

# Spartan<sup>®</sup> Legionella Detection System

**Operator's Manual** 



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Spartan<sup>®</sup> Legionella Detection System Operator's Manual



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## PREFACE

The Spartan Legionella Detection System is the first on-site DNA test for *Legionella pneumophila* in water systems, such as cooling towers, domestic hot water systems, fountains, hot tubs, and humidifiers. It quantifies the amount of live Legionella bacteria in a water sample in 45 minutes. For the first time, buildings can get actionable Legionella results on demand.

The system consists of a portable DNA analyzer called the Spartan Cube<sup>®</sup>, single-use disposable test kits, and a laptop with an easy-to-use interface. Spartan's technology is based on a highly-accurate Nobel-Prize winning chemistry called quantitative Polymerase Chain Reaction (qPCR) and it is designed to meet the objectives of ISO/Technical Standard 12869:2012: "Water quality--Detection and quantification of Legionella spp. and/or *Legionella pneumophila* by concentration and genic amplification by quantitative polymerase chain reaction (qPCR)".

## **HOW IT WORKS**

Sample water is added to the Concentration System with a syringe. Through a series of filters and valves, any Legionella bacteria in the sample water is isolated and dispensed into a test cartridge.

The test cartridge is then placed in the Spartan Cube<sup>®</sup> where the sample undergoes a thermal cycle reaction to quantify any *Legionella pneumophila* bacteria present. Results are available in 45 minutes.



## TABLE OF SYMBOLS

Symbols are used throughout this document or on the product. Symbols are used as visual signals to point out important information. The table below lists the symbols and a brief description of their meanings.

	Warning, Risk of Danger – This symbol is used to indicate that non-compliance with the instructions or procedures may lead to physical injury, or even death, or could damage the instrument.
i	Important Note – This symbol is used to bring the user's attention to an important annotation. Indicates the need for the user to consult the instructions.
	This symbol indicates the manufacturer of the device or system component.
Â	Caution, Risk of Electrical Shock – This symbol is used to indicate that certain precau- tions must be taken to avoid electrical shock.
SN	Device serial number – Symbol denotes the manufacturer's serial number.



## INTRODUCTION

Thank you for using the Spartan Legionella Detection System.

If you have any questions or concerns, please contact Spartan Bioscience by e-mail at legionella.support@spartanbio.com or by telephone from 9 am-5 pm ET at +1.877.228.7756.

#### Legionella Concentration System

The Spartan Legionella Concentration System comprises all the components necessary to transfer the Legionella bacteria from a water sample to a test cartridge. Analysis of the sample in the test cartridge is performed using the Spartan Cube<sup>®</sup> Platform.

#### Spartan Cube<sup>®</sup> Platform

The Spartan Cube<sup>®</sup> is a portable, multi-well thermal cycler with optical detection capabilities. The device has two optical detection channels. A laptop is provided that connects to the Spartan Cube. The laptop contains software for performing a test and viewing test results.

Each instrument is uniquely identified by a serial number on the bottom of the Cube.





#### **Operating Requirements**

The Spartan Cube<sup>®</sup> Platform should be set up in an area that meets the criteria below. Failure to adhere to these constraints may result in poor performance.

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- The Spartan Cube<sup>®</sup> Platform is designed for indoor use only.
- Operate in an ambient temperature between 15°C and 30°C.
- Operate in an ambient relative humidity of 20% to 70%.
- Ensure adequate ventilation at the rear of the Cube. A minimum gap of 10 cm from the vents at the back of the device must be maintained.
- A minimum of 60x60 cm of desk space.
- Two electrical power outlets.
- Within range of a WiFi network with internet access (optional).

Users <u>must not</u> make any changes to the computer, software, instrument, or operating system.

The contents of the syringes may cause an allergic skin reaction for some operators. Refer to

the SDS located at https://support.spartanbio.com.

Specification	Min	Typical	Max	Comments
Electrical Compatibility	100VAC		240VAC	100 – 240 VAC, 50 – 60 Hz
Max Electrical Power	50W		200W	90W for Cube
DC Adapter Input Current			1.2A	
DC Adapter Operating Voltage		19V		+/- 5% as per power adapter
DC Adapter Operating Current			4.7A	Max current
USB Port		5VDC		
Operating Altitude			2000 m	
Operating Temperature	15		30	Degrees Celsius
Operating Humidity	10		80	% RH Non-condensing
Pollution Degree		2		
Storage/transportation conditions	-20		55	Degrees Celsius
	10		80	% RH Non-condensing
Spartan Cube <sup>®</sup> Mass		1.6 kg		
Spartan Cube <sup>®</sup> Platform Mass		5 kg		
Spartan Cube <sup>®</sup> Platform Dimensions		60x60 cm		

**Other Indications** 



- To disconnect from power supply: Press and hold the button on the back of the Cube for 2-3 seconds until the light on top of the Cube changes to yellow. The Cube will take a few seconds to power down. Remove the power cable from the electrical outlet and then remove the power cable from the Spartan Cube<sup>®</sup>.
- After receiving your Spartan Cube<sup>®</sup>, transport it in its original packaging to the location of intended use.
- When performing tests on biological and/or chemical samples, wear the appropriate personal protection equipment (PPE), such as disposable gloves, safety glasses, and masks.

The Spartan Cube<sup>®</sup> connects to a computer via a provided USB or an Ethernet cable.



## SYSTEM COMPONENTS



CONCENTRATION SYSTEM



## **TEST CARTRIDGE**



## SYRINGES



## SAMPLE BOTTLE



## **ORDERING INFORMATION**

To order new Legionella Concentration Kits or replacement parts, contact Spartan Sales at +1.877.228.7756.

## WARNINGS AND PRECAUTIONS

If you have any questions or concerns, please contact Spartan Bioscience by e-mail at legionella.support@spartanbio.com or by telephone from 9 am-5 pm EST at +1.877.228.7756.



Training

Before using this system, it is important to review all training materials and to follow the instructions in this manual.



The Spartan Legionella Detection System includes an electromechanical instrument called the Spartan Cube<sup>®</sup>. There is a potential danger of electrical shock or physical injury to the user if the instrument is not used according to the instructions given in this manual. Observe all general safety precautions which apply to electrical instruments.

- The power supply cord must be inserted into a power outlet with a protective earth contact (ground).
- Unplug the power supply cord from the power outlet before cleaning the instrument.
- Only use the supplied power cords or cables. If any of the cables become damaged or inoperable, please contact your Authorized Spartan Dealer for a replacement.
- Do not use the instrument near water or immerse the instrument in water.
- The instrument should be operated only with the power source supplied with the instrument and as indicated on the marking label of the power supply. If the power supply becomes inoperable, please contact your Authorized Spartan Dealer for a replacement.
- Always plug the power supply into the instrument, and then plug the power supply into the power outlet.
- Do not allow anything to rest on the power cord.
- Do not install the instrument where the power cord may be stepped on.
- To reduce the risk of electrical shock, do not disassemble the instrument. Refer servicing to Spartan authorized service personnel only.
- Do not overload power outlets because this may result in risks of fire or electrical shock.
- Unplug the power supply cord from the power outlet and refer to Spartan authorized service personnel if one or more of the following conditions exist:
  - The power supply cord or plug is damaged or frayed.
  - o Liquid has been spilled onto the instrument.
  - The instrument has been exposed to water.
  - The instrument does not operate normally by following the operating instructions.



#### Biological

The Spartan Legionella Detection System includes a mechanical device referred to as the Concentration System that prepares the bacteria found in a sample of water for analysis. Be aware for your own safety that all water samples have the potential to cause disease. Follow all applicable local, state/provincial, and/or national regulations. Wear appropriate protective clothing and gloves.

Observe the following precautions when using the Concentration System:

- Wear gloves when operating the Spartan Legionella Detection System.
- Discard the Concentration System if it or any of its components appear broken or damaged.
- Do not disassemble the Concentration System. If the system breaks during use, immediately discard the Concentration System.
- When used according to Spartan's instructions, concentrated bacteria are automatically inactivated during processing of the water sample; used Concentration Systems may be discarded with normal waste.
- Never open a cartridge after performing a test; this could lead to false positive results. If you are concerned that your system has been contaminated, follow the decontamination procedure below (see Maintenance section).
- After a test has finished, discard the cartridge immediately and ensure that your waste receptacles are regularly emptied. It is normal that, after disposal, 15-30 mL (1-2 tablespoons) of filtered, clean water may leak out of the concentration kit.
- Do not attempt to crush or compact Test Cartridges or Concentration Systems after their disposal; there is a needle inside which could become exposed.

#### Maintenance



If the instrument appears dusty, use a dry, static-free cloth to clean the surface of the instrument. Solids or liquids should not be allowed to fall into the sample loading area at any time because they could interfere with the optical detection apparatus. As a preventive measure, keep the lid closed at all times, except when samples are being loaded or unloaded. If debris or liquid has fallen into the Cube, it may be necessary to replace the dust screen inside the device. For a replacement dust screen and instructions on the replacement procedure please contact Spartan Bioscience by email at

legionella.support@spartanbio.com or by telephone from 9 am-5 pm EST at +1.877.228.7756.

If you are concerned that your system has become contaminated, such as by spillage of a biological sample or opening of a post-run cartridge, please follow the decontamination procedure:

- 1. Wipe the testing system, and any contaminated area around the system, with a paper towel moistened with a 10% bleach solution. Ensure that no liquid falls inside the Cube.
- 2. Wait for 15 minutes.
- 3. Use a cloth moistened with water to remove the bleach solution from the cleaned area.



If you have any issues or concerns about the instrument, please contact Spartan Bioscience by e-mail at legionella.support@spartanbio.com or by telephone from 9 am-5 pm EST at +1.877.228.7756.

#### Servicing

The Spartan Cube<sup>®</sup> System is designed to not require in-field calibration. The Positive System Control (PSC) is designed to detect a change in performance of either the Spartan Cube<sup>®</sup> Platform or the Spartan Legionella Detection Assay. When the PSC is triggered, you will receive an error code. Follow the troubleshooting information at <u>https://support.spartanbio.com/troubleshooting</u> when you encounter an error code. If you receive error codes repeatedly, please contact Spartan Bioscience by e-mail at legionella.support@spartanbio.com or by telephone from 9 am-5 pm EST at +1.877.228.7756 and arrange for factory recalibration.

## DISPOSAL

There are no special disposal requirements other than standard procedures used for the disposal of electrical and electronic devices. The unit itself does not pose any biohazard risks.

Spartan Bioscience supports European Union Directive 2012/19/EU regarding the waste of electrical and electronic equipment (WEEE). As such, final holders and resellers can return the electrical and electronic waste of the Spartan Cube<sup>®</sup> System free of charge. Arrangements may be made by contacting Spartan Bioscience at +1.877.228.7756 or <u>legionella.support@spartanbio.com</u>.

After performing a test, discard the Concentration system, syringes and plungers, and gloved test cartridge. The sample bottle is reusable (see rinsing instructions below).

### **GETTING STARTED**

#### **UNPACKING & SETUP**

Do not accept receipt of the shipping boxes if you observe any damage.

The Spartan Legionella Detection System installation is completed by following the steps below.

- 1. Remove the Spartan Cube<sup>®</sup>, laptop, and cabling from the shipping boxes.
- 2. Connect the Spartan Cube<sup>®</sup> power cable to the Spartan Cube<sup>®</sup>.
- 3. Connect the Spartan Cube<sup>®</sup> to the laptop using the provided cable.
- 4. Connect the power cable to the laptop.

#### TURNING ON THE SYSTEM



The Spartan Legionella Detection System user interface has been pre-loaded on the laptop. It will automatically run after you start the system, to start the system:

- 1. Turn on the Spartan Cube<sup>®</sup> using the power button on the back of the unit.
- 2. Turn on the laptop using the power button located on the right side of the device.

#### LOGGING IN

When you first load the Spartan Legionella Detection System software, the system will require you to log on. The default logon credentials are the following:

#### Username: Admin Password: Spartan123

When you first log in to the system, you will be required to change the password for this account.



Please note that if you forget or lose this password, it will be necessary to reinstall the software

and you will lose all of your historical test results.

This user account is an administrator account. An administrator can add additional users and turn off the password requirement for non-administrator users (refer to **Users & System Settings** section below).

#### DATA SHARING

The first time you launch the software, you will be asked if your facility has agreed to share data with Spartan. Please confirm that your business/organization consents to share data before launching the software for the first time and selecting the **Share data** option.

If you need to change the data sharing configuration of your system later, an administrator user can access the **Settings** menu at any time (see **Users & System Settings** below).

The data transfer is performed by a service that can be switched on and off in the taskbar.



#### CONNECT TO WiFi

For the most up-to-date software and support, Spartan recommends that you connect the laptop to the internet via your WiFi network. To connect the laptop to your WiFi Network:

- 1. Select the WiFi icon on the bottom right of the screen.
- 2. Select your WiFi network.
- 3. Provide any required login details.



#### **SETTING THE DATE & TIME**

To ensure that the timestamps on your test results are accurate, it may be necessary for you to set the time zone in Windows to match your Geographical location. To set the time zone:

Examine the time present on the bottom-right of the screen. To change the time to reflect your time zone:

- 1. Right-click on the date/time and select **Adjust date/time**.
- 2. Turn off the "set time zone automatically" setting.
- 3. Select the appropriate time zone.



#### **USERS & SYSTEM SETTINGS**

The laptop computer on which the Spartan Legionella Detection System software runs comes

pre-configured with a single Windows user account ("spartan"). Spartan Bioscience does not support the use of multiple Windows user accounts on the platform.

The Spartan Legionella Detection System software contains a variety of security options. In order to perform a test, a system operator name (i.e., username) must be selected. This may be the administrator account that is loaded by default onto the system, or a custom user account that has been added to the system.

A user can be a standard user or an administrator. Only administrators can add and remove users and water sources. Administrators can also set other system settings such as password requirements, user privileges, and other lock-out overrides. These settings are accessed in the Settings screen. To enter the Settings screen:

- 1. Turn on the laptop and log in as an administrator. The first time you use your system, the default user account has the username "Admin" and password "Spartan123".
- 2. Select **Options** in the top, right corner to open the options menu.
- 3. Select Settings.





By default, the software requires a password to perform a test. If you would prefer to not require nonadministrator operators to input a password to perform tests and access previous test data you can turn this feature off by the following:

- 1. Select **System** on the Settings screen.
- 2. Deactivate the option **Enable passwords for standard users**.

To add a user to the system:

- 1. Select **Users** on the Settings screen.
- 2. On the Users screen, select **Create** and fill out the pertinent information in the Create Account screen. You may also grant the user administrator privileges and enable or disable the user in this screen.



- 3. If passwords for standard users are not enabled, select **Save**. (If the user is an administrator, they will have to provide a password.)
- 4. If the system has been set to require all users to provide a password, or if the new user is an administrator, you will need to enter and confirm a password for the new user. Notify the user of this password.
- 5. Select "User must change password on next logon" to require the user to set their own password.
- 6. Select Save.

There are additional options in the Settings screen, including:

**Allow expired test kits**: Enabling this option allows standard users to perform tests with expired test kits. Note that this is not recommended as the result of a test performed with an expired kit may be inaccurate.

Allow standard users to export results: This option toggles the ability of standard users to print or save the test results onto a location on the laptop.

**Enable automatic Cube detection**: It is recommended that this feature remain on in order for the laptop to communicate with the Spartan Cube<sup>®</sup>.

**Reset system to factory defaults**: Selecting **Reset** will delete all data on the system and return the Spartan software to the state in which it was originally shipped.



#### **REGISTERING WATER SOURCES**

In order to perform a test, the water source being tested (e.g, cooling tower, shower, water fountain, hot tub) must be registered in the software. Once registered in the system, the water source will be available as a selection when performing a test.



Be sure to register each separate water source being tested so that subsequent analysis can be

performed on each water source. Note that when any changes are made to a previously registered water source, such as the street address or water source name, the system automatically updates the log so that the previous, historical testing data contains the new information.

Water sources must be associated with a Location (i.e., a building address), so at least one Location must be registered before registering any water sources.

Perform the following steps to register a Location:

1. Enter the Settings screen by selecting **Options** and then **Settings**.





2. Select Water Sources.





3. Select Add an address, fill out the appropriate fields on the right side of the screen, and select Save.



4. To add a water source, select Add a water source under the location.



- 5. Select the appropriate Water Type (e.g., Cooling Tower) from the Water Type dropdown menu.
- 6. In the Name field, provide a unique alias for your water source. The Name is the infor-

mation that will appear, together with the street address, as a selection when performing a test. Note that the software will not permit more than one water source with the same Name at the same Location.

7. Select **Save** to store the water source in the system. The water source will now be available as a selection when performing a test. Close the window to return to the main screen. You are now ready to perform your first test.





#### SETTING RESULT THRESHOLDS

In addition to providing a quantitative Legionella Concentration, test results on the Spartan Legionella Detection System can provide results with colour-coding that corresponds to pre-defined levels of Legionella concentrations. For example, a building operating in conformity with New York Administrative Code 17-194.1 could use the following threshold colour and quartile settings to distinguish 4 levels of Legionella concentrations:



Using these settings, a test result below 10 GU/mL would show the result with a green background, while a result between 101 and 1000 GU/mL would have an orange background (for additional details on test results, see the **Test Results** section below).



To set the thresholds on your system:

1. Enter the Settings screen by selecting **Options** and then **Settings**.

X	X
Options C	Options 👻
	Admin
	Settings 💦



2. Select Thresholds.



3. If you have a thresholds file, select **Import** and then navigate to and open the file. The file will then appear in the **Existing Thresholds** list.

Spartan Cube Legionella		X
Settings	Result Thresholds	Close 🗙
	Import new threshold Import	
	Existing Thresholds	
	No levels - Quantification only (active)	
	O NYC Code 17-194.1-(2016) View	
	O MD-15161 (2013) View	
	Save	
STATUS		2.0.0

4. Select the appropriate thresholds setting from the list and then select **Save**. (To examine the specific values of an existing thresholds setting, select **View** next to the threshold name.)



## SYSTEM PERFORMANCE

In the event *Legionella* is detected in a water sample, a value will be reported. Below is a summary of how the results can be interpreted:

Result	Confidence Interval
Reported Value < LOD <sup>a</sup>	90%
LOD< Reported Value< LOQ <sup>b</sup>	90%
Reported value > LOQ	95%

<sup>a</sup>LOD, limit of detection

<sup>b</sup>LOQ, limit of quantification

## TRAINING

Before testing water samples, each user should perform the training module in the software. The training module requires a training kit that comprises a training concentration system and a set of syringes and black screw. The training test is performed on a tap water sample.



U The Training Kit cannot be used to perform a test. The software will not allow a kit with a Training

Kit barcode to be used to perform a test.

To complete the training module, select **Options** and then **Start Training Module**. A brief video will provide you with an overview of the testing procedure. Please note that all of the test procedure steps presented in the video are provided on the computer screen when performing a test.

After the video completes, perform the training test by following the on-screen instructions. If the procedure was performed successfully, the system will provide a training certificate. If the system detects an irregularity in the sample, then it is recommended that the training test is repeated. If you experience two unsuccessful training tests in a row, please contact Spartan Bioscience at +1.877.228.7756 or legionella.support@spartanbio.com.



### LEGIONELLA DETECTION PERFORMING A TEST



Select **Run a test** and follow the instructions on the screen.

Run a test



When performing a test, please note the following important tips:

- 1. Sample preparation.
  - a. Because Legionella is a living organism that can replicate or expire within relatively short time intervals, it is recommended that the Spartan Legionella detection assay is performed with minimal delay after collection of the water sample. For "on-site" testing, Spartan recommends that the sample be tested on the same day (i.e., within 8-10 hours) as collection.
  - b. After the concentrated sample is dispensed into the cartridge, it should be immediately placed into the Spartan Cube<sup>®</sup> and analyzed.
- 2. Filling the yellow syringe.
  - a. **Normal procedure**: Ensure that you fill the yellow syringe until the plunger stops at the top. Note that this will be above the 20 mL mark (22 mL).



- b. Lower input volume (Troubleshooting): In certain circumstances (see Troubleshooting Table below and the Troubleshooting section at https://support.spartanbio.com), it may be necessary to use a lower volume of sample water. The following steps describe this procedure:
  - i. After beginning a test, select **Advanced** on the Select a Water Source Screen.
  - ii. Click the toggle to Enable troubleshooting mode.
  - iii. You will be instructed to fill the yellow syringe to 11 mL.



3. Before placing the Test Cartridge into the Spartan Cube<sup>®</sup>, ensure that there are no bubbles below the surface of the liquid in the sample. If there are bubbles present, gently tap on the tube to move the bubbles to the top of the tube.



#### CLEANUP

The Spartan Legionella Concentration System can be used only once. Discard the Concentration system with your normal waste after use.

The sample bottle is reusable. After a test, rinse the bottle three times with normal tap water and let dry.

After a test has finished, the Test Cartridge contains a large amount of amplified DNA. In order to prevent this DNA from interfering with subsequent tests, it is recommended that you seal the cartridge in a bag or disposable gloves before discarding with normal waste. If you believe your system has been contaminated (e.g., a post-run cartridge leaked or was opened), follow the decontamination procedure in the Maintenance section above.

#### SYSTEM

When not in use, the platform should be powered off. To shut down the system:

- 1. Press and hold the button on the back of the Cube for 2-3 seconds until the light on top of the Cube changes color. The Cube will take a few seconds to power down.
- 2. Shut down the laptop through the Windows menu.



#### **TEST RESULTS**

There are two ways to view test results:

- 1. Selecting View Results after a test has completed.
- 2. Reviewing previous tests in the test log.

Both methods will generate the same screen, which appears as in the example below.

lotes:	Notes about this test
Address:	123 Spartan St Spartan Town, Alberta, Canada 1A1 A1A
ater sourc	e: My Cooling Tower

Features of the Results screen:

**Legionella Concentration**: The Legionella amount as measured in the water sample is provided in genomic units per millilitre (GU/mL).

**Colour code**: The background colour of the Legionella Concentration represents the criticality of the result. There are up to four possible colours, which are determined by your settings (see **Setting Result Thresholds** section above):

- Green
- Yellow
- Orange
- Red

**Notes**: This field will contain the notes provided at the start of the test.

Water source: The water source selected at the start of the test.

**Start time**: The time at which analysis of the sample began.

**Threshold**: This field indicates which setting has been chosen to define the result thresholds (see **Setting Result Thresholds** section above).

**Result level**: This result specifies in which threshold level the Legionella Concentration falls.



#### **REVIEWING PREVIOUS RESULTS IN THE LOG**

The Spartan Legionella Detection System stores the results of every test performed on the system. To examine the results of a previous test, select **View the Log** from the initial screen in the interface and then select the test you wish to view. You can search for a specific test or tests by entering text in the search field. You may also sort the data based on the Start time, Water source, Notes, User, or Results by selecting the picture of the funnel ( $\mathbf{T}$ ) next to the desired sort criterion.

#### **PRINTING & SAVING INDIVIDUAL TEST RESULTS**

The results screen (see example above) contains options to print or save the test results. Selecting **Print** opens the Windows print dialog box. You may print to any printer installed on the system as per your printer manufacturer's instructions.

Selecting **Save PDF** enables you to save the results as a portable document file (.pdf) on any path available in Windows (e.g., a USB drive, a location on the hard drive of the laptop).

#### **RESULTS LOG AND EXPORTING TEST DATA**

In addition to saving individual test results as .pdf files, you can also export all the results or a subset of results from the log. This can be accomplished as follows:

- 1. Open the test log by selecting **View the log** on the main screen of the software.
- 2. Select the test or tests you wish to export. You can select all the runs by selecting the check box at the top of the selection column.
- 3. Select Export.
- 4. The dialog box will indicate how many results have been selected.
- 5. By default a table of all the results will be exported. There are two additional options that may be selected.
  - a. **Include detailed run information**: Exports the raw data with each exported test. (This option is unavailable if the Data Sharing is turned off in the Settings.)
  - b. **Include extra diagnostic data**: Exports additional data that may help to troubleshoot issues or provide feedback on software use.
- 6. Select the **Export** button.
- 7. A save window box will now appear, enabling you to browse to a location (e.g., a USB drive, a location on the hard drive of the laptop) to save the data.



## TROUBLESHOOTING AND FREQUENTLY ASKED QUESTIONS

Potential solutions to common issues are provided below. If you are having additional difficulty using the Spartan Legionella Detection System, please contact Spartan Bioscience by e-mail at legionella.support@spartanbio.com or by telephone from 9 am-5 pm EST at +1.877.228.7756.



For the most up to date troubleshooting information, visit <u>https://support.spartanbio.com</u>. The username and password for the Support Portal are "legionella" and "Support!613z", respectively.

1. I have already completed my training test, but would like to review the training video again.

The training video can be opened via the help screen, which is accessed by selecting **Options** after logging in to the software.

2. I got "Unsuccessful Test" when performing the training module.

Examine the cartridge before placing it in the Spartan Cube<sup>®</sup> (or examine the cartridge that resulted in the Unsuccessful Test). The cartridge should be almost completely filled with liquid as in the picture below.



If you see two white beads inside the cartridge and no liquid, repeat the test ensuring to allow the grey portion of the concentration system rest on the blue bottom when moving the system into position 2.

If you see white powder inside the cartridge and no liquid, repeat the test, ensuring the dial is moved to the appropriate positions and that the blue syringe is not pulled up past the point of resistance when pulsing. Also make sure the blue syringe plunger is in the fully down position before moving the dial to the square.

If a second training test is unsuccessful, please contact Spartan Support.

3. I got "Code 3001..." when performing the training module.



If you encounter this error when performing the training module, remove the test cartridge and power down the platform (Cube and Computer). Turn the system back on and repeat the training module without using another Concentration Kit and without putting a cartridge into the Cube (i.e., a "blank test"). If the test result is **Unsuccessful Test**, the system is performing correctly, and you may proceed to repeat the training module with a new Training Kit. If you encounter another Code 3001 message, contact Spartan Support.

4. My Results screen says "Code 3xxx..."

Please refer to the **Troubleshooting Table** below.

5. The barcode takes a long time or does not scan.

When scanning the Concentration System barcode, present the barcode to the webcam so that you see the barcode in the window—about 20-25 cm from the webcam located above the laptop screen. Hold the barcode in place for approximately 2 seconds.



6. I forgot to put the dial to the circle before introducing the water in the yellow syringe. Can I put the dial to circle and continue?

Unfortunately, introducing any water into the system when the dial is in the start (.) position will

render the test kit unusable.

test, you can get a false negative result.



7. I accidentally moved the blue syringe plunger up and down greater than 10 times. Will this interfere with my results?

No. Ten is the minimum number of pulses you should perform. Note that one pulse is the upand-down motion. It will not affect the test if you move the plunger up and down a few extra times. You must always finish in the down position.

8. I accidentally removed the white syringe. What should I do?

It will not interfere with the test if you remove the white syringe. If you do so, it is not necessary to put it back into the system.

9. I accidentally removed the blue syringe. What should I do?

Removing the blue syringe will not interfere with the test.

10. Can I leave in the middle of concentrating the water and come back?

Once you have opened the Concentration System package, you must complete the process immediately.

11. What if I see white powder in the cartridge when I put it in the Cube?

A correctly loaded cartridge will be filled with liquid and have the bottom portion of a blue cap visible (see image below). If you see the cartridge filled with a white powder, discard the cartridge and perform a new test. Please contact Spartan Support to let us know that this occurred.



12. Is it okay to leave the laptop on all the time?

It is recommended that you power off the system (computer and Spartan Cube<sup>®</sup>) at least once a week. For example, shut the system down on Friday and start it up again when you run your next test the following week.

13. I disconnected the Cube from the laptop and now the system does not recognize the Cube.



If you need to unplug the cable connecting the Cube to the Laptop, please power down the Cube before disconnecting it from the laptop. If this has occurred with the Cube switched on, power off and then back on the Cube and the system will recognize it once again.

14. My sample water contained a high level (> 1000 GU/mL) of Legionella. Can I still re-use the sample bottle?

Yes. Rinsing the bottle three times and letting it dry is adequate to prevent any carryover from one test to the next.

15. The cap came off a syringe. Can I still use it?

Yes. If the syringe remains appropriately filled with liquid, you may still use it.

#### TROUBLESHOOTING TABLE

When the Spartan Legionella Detection System is unable to give a result, it will provide a code number as well as a brief message describing the type of issue the system encountered. The table below provides an overview of the symptoms and causes of the types of issues that can lead to an unsuccessful test. Detailed troubleshooting procedures are provided online at https://support.spartanbio.com.



Code	Cause(s)	Troubleshooting
3001	An instrument error was detected.	Power cycle computer and Cube and perform a test without a cartridge ("blank test"). If this message appears again after the blank test, contact Spartan Support.
3002	A bubble was detected in the cartridge.	Repeat the test and check for bubbles; after re- moving the cartridge from the Concentration System, move any bubbles to the top of the sam- ple.
3003	Water sample impurities were detected in the water sample.	Perform test with lower input volume (11 mL; Troubleshooting mode).
3004	a) Low cartridge volume.	If the volume in the cartridge is correct, perform
	(or)	test with lower input volume (11 mL; Trouble- shooting mode); If low volume, review sample
	b) A bubble was detected in the cartridge.	concentration procedure.
	(or)	
	c) Water sample impurities	
3005	Empty sample or high water sample impurities.	If the volume in the cartridge is correct, perform test with lower input volume (11 mL; Trouble- shooting mode); If there is no liquid in the car- tridge, review sample concentration procedure.
3006	Chemical or other impurities when using lower input volume.	Contact Spartan Support.

## LICENSES AND PATENTS

This product is covered by US Patent Numbers 8,528,777; 8,735,104; 9,593,369 and other patents issued and pending by Spartan Bioscience worldwide.

### **TRADEMARKS**

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