
| | Enable autoscanning of barcodes | Automatically start scanning barcodes when beginning a run. This preference cannot be used with the 'Skip the Carousel Loading' screen preference. | ✓ |
| | Enable the detailed progress bar display toggle during the sample runs | Enable the user to toggle between the standard and detailed view of the progress bar during sample runs | ○ |
| | Load the most recently used protocols at startup | RoboSep™-S will remember the most recent protocols and sample volumes a user last ran and will automatically assign them to the **Run Samples** screen. This setting is helpful for users who routinely perform the same separation protocols. | ○ |
| | Skip the **Carousel Loading** screen | Bypass the guided **Carousel Loading** screen to immediately run samples. This preference cannot be used with the 'Enable autoscanning of barcodes' preference. | ○ |
| | Use abbreviations for protocol names | The abbreviated names will fit within the horizontal space of the touchscreen | ○ |
| | Use the first tab to display the **All Protocols** tab | The arrangements of the **My Protocols** and **All Protocols** tabs are reversed such that **All Protocols** is listed first | ○ |
| Device Preferences | Enable beep sound when a separation is paused | A beep will sound intermittently when a separation protocol is paused | ✓ |
| | Privacy Setting – Disable carousel video camera | This setting will inactivate the carousel video camera | ○ |
| | Privacy Settings – Delete video camera log files | This setting deletes all the saved carousel video camera log files | ○ |

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### 4.1.4 Privacy Settings

RoboSep™-S has an internal video camera (including microphone) that can record sample handling. These monitoring devices can be made active throughout protocol runs and the recorded data is stored in the instrument's internal hard drive. In the event your instrument malfunctions, this data can be retrieved and analyzed by STEMCELL Technologies Technical Support team to help get your RoboSep™-S up and running again as quickly as possible.

By default, RoboSep™-S records both video and sound of the carousel workspace including a limited field of vision in front of the instrument. These features can be configured during installation or modified at any time by the customer. To disable, edit the following two **Privacy Setting** preferences under the **User Profile Preferences** (section 4.1.3):

- Privacy Setting – Disable carousel video camera
- Privacy Settings – Delete video camera log files

*Note: Video camera log files can be deleted at any time.*

*Note: Up to 20 video camera log files are stored in the instrument's internal hard drive. Older video files are automatically deleted as new protocol runs are completed.*

Users are expected to follow region- and institution-specific privacy policies. It is the user's responsibility to protect sensitive information and to NOT make such information accessible to STEMCELL Technologies. Sensitive information includes any information concerning personal/material circumstances of an identified individual.

Users shall not hold STEMCELL Technologies liable for any data or sensitive information that is disclosed.

To comply with your region and institution's privacy policies, update these settings as needed.

## 4.2 RoboSep™ Protocols

RoboSep™ cell separation protocols involve a series of software commands and scheduling instructions designed to optimize the automation of EasySep™ cell separation kits. Each RoboSep™ protocol has been optimized for an automated system and may differ from manual EasySep™ separation protocols. Refer to the Product Information Sheet (PIS) of the EasySep™ kit for protocol names to be used. Unless otherwise noted, **All Protocols** have been optimized for use at room temperature (15 - 25°C).

RoboSep™-S will contain all cell separation protocols available at the time of purchase. The instrument may need to be updated with new protocols as new EasySep™ cell separation kits become available or as existing protocols are improved. Contact STEMCELL Technologies at techsupport@stemcell.com for more information on how to update RoboSep™ protocols or refer to section 4.2.3.

RoboSep™-S organizes cell separation protocols into two tabs in the **Protocols** screen (Figure 17):

- **My Protocols** - lists only the RoboSep™ protocols added to the selected user profile
- **All Protocols** - lists all RoboSep™ protocols available on the RoboSep™-S instrument

*Note: To run a RoboSep™ protocol, it must be listed under the user's **My Protocols** tab.*

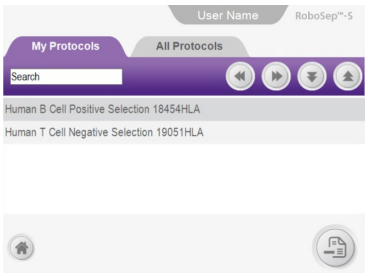


**Figure 17. Protocols Screen.** In this example, the **My Protocols** tab is selected.

### 4.2.1 Adding Protocols to a User Profile

*Note: Figure 18 represents an overall schematic of the detailed instructions described below.*

1. Select a user profile (section 4.1) and ensure that no protocols have been assigned to a quadrant in the **Run Sample** screen (i.e. all quadrants have <Select Protocol> listed under Protocol Name).
2. Select [Protocols] on the **Home** Screen. The **Protocols** screen will appear (Figure 17).
3. Select the **All Protocols** tab and search for the desired protocol using at least one of the following options:
    - Use the Search box to type in key words related to a protocol name. For example, enter the EasySep™ kit catalog number.
    - Scroll up and down the **All Protocols** list as needed using the [Scroll up] and [Scroll down], respectively.
4. Select all desired protocols to be added to the **My Protocols** tab. A [Select] will appear to the left of the selected protocol names.
5. Select [Add protocol]. The protocols will be added to the **My Protocols** tab.

    *Note: Once a protocol has been added to the **My Protocols** tab, the icon will appear to the left of the protocol name in the **All Protocols** tab.*

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**Figure 18. Adding a Protocol to a User Profile**

### 4.2.2 Removing Protocols from a User Profile

*Note: Figure 19 represents an overall schematic of the detailed instructions described below.*

1. Select a user profile (section 4.1).
2. Select [Protocols] on the **Home** Screen. The **Protocols** screen will appear (Figure 17).
3. Select the desired protocols to be removed under the **My Protocols** tab. A [Select] will appear to the left of the selected protocol names.
4. Select [Remove protocol]. The selected protocols will be removed from the **My Protocols** tab.

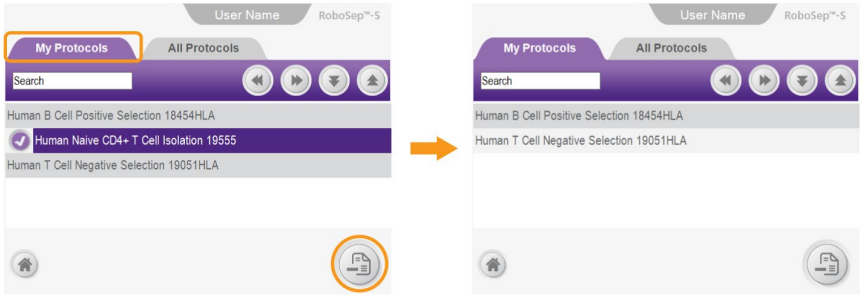


**Figure 19. Removing a Protocol from a User Profile**

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### 4.2.3 Adding New Protocols to RoboSep™-S

New RoboSep™ protocols can be added to RoboSep™-S simply by using a USB drive. Contact STEMCELL Technologies at techsupport@stemcell.com for more information on how to customize existing protocols or add new protocols to RoboSep™-S.

Once you have a new RoboSep™ protocol, transfer it onto a USB drive and use the following set of instructions to add it onto RoboSep™-S:

1. Select [Protocols] on the **Home** screen. Ensure the **All Protocols** tab is selected.
2. Insert a USB drive into one of the USB ports of RoboSep™-S (Figure 1).
3. Select [Add USB] and navigate to the location of the new protocol on the USB drive.
4. Select the new RoboSep™ protocol and then select [Save].
5. Confirm that the new separation protocol is listed under the **All Protocols** tab has the icon next to it and then remove the USB drive.

   *Note: Refer to section 4.2.1 for instructions on how to add protocols to the **My Protocols** tab.*

   *Note: Only handle (e.g. open, download, or forward) RoboSep™ protocols using a Windows device. If protocols are handled on Apple devices (e.g. MacBook, iPhone, etc.), the Apple software may alter the protocols, rendering them unreadable by the RoboSep™-S software.*

## 4.3 Setting Up a Run

RoboSep™-S is designed to avoid any cross-contamination of the samples and reagents manipulated during experiments. RoboSep™-S can be operated within a biohazard safety cabinet to maintain sample and reagent sterility. When using RoboSep™-S, it is essential to observe good laboratory practices as described by your institution.

### 4.3.1 Selecting a Cell Separation Protocol

*Note: Figure 20 represents an overall schematic of the detailed instructions described below.*

1. Select a user profile (section 4.1).
2. Select <Select Protocol> and choose the desired RoboSep™ protocol from the **My Protocols** tab.

   A [Select] will appear next to the selected protocol.

   *Note: Only protocols listed under the **My Protocols** tab can be assigned to a quadrant. Refer to section 4.2.1 for instructions on how to add protocols to the **My Protocols** tab.*
3. Select [Next], type the start sample volume (in mL) and then select **Enter**. The **Sample Volume** dialog box will list a volume range possible for each protocol.

   *Note: The quadrant number to be used for that protocol will be highlighted in purple in the **Run Samples** screen. If more than one quadrant is needed for a protocol, adjacent quadrants will automatically be highlighted. The start volume for each protocol will also be noted on the **Run Samples** screen.*
4. Optional: Repeat steps 2 - 3 to run additional protocols. Up to four RoboSep™ protocols can be selected.

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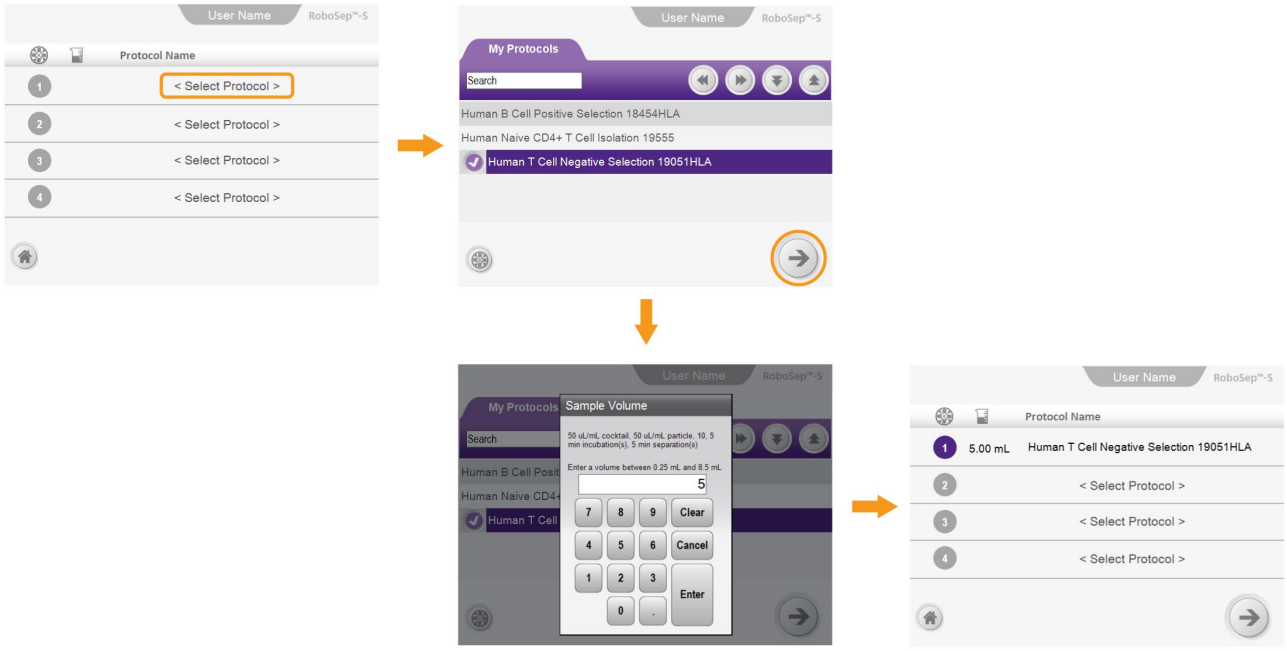


**Figure 20. Selecting a Protocol and Assigning it to a Quadrant**

*Note: If the same protocol has been selected in more than one quadrant, RoboSep™-S will automatically provide the option of sharing reagents across multiple quadrants. The quadrants that will utilize a single set of reagents can be selected in the* ***Resource Sharing*** *screen. RoboSep™-S will indicate if a single reagent set has insufficient volume to accommodate all the specified quadrants.*

*Note: To remove a protocol from an assigned quadrant, select the quadrant number icon on the* ***Run Samples*** *screen. An* ***X*** *will appear on the quadrant number icon (Figure 21). Select [Delete] to remove the selected protocol from the assigned quadrant. Any combination of quadrants can be selected in this manner.*

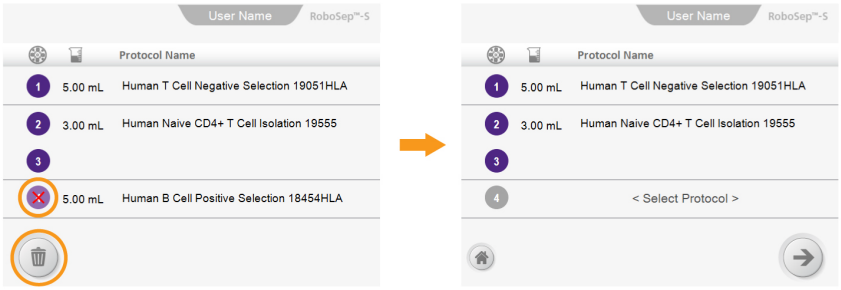


**Figure 21. Removing a Protocol from an Assigned Quadrant**

### 4.3.2 Preparing the Cells

Refer to the Product Information Sheet (PIS) that came with your cell separation kit for instructions on how to prepare cells for separation.

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### 4.3.3 Loading the Carousel and Starting a Run

RoboSep™-S comes with a RoboSep™ Service Rack to hold and organize reagents and sample tubes prior to loading them onto the carousel (Figure 22). The rack can also be used to hold the tube caps during the separation protocol. Place the caps upside down in the rack's designated spots.

**Figure 22. RoboSep™ Service Rack.** Tubes and vials placed in the rack before loading the carousel. Quadrant numbers are noted on the side of the rack.

Use the following instructions to load resources (i.e. reagents, samples, tubes and tip racks) onto the carousel:

1. Select [Next] on the **Run Samples** screen after selecting the desired protocols.
2. Verify that you have sufficient volume of reagents before loading them into the carousel. Ensure that all lids/caps are removed from each resource before loading onto the carousel.

   *Note: The **Carousel Loading** screen will indicate the reagent volumes required for the separation based on the sample volume assigned (Figure 23).*
3. Select a resource (e.g. Magnetic Particles) from the resource list on the **Carousel Loading** screen, then place the resource in the corresponding position of the carousel (highlighted in dark purple), without the cap on.

   *Note: Ensure the resource is loaded in the correct quadrant. The quadrant number is displayed both in the bottom left corner (highlighted in dark purple) and in the carousel schematic on the **Carousel Loading** screen (Figure 23). Some RoboSep™-S protocols may require reagent resources to be placed in positions with conflicting symbols (e.g. Magnetic Particles [triangle] assigned to the circle position); these exceptions are noted in the list of reagent resources provided on the display screen and are correct.*
4. Scroll down the resource list until all resources have been placed in the carousel. Ensure all resources are oriented straight and firmly pushed all the way down into the carousel.

   *Note: The position for the RoboSep™ Buffer Bottle will not appear on the carousel schematic on the **Carousel Loading** screen. The buffer bottle should be loaded in its compartment (Figure 1).*
5. Optional: Scan barcodes to record reagent-specific information such as catalog numbers, lot numbers, and expiration dates (section 4.3.4). Select [Barcode scanner] on the **Carousel Loading** screen (Figure 23) to scan desired barcodes for resources loaded in each quadrant. Once all scanning is finished, select [Save] to save the information. Resource-specific information will be recorded in the End-of Run Reports for each protocol (section 5.1).

   *Note: Sample ID and Reagent Lot IDs can also be manually entered.*
6. Select [Run] on the **Carousel Loading** screen to start the protocol. A **Run Progress** screen will appear after approximately one minute (Figure 23).

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*Note: If more than one quadrant is used during the run, you will be asked to load the remaining quadrants as needed until all resources have been placed into the carousel. If a hydraulic fluid warning dialog box appears, refill the hydraulic bottle with sterile deionized water and prime the hydraulic system as described in section 3.5 before continuing.*

*Note: Users can pause a separation by selecting* *[Pause] or stop a run altogether by selecting* *[Stop]. In both cases RoboSep™-S will complete the current action before stopping. To resume a run after pausing, select* ***Resume****. RoboSep™-S will* ***Home*** *the carousel and resume the separation. If the run is stopped, the run cannot be restarted from where it was stopped and will need to be set up again from the start.*

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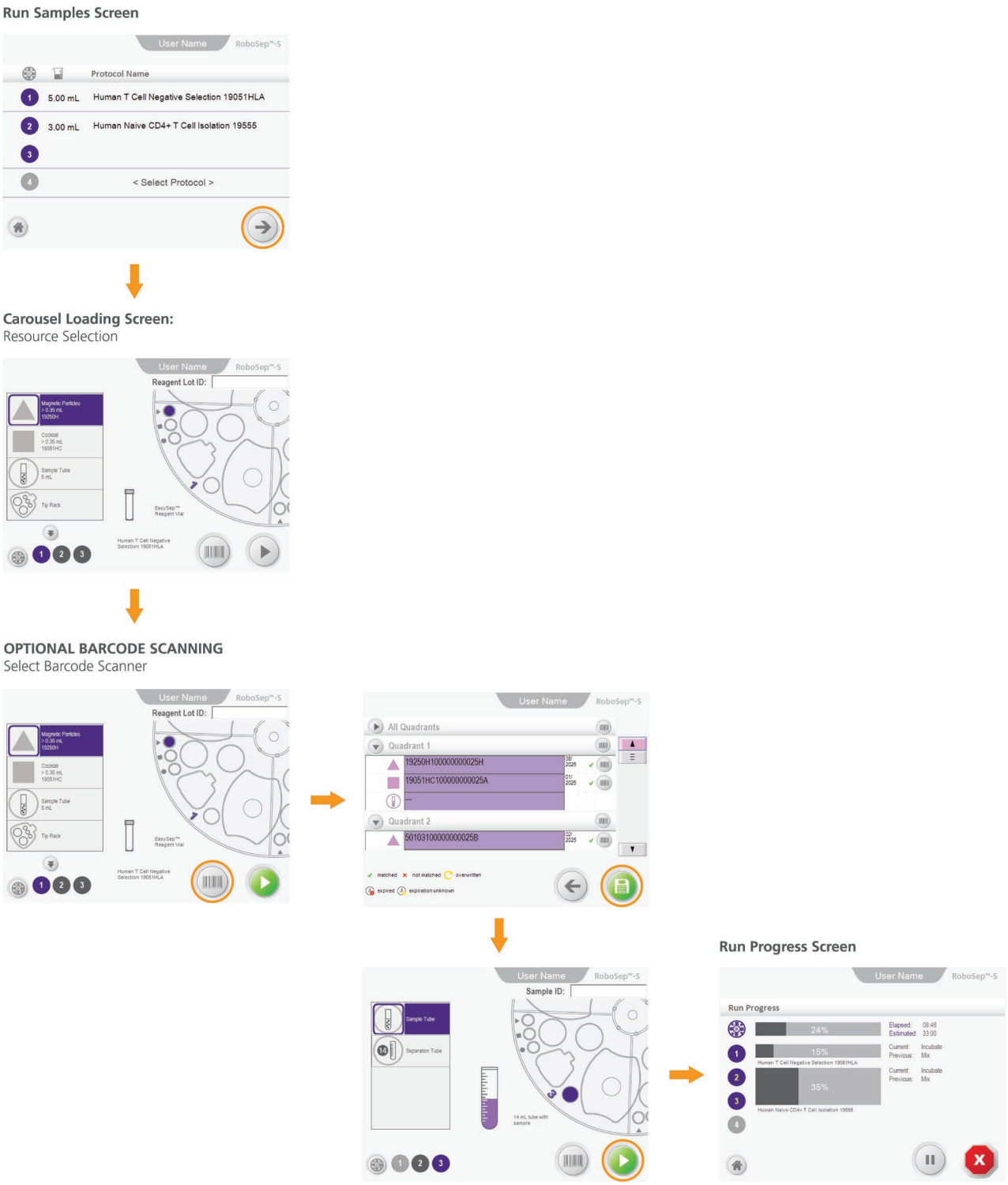


**Figure 23. Loading the Carousel and Running a Protocol**

### 4.3.4 Scanning Barcodes

It is optional to scan the EasySep™ vial barcodes to record reagent-specific information, such as catalog and lot numbers. This can be done using the RoboSep™-S built-in scanner or using a handheld barcode scanner (optional). For standard EasySep™ kits (i.e. non-custom), RoboSep™-S will also detect if the correct barcoded EasySep™ vial has been loaded in the appropriate position in the carousel and if the vial is expired. Vial catalog IDs will be shown in the **Resources** screen, and this information is recorded in the End-of-Run Reports for each protocol that is run (section 5.1).

*Note: If the user labels sample tubes with barcodes, these can be scanned by the user with a manual barcode scanner.*

By default, all barcodes will be scanned. If you do not want to scan all barcodes at once during each run, edit the user profile preferences and deselect the "Enable autoscanning of barcodes" option (section 4.1.3). Then select [Barcode scanner] on the **Carousel Loading** screen (Figure 23) to scan desired barcodes for resources loaded in each quadrant. Once all scanning is finished, select [Save] to save the information. Refer to Table 3 for the various messages and icons that may appear on the screen after barcode scanning.

**Table 3. On-Screen Messages and Icons After Barcode Scanning**

| ON-SCREEN MESSAGE | EXPLANATION |
|---|---|
| Scanned Catalog # shown in resource screen<br>Icon: ✓ matched | Scanned Catalog # matches the expected Catalog # based on chosen protocol |
| Yellow flashing warning message:<br>Scanned Catalog # shown in resource screen | Scanned Catalog # was **not** expected due to use of custom protocol, etc. |
| Red flashing error message:<br>Scanned Catalog # shown in resource screen<br>Icon: ✗ not matched | Scanned Catalog # **does not** match the expected Catalog # based on chosen protocol |
| Yellow flashing message:<br>"NONE_DETECTED" | No barcode detected; Catalog # not applicable due to use of custom protocol, etc. |
| Red flashing error message:<br>"NONE_DETECTED"<br>Icon: ✗ not matched | No barcode detected; Catalog # was expected based on chosen protocol |
| Icon: expired | Indicated reagent vial was determined to be past its expiration date based on scanned barcode data. |
| Icon: expiration unknown | Expiry date for indicated reagent vial is unknown. Either no barcode detected or scanned barcode does not contain expiry date data. |
| Icon: overwritten | Data was manually overwritten after barcode scanning |

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### 4.3.5 Collecting Isolated Cells

A beep will notify you once the run has been completed. To collect the isolated cells:

1. Select [Unload] from the **Run Progress** screen (Figure 24).
2. Open the RoboSep™-S lid, if necessary.
3. Collect the tube(s) from the quadrant containing the desired isolated cells as indicated on the **Unloading** screen (Figure 24). Click on each quadrant icon on the screen to ensure you have collected all tubes.
4. Unload the rest of the carousel. Store reagents appropriately and discard the used RoboSep™ Filter Tip Rack as well as any waste and remaining tubes. The instrument is now ready for another isolation.

**Figure 24. Collecting Isolated Cells at the End of a Protocol Run.** The desired isolated cells are in the tube highlighted in color in quadrant #1 of the **Unloading** screen.

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# 5.0 Report Files

Two types of report files are automatically saved during RoboSep™-S operation: RoboSep™-S End-of-Run Reports (section 5.1) and log files (section 8.1). RoboSep™-S End-of-Run Reports contain details of each run as entered by the operator, while log files contain more detailed information about instrument operation.

## 5.1 RoboSep™-S End-of-Run Report Files

RoboSep™-S End-of-Run Reports contain information such as the operator ID (User Profile), protocol name, run time, reagent information, sample ID, and volumes used.

EasySep™ reagent lot numbers as well as sample ID information can be entered before each run at the time of loading the carousel (section 4.3.3).

To access RoboSep™-S End-of-Run Reports:

1. Select [Reports] from the **Home** screen.
2. Select the desired report you want to view. A [Select] will appear to the left of the selected report.
3. Select **View Report** to view details of the report directly on the software user interface (Figure 25).

   *Note: Multiple reports can be selected and saved onto a USB drive by selecting "Save Reports to USB". Reports are saved in a PDF format and can be viewed using a PDF reader.*

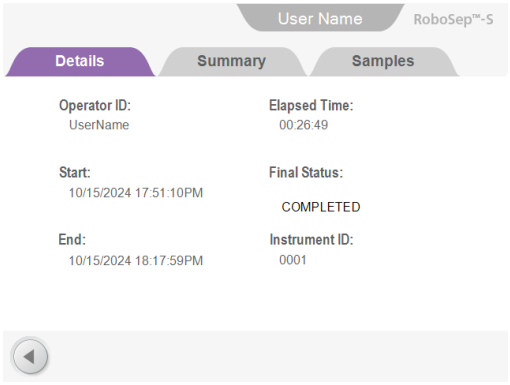


**Figure 25. Report Details View**

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# 6.0 Care and Maintenance

As RoboSep™-S uses disposable pipette tips in a column-free system, no daily maintenance is required. However, the following routine maintenance and cleaning steps are recommended to ensure optimal performance, reliability, and longevity of your instrument:

- Lightly spray a soft, clean towel with 70% ethanol or 70% isopropanol and wipe clean the instrument's external surfaces. (section 6.2.1).
- Verify that the hydraulic fluid bottle is full of sterile deionized water (section 3.5).
- Clean the tip head (section 6.1).

## 6.1 Cleaning the Tip Head

Use the RoboSep™ Tip Head Polishing Compound (Catalog #20119) provided with the instrument to clean the tip head. Do not apply other cleaning agents to the tip head.

*Note: The RoboSep™ Tip Head Polishing Compound can be conveniently stored in its designated compartment in the instrument (Figure 1).*

Over time, the tip head can accumulate a thin film of plastic from repeated loading and unloading of pipette tips. This accumulation can prevent RoboSep™-S from stripping the disposable pipette tips from the tip head. RoboSep™ Tip Head Polishing Compound is specially formulated to help remove this build up and disinfect the tip head when used as described below:

1. Apply 1 - 2 drops of RoboSep™ Tip Head Polishing Compound to a clean paper towel or other non-abrasive laboratory wipe.
2. Wipe the RoboSep™-S tip head.
3. Use a clean paper towel or other non-abrasive laboratory wipe to polish the tip head. Ensure that all traces of the cleaner are removed.

## 6.2 Cleaning RoboSep™-S

### 6.2.1 External Surface

It is recommended to clean RoboSep™-S by lightly spraying a soft, clean towel with 70% ethanol, 70% isopropanol, or diluted bleach solution (e.g. 1 in 10 dilution of 5% sodium hypochlorite solution) and then using the towel to wipe clean the instrument's external surfaces. If using diluted bleach solution, wipe the instrument's external surfaces afterwards with a towel sprayed with water to remove any leftover.

*Note: Never spray the instrument directly with cleaning solution. It may result in fluid entering the instrument via the openings present on the instrument enclosure, which can potentially damage the instrument.*

To avoid fluid seeping behind the touchscreen's external surface, it is recommended to wipe down the touchscreen with another dry towel afterwards. Do not allow excess fluid to pool at the margins of the touchscreen.

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### 6.2.2 Internal Surface

If accidental spilling of biological material occurs in the carousel area of the instrument or if more thorough cleaning is needed:

1. Remove all reagents and materials (including magnets) from the carousel.
2. Rotate the carousel so that quadrant #1 faces the front side of the instrument.
3. Unscrew the black central knob (Figure 26A) counterclockwise until the threads have disengaged.
4. Lift out the carousel.
5. Clean any spilled biological material according to the good laboratory practices described by your institution. Clean the carousel and magnets by lightly spraying with 70% ethanol or 70% isopropanol and wiping clean with a soft, clean towel. Exercise caution when cleaning the gaskets located within the reagent vial and 14 mL sample tube locations. Ensure you do not overly bend or permanently crease the plastic fingers of the gaskets during the cleaning process.

   *Note: Never spray the instrument directly with cleaning solution. It may result in fluid entering the instrument via the openings present on the instrument enclosure, which can potentially damage the instrument.*
6. Place the carousel back into the instrument so that quadrant #1 faces the front side of the instrument and screw the central knob clockwise until locked back into place.

*Note: After cleaning the instrument, ensure that the disc at the base of the robotic arm is flat (*Figure 26B*). To verify correct placement of disc, manually rotate the arm in both directions. The disc should always sit flat and rotate smoothly along with the arm.*

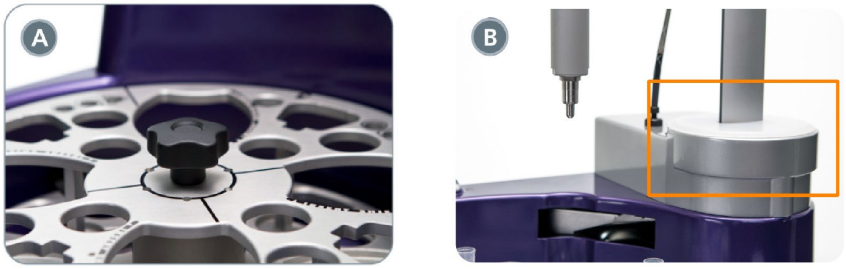


**Figure 26. (A) Black Central Knob Used to Remove the Carousel and (B) Disc at the Base of the Robotic Arm**

## 6.3 Replacing the Fuses

If RoboSep™-S does not turn on after plugging it in and following the startup procedure (section 3.3), the fuses may need to be replaced.

Two fuses are located on the back of the instrument next to the power supply outlet and the main power switch (Figure 11). To replace the fuses:

1. Ensure that RoboSep™-S is shut down (section 3.4) and that the main power switch located on the back of the instrument (Figure 11) is turned OFF.
2. Unplug the instrument and open the fuse box.
3. Examine the fuses and replace any faulty fuse with a FB 4 A 250 V~.
4. Reinsert the fuse box containing the new fuse(s) in its slot. Press gently until it snaps back into place.
5. Plug in the instrument and start up RoboSep™-S (section 3.3) to check if it turns back on.

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## 6.4 Help Videos

Help Videos are available on the RoboSep™-S instrument. To access **Help Videos**, select [Help] from the **Home** screen. Select the **Help Videos** tab to view the list of videos available (Figure 27). Use the scroll bar on the right side of the screen to scroll through the list of videos available. Selecting a video will automatically play the video at full screen via Windows Media Player. Videos can be paused or stopped using Windows Media Player's user interface. If a video is played to the end or stopped, Windows Media Player closes and the software returns to the **Help Videos** screen.

*Note: RoboSep™-S software version 1.2.0.2 or later is required to play Help Videos. If Help Videos are not available or cannot be played, they can be viewed online. Contact us at techsupport@stemcell.com for additional assistance in accessing the videos.*

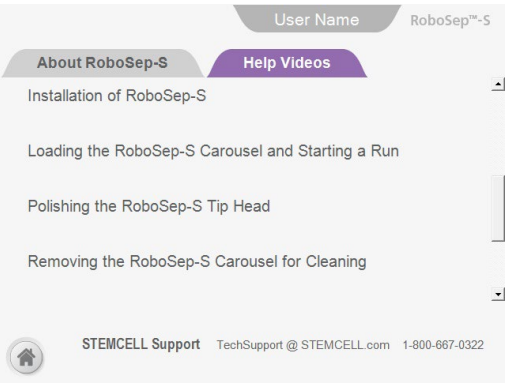


**Figure 27. Help Videos Available for Viewing**

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# 7.0 Specifications

| | |
|---|---|
| Capacity | Labels and separates up to 4 samples simultaneously<br>Sample volume: from 0.25 - 8.5 mL for each sample |
| Dimensions (with lid) | 42 cm W x 42 cm D x 52.2 cm H<br>16.5” W x 16.5” D x 20.5” H |
| Weight | 22 kg (48.5 lb) dry weight (without magnets)<br>58 kg (123 lb) shipping weight |
| Power Requirements | 100 - 240 V~, 50/60 Hz, 65W<br>2 x fuses: FB 4 A 250 V~ |
| Optimal Operating Conditions | 15 - 30°C<br>20 - 85% relative humidity (non-condensing)<br>Not specified for use inside an incubator or cold room<br>Does not require placement in a biohazard safety cabinet<br>Indoor use only |
| Storage and Shipping Conditions | -30°C to 50°C<br>10 - 90% relative humidity |
| Applied Standards | Certified to CAN/CSA STD 22.2 No. 61010-1-12<br>Conforms to UL STD 61010-1:2012<br>Conforms to IEC STD 61326-1:2012 / EN STD 61326-1:2013<br>FCC Part 15 Subpart B: 2014<br>ICES-003:2014 |
| Meets all the Provisions of the Indicated European Directives | 2014/35/EU (Low Voltage Directive) and 2014/30/EU (EMC Directive) |

RoboSep™-S is designed and manufactured so that it does not endanger the safety of operators when properly installed, maintained, and used in applications for which it was intended. RoboSep™-S meets the requirements of European Directives 2014/35/EU and 2014/30/EU. RoboSep™-S meets the requirements of CAN/CSA-C22.2 No. 61010-1-12 and UL standard No. 61010-1:2012 (safety requirements for electrical equipment for measurement, control, and laboratory use).

The RoboSep™-S unit has the following symbol affixed to the rear:

This waste electrical and electronic equipment (WEEE) directive symbol denotes that the device should not be disposed of in municipal waste collection centers. RoboSep™-S has been designed for easy dismantling and recycling. Contact STEMCELL Technologies regarding end-of-life care for RoboSep™-S.

For more information on RoboSep™-S warranties, refer to www.stemcell.com or contact us at techsupport@stemcell.com.

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# 8.0 Troubleshooting

## 8.1 Log Files

To assist with troubleshooting and diagnostics, a STEMCELL Technologies representative may ask to receive the log files.

To access RoboSep™-S log files:

1. Select [Maintenance] from the **Home** screen.
2. Select [Diagnostic Package]. Saving Diagnostic Package pop up window will appear on screen (Figure 28).
3. If saving video log and/or error video log files, specify date range to obtain required videos. Windows Events and End of Run Reports can also be included in the diagnostic package by selecting the checkbox (Figure 28).
4. Insert a USB drive into one of the USB ports of the RoboSep™-S (Figure 1).
5. Select to proceed forward.
6. Navigate to the USB drive folder where you want to save the log files. The files will automatically be transferred onto the USB drive.

   *Note: Including video logs, error video logs and end of run reports is only possible with software version 1.5.1 and onwards. Refer to **Section 8.1.1 Video Log Files** if using an earlier software version.*

   *Note: This may take a while depending on the size of the files being transferred.*

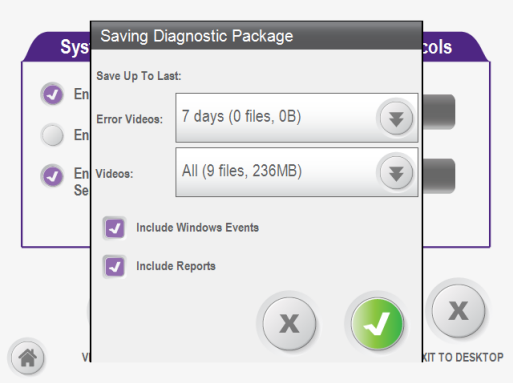


**Figure 28. Saving Diagnostic Package Window**

7. Remove the USB drive.

### 8.1.1 Video Log Files

To retrieve Video Log and Error Video Log files, follow the instructions below. Select [Maintenance] from the **Home** screen.

1. Select [Video Logs] from the **Maintenance** screen.
2. Insert a USB drive into one of the USB ports of the RoboSep™-S (Figure 1).

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3. Video Log and Video Error Log files are displayed on different tabs at the top of the screen. Select tab, then select videos to be retrieved by checking off checkbox beside the videos. Click “Copy” to copy the selected videos to your USB flash drive (Figure 29).

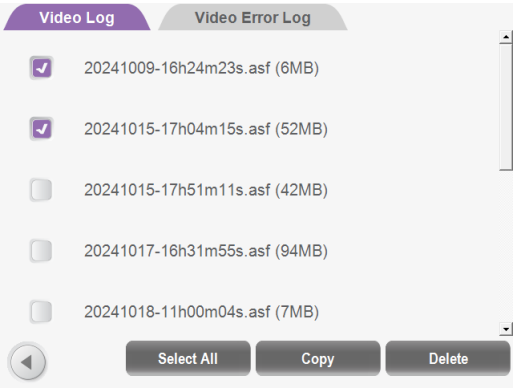


**Figure 29. Saving Video Log and Video Error Log files screen**

4. Navigate to the USB drive folder where you want to save the log files. The files will automatically be transferred onto the USB drive.

   *Note: This may take a while depending on the size of the files being transferred.*

5. Remove the USB drive.

## 8.2 Power Issues

| PROBLEM | POTENTIAL CAUSE | SOLUTION |
|---|---|---|
| RoboSep™-S will not start up | No power in outlet | Plug into an outlet that is known to be live |
| | Faulty fuse | Replace fuse (section 6.3) |
| | Faulty cable | Test by temporarily attaching PC computer tower cable in place of usual cable |
| | Faulty power supply | Contact Technical Support |

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## 8.3 Software/Hardware Issues

| PROBLEM | POTENTIAL CAUSE | SOLUTION |
|---|---|---|
| Operating system fails to start. BIOS screen error is displayed or beeping is heard emanating from instrument. | RAM disconnected or Operating System software corruption | Copy any error messages displayed and contact STEMCELL Technologies Technical Support |
| Operating system boots up but RoboSep™-S fails to fully initialize | Power switch (front of instrument) not left off long enough after shutdown. It takes up to 10 seconds for the electronics to fully reset after the power switch has been turned off. | After shutdown, turn off the power switch and wait 10 seconds before turning the power back on again |
| RoboSep™-S software application fails to start | Ethernet cable is connected | Disconnect Ethernet cable and restart the instrument. If issue persists, contact STEMCELL Technologies Technical Support. |
| RoboSep™-S fails to shut down | Previous run not complete or needs to be unloaded | Let run finish. Press **Unload** on the **Run Progress** screen. |
| RoboSep™-S fails to resume a paused run | The lid is open | Close the lid and press **Resume** on the touchscreen |
| Cannot add protocols in the **My Protocols** tab | Protocols are assigned to a quadrant | Remove protocols assigned to any quadrant and then add protocols to a user profile (section 4.2.1) |
| Touchscreen not functioning | Physical damage to screen or recalibration problem | Contact STEMCELL Technologies Technical Support |

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## 8.4 Mechanical Performance Issues

| PROBLEM | POTENTIAL CAUSE | SOLUTION |
|---|---|---|
| Barcode scanning fails | Barcode scanner cannot read barcode label on vial. | Check the barcode label is not damaged. Twist the vial and scan the barcode again. |
| Unsuccessful tip pickup | Tip rack not secure or seated properly in the carousel. | Ensure tip rack is properly inserted and flush against the carousel. |
| | RoboSep™-S arm disturbed during a protocol run. | Record the current step of the protocol run. Abort current run. If appropriate, finish separation manually. Otherwise, prepare new sample(s) and restart the protocol from the beginning.<br>If issue persists, contact STEMCELL Technologies Technical Support. |
| Tips not well aligned with tubes | Tip rack not secure or seated properly in the carousel. | Ensure tip rack is properly inserted and flush against the carousel. |
| | RoboSep™-S arm disturbed during a protocol run. | Record the current step of the protocol run. Abort current run. If appropriate, finish separation manually. Otherwise, prepare new sample(s) and restart the protocol from the beginning.<br>If issue persists, contact STEMCELL Technologies Technical Support. |
| Tip stripping failure | Plastic buildup on tip head. | Clean tip head using RoboSep™ Tip Head Polishing Compound (section 6.1). Do not use ethanol. |
| Robotic arm stuck and bouncing up and down in fully extended position | Homing flag on carousel is misaligned. | Power off the instrument and physically move the arm all the way down. Start instrument again. If issue persists, contact STEMCELL Technologies Technical Support. |
| Tip rack separates when removing the lid to open it | Excess force applied when removing the tip rack lid. | Ensure only the top lid is removed. |
| Instrument waits for approximately one minute with tip attached | This is a normal operation to optimize the overall run time of the instrument. | Contact STEMCELL Technologies Technical Support to change the default threshold time. |

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## 8.5 Liquid Handling Performance Issues

| PROBLEM | POTENTIAL CAUSE | SOLUTION |
|---|---|---|
| No water ejected from the tip head prior to run | Priming step missed or incomplete | Refill the hydraulic fluid bottle and make sure the connection between the bottle and tubing is secure by disconnecting and reconnecting the quick connect firmly |
| Leaking water from tip head onto the tips' filter inserts | Compromised Teflon tube or leak in the hydraulic system | Take a photo of the end of the tip head and contact STEMCELL Technologies Technical Support |
| Dripping of sample from pipette tips onto carousel | Incomplete seal between the tip head and disposable tip | Clean tip head and replace the tip rack (use new tips) |
| | A leak in the hydraulic system | Clean tip head and replace the tip rack (use new tips). If issue persists, contact STEMCELL Technologies Technical Support. |
| Liquid transfer not taking place or not accurate during a protocol run | Hydraulic fluid bottle has run out of water | Refill hydraulic fluid bottle and run Prime protocol (section 3.5) 3 - 5 times |
| | Compromised Teflon tube or leak in the hydraulic system | Take photo of the end of the tip head and Contact STEMCELL Technologies Technical Support |
| Hydraulic fluid sputtering out of tip head/particulate matter present in hydraulic fluid lines | Hydraulic fluid line contamination | Replace contents of hydraulic fluid bottle with 70% isopropanol or ethanol and prime > 4 times. Leave alcohol in line for 1 hour. Replace contents of hydraulic fluid bottle with sterile deionized water and prime > 5 times. If problem persists, take a photo of the end of the tip head and contact STEMCELL Technologies Technical Support. |
| Backflow of sample/blood into hydraulic fluid bottle | Faulty valves within pump | Take photo of hydraulic fluid bottle and contact STEMCELL Technologies Technical Support |
| Reagents left in tips | This is a normal operation and is required to meet the accuracy requirements for low volume reagent addition. The residual volume should be ≤ 20 µL. | If the residual volume in the tips is > 20 µL, take a photo of the tips in question and contact STEMCELL Technologies Technical Support |
| Residual diluted sample volume left in tubes | Under most normal conditions, RoboSep™-S leaves a residual volume of ≤ 250 µL in tubes | If the volume of the diluted sample is > 250 µL, measured with a micropipette, take a photo of the tube in question and contact STEMCELL Technologies Technical Support |

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## 8.6 Barcode Scanning Issues

| ON-SCREEN MESSAGE | EXPLANATION |
|---|---|
| Scanned Catalog # shown in resource screen<br>Icon: ✓ matched | Scanned Catalog # matches the expected Catalog # based on chosen protocol |
| Yellow flashing warning message:<br>Scanned Catalog # shown in resource screen | Scanned Catalog # was **not** expected due to use of custom protocol, etc. |
| Red flashing error message:<br>Scanned Catalog # shown in resource screen<br>Icon: ✗ not matched | Scanned Catalog # **does not** match the expected Catalog # based on chosen protocol |
| Yellow flashing message:<br>“NONE_DETECTED” | No barcode detected; Catalog # was **not** expected due to use of custom protocol, etc. |
| Red flashing error message:<br>“NONE_DETECTED”<br>Icon: ✗ not matched | No barcode detected; Catalog # was expected based on chosen protocol |
| Icon: expired | Indicated reagent vial was determined to be past its expiration date based on scanned barcode data. |
| Icon: expiration unknown | Expiry date for indicated reagent vial is unknown. Either no barcode detected or scanned barcode does not contain expiry date data. |
| Icon:  overwritten | Data was manually overwritten after barcode scanning |

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## 8.7 Failed Protocol Run Recovery

*This section is applicable for RoboSep™-S instruments with software version 1.5.1 and later.*

If an error or failure occurs partway through a protocol run resulting in the unexpected shutdown of the instrument hardware (e.g. power failure) or software (e.g. software crash), RoboSep™-S will still keep track of the protocol run progress. Upon restarting of RoboSep™-S, the **Error Recovery** screen will be displayed automatically (Figure 30).

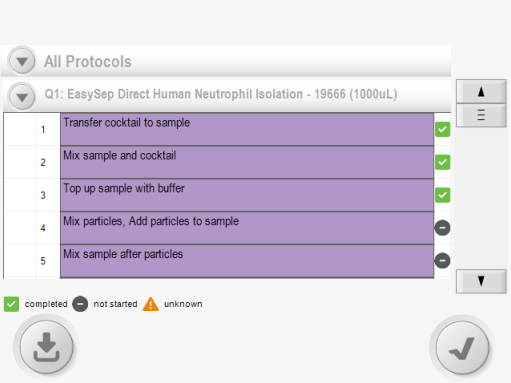


**Figure 30. Error Recovery Screen**

The **Error Recovery** screen will display the steps completed and the steps remaining in the failed protocol run. Using this information, you may be able to complete the remaining steps of the protocol run manually. The information displayed on screen can be downloaded in a report format onto a USB flash drive plugged into the instrument by selecting the button.

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# 9.0 Software and Hardware Updates

## 9.1 Software Updates

To find the current RoboSep™-S software version number, visit www.stemcell.com/software-updates.

The following table outlines the new functionality and/or fixes to RoboSep™-S software versions.

| ROBOSEP™-S SOFTWARE VERSION | NEW FUNCTIONALITY/FIX |
|---|---|
| 1.2.1.1 | • Pre-set user profiles removed<br>• Updated branding<br>• Barcode scanning updated to include reagent lot number<br>• Bug fixes |
| 1.3.0.0 | • Customization of reagent names displayed on graphical user interface (GUI): Reagent names can now be customized via the Protocol Editor.<br>• Update to barcode scanning logic, as required for new format of catalog numbers<br>• Update to End of Run report template<br>• Bug fixes |
| 1.4.0.0 | • Customized protocol consumable names displayed on graphical user interface (GUI).<br>• Update to startup splash screen: Pulsing dots have been replaced by an orange bar delineating startup progress. |
| 1.5.X* | • User Interface Changes, including:<br>  ○ User Profile Selection screen upon startup of instrument<br>  ○ Separated User Selection and User Management<br>  ○ End of Run Report detail view replacing PDF viewer<br>  ○ Added Lab Manager Menu<br>• Implemented failed protocol run recovery feature and downloadable report<br>• Addition of reagent expiry date verification during reagent vial barcode scanning<br>• Addition of reagent expiry date to End of Run Report<br>• Changes to Diagnostic Package including<br>  ○ Option to include video logs and reports<br>  ○ Include Windows events by default<br>  ○ Removal of FTP option<br>• Improved accuracy of required buffer volume displayed at Carousel Load screen<br>• Improved accuracy of estimated protocol run time displayed at Run Progress screen<br>• Change to carousel homing logic for improved positional accuracy<br>• Bug Fixes |

*This documentation applies to version 1.5.X where X represents minor updates or patches that do not affect the functionality described herein.

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## 9.2 Hardware Updates

In 2018, the RoboSep™-S carousel was updated to accommodate multiple reagent vial sizes, including reagents found in the EasySep™ RBC Depletion Reagent (Catalog #18170) and various EasySep™ Direct Human Cell Isolation Kits. This carousel requires software version 1.2.0.2 or later. Contact us at techsupport@stemcell.com for more information.

# 10.0 Related Products

| PRODUCT | SIZE | CATALOG # |
|---|---|---|
| RoboSep™ Service Rack | 1 Rack | 20101 |
| RoboSep™ Buffer | 250 mL | 20104 |
| RoboSep™ Buffer (5X Concentrate) | 250 mL | 20124 |
| RoboSep™ Filter Tips | 8 Racks | 20125 |
| RoboSep™ Tip Head Polishing Compound | 7 mL | 20119 |

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TECHNICAL MANUAL

# RoboSep™-S: The Fully Automated Cell Separator

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