

# QuantStudio™ 3D Digital PCR System

for use with:

QuantStudio™ 3D Digital PCR Instrument  
Dual Flat Block GeneAmp® PCR System 9700  
QuantStudio™ 3D Digital PCR Master Mix  
QuantStudio™ 3D Digital PCR 20K Chip  
QuantStudio™ 3D Digital PCR Chip Loader

**Catalog Number** 4482593 and 4481097

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# About This Guide



**CAUTION! ABBREVIATED SAFETY ALERTS.** Hazard symbols and hazard types specified in procedures may be abbreviated in this document. For the complete safety information, see the “Safety” appendix in this document.

**IMPORTANT!** Before using this product, read and understand the information in the “Safety” appendix in this document.

## Revision history

| Revision | Date     | Description                                                                                                                                                        |
|----------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 01       | 03, 2013 | Initial version                                                                                                                                                    |
| 02       | 06, 2013 | Updated general chip preparation and instrument networking.                                                                                                        |
| A.0      | 12, 2013 | Updated the manual chip preparation and added procedures for chip preparation using the QuantStudio™ 3D Digital PCR Chip Loader and wireless network installation. |

## Purpose

This user guide provides step-by-step instructions for preparing and loading samples onto QuantStudio™ 3D Digital PCR 20K Chips, thermal cycling the prepared consumables using a Dual Flat Block GeneAmp® PCR System 9700, and analyzing the consumables using the QuantStudio™ 3D Digital PCR Instrument.



**WARNING!** The protection provided by the equipment may be impaired if the instrument is operated outside the environment and use specifications, the user provides inadequate maintenance, or the equipment is used in a manner not specified by the manufacturer (Life Technologies).

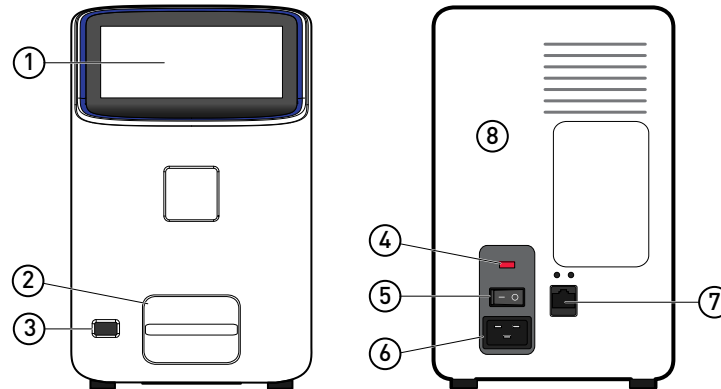
## Prerequisites

This guide also assumes that you have:

- Knowledge of techniques for handling and preparing samples for PCR.
- A general understanding of data storage, file transfers, and copying and pasting.

## Instrument hardware

The QuantStudio™ 3D Digital PCR Instrument consists of the components shown in the following figure.



- |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>① <b>Touchscreen</b> – Provides access to the instrument functions, such as data transfer and instrument operation.</p> <p>② <b>Chip tray</b> – Conveys the QuantStudio™ 3D Digital PCR 20K Chip to and from the imaging stage in the interior of the instrument.</p> <p>③ <b>USB port</b> – Provides USB communication with the QuantStudio™ 3D Instrument. Can be used to transfer data to and from the instrument.</p> <p>④ <b>Fuse cover</b> – Dual 1.6A, Time Lag T, 250 VAC, 5 × 20-mm electrical fuses that protect the instrument from excessive electrical current.</p> | <p>⑤ <b>Power switch</b> – Power switch for the instrument, where the states are on ( I ) or off ( O ).</p> <p>⑥ <b>Power port</b> – A 100–240 VAC port that provides power to the QuantStudio™ 3D Instrument.</p> <p>⑦ <b>Ethernet port</b> – An RJ45 port that provides Ethernet (gigabit) communication with the QuantStudio™ 3D Instrument.</p> <p>⑧ <b>Access panel</b> – Provides access to the interior of the QuantStudio™ 3D Instrument.</p> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Instrument software

The QuantStudio™ 3D Digital PCR Instrument includes a software suite used to analyze and manage digital PCR data generated by imaging QuantStudio™ 3D Digital PCR 20K Chips. The QuantStudio™ 3D AnalysisSuite™ Software features a server, and cloud deployment that can satisfy a broad range of laboratory requirements.

**Note:** For more information on the AnalysisSuite™ Software, refer to the AnalysisSuite™ Software Help which is available from any point in the software by clicking the ? button.

### Computer requirements

The QuantStudio™ 3D AnalysisSuite™ Software is accessed as a web-based application that is optimized for use with the Microsoft® Windows® 7 operating system running the following Internet browsers:

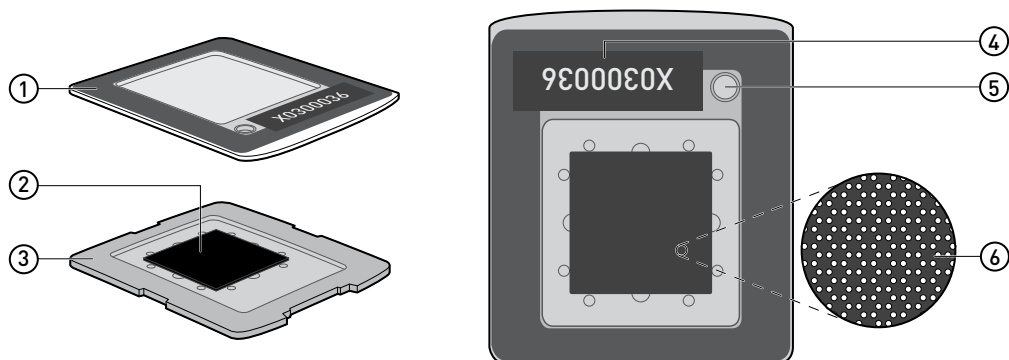
- Google® Chrome™ v21 or later
- Microsoft® Internet Explorer® v10.0 or later

## Instrument consumables

### About the Digital PCR 20K Chip

The QuantStudio™ 3D Digital PCR 20K Chip is a 10-mm<sup>2</sup> high-density reaction plate that consists of a single array of 20,000 reaction wells. Hydrophobic coatings on the chip surface enables loading and isolation of independent PCR reactions within the reaction wells.

Once loaded with a PCR reaction, the Digital PCR 20K Chip must be sealed using a QuantStudio™ 3D Digital PCR Chip Case Lid and filled with QuantStudio™ 12K Flex OpenArray® Immersion Fluid. The following illustration shows the components of the Digital PCR 20K Chip assembly.



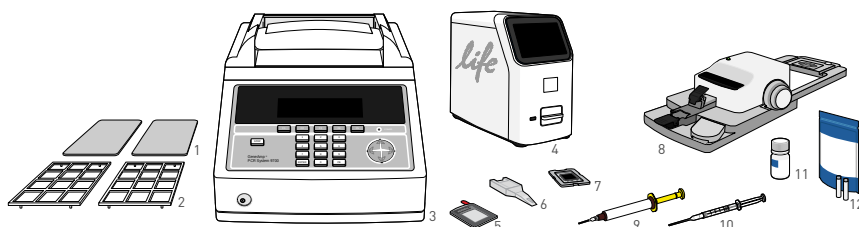
- ① **Chip Case Lid** – The lid used to seal the Digital PCR 20K Chip for thermal cycling and imaging on the QuantStudio™ 3D Instrument.
- ② **Digital PCR 20K Chip** – The 10-mm<sup>2</sup> consumable that contains the 20,000 reaction wells, which suspend the individual PCR reactions for thermal cycling and imaging.
- ③ **QuantStudio™ 3D Digital PCR Chip Case** – The thermal-conductive base that secures and protects the Digital PCR 20K Chip during all phases of use.
- ④ **Chip ID** – A label applied to the QuantStudio™ 3D Digital PCR Chip Case Lid that can be used to uniquely identify the chip to which it is applied.
- ⑤ **Fill port** – The aperture within the Chip Case Lid through which Immersion Fluid is injected onto the chip.
- ⑥ **Reaction wells** – The 20,000 physical holes within the Digital PCR 20K Chip that suspend the individual PCR reactions.

|                                                                |    |
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## About the QuantStudio™ 3D Digital PCR System

The QuantStudio™ 3D Digital PCR System uses fluorescent-labeled, probe-based quantitative polymerase chain reaction (PCR) reagents to provide quantitative and qualitative research detection of target nucleic acid sequences (targets) using post-PCR (endpoint) analysis. The QuantStudio™ 3D Instrument performs imaging and primary analysis of QuantStudio™ 3D Digital PCR 20K Chips that have been loaded with TaqMan® assays and thermal cycled using a Dual Flat Block GeneAmp® PCR System 9700. Secondary analysis and post-processing is performed by the QuantStudio™ 3D AnalysisSuite™ Software to yield relative or absolute quantification results from the raw imaging data.

The following figure lists the components of the QuantStudio™ 3D System.



- |                                                    |                                                                                      |
|----------------------------------------------------|--------------------------------------------------------------------------------------|
| ① QuantStudio™ 3D Digital PCR Thermal Pads         | ⑧ [Optional] QuantStudio™ 3D Digital PCR Chip Loader                                 |
| ② QuantStudio™ 3D Digital PCR Chip Carriers        | ⑨ UV-Activated Chip Sealant Syringe                                                  |
| ③ Dual Flat Block GeneAmp® PCR System 9700         | ⑩ QuantStudio™ 12K Flex OpenArray® Immersion Fluid                                   |
| ④ QuantStudio™ 3D Digital PCR Instrument           | ⑪ QuantStudio™ 3D Digital PCR Master Mix                                             |
| ⑤ QuantStudio™ 3D Digital PCR Chip Case Lid        | ⑫ TaqMan® Assays                                                                     |
| ⑥ QuantStudio™ 3D Digital PCR Sample Loading Blade | ⑬ (Not shown) QuantStudio™ 3D Tilt Base for Dual Flat Block GeneAmp® PCR System 9700 |
| ⑦ QuantStudio™ 3D Digital PCR 20K Chip             | ⑭ (Not shown) QuantStudio™ 3D AnalysisSuite™ Software                                |

## Data collection

The QuantStudio™ 3D Digital PCR System collects raw fluorescence data from the QuantStudio™ 3D Digital PCR 20K Chip following PCR amplification.

The instrument performs a reading of a Digital PCR 20K Chip, which consists of multiple image captures, in the following three phases:

1. **Excitation** – The QuantStudio™ 3D Digital PCR Instrument illuminates all wells of the Digital PCR 20K Chip within the instrument, exciting the fluorophores in each reaction.
2. **Emission Collection** – The QuantStudio™ 3D Digital PCR Instrument optics collect the residual fluorescence emitted from the wells of the Digital PCR 20K Chip. The resulting image collected by the device consists of light corresponding to the range of emission wavelengths for the filter in use.
3. **Interpretation** – The QuantStudio™ 3D Digital PCR Instrument assembles a digital representation of the residual fluorescence collected over a fixed time interval.

After a run, the QuantStudio™ 3D Digital PCR Instrument determines the location and intensity of the fluorescent signals in each image, the dye associated with each fluorescent signal, and the significance of the signal.

## Instrument filters and supported dyes

The QuantStudio™ 3D Digital PCR System features a filter set that is optimized for the FAM™, VIC®, and ROX® dyes available from Life Technologies.

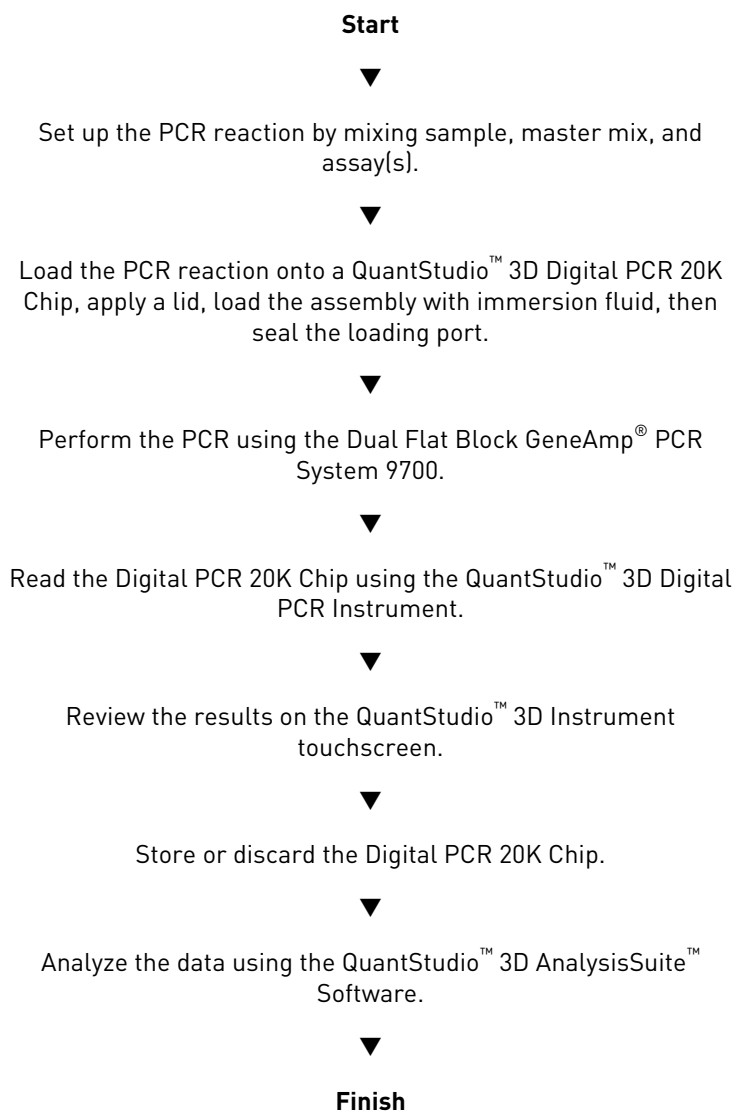
## Operating the instrument

### Compatible reagent kits and consumables

The QuantStudio™ 3D Digital PCR System can be used to perform experiments using compatible reagent kits and assays sold by Life Technologies. For specific information on a reagent kit or assay, refer to the documentation accompanying the product or consult the Life Technologies website.

### Operational workflow

The following figure shows the workflow for performing a single experiment on the QuantStudio™ 3D Digital PCR System. The procedures for sample and/or consumable preparation and result analysis can vary depending on the specific experiment that you are performing.



**Note:** Refer to the *QuantStudio™ 3D AnalysisSuite™ Software User Guide* (Pub. no. MAN0008161) for detailed information on data analysis.

## Prepare the QuantStudio™ 3D Digital PCR System for use

### About the installation

You can install the QuantStudio™ 3D Digital PCR System within one hour. The installation requires your participation at all times, so plan to spend most of your time working with the instrument.

**Note:** The time required to install the QuantStudio™ 3D System can vary depending on the type of networking solution that you choose. See Appendix B, “Networking” for a complete description of the networking options supported by the QuantStudio™ 3D System.

### Materials required

You need the following materials to install the QuantStudio™ 3D Digital PCR System:

- Powder-free gloves
- Safety glasses
- Scissors or pocketknife

### Before you begin

Before you install the QuantStudio™ 3D Digital PCR System, do the following:

- Obtain the tools and materials required for installation as shown above.
- Confirm that the installation site meets the environmental and electrical requirements explained in Appendix D, “Specifications and Layout”.
- If you intend to connect the QuantStudio™ 3D Instrument to your network, confirm that the installation site contains a viable connection that meets the networking requirements explained in Appendix B, “Networking”.
- Read “Choose additional protective devices” on page 15 and if necessary, obtain the additional components that you want to install.

### Plan the laboratory layout

When planning the placement of the QuantStudio™ 3D Digital PCR System components, give special consideration to the design and organization of the laboratory. To minimize the potential for contamination, we recommend organizing your laboratory so that the area where amplified DNA is handled is physically isolated from the work areas for DNA extraction and PCR setup. These pre- and post-PCR designated work areas, each ideally with dedicated equipment and supplies, will allow you to maintain strict physical isolation between the area designated for handling amplified DNA and the other area, thereby avoiding transfer of amplified DNA out of the designated work area.

| Room                                    | Activities                                                                                                                                                                                                                                                 | Equipment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PCR Setup Work Area (pre-PCR room)      | <ul style="list-style-type: none"> <li>Sample preparation and DNA extraction</li> <li>Extracted DNA sample storage</li> <li>PCR reaction preparation and DNA sample additions</li> <li>QuantStudio™ 3D Digital PCR 20K Chip loading and sealing</li> </ul> | <ul style="list-style-type: none"> <li>General laboratory supplies (such as gloves and wipes)</li> <li>Microcentrifuge</li> <li>Vortexer</li> <li>Pipettes, P10 to P1000 with tips</li> <li>QuantStudio™ 3D Digital PCR 20K Chip</li> <li>QuantStudio™ 3D Digital PCR Chip Case Lid</li> <li>QuantStudio™ 3D Digital PCR Sample Loading Blade</li> <li>QuantStudio™ 12K Flex OpenArray® Immersion Fluid</li> <li>UV-Activated Chip Sealant Syringes and Tips</li> <li>UV-Curing Stylus for Chip Sealant and Stand</li> </ul> |
| Amplified DNA Work Area (post-PCR room) | <ul style="list-style-type: none"> <li>PCR amplification</li> <li>QuantStudio™ 3D Digital PCR 20K Chip reading and storage</li> <li>Sealed QuantStudio™ 3D Digital PCR 20K Chip storage</li> </ul>                                                         | <ul style="list-style-type: none"> <li>Dual Flat Block GeneAmp® PCR System 9700</li> <li>QuantStudio™ 3D Digital PCR Instrument</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                   |

**Note:** Ideally, amplified DNA or equipment and supplies used to handle amplified DNA should not be taken out of the designated work area. If the work area for amplified DNA is in a separate but contiguous room, make sure that air flows toward the amplified DNA area. In addition, it is helpful if there is a separate exit from the post-PCR work area that does not exit into the pre-PCR work area.

**Note:** If possible, the station for loading Digital PCR 20K Chips should be physically separated from the PCR area, away from the GeneAmp® PCR System 9700 and the QuantStudio™ 3D Instrument.

### Choose the instrument locations

Placement of the QuantStudio™ 3D Digital PCR Instrument and GeneAmp® PCR System 9700 can greatly affect their performance. For both instruments, select installation locations that satisfy all of their specific environmental requirements. To prevent vibration, place the instruments on a solid, stable, level surface that allows free airflow overhead and around the sides and backs. To ensure optimal heat dissipation, keep all instrument ventilation slots free of obstructions.

| Instrument                             | For environmental requirements, see...                                     |
|----------------------------------------|----------------------------------------------------------------------------|
| QuantStudio™ 3D Digital PCR Instrument | "Environmental requirements" on page 95                                    |
| GeneAmp® PCR System 9700               | <i>GeneAmp® PCR System 9700 Base Module User Manual</i> (Pub. no. 4303481) |

## Choose additional protective devices

We recommend several electrical devices to protect the systems in environments with large voltage and power fluctuations.

### Power line regulator

We recommend the use of a 1.5-kVA power line regulator in areas where the supplied power fluctuates in excess of  $\pm 10\%$  of the normal voltage. Power fluctuations can adversely affect the function of the systems.

**Note:** A power line regulator monitors the input current and adjusts the power supplied to the systems. It does not protect against a power surge or failure.

### Surge protector

We recommend the use of a 10-kVA surge protector (line conditioner) in areas with frequent electrical storms or near devices that are electrically noisy, such as refrigerators, air conditioners, or centrifuges. Short-duration, high-voltage power fluctuations can abruptly terminate the function of, and thereby damage the components of, the systems.

**Note:** A dedicated line and ground between the systems and the building's main electrical service can also prevent problems caused by power fluctuations.

## Install the QuantStudio™ 3D Digital PCR System

1. Plan the organization of your laboratory. Identify the locations of all stations in the QuantStudio™ 3D Digital PCR Instrument workflow, including:
  - Reagent and consumable storage
  - PCR reaction preparation
  - QuantStudio™ 3D Digital PCR 20K Chip loading and sealing
  - Dual Flat Block GeneAmp® PCR System 9700 for PCR amplification
  - QuantStudio™ 3D Digital PCR Instrument for imaging and analysis

**Note:** See “Plan the laboratory layout” on page 13 for more information on planning the instrument placement.

2. Confirm that you have received the following materials required for the installation of the QuantStudio™ 3D Instrument:
  - QuantStudio™ 3D Digital PCR Instrument
  - QuantStudio™ 3D Digital PCR Chip Carrier for Dual Flat Block GeneAmp® PCR System 9700 and QuantStudio™ 3D Digital PCR Thermal Pad for Dual Flat Block GeneAmp® PCR System 9700
  - QuantStudio™ 3D Digital PCR 20K Chip (12-pack)
  - GeneAmp® PCR System 9700 Base Module
  - QuantStudio™ 3D Tilt Base for Dual Flat Block GeneAmp® PCR System 9700
  - QuantStudio™ 3D Digital PCR Chip Loader
  - GeneAmp® PCR System 9700 Dual Flat Block Module
  - QuantStudio™ 3D Digital PCR Master Mix

If you have not received one or more of the items listed above, contact Life Technologies for a replacement.

3. If you plan to connect your instrument to a network, confirm that you have ordered and received either the:
  - (Wired network) Category-6 Ethernet cable
  - (Wireless network) SparkLAN WUBR-170GN 802.11n Single-Band Wireless Dongle

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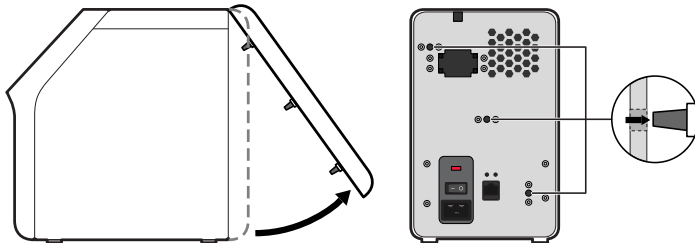
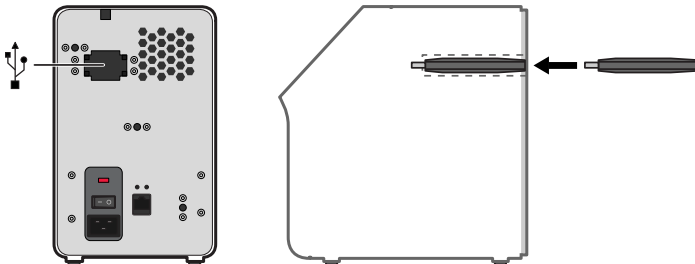
**IMPORTANT!** Network setup is not required for instrument installation. If necessary, you can connect your instrument to a network at a later time after the installation.

---

4. Confirm that all chemistry kits and accessories have been stored at the correct temperature.
5. Unpack and install the QuantStudio™ 3D Instrument:
  - a. Open the QuantStudio™ 3D Digital PCR Instrument Package.
  - b. Confirm that you have received all parts listed on the shipping manifest.  
If you have not received one or more parts, contact Life Technologies for a replacement.
  - c. Remove the QuantStudio™ 3D Instrument from the package and set it on a clean level surface, then remove the protective cover.
  - d. Inspect the QuantStudio™ 3D Instrument for damage caused during transportation.  
If the instrument is damaged, note the location and appearance of the damage, then contact Life Technologies support or your service representative for assistance.

6. If you intend to connect your instrument to a network, prepare the physical network connection:

**IMPORTANT!** Connecting the instrument to a network is optional and can be done at a later time if you desire.

| Connection | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Wired      | Connect one end of a standard category-6 Ethernet cable to the RJ-45 port on the back panel of the instrument and the other end to an open network port.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Wireless   | <ol style="list-style-type: none"> <li>1. If required for network setup, record the MAC address of the SparkLAN WUBR-170GN 802.11n Single-Band Wireless Dongle, which is located on the underside of the device.</li> <li>2. Unplug the QuantStudio™ 3D Instrument.</li> <li>3. Turn the QuantStudio™ 3D Instrument over, then use your fingers to carefully pry open the rear panel.</li> </ol> <p><b>IMPORTANT!</b> The rear panel is secured to the instrument by three pegs that require significant force to decouple. If necessary, insert a flathead screwdriver into the slot at the base of the panel to pry it from the instrument chassis.</p>  <ol style="list-style-type: none"> <li>4. Turn the instrument over, then uncap the wireless dongle and insert it into the USB port <i>within</i> the instrument. When the device is seated within the USB port, firmly push on the wireless dongle to ensure that it is plugged in completely. The internal USB port is accessed through a small opening in the instrument chassis.</li> </ol>  <ol style="list-style-type: none"> <li>5. Reattach the rear panel to the instrument chassis, then plug in and power on the QuantStudio™ 3D Instrument.</li> </ol> |

**7. Install the QuantStudio™ 3D Instrument:**

- a. Connect the power cord to the QuantStudio™ 3D Instrument, press the power switch to the ON position, then wait for it to start (about 30 sec). The QuantStudio™ 3D Instrument is ready to configure when the touchscreen displays the End User License Agreement.

---

**IMPORTANT!** If the QuantStudio™ 3D Instrument does not start, contact Life Technologies support or your service representative for assistance.

---

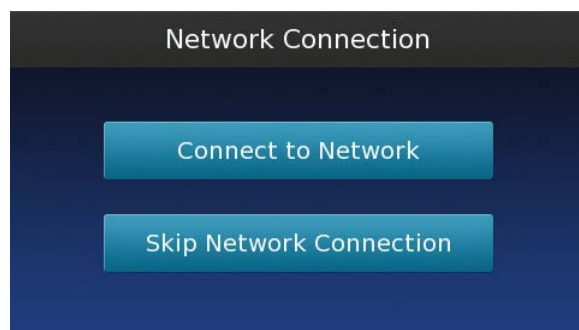
- b. In the End User License Agreement screen, touch **Accept** to accept the agreement.
- c. In the Network Connection screen, select the appropriate action:

---

**IMPORTANT!** The QuantStudio™ 3D Instrument is pre-configured for DHCP network operation. If connecting your instrument to a network that requires static IP assignment or advanced network configuration, touch **Skip Network Connection** and connect your instrument to the network following the installation.

---

- Touch **Connect to Network** to connect the QuantStudio™ 3D Instrument to a wired or wireless network that supports DHCP. Go to substep 4.
- Touch **Skip Network Connection** if you do not want to connect to a network, if you want to connect the instrument at a later time, or if your network requires static IP assignment or advanced network settings. Go to step 8.

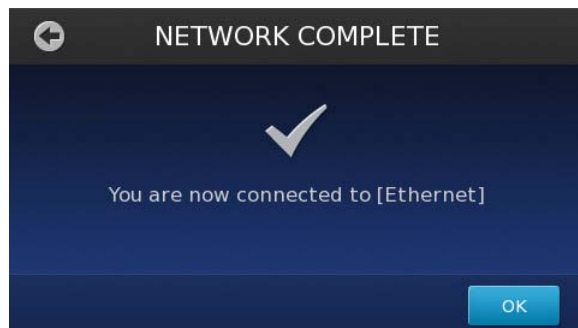


d. In the Choose Connection Type screen, select the appropriate connection:

| Connection                   | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Wired                        | Touch  <b>LAN</b> , then wait for the instrument to connect to the network.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Wireless                     | <ol style="list-style-type: none"> <li>Touch  <b>Wireless</b>.</li> <li>In the Available Wireless Network screen, touch the desired wireless hotspot. <p><b>Note:</b> The signal strength of a wireless hotspot is indicated by the number of bars present in the wireless icon (). The presence of a lock icon () indicates that the hotspot is secure (WPA, WEP, or WPA2).</p>  </li> <li>If your selected wireless hotspot is secure, enter the required authentication information (user name/ password), then touch <b>OK</b>.  </li> </ol> |
| None (no network connection) | Touch  <b>Offline</b> to configure the instrument to save data to a local USB drive.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

The QuantStudio™ 3D Instrument is connected to the network when the touchscreen displays the Network Complete screen.

- e. In the Network Complete screen, touch **OK**.



- f. In the Configuration screen, touch **Edit** to change the instrument settings.



- g. In the Edit Configuration screen, modify the fields as needed, then touch **Save**.
- Touch the **Instrument Name** field, enter up to a 16-character name for the instrument, then touch  to save the setting.

---

**IMPORTANT!** The instrument name is an alphanumeric string used to identify the QuantStudio™ 3D Instrument on the network. The instrument name:

- Can be up to 16 characters long.
  - Must consist of alphabetic and numeric characters.
  - Can contain hyphens, but not as the first or last characters in the name.
  - Cannot include spaces or special characters ( ; : " < > \* + = \ | ? , ).
- 

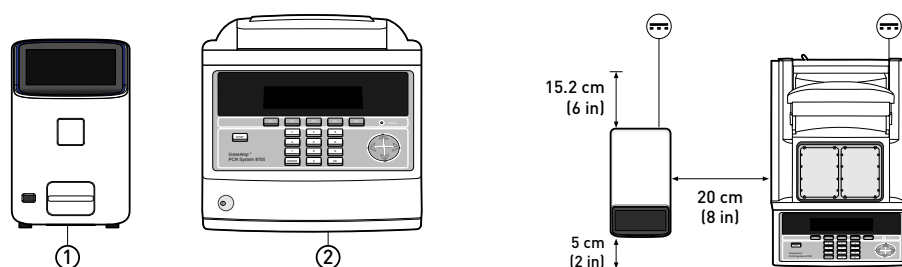
**Note:** By default, the Instrument Name is set as the serial number of the instrument.

- Touch the **Time Zone** field, then select the correct continent and region from the list.
- Touch the **Date** field, enter the current date, then touch **Enter**.
- Touch the **Time** field, enter the appropriate time units, then touch **Enter**.

- h. In the Configuration screen, touch **OK** to accept the instrument configuration.  
The QuantStudio™ 3D Instrument is ready to use when the touchscreen displays the Start Run screen.



8. Unpack and place the GeneAmp® PCR System 9700 Base Module:
  - a. Open the package containing the GeneAmp® PCR System 9700 Base Module.
  - b. Remove the packing crate from the GeneAmp® PCR System 9700 Package, and verify that it contains all of the parts listed on the shipping manifest.  
If you have not received one or more of the parts, contact Life Technologies for replacement.
  - c. Remove the GeneAmp® PCR System 9700 Base Module from the package and set it on a clean level surface, then remove the protective cover.



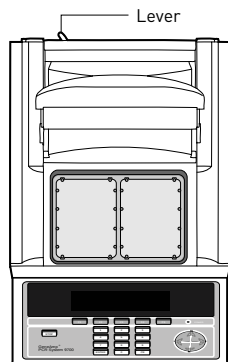
① QuantStudio™ 3D Instrument

② GeneAmp® PCR System 9700

**Note:** If not located next to the GeneAmp® PCR System 9700, the QuantStudio™ 3D Instrument requires only 15.2 cm (6 in) of clearance on either side of the instrument.

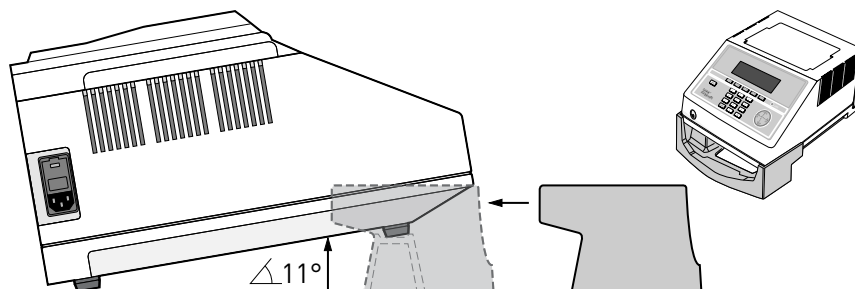
- d. Inspect the GeneAmp® PCR System 9700 Base Module for damage caused during transportation.  
If the instrument is damaged, note the location and appearance of the damage, then contact Life Technologies support or your service representative for assistance.

9. Unpack and install the Dual Flat Block Module:
  - a. Open the package containing the Dual Flat Block Module.
  - b. Pull the lever out from the GeneAmp® PCR System 9700 Base Module.



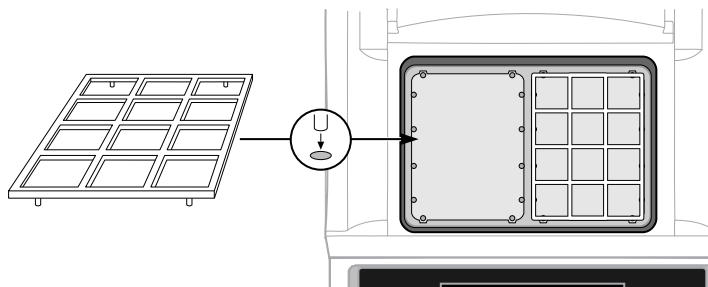
- c. Remove the Dual Flat Block Module from the package, remove the protective cover, place it onto the GeneAmp® PCR System 9700 Base Module, then push the Dual Flat Block Module back to seat the electrical connections.
  - d. Push the lever into the GeneAmp® PCR System 9700 Base Module to secure the Dual Flat Block Module.
  - e. Inspect the Dual Flat Block Module for damage caused during transportation.

If the instrument is damaged, note the location and appearance of the damage, then contact Life Technologies support or your service representative for assistance.
10. Set up the GeneAmp® PCR System 9700:
  - a. Open the package containing the QuantStudio™ 3D Tilt Base for Dual Flat Block GeneAmp® PCR System 9700 and install it beneath the thermal cycler.



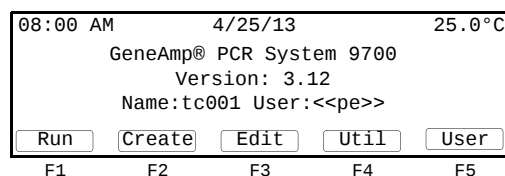
- b. Open the containing the QuantStudio™ 3D Digital PCR Chip Carrier for Dual Flat Block GeneAmp® PCR System 9700 and install them.

**Note:** Each Chip Carrier includes a set of four alignment pegs that fit into the holes of a flat sample block. The Chip Carrier can fit onto either side of the sample block (right or left) and in any orientation.



- c. Connect the GeneAmp® PCR System 9700 power cord, power on the thermal cycler, then wait for it to start (about 30 sec).

The cooling fan powers up and the start-up screens appear. The GeneAmp® PCR System 9700 is ready to use when the Main Menu displays.

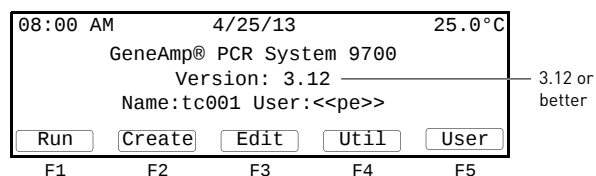


**IMPORTANT!** If the GeneAmp® PCR System 9700 does not start, check the position of the Dual Flat Block Module. The instrument cannot be powered on if the module is seated incorrectly.

**IMPORTANT!** If the GeneAmp® PCR System 9700 does not start, even after adjusting the Dual Flat Block Module, or if the screen contains any permanent patterns of lines or bars, contact Life Technologies support or your service representative for assistance.

- d. When the GeneAmp® PCR System 9700 displays the main menu, confirm that the version number displayed on the screen is **3.12** or greater. If the version number is less than 3.12, contact Life Technologies support to upgrade the instrument firmware before continuing.

**IMPORTANT!** The GeneAmp® PCR System 9700 must be running firmware version 3.12 or later to thermal cycle Digital PCR 20K Chips.

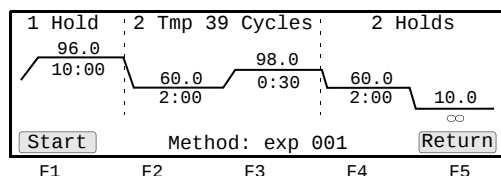


- e. Program the GeneAmp® PCR System 9700 with the method for thermal cycling the QuantStudio™ 3D Digital PCR 20K Chips:

- Protocol:

| Stage               | Step                      | Temp (°C) | Time (mm:ss) | Ramp rate |
|---------------------|---------------------------|-----------|--------------|-----------|
| Hold                | DNA polymerase activation | 96.0      | 10:00        | Default   |
| Cycling (39 cycles) | Anneal/extend             | 60.0      | 2:00         |           |
|                     | Denature                  | 98.0      | 0:30         |           |
| Hold                | Final extension           | 60.0      | 2:00         |           |
| Hold                | Storage                   | 10.0      | 99:59        |           |

- Run speed: **Standard**
- Reaction volume: **20 µL**



**Note:** For information on programming the GeneAmp® PCR System 9700, see the *GeneAmp® PCR System 9700 Base Module User Manual* (Part no. 4303481).

11. Open the package containing the QuantStudio™ 3D Digital PCR Chip Loader and install to the bench where you will load QuantStudio™ 3D Digital PCR 20K Chips. Attach the power cord to the Chip Loader and plug it onto a power outlet.

---

**IMPORTANT!** Do not power on the Chip Loader at this time.

---



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**IMPORTANT!** Do not install the Chip Loader in an area where the enclosure may become damaged.

---

The installation of the QuantStudio™ 3D Digital PCR Instrument and GeneAmp® PCR System 9700 is complete and the components are ready for use.

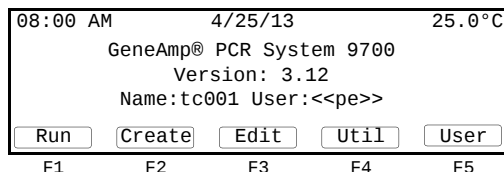
## Configure the GeneAmp® PCR System 9700 settings

After placing the GeneAmp® PCR System 9700, prepare it for use by configuring the system settings for your region as explained below.

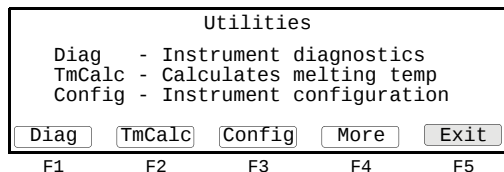
**Note:** This section includes the essential procedures required to prepare the GeneAmp® PCR System 9700 for use. For complete instructions, see the *GeneAmp® PCR System 9700 Base Module User Manual* (Pub. no. 4303481) or the *GeneAmp® PCR System 9700 Dual Flat Block User Manual* (Pub. no. 4307808).

### Set the instrument date and time

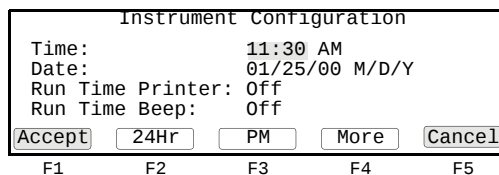
1. From the Main menu, press **Util** (F4).



2. From the Utilities screen, press **Config** (F3).



3. From the Instrument Configuration screen, set the instrument time:
  - a. Use the Circular Key Pad to select the **Time** field.
  - b. Press the **24 Hr** (F2) or **PM (AM)** (F3) soft keys until the format you want for the current time displays in the Time field.
  - c. Use the numeric keys to type in the hours followed by minutes.
  - d. Press **Accept** (F1) when your entries are complete.



**Note:** CE clears an entry.

4. From the Configuration screen, set the instrument date:
  - a. Use the circular key to select the **Date** field.
  - b. Press the **D/M/Y** or **Y/M/D** soft keys until the format you want for the current date displays in the Date field.
  - c. Use the numeric keys to enter the values into the **Day**, **Month**, and **Year** fields.

## Add new users

The GeneAmp® PCR System 9700 stores methods by user's names. You can add up to 19 different user names to the instrument. Once you've added your name to a list of users, you can store methods under that name and run them at any time from the Stored Methods screen.

1. From the Main menu, press **User** (F5).

The Select User Name screen displays a list of names of all users who have been added to the instrument displays in a 4 x 5 matrix.

08:00 AM 4/25/13 25.0°C  
 GeneAmp® PCR System 9700  
 Version: 3.12  
 Name:tc001 User:<<pe>>  
 Run Create Edit Util User  
 F1 F2 F3 F4 F5

2. Press **New** (F2) to add a new name to the list.

Select User Name  
 <<pe>>  
 adrian  
 doug  
 peter  
 Accept New Edit Delete Cancel  
 F1 F2 F3 F4 F5

3. In the User Name field, enter an alphanumeric name up to six characters in length, then press **Accept** (F1) to accept a name.

User Name   
 Use ENTER key to select a character.  
 Accept Backsp Cancel  
 F1 F2 F3 F4 F5

The name you add or the name you select from a list of existing user names becomes the current user name. All new methods that you create are stored by default under the current user name.

4. Configure the Security Code screen according to your needs.

User Name: hank PIN number: None  
 Protection: Unlocked  
 Press PIN # to create a #. Then you set  
 protection to Locked to prevent methods  
 from being overwritten or deleted.  
 Accept Name PIN# Cancel  
 F1 F2 F3 F4 F5

| If you...                                                        | Then...                                                                                                           |
|------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| do not want to protect your methods                              | press <b>Accept</b> (F1) again.                                                                                   |
| want to protect your methods                                     | see the <i>GeneAmp® PCR System 9700 User Manual</i> (Pub. no. 4303481) for instructions on securing your methods. |
| want to return to the Main menu without adding the new user name | press <b>Cancel</b> (F5).                                                                                         |

## Connect the QuantStudio™ 3D Instrument to a network

If you choose not to connect the QuantStudio™ 3D Instrument using the setup wizard during installation, you can connect it to a network at any time afterwards to streamline data transfer to the QuantStudio™ 3D AnalysisSuite™ Software. If you choose to connect your QuantStudio™ 3D Instrument, see Appendix B, “Networking” for the complete installation procedure, including guidelines for integrating the instrument into your laboratory network.

---

**IMPORTANT!** This document *does not* provide adequate detail to integrate the QuantStudio™ 3D Instrument into all possible network architectures. Because your laboratory network can contain advanced features (such as firewalls), Life Technologies recommends that you consult a network administrator before connecting your instrument.

---

## Connect the QuantStudio™ 3D AnalysisSuite™ Software

You can connect to the QuantStudio™ 3D AnalysisSuite™ Software before or after you install the QuantStudio™ 3D Digital PCR Instrument. The software supports two methods of deployment (cloud and server), so the method that you follow will depend upon the deployment you purchased. Regardless of the deployment, you can use the AnalysisSuite™ Software web application to analyze data generated by your QuantStudio™ 3D Instrument after you connect it to your network. For instructions on using the AnalysisSuite™ Software, see the *QuantStudio™ 3D AnalysisSuite™ Software Help*.



# Prepare Samples and Load Reactions

|                                           |    |
|-------------------------------------------|----|
| ■ Prepare the DNA samples .....           | 28 |
| ■ Prepare the digital PCR reactions ..... | 30 |
| ■ Load the Digital PCR 20K Chips .....    | 32 |

## Prepare the DNA samples

Life Technologies recommends the following best practices for the preparation of DNA template for use in digital PCR experiments. Because digital PCR experiment strategy and methodology can vary significantly, sample preparation and template quality must be assessed on an individual basis.

### Quality of DNA

Make sure that the DNA you use for experiments:

- Is extracted from the raw material that you are testing with an optimized protocol; salting-out procedures and crude lysates are not recommended
- Does not contain PCR inhibitors
- Has  $A_{260/230}$  and  $A_{260/280}$  ratios between 1.7 and 1.9

**Note:** The ratio of absorbance at 260 nm and 280 nm is used to assess the purity of DNA and RNA. A ratio of ~1.8 is generally accepted as “pure” for DNA; a ratio of ~2.0 is generally accepted as “pure” for RNA. If the ratio is appreciably lower in either case, it may indicate the presence of protein, phenol, or other contaminants that absorb strongly at or near 280 nm.

The ratio of absorbance at 260 nm and 230 nm is used as a secondary measure of nucleic acid purity. The 260/230 values for “pure” nucleic acid are often higher than the respective 260/280 values. Expected 260/230 values are commonly in the range of 2.0-2.2. If the ratio is appreciably lower than expected, it may indicate the presence of contaminants that absorb at 230 nm.

- Is intact as visualized by gel electrophoresis
- Has not been heated above 60°C; temperatures above 60°C can cause degradation

### Quantity of DNA

The quantity of sample added to a digital PCR reaction depends on the:

- Concentration of genomic or complementary DNA (gDNA or cDNA) present in each sample
- Number of copies of the target sequence present in the genome or total RNA of your samples

## Quantitation methods

Before performing digital PCR experiments, consider quantifying the amount of gDNA or cDNA in each sample.

We recommend the following methods of quantitation:

- Quant-iT™ assay nucleic acid quantitation using the Qubit® Quantitation Platform *or*
- Use spectrophotometer to determine nucleic acid concentration

## Sample dilution

Should a target be present at a sufficiently high concentration in the sample of interest, it is possible that all reaction replicates will be positive thus preventing the digital calculation of the target concentration. In this case, the sample must first be diluted prior to running the digital PCR experiment.

## Determine the optimal dilution when the target is known

In a digital PCR experiment performed on an QuantStudio™ 3D Digital PCR System, gDNA samples are diluted down to a limiting quantity, such that most individual PCR reactions contain either zero or one target molecule. The procedure for determining the optimal dilution for a sample differs depending on whether or not the target copy number per genome is known.

If the target copy number per genome of your samples is known, dilute the samples so that, when loaded on a QuantStudio™ 3D Digital PCR 20K Chip, each through-hole reaction will contain approximately 0.6 to 1.6 copies of the target sequence. For example, assuming 3.3 pg/copy of a given gene are present per genome and a 865-pL reaction well volume, the stock gDNA in a given sample would be diluted down to 600 copies/μL or 1.98 ng/μL in the final reaction to give 0.6 copies per reaction well.

## How to determine the target copy number per genome

To help determine copy number per genome, collect the following information:

1. If the source or species of the gDNA is known but the genome size of the organism of interest is unknown, refer to <http://www.cbs.dtu.dk/databases/DOGS/index.html> to determine the size of the genome in question.
2. Once the size of the genome is known, determine the mass of the genome using the following formula:

$$m = (n) (1.096 \times 10^{-21} \text{ g/bp})$$

where  $m$  is the genome mass in grams, and  $n$  is the genome size in base pairs.

The following example calculates the mass of the human genome using the Celera Genomics estimate of  $3.0 \times 10^9$  bp (haploid):

$$m = (3.0 \times 10^9 \text{ bp}) (1.096 \times 10^{-21} \text{ g/bp})$$

$$m = 3.3 \times 10^{-12} \text{ g or } 3.3 \text{ pg}$$

The example is relevant to any gene that is present at the “normal” rate of two copies per diploid genome, such as RNase P, and provides a basis to perform a digital screening experiment to determine the optimal digital range.

**Determine the optimal dilution when the target is unknown**

If the target copy number per genome is unknown, say for a locus of unknown copies per genome or RNA of unknown expression level, we recommend that you determine the optimal dilution by loading and imaging a dilution series of the each sample at the expected digital range. By assaying three to four data points above and below the expected digital range, you ensure that one of the data points is within the optimal digital range. Should real-time data be available for the assay and sample being used, this can guide the starting and end point of the dilution series.

**Prepare the digital PCR reactions****Required materials**

The following materials are required to prepare digital PCR reactions for use on the QuantStudio™ 3D Digital PCR System.

- TaqMan® Assay(s) for your experiment
- QuantStudio™ 3D Digital PCR Master Mix
- Gloves, powder-free, nitrile
- Laboratory-grade, lint-free wipes
- Microcentrifuge
- Permanent marker or pen
- Pipettes and tips, P10 to P1000
- Reaction tubes, DNase/RNase-free, non-stick or low-binding, 0.5-mL or 1.5-mL
- TE Buffer, 1X Molecular Biology Grade
- Vortexer
- Water, DNase-free, sterile-filtered

**Guidelines for PCR sample preparation**

When preparing samples for PCR amplification:

- Use a positive-displacement pipette or aerosol-resistant pipette tips.
- Follow proper pipette-dispensing techniques to prevent aerosols.
- Wear clean gloves and a clean lab coat (not previously worn while handling amplified PCR products or used during sample preparation).
- Change gloves whenever you suspect that they are contaminated.
- Maintain separate areas and dedicated equipment and supplies for:
  - Sample preparation
  - PCR setup
  - PCR amplification
  - Analysis of PCR products
- Never bring amplified PCR products into the PCR setup area.
- Open and close all sample tubes carefully. Centrifuge tubes before opening. Try not to splash or spray PCR samples.
- Keep reactions and components capped as much as possible.
- Clean lab benches and equipment periodically with 10% bleach solution. Use DNAZap™ Solution (PN AM9890).

## Prepare the reaction mix and samples

In this procedure, you will prepare the PCR reactions for the samples that you intend to load to QuantStudio™ 3D Digital PCR 20K Chip. The volumes of the example protocol have been adjusted so that two are run for each sample.

**Table 1** PCR Reaction Mix

| Material                                   | Volume (μL) <sup>[1]</sup> | Stock    | Final    |
|--------------------------------------------|----------------------------|----------|----------|
| QuantStudio™ 3D Digital PCR Master Mix, 2X | 18.0                       | 2X       | 1X       |
| TaqMan® Assay, 20X (primer/probe mix)      | 1.8                        | 20X      | 1X       |
| Diluted DNA                                | 3.6                        | 10 ng/μL | 1 ng/μL  |
| Water                                      | 12.6                       | —        | —        |
| <b>Total volume (for 1 sample/2 chips)</b> | <b>36.0</b>                | <b>—</b> | <b>—</b> |

<sup>[1]</sup> Volumes include 20% excess to compensate for volume loss from pipetting.

1. Remove the following from storage and allow them to warm at room temperature:
  - QuantStudio™ 3D Digital PCR Master Mix
  - TaqMan® Assay(s)
2. Review the concentration of your DNA samples, and prepare dilutions if necessary.
3. Gently invert the tube of Digital PCR Master Mix 10 times (or gently vortex on low-medium speed).
4. In a 0.5- or 1.5-mL reaction tube, prepare sufficient PCR reaction mix for your samples. Scale the component amounts appropriately, depending on the number of samples that you are running.

**Note:** The following example assumes that you will load each sample to two Digital PCR 20K Chips.

| Material                                   | Volume (μL)                         |                                        |
|--------------------------------------------|-------------------------------------|----------------------------------------|
|                                            | 1 sample/<br>2 chips <sup>[1]</sup> | 10 samples/<br>20 chips <sup>[1]</sup> |
| QuantStudio™ 3D Digital PCR Master Mix, 2X | 18.0                                | 180.0                                  |
| TaqMan® Assay(s), 20X (primer/probe mix)   | 1.8                                 | 18.0                                   |
| Water                                      | 12.6                                | 126.0                                  |
| <b>Total volume</b>                        | <b>32.4</b>                         | <b>324.0</b>                           |

<sup>[1]</sup> Volumes include 20% excess to compensate for volume loss from pipetting.

5. Using a permanent marker, label a 0.5- or 1.5-mL reaction tube for each sample that you intend to run.
6. Vortex, then briefly centrifuge the DNA samples.

7. Transfer 32.4  $\mu\text{L}$  of PCR reaction mix to each labeled reaction tube.
8. Transfer 3.6  $\mu\text{L}$  of each sample, diluted to the appropriate concentration, to the corresponding reaction tube. Mix well by gently pipetting up and down after each transfer (or gently vortex on low-medium speed).
9. Cap the reaction tubes, then briefly centrifuge them and immediately proceed to load the Digital PCR 20K Chips.

---

**IMPORTANT!** For optimal results, load the Digital PCR 20K Chips as soon as possible after setting up the reactions. If necessary, place the reactions on ice until you are ready to use them. If placed on ice, warm the samples to room temperature prior to loading.

---

## Load the Digital PCR 20K Chips

After preparing your PCR reactions, you can load them into QuantStudio™ 3D Digital PCR 20K Chips manually or automatically using a QuantStudio™ 3D Digital PCR Chip Loader.

To load and seal Digital PCR 20K Chips:

- **Automatically** — See “Load the chips using the Chip Loader” on page 33.
- **Manually** — See “Load chips manually” on page 41.

### Guidelines for loading and sealing Digital PCR 20K Chips

To ensure the proper function of your loaded Digital PCR 20K Chip, handle them according to the following guidelines:

- Always wear powder-free gloves when loading and sealing Digital PCR 20K Chips.

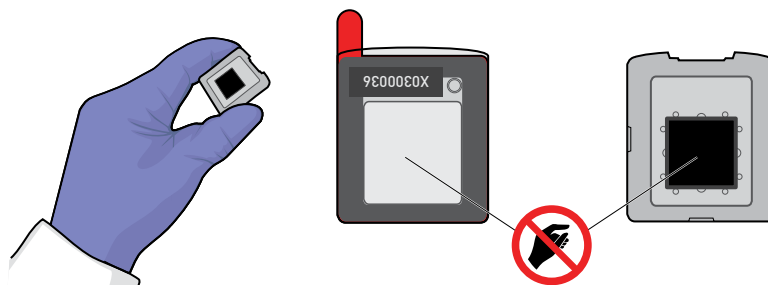
---

**IMPORTANT!** Never handle Digital PCR 20K Chips or Chip Case Lids without gloves. Oils from your hands can contaminate the components and interfere with thermal cycling and imaging.

---

- Handle the Digital PCR 20K Chips and Chip Case Lids as follows:
  - Hold the Digital PCR 20K Chips and Chip Case Lids by gently gripping them by their sides.
  - Do not touch the surface of the Digital PCR 20K Chips. If you accidentally touch the surface of a chip, discard it.

**Note:** Debris or excess sample on the Chip Case Lid can fluoresce and interfere with thermal uniformity.



- If necessary, use a permanent pen or marker to label the back of each loaded Chip Case to aid in sample tracking.
- Load each Digital PCR 20K Chip within 2 hours after opening it.
- Load Digital PCR 20K Chips in alphanumeric order (according to Digital PCR 20K Chip serial number) to avoid data-entry errors.
- Seal each Digital PCR 20K Chip immediately after loading it to avoid evaporation.
- Load and seal Digital PCR 20K Chips in batches of 24 or less (the maximum number that can be loaded onto the GeneAmp® PCR System 9700).
- If you do not intend to load an opened Digital PCR 20K Chip immediately, cover the chip using the aluminum plate found within the packaging to prevent contamination.
- When not in use, store the Chip Sealant within its original protective package to prevent the sealant in the syringe tip from curing. The Chip Sealant can be stored with the syringe tip attached.
- Use all of the QuantStudio™ 12K Flex OpenArray® Immersion Fluid within 60 minutes of uncapping the syringe. Once a syringe is opened, you cannot reattach the cap for later use.
- Thermal cycle Digital PCR 20K Chips within 2 hours after loading them.

## Load the chips using the Chip Loader

The following procedure explains how to load QuantStudio™ 3D Digital PCR 20K Chips automatically using a QuantStudio™ 3D Digital PCR Chip Loader. This procedure assumes that you have prepared your PCR reactions as explained in “Prepare the reaction mix and samples” on page 31 and are ready to load them onto Digital PCR 20K Chips.

### Materials required

The following materials are required to load and seal QuantStudio™ 3D Digital PCR 20K Chips for use on the QuantStudio™ 3D Digital PCR System.

- Prepared digital PCR reactions (from the previous section)
- QuantStudio™ 3D Digital PCR 20K Chips
- QuantStudio™ 3D Digital PCR Chip Case Lids
- QuantStudio™ 3D Digital PCR Sample Loading Blades
- QuantStudio™ 12K FlexOpenArray® Immersion Fluid
- QuantStudio™ 12K FlexOpenArray® Immersion Fluid Tip
- QuantStudio™ 3D Digital PCR Chip Loader
- UV-Activated Chip Sealant Syringe
- Isopropanol
- Gloves, powder-free, nitrile
- Scissors
- Laboratory-grade, lint-free wipes
- Microcentrifuge
- Pipettes and tips, P10 to P1000
- Vortexer

**QuantStudio™ 3D Digital PCR Chip Loader status light**

The QuantStudio™ 3D Digital PCR Chip Loader features an LED at the top of the Chip Loader that indicates its status. The status light is illuminated at all times when the Chip Loader is powered on and changes color according to instrument readiness.

| Color           | Status                                                                  |
|-----------------|-------------------------------------------------------------------------|
| Blue, solid     | The Chip Loader is booting.                                             |
| White, flashing | The chip nest is not at temperature or the lever arm is not fully open. |
| Green, solid    | The Chip Loader is ready to load a Digital PCR 20K Chip.                |
| Green, flashing | The Chip Loader is loading a Digital PCR 20K Chip.                      |
| Red, flashing   | The Chip Loader has encountered an error.                               |

**Recovering from a Chip Loader error**

Perform the following steps if the QuantStudio™ 3D Digital PCR Chip Loader status light flashes red, indicating that it has encountered an error.

1. Power off the Chip Loader, wait 30 seconds, then power it on.
2. If the status light is still flashing red, press the load button and record the sequence of colors displayed.
3. Contact Life Technologies support.

**Load and seal the chips using a Chip Loader**

**WARNING! ULTRAVIOLET LIGHT HAZARD.** Looking directly at a UV light source can cause serious eye damage. Never look directly at a UV light source and always prevent others from UV exposure. Wear appropriate protective eyewear and clothing.

**IMPORTANT!** Wear powder-free gloves while preparing QuantStudio™ 3D Digital PCR 20K Chips.

1. Prepare the workspace:
  - a. Allow the prepared digital PCR reaction to equilibrate to room temperature (approximately 15 minutes).
  - b. Remove the following consumables from their packaging and place them on a clean, dry, lint-free surface:
    - QuantStudio™ 3D Digital PCR Chip Case Lid
    - QuantStudio™ 3D Digital PCR Sample Loading Blade

2. Prepare the syringe containing Chip Sealant:

- a. Remove the syringe, plunger, and tip from the protective packaging.

---

**IMPORTANT!** Do not discard the protective packaging. When not in use, store the syringe containing Chip Sealant within the packaging.

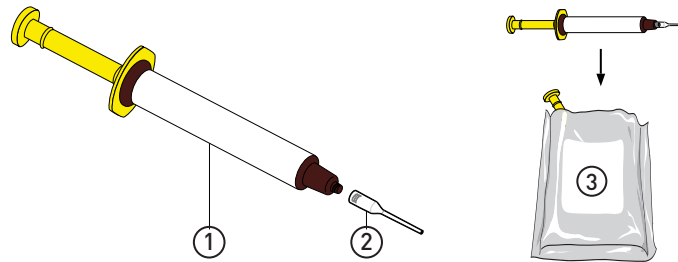
---

- b. Remove the protective caps from both ends of the syringe, twist the tip to lock it into place, then insert the plunger into the opposite end of the syringe.
- c. Place the assembled syringe within its protective package until ready for use.

---

**IMPORTANT!** Confirm that the tip is locked firmly in place before proceeding.

---



- 1 UV-Activated Chip Sealant Syringe
- 2 Chip Sealant Tip (twist to attach)

- 3 Syringe packaging (do not discard)

3. Prepare a syringe containing QuantStudio™ 12K Flex OpenArray® Immersion Fluid:

- a. Remove the syringe, plunger, and tip from the packaging.
- b. Before uncapping the syringe, gently pull back the plunger 1-2 mm and release it to break any resistance that may have formed during storage.
- c. Unscrew the cap from the syringe, then attach the OpenArray® Immersion Fluid Tip by pushing it into place.

---

**IMPORTANT!** The application of the Immersion Fluid Tip requires force. No twisting or screwing is required to attach it.

---

- d. Carefully depress the plunger until Immersion Fluid flows from the tip of the assembled syringe, then place it on a clean surface until ready for use.

---

**IMPORTANT!** Confirm that the tip is locked firmly in place before proceeding.

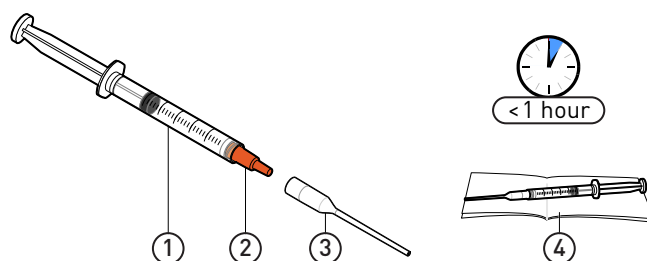
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---

**IMPORTANT!** Use all of the Immersion Fluid within 60 minutes of uncapping the syringe. Once a syringe is opened, you cannot reattach the cap for later use.

---



- |                                      |                                        |
|--------------------------------------|----------------------------------------|
| 1 OpenArray® Immersion Fluid Syringe | 3 Immersion Fluid Tip (push to attach) |
| 2 Cap (remove)                       | 4 Lint-free wipe                       |

4. Load the PCR reaction onto a Digital PCR 20K Chip:
  - a. Plug in and power on the QuantStudio™ 3D Digital PCR Chip Loader, then wait until the Chip Loader status light illuminates solid green ( $\leq 20$  minutes), indicating that the chip nest has reached operating temperature.
  - b. Open the QuantStudio™ 3D Digital PCR 20K Chip package, then gently grasp the chip by its sides and load it face-up into the chip nest. Lock the Digital PCR 20K Chip into place by pressing down the chip nest lever prior to placing the chip into the chip nest as shown.

---

**IMPORTANT!** Confirm that the Digital PCR 20K Chip is correctly aligned within the Chip Loader.

---

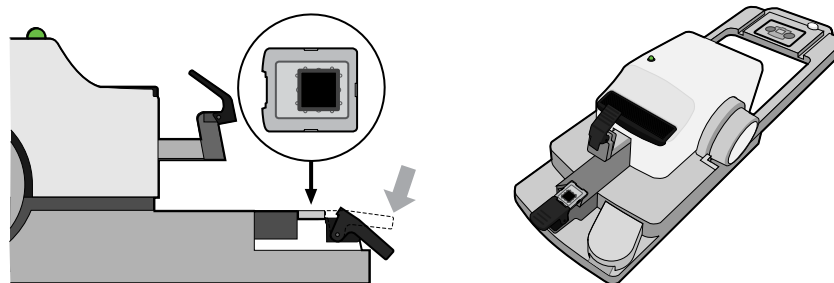


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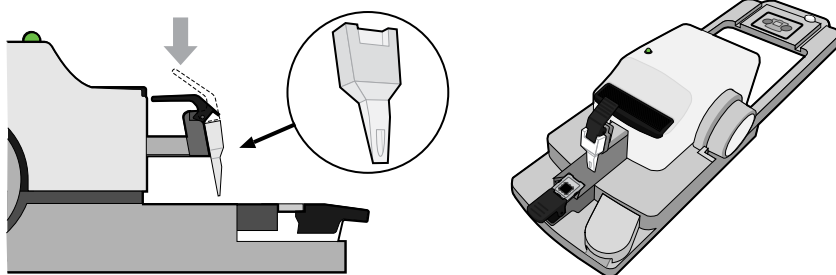
**IMPORTANT!** If you do not intend to load an opened Digital PCR 20K Chip immediately, cover the chip using the aluminum plate found within the packaging to prevent contamination.

---

**Note:** If desired, use a pen to label the back of the Digital PCR 20K Chip. Marking the back of the chips will not affect the imaging data.

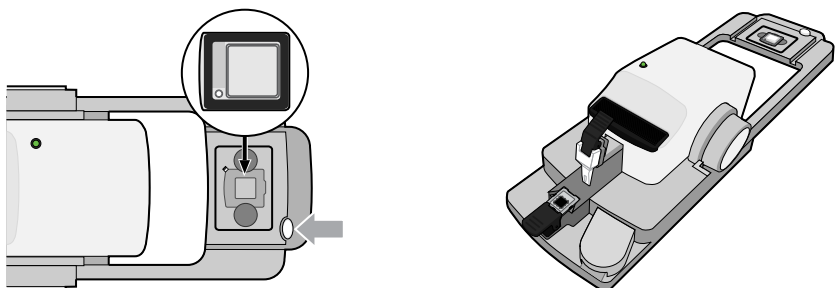


- c. Press the sample loading blade lever, then install the QuantStudio™ 3D Digital PCR Sample Loading Blade to the Chip Loader as shown. Press down on the body of the Sample Loading Blade to confirm that the blade is properly seated.



- d. Remove the red protective film from a QuantStudio™ 3D Digital PCR Chip Case Lid, press the Lid Nest button, carefully place the Chip Case Lid into the Lid Nest as shown, then release the button to clamp the chip in place.

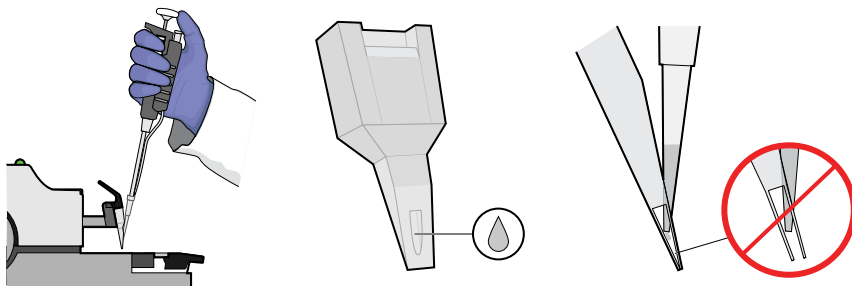
**IMPORTANT!** Before applying the Chip Case Lid, make certain that it is correctly oriented to the Digital PCR 20K Chip assembly.



- e. Briefly vortex and centrifuge the prepared digital PCR reaction (master mix, assay, and template), then carefully transfer 14.5  $\mu$ L of the solution into the sample-loading port of the Sample Loading Blade. If the reactions were placed on ice, allow them to warm prior to loading.

While filling the Sample Loading Blade:

- Hold the pipet so that the tip meets the sample-loading port at a sharp angle and so it does not deflect either blade (forward or rear).
- Do *not* depress the pipette to the second stop. Doing so increases the chance of introducing an air bubble to the Sample Loading Blade.
- Avoid creating air bubbles.



- f. Press the black loading button on the Chip Loader to load the Digital PCR 20K Chip.

The status light flashes green during the loading sequence, and displays solid green when finished.

- g. After the Chip Loader loads the Digital PCR 20K Chip, immediately add 10-15 drops of Immersion Fluid *directly* onto the chip so that the fluid covers the entire surface. If any fluid is present on the edges of the case that will contact the lid, remove it with a lint-free wipe that has been sprayed with isopropanol.

---

**IMPORTANT!** Pipet the Immersion Fluid only onto the chip. A small amount of fluid running off the surface of the chip is acceptable. Do *not* fill the case with fluid.

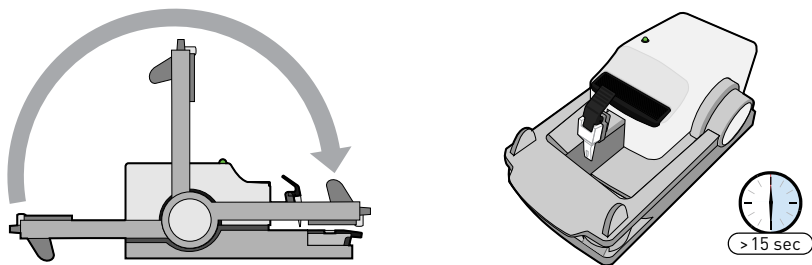
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---

**IMPORTANT!** Do not allow the syringe tip to contact the Digital PCR 20K Chip.

---

5. Rotate the Chip Loader arm so that the Chip Case Lid solidly contacts the Digital PCR 20K Chip, *firmly* press down for 15 seconds to ensure a tight seal, then press and hold the Lid Nest button while returning the Chip Loader arm to its original position.



---

**IMPORTANT!** Press down on the Chip Loader until you reach the hard stop. The arm requires >20 lbs of force to apply the Chip Case Lid.

---

6. Fill the Chip Case with Immersion Fluid:

- a. Hold the Chip Case by its edges and at a 45° angle so that air can escape from the loading port as you fill it, then carefully dispense Immersion Fluid into the port until the Chip Case contains an air bubble no larger than the fill port (<2-3 mm in diameter).

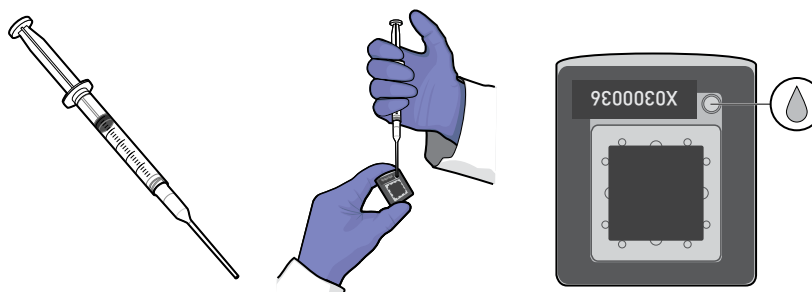
After filling the Immersion Fluid, rotate it slightly to reveal any air bubbles that might be hidden behind the serial number label. If bubbles are present, add additional Immersion Fluid to remove them.

---

**IMPORTANT!** Expel the Immersion Fluid slowly. If injected too quickly, the fluid can flush the reactions suspended within the chip.

---

**Note:** Minimize air bubble creation when you dispense the fluid; however, one small air bubble (<2-3 mm in diameter) is acceptable.



- b. Using a lint-free laboratory wipe, remove any excess Immersion Fluid from the Chip Case to ensure optimal imaging on the QuantStudio™ 3D Instrument.

7. Seal the Chip Case using Chip Sealant:

- a. Insert the syringe tip into the fill port of the sealed Chip Case, then carefully fill the port with Chip Sealant, ensuring that the fluid touches the walls of the hole. When full, finish the seal by lifting the syringe tip and add a small amount of sealant over the top of the port.

---

**IMPORTANT!** Apply the Chip Sealant to the fill port only. Do not apply the sealant to the Chip Case Lid window.

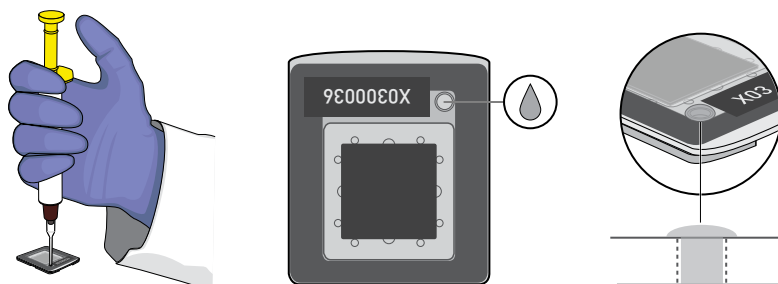
---



---

**IMPORTANT!** When not in use, store the Chip Sealant inside its original protective package and with the syringe tip attached to prevent the sealant in the tip from curing.

---



- b. Insert the Digital PCR 20K Chip assembly into the UV-Curing Station on the Chip Loader. Push the chip into the station until the ultraviolet light illuminates.

---

**IMPORTANT!** Make sure that the chip is oriented so that the fill port is directly beneath the beam of ultraviolet light.

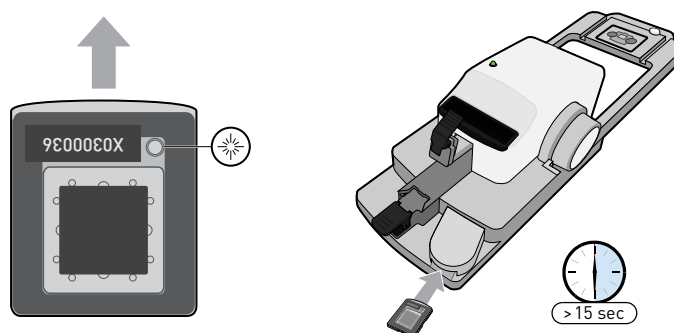
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---

**IMPORTANT!** Do not allow the Digital PCR 20K Chip to contact the roof of the UV-Curing Station.

---



- c. When the light powers off (approximately  $\geq 15$  seconds), remove the chip and place it on a clean, dry, lint-free surface.

---

**IMPORTANT!** Remove the Digital PCR 20K Chip assembly *only* after the ultraviolet light powers off, indicating that the curing of the Chip Sealant is complete.

---



---

**IMPORTANT!** Do not squeeze sealed Digital PCR 20K Chips. After curing the adhesive, pressure placed on the surface of the chip lid can expel the PCR reactions held within the chip wells.

---

**Note:** If necessary, you can illuminate the fill port for up to 3 minutes to ensure complete curing of the Chip Sealant.

8. Visually inspect the sealed Digital PCR 20K Chip for potential problems:
- **Leaks** – Confirm that no Immersion Fluid is leaking from the fill port or around the seal between the Chip Case and lid.
  - **Bubbles** – Confirm that the Chip Case is free of excessive bubbles. One small air bubble is acceptable.
  - **Correct lid orientation** – Confirm that the Chip Case Lid and the Digital PCR 20K Chip are correctly aligned.

If the loaded and sealed Digital PCR 20K Chip fails any of the criteria above, discard it and prepare a duplicate chip. Once sealed, the Chip Case cannot be opened and resealed.

---

**IMPORTANT!** Handle the Chip Cases gently, being careful to not apply pressure to the Digital PCR 20K Chips within them.

---

Thermal cycle the prepared Digital PCR 20K Chips within 2 hours after loading them.

---

**IMPORTANT!** Store the prepared Digital PCR 20K Chips in a clean, dry, dark location until you are ready to load them onto the GeneAmp® PCR System 9700.

---

## Load chips manually

The following procedure explains how to load QuantStudio™ 3D Digital PCR 20K Chips manually using a UV Stylus and UV-Curing Stylus Stand. It can be used as an alternative method for loading chips if a QuantStudio™ 3D Digital PCR Chip Loader is unavailable. This procedure assumes that you have prepared your PCR reactions as explained in “Prepare the reaction mix and samples” on page 31 and are ready to load them onto Digital PCR 20K Chips.

### Materials required

The following materials are required to load and seal QuantStudio™ 3D Digital PCR 20K Chips for use on the QuantStudio™ 3D Digital PCR System.

- Prepared digital PCR reactions (from the previous section)
- QuantStudio™ 3D Digital PCR 20K Chips
- QuantStudio™ 3D Digital PCR Chip Case Lids
- QuantStudio™ 3D Digital PCR Sample Loading Blades
- QuantStudio™ 12K Flex OpenArray® Immersion Fluid
- QuantStudio™ 12K Flex OpenArray® Immersion Fluid Tip
- UV-Activated Chip Sealant Syringe
- UV-Curing Stylus for Chip Sealant
- UV-Curing Stylus Stand
- Isopropanol
- Gloves, powder-free, nitrile
- Heated block (capable of maintaining 40±1°C)
- Scissors
- Laboratory-grade, lint-free wipes
- Microcentrifuge
- Pipettes and tips, P10 to P1000
- Vortexer

## Load and seal the Digital PCR 20K Chips



**WARNING! ULTRAVIOLET LIGHT HAZARD.** Looking directly at a UV light source can cause serious eye damage. Never look directly at a UV light source and always prevent others from UV exposure. Follow the manufacturer's recommendations for appropriate protective eyewear and clothing.

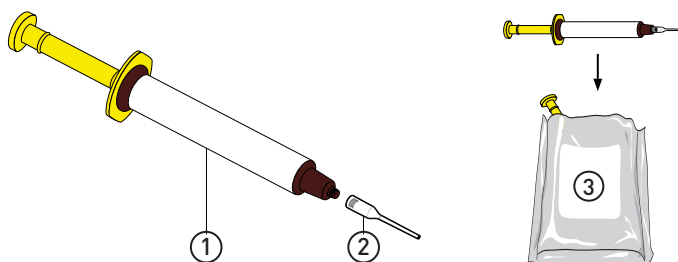
**IMPORTANT!** Wear powder-free gloves while preparing the QuantStudio™ 3D Digital PCR 20K Chips.

1. Prepare the workspace:
  - a. Preheat the heated block to 40°C, the optimal temperature for loading Digital PCR 20K Chips.  
**Note:** The loading surface should be a flat, temperature-controlled aluminum surface that is large enough to accommodate the Digital PCR 20K Chip consumable.
  - b. Allow the prepared digital PCR reaction to equilibrate to room temperature (approximately 15 minutes).
  - c. If necessary, replace the batteries of the UV Stylus in the UV Stylus Stand.  
**Note:** Replace the batteries of the UV Stylus after 10 hours of use.
2. Prepare the syringe containing Chip Sealant:
  - a. Remove the syringe, plunger, and tip from the protective packaging.

**IMPORTANT!** Do not discard the protective packaging. When not in use, store the Chip Sealant syringe within the packaging and in a dark location.

- b. Remove the protective caps from both ends of the syringe, twist the tip to lock it into place, then insert the plunger into the opposite end of the syringe.
- c. Place the assembled syringe within its package until ready for use.

**IMPORTANT!** Confirm that the tip is locked firmly in place before proceeding.



- 1 UV-Activated Chip Sealant Syringe
- 2 Chip Sealant Tip (twist to attach)

- 3 Syringe packaging (do not discard)

3. Prepare a syringe containing QuantStudio™ 12K Flex OpenArray® Immersion Fluid:

- a. Remove the syringe, plunger, and tip from the packaging.
- b. Before uncapping the syringe, gently pull back the plunger 1-2 mm and release it to break any resistance that may have formed during storage.
- c. Uncap the syringe, then attach the OpenArray® Immersion Fluid Tip by pushing it into place.

---

**IMPORTANT!** The application of the Immersion Fluid Tip requires force. No twisting or screwing is required to attach it.

---

- d. Carefully depress the plunger until Immersion Fluid flows from the tip of the assembled syringe, then place it on a clean surface until ready for use.

---

**IMPORTANT!** Confirm that the tip is locked firmly in place before proceeding.

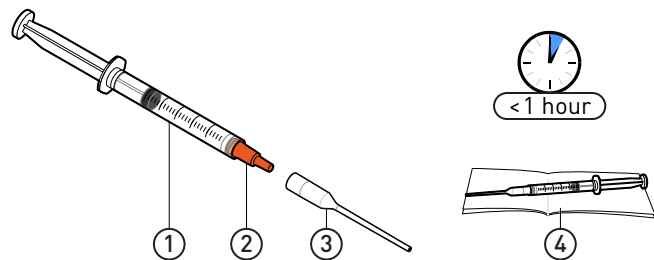
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---

**IMPORTANT!** Use all of the Immersion Fluid within 60 minutes of uncapping the syringe. Once a syringe is opened, you cannot reattach the cap for later use.

---



- |                                                                         |                  |
|-------------------------------------------------------------------------|------------------|
| ① OpenArray® Immersion Fluid Syringe                                    | ④ Lint-free wipe |
| ② Cap (remove)                                                          |                  |
| ③ QuantStudio™ 12K Flex OpenArray® Immersion Fluid Tip (push to attach) |                  |

4. Remove the following consumables from their packaging and place them on a clean, dry, lint-free surface:

- QuantStudio™ 3D Digital PCR Chip Case Lid
- QuantStudio™ 3D Digital PCR Sample Loading Blade

5. Open the QuantStudio™ 3D Digital PCR 20K Chip package, gently grasp the chip by its sides, then place it face-up on the heated block, preheated to 40°C.

---

**IMPORTANT!** Allow the Digital PCR 20K Chip to sit on the heated block for at least 5 seconds before loading it.

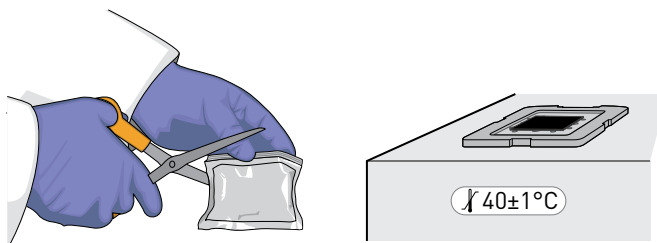
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---

**IMPORTANT!** Place only one Digital PCR 20K Chip on the heated block at a time.

---

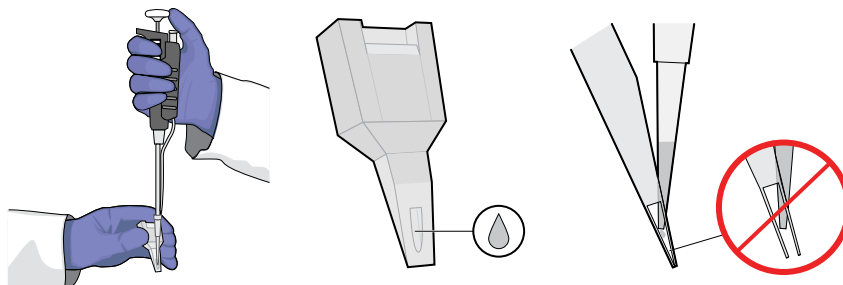
**Note:** If desired, use a permanent pen or marker to label the back of the Digital PCR 20K Chip. Marking the back of the chips will not affect the imaging data.



6. Load the PCR reaction onto the Digital PCR 20K Chip:
  - a. Briefly vortex and centrifuge the prepared digital PCR reaction (master mix, assay, and template), then aspirate 14.5 µL of the solution into a P20 pipette. If the reactions were placed on ice, allow them to warm prior to loading.
  - b. While holding the Sample Loading Blade by its edges, carefully dispense the reaction into the sample-loading port. After loading, gently tap the top of the Sample Loading Blade to spread the reaction across the full length of the blade.

While filling the Sample Loading Blade:

- Hold the pipet so that the tip meets the sample-loading port at a sharp angle and so it does not deflect either blade (forward or rear).
- Do *not* depress the pipette to the second stop. Doing so increases the chance of introducing an air bubble to the Sample Loading Blade.
- Avoid creating air bubbles.



- c. While holding the Sample Loading Blade at a 70-80° angle relative to the heated block so that the port faces up, place the edge of the blade at the end of the Digital PCR 20K Chip. Adjust the angle of the blade until you visually confirm that it is wetting the chip. Then, in one smooth motion, slowly drag the blade across the chip while applying a slight downward pressure to dispense the reaction.

---

**IMPORTANT!** Move the Sample Loading Blade slowly. The time required to move the blade across the chip should be approximately 10-12 seconds.

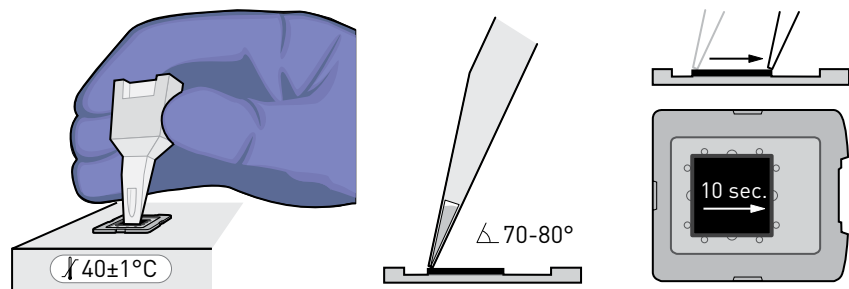
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---

**IMPORTANT!** Before you draw the blade across the chip, visually confirm that the Sample Loading Blade is wetting the chip. If not, adjust the angle slightly.

---



- d. Confirm that the Sample Loading Blade contains no residual fluid, indicating that the reaction has been completely loaded onto the chip.

---

**IMPORTANT!** Do not apply the Sample Loading Blade to the Digital PCR 20K Chip more than once.

---

- e. Allow the Digital PCR 20K Chip to sit on the heated block for 20 seconds while the PCR reaction stabilizes within the chip.
- f. Add 10-15 drops of Immersion Fluid directly to the chip so that the fluid covers the entire surface.

---

**IMPORTANT!** Do not allow the syringe tip to contact the Digital PCR 20K Chip.

---

**Note:** A small amount of fluid running off the surface of the chip is acceptable.

## 7. Seal the Digital PCR 20K Chip:

- a. Remove the red protective film from the QuantStudio™ 3D Digital PCR Chip Case Lid, then carefully place it onto the prepared Digital PCR 20K Chip so that the window in the lid aligns with the chip.

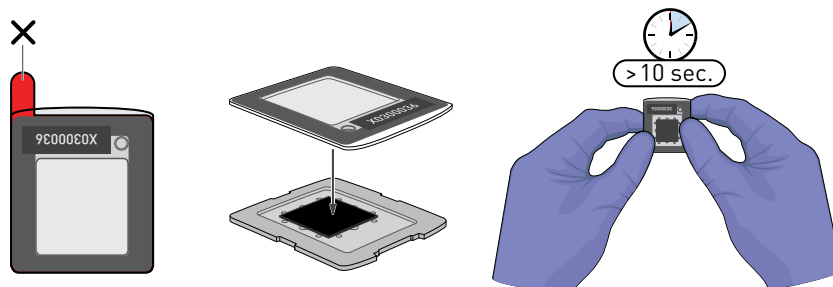
---

**IMPORTANT!** Before applying the Chip Case Lid, make certain that it is correctly oriented to the Digital PCR 20K Chip assembly.

---

- b. Pinch together all four sides and corners of the Chip Case for at least 10 seconds to seal it. While pressing, apply some lateral pressure to ensure a tight seal.

**Note:** You can remove the Digital PCR 20K Chip from the loading surface when you apply pressure to seal it.



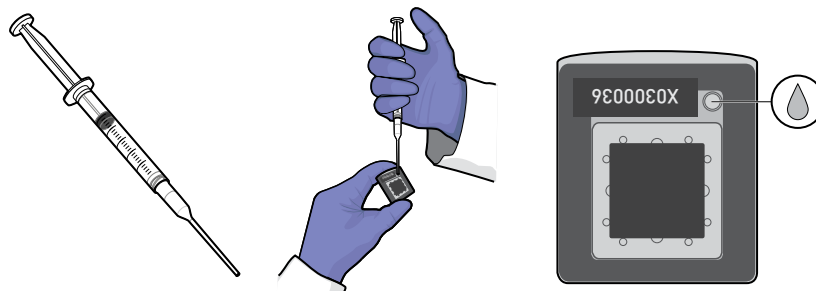
8. Fill the Chip Case with Immersion Fluid:
  - a. Hold the Chip Case by its edges and at a 45° angle so that air can escape from the loading port as you fill it, then carefully dispense Immersion Fluid into the port until the Chip Case contains an air bubble no larger than the fill port (<2-3 mm in diameter).

---

**IMPORTANT!** Expel the Immersion Fluid slowly. If injected too quickly, the fluid can flush the reactions suspended within the chip.

---

**Note:** Minimize air bubble creation when you dispense the fluid; however, one small air bubble (<2-3 mm in diameter) is acceptable.



- b. Using a lint-free laboratory wipe, remove any excess Immersion Fluid from the Chip Case to ensure optimal imaging on the QuantStudio™ 3D Instrument.

9. Seal the Chip Case using Chip Sealant:

- a. Insert the syringe tip into the fill port of the sealed Chip Case, then carefully fill the port with Chip Sealant, ensuring that the fluid touches the walls of the hole. When full, finish the seal by lifting the syringe tip and add a small amount of sealant over the top of the port.

---

**IMPORTANT!** Apply the Chip Sealant to the fill port only. Do not apply the sealant to the Chip Case Lid window.

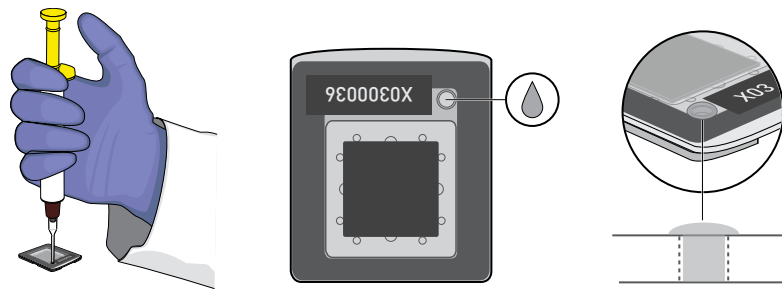
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---

**IMPORTANT!** When not in use, store the Chip Sealant inside its original protective package and with the syringe tip attached to prevent the sealant in the tip from curing.

---



- b. Power on the UV Stylus in the UV Stylus Stand by twisting the cap near the power button.

**Note:** The UV Stylus can remain on until all chips are loaded. To maximize battery life, make sure to power off the UV Stylus after the last chip has been sealed.

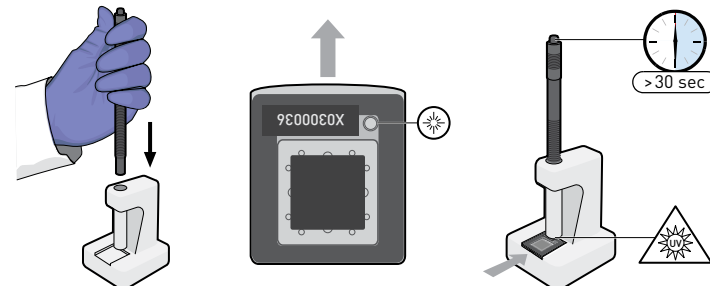
- c. Load the Digital PCR 20K Chip assembly into the UV Stylus Stand, and allow the Chip Sealant to cure for 0.5-3 minutes. A longer exposure, no longer than 3 minutes, ensures a complete seal.

---

**IMPORTANT!** Make sure that the fill port is located directly beneath the beam of ultraviolet light.

---

**Note:** If necessary, you can illuminate the fill port for up to 3 minutes to ensure complete curing of the Chip Sealant.



10. Visually inspect the sealed Digital PCR 20K Chip for potential problems:

- **Leaks** – Confirm that no Immersion Fluid is leaking from the fill port or around the seal between the Chip Case and lid.
- **Bubbles** – Confirm that the Chip Case is free of excessive bubbles. One small air bubble is acceptable.
- **Correct lid orientation** – Confirm that the Chip Case Lid and the Digital PCR 20K Chip are correctly aligned.

If the loaded and sealed Digital PCR 20K Chip fails any of the criteria above, discard it and prepare a duplicate chip. Once sealed, the Chip Case cannot be opened and resealed.

---

**IMPORTANT!** Handle the Chip Cases gently, being careful to not apply pressure to the Digital PCR 20K Chips within them.

---

Thermal cycle the prepared Digital PCR 20K Chips within 2 hours after loading them.

---

**IMPORTANT!** Store the prepared Digital PCR 20K Chips in a clean, dry, dark location until you are ready to load them onto the GeneAmp® PCR System 9700.

---



# Perform the PCR

|                                                 |    |
|-------------------------------------------------|----|
| ■ Choosing a thermal cycler .....               | 49 |
| ■ Thermal cycle the Digital PCR 20K Chips ..... | 52 |

## Choosing a thermal cycler

The Dual Flat Block GeneAmp® PCR System 9700 is the only thermal cycler that can be used to run prepared QuantStudio™ 3D Digital PCR 20K Chip.

---

**IMPORTANT!** Due to the physical characteristics of the Digital PCR 20K Chips, no other thermal cycler can be substituted for the GeneAmp® PCR System 9700.

---

### About the Dual Flat Block GeneAmp® PCR System 9700

The GeneAmp® PCR System 9700 is an automated thermal cycler designed for the amplification of nucleic acids using the Polymerase Chain Reaction (PCR) process. The user interface consists of a control panel with a full numeric keypad, soft keys, and a graphical display screen that shows the time and temperature profile for each run.

The Dual Flat Block Sample Module is an interchangeable sample block that attaches to the top of the GeneAmp® PCR System 9700 Base Module. The module features two flat aluminum sample blocks that are designed to perform thermocycling of up to 24 sealed Digital PCR 20K Chips simultaneously. The Dual Flat Sample Block Module includes a heated cover that is manually positioned over the sample block prior to the PCR run. The cover applies pressure to the Digital PCR 20K Chips to seat them firmly and precisely on the sample block, ensuring proper heat transfer.

## Prepare the GeneAmp® PCR System 9700

Before running each batch of Digital PCR 20K Chips, perform the following to ensure efficient thermal cycling:

1. Confirm that the following parts are installed or available for use:
  - a. Confirm that clean QuantStudio™ 3D Digital PCR Thermal Pads are available for use.

---

**IMPORTANT!** If a QuantStudio™ Thermal Pad becomes dirty, clean the pad using a lint-free lab wipe sprayed with isopropanol, then let it dry. Fluids, debris, and other contaminants that adhere to the pad can transfer to the Digital PCR 20K Chips during thermal cycling and fluoresce during imaging.

---



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**IMPORTANT!** Use only QuantStudio™ Thermal Pads that are approved for use with Digital PCR 20K Chips. Thermal compression pads from other PCR applications may not apply uniform pressure or heat distribution to all chips on the sample block.

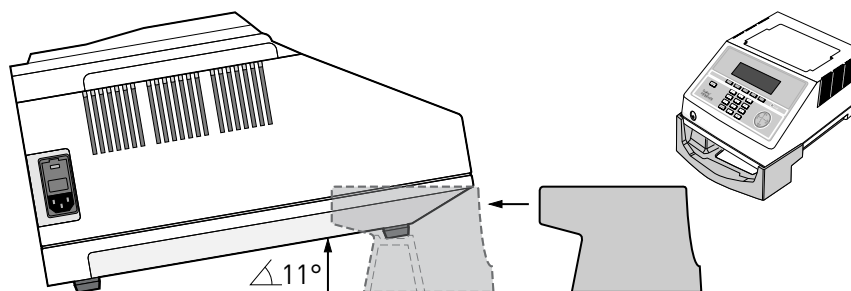
---

- b. Confirm that the QuantStudio™ 3D Tilt Base for Dual Flat Block GeneAmp® PCR System 9700 is installed beneath the thermal cycler.

---

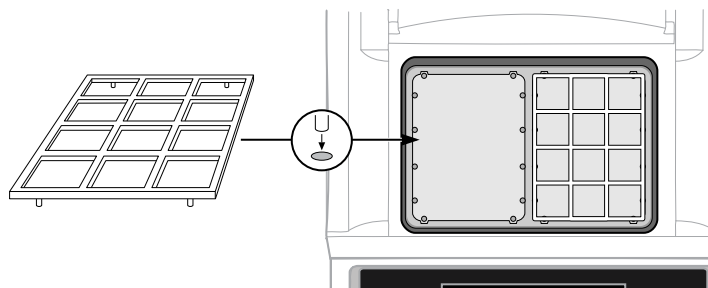
**IMPORTANT!** The Tilt Base inclines the GeneAmp® PCR System 9700 sample block by 11°, the angle required for the optimal performance of the Digital PCR 20K Chips.

---



- c. Open the GeneAmp® PCR System 9700 lid and confirm that a QuantStudio™ 3D Digital PCR Chip Carrier for Dual Flat Block GeneAmp® PCR System 9700 is installed to both sample blocks.

**Note:** Each Chip Carrier includes a set of four alignment pegs that fit into the holes of a flat sample block. The Chip Carrier can fit onto either side of the sample block (right or left) and in any orientation.



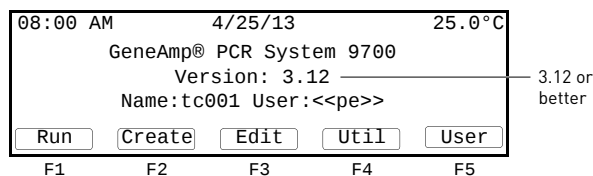
2. Power on the GeneAmp® PCR System 9700, then wait for the thermal cycler to start. When the GeneAmp® PCR System 9700 displays the main menu, confirm that the version number displayed on the screen is **3.12** or later.

If the GeneAmp® PCR System 9700 version is less than 3.12, contact Life Technologies support to upgrade the instrument firmware before thermal cycling Digital PCR 20K Chips.

---

**IMPORTANT!** The GeneAmp® PCR System 9700 must be running firmware version 3.12 to thermal cycle Digital PCR 20K Chips.

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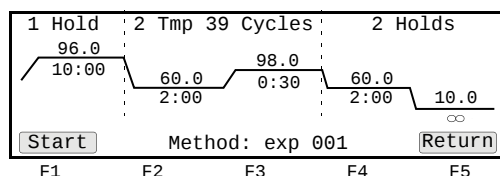
3. Confirm that the GeneAmp® PCR System 9700 contains the method for thermal cycling QuantStudio™ 3D Digital PCR 20K Chips.

If missing, program the GeneAmp® PCR System 9700 with the following method. See the *GeneAmp® PCR System 9700 Base Module User Manual* (Part no. 4303481) for more information on programming methods.

- Protocol:

| Stage                  | Step                      | Temp (°C) | Time (mm:ss) | Ramp rate |
|------------------------|---------------------------|-----------|--------------|-----------|
| Hold                   | DNA polymerase activation | 96.0      | 10:00        | Default   |
| Cycling<br>(39 cycles) | Anneal/extend             | 60.0      | 2:00         |           |
|                        | Denature                  | 98.0      | 0:30         |           |
| Hold                   | Final extension           | 60.0      | 2:00         |           |
| Hold                   | Storage                   | 10.0      | 99:59        |           |

- Run speed: **Standard**
- Reaction volume: **20 µL**



## Thermal cycle the Digital PCR 20K Chips

### Materials required

The following materials are required to thermal cycle prepared QuantStudio™ 3D Digital PCR 20K Chips for use with the QuantStudio™ 3D Digital PCR System.

- Prepared QuantStudio™ 3D Digital PCR 20K Chips (from the previous section)
- GeneAmp® PCR System 9700 Base Module
- Dual Flat Block Module GeneAmp® PCR System 9700
- QuantStudio™ 3D Digital PCR Chip Carriers
- QuantStudio™ 3D Digital PCR Thermal Pads
- QuantStudio™ 3D Digital PCR Tilt Base
- Isopropanol
- Gloves, powder-free, nitrile
- Laboratory-grade, lint-free wipes

### Guidelines for handling Chip Cases

To ensure the proper function of your loaded Digital PCR 20K Chips, handle the Chip Cases according to the following guidelines:

- Always wear powder-free gloves when handling Chip Cases.

---

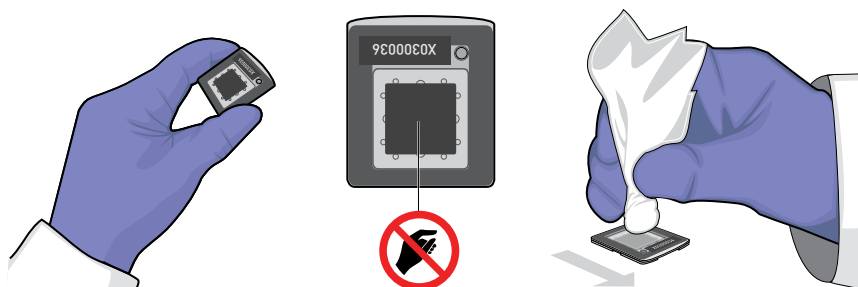
**IMPORTANT!** Never handle the Chip Cases without gloves. Oils from your hands can contaminate the Digital PCR 20K Chips and interfere with imaging.

---

- Handle the loaded Digital PCR 20K Chips by gently gripping the sides of each Chip Case, being careful to not apply pressure to the Digital PCR 20K Chip within it.
- Do not touch the surface of the QuantStudio™ 3D Digital PCR Chip Case Lid. If you accidentally touch the surface of a Chip Case Lid, clean the Chip Case using a laboratory wipe that has been thoroughly sprayed with isopropanol, then dry it by wiping in one direction using a clean laboratory wipe.

**Note:** Debris or excess sample on the Chip Case Lid can fluoresce and interfere with thermal uniformity.

- Thermal cycle loaded Chip Cases within 2 hours after loading them.



## Perform the PCR

**Note:** Install the Tilt Base to the thermal cycler for the following procedure.



**CAUTION! PHYSICAL INJURY HAZARD.** During operation, the sample block can be heated to 100°C. Before performing the following procedure, be sure to wait until the sample block reaches room temperature.

**IMPORTANT!** Thermal cycle prepared QuantStudio™ 3D Digital PCR 20K Chips within 2 hours after loading them.

**IMPORTANT!** Thermal cycling of Digital PCR 20K Chips must be performed on a Dual Flat Block GeneAmp® PCR System 9700 as described in this guide. No other thermal cyclers can be substituted at the time of the release of this manual.

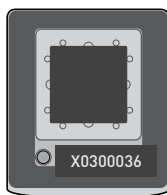
1. Open the GeneAmp® PCR System 9700 heated cover, then wipe the surface of both sample blocks using a lint-free wipe to ensure that they are clean and dry.
2. Confirm the Tilt Base is installed to the GeneAmp® PCR System 9700 and that Chip Carriers are installed to *both* sample blocks.

**IMPORTANT!** You must install Chip Carriers to *both* sample blocks when thermal cycling Digital PCR 20K Chips, even if you are using only one of the blocks.

3. Load the QuantStudio™ 3D Digital PCR 20K Chips into the GeneAmp® PCR System 9700:
  - a. Place the sealed Digital PCR 20K Chips onto the sample block so that the fill ports on the chips are positioned toward the *front* of the thermal cycler. The fill port must be elevated during thermal cycling to prevent leaks from improperly sealed chips.

**IMPORTANT!** If you are thermal cycling less than 24 Digital PCR 20K Chips, load according to the following guidelines:

- Load each Digital PCR 20K Chip so that the fill port is oriented toward the *front* of the GeneAmp® PCR System 9700.



Front of instrument

- Load the right sample block first, placing at least 1 chip on the right sample block.
- Balance the load between the left and right blocks so that the pressure applied by the heated cover and thermal pads is uniform across all of the loaded chips.

- b. Lay the QuantStudio™ Thermal Pads over the Digital PCR 20K Chips.

---

**IMPORTANT!** Make certain that each QuantStudio™ Thermal Pad is centered on the sample block and that it completely covers the Digital PCR 20K Chips.

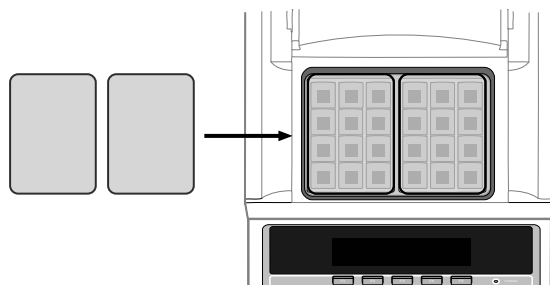
---



---

**IMPORTANT!** Do not allow the QuantStudio™ Thermal Pads to become dirty. Fluids, debris, and other contaminants that adhere to the pad can transfer to the Digital PCR 20K Chips during thermal cycling and fluoresce during imaging.

---



- c. Slide the heated cover forward and pull the heated cover lever down to engage the cover with the QuantStudio™ 3D Digital PCR 20K Chips.

---

**IMPORTANT!** Pull the heated cover completely forward to ensure a proper seal.

---

4. From the Main menu of the GeneAmp® PCR System 9700, press **Run** (F1).

|                          |         |        |
|--------------------------|---------|--------|
| 08:00 AM                 | 4/25/13 | 25.0°C |
| GeneAmp® PCR System 9700 |         |        |
| Version: 3.12            |         |        |
| Name:tc001 User:<<pe>>   |         |        |
| Run                      | Create  | Edit   |
| Util                     | User    |        |
| F1                       | F2      | F3     |
| F4                       | F5      |        |

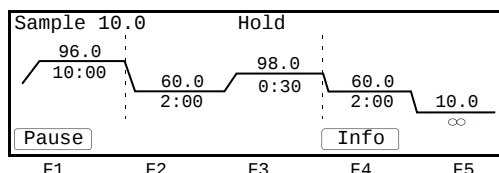
5. From the Stored Methods screen, use the Circular Key Pad to select the method that you created previously, then press **Start**.

| Methods on Inst | User   | Size | Stored |
|-----------------|--------|------|--------|
| XL PCR          | <<pe>> | 11   | 9/9/13 |
| Touchdown PCR   | <<pe>> | 6    | 9/9/13 |
| AmpliTaQ Gold™  | <<pe>> | 9    | 9/9/13 |
| AmpliCycle Seq  | <<pe>> | 8    | 9/9/13 |

|      |      |      |      |        |
|------|------|------|------|--------|
| Copy | View | User | Sort | Cancel |
| F1   | F2   | F3   | F4   | F5     |

- Select **STD** mode, enter **20 µL** in the Reaction Volume field, then press **Start** (F1) to begin the run.

You can remove the Digital PCR 20K Chips from the block immediately after the final extension step at 60°C is complete and the temperature of the block is <30°C.



**IMPORTANT!** Read the Digital PCR 20K Chips within one hour after you remove them from the GeneAmp® PCR System 9700 sample block.

**Note:** After thermal cycling, the Digital PCR 20K Chips can remain on the sample block for up to 24 hours.

**Note:** If your GeneAmp® PCR System 9700 performs a 10°C hold following thermal cycling, you might observe condensation on the Digital PCR 20K Chips. If so, use a lint-free wipe to remove the moisture before imaging.

## Unload the thermal cycler



**CAUTION! PHYSICAL INJURY HAZARD.** During operation, the sample block can be heated to 100°C. Before performing the following procedure, be sure to wait until the sample block reaches room temperature.

- Raise the heated cover lever and slide the cover back to expose the Digital PCR 20K Chips.
- Remove the QuantStudio™ Thermal Pads from the sample block and set them on a clean, dry surface.

**IMPORTANT!** Do not discard the QuantStudio™ Thermal Pads. They can be reused multiple times.

- Remove the Chip Carriers from the GeneAmp® PCR System 9700 sample block and place them on a clean, dry surface. Remove the Digital PCR 20K Chips from the Chip Carriers and allow them to equilibrate to room temperature.

**Note:** To remove a chip from a Chip Carrier, push the Digital PCR 20K Chip from beneath and grasp the edges of the Chip Case, then remove it.

**IMPORTANT!** Handle the Chip Cases gently, being careful to not apply pressure to the Digital PCR 20K Chips within them.

4. Visually inspect each Digital PCR 20K Chip for signs of leaks or potential problems. Using a lint-free laboratory wipe, remove any condensation or Immersion Fluid from the surface of the chip by wiping in one direction. If necessary, use a lint-free laboratory wipe sprayed with isopropanol to remove any dried residue.

---

**IMPORTANT!** Thoroughly clean each Chip Case before proceeding.

---



The Digital PCR 20K Chip is now ready to be imaged by the QuantStudio™ 3D Instrument. Run the prepared Digital PCR 20K Chips within 1 hour after removing them from the thermal cycler.

---

**IMPORTANT!** Store the prepared Digital PCR 20K Chips in a clean, dry, dark location until you are ready to image them. Prolonged exposure to light can diminish the fluorescence of the photosensitive dyes in the chips.

---

**Note:** If a Digital PCR 20K Chip is sealed improperly, the chip may leak and contaminate the sample block. If you suspect that a chip has leaked, remove the fluid from the sample block using a lint-free laboratory wipe sprayed with isopropanol.

# 4

## Analyze the Prepared Chips

|                                                           |    |
|-----------------------------------------------------------|----|
| ■ Using the QuantStudio™ 3D Digital PCR Instrument .....  | 57 |
| ■ Analyze the chips .....                                 | 60 |
| ■ Analyzing the data .....                                | 63 |
| ■ Using the QuantStudio™ 3D AnalysisSuite™ Software ..... | 67 |

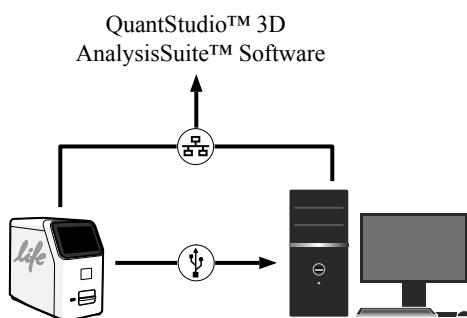
### Using the QuantStudio™ 3D Digital PCR Instrument

#### About imaging and primary analysis

The QuantStudio™ 3D Digital PCR Instrument performs the image capture and subsequent preliminary analysis of QuantStudio™ 3D Digital PCR 20K Chips following thermal cycling on the GeneAmp® PCR System 9700. The QuantStudio™ 3D Instrument processes Digital PCR 20K Chips individually, where each run lasts approximately one minute. After reading a chip, the instrument performs an initial evaluation of the imaging data collected during the run and displays the results on the instrument touchscreen.

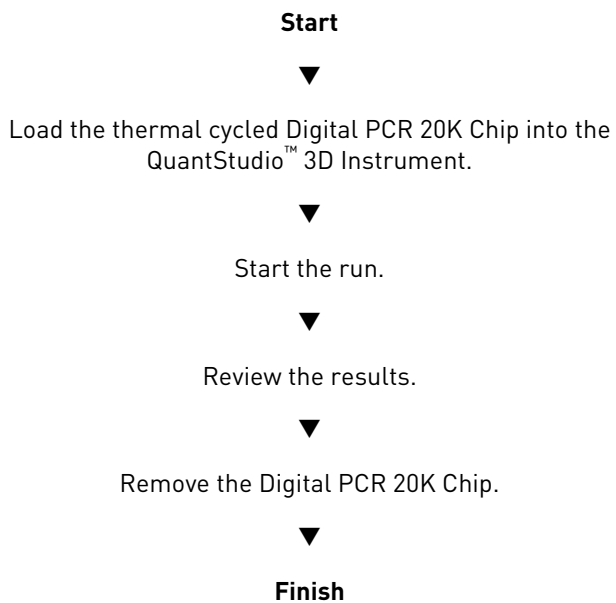
#### QuantStudio™ 3D System data flow

For each imaged Digital PCR 20K Chip, the QuantStudio™ 3D Instrument generates and saves a single experiment (.eds) file that contains the processed imaging data and the results from the primary analysis. Depending on the chosen data destination, the instrument transfers the saved imaging data directly to the Life Technologies cloud for immediate access by the AnalysisSuite™ Software, or to a network file server or local USB drive for later manual import.



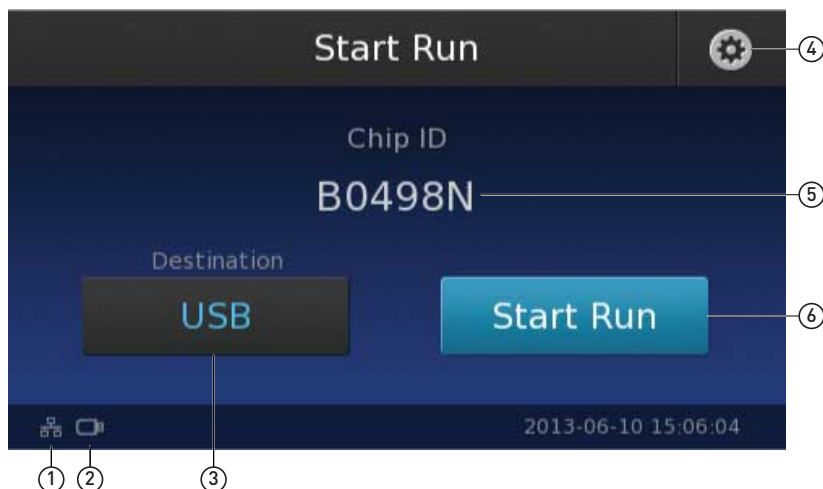
## Analysis workflow

The following figure shows the workflow for running a single QuantStudio™ 3D Digital PCR 20K Chip on the QuantStudio™ 3D Digital PCR Instrument.



## About the instrument interface

The QuantStudio™ 3D Digital PCR Instrument features a simple interface for reading thermal cycled QuantStudio™ 3D Digital PCR 20K Chips.



- 1 Network status icon** – Represents the status of the QuantStudio™ 3D Instrument network connection:

  - – Wired (Ethernet) connection selected; connected to network.
  - – Wired (Ethernet) connection selected; no connection available.
  - – Wireless connection selected; connected to network.
  - – Wireless connection selected; no connection available.
- 2 Data destination icon** – Represents the selected data destination:

  - – Cloud data destination selected.
  - – USB drive destination selected.
- 3 Destination button** – Lists the name of the destination to which the QuantStudio™ 3D Instrument will save data. Touch the button to select a data destination.
- 4 Settings button** – Touch to open the Instrument Settings menu that allows you to set the system date and time, the network connection, and perform other maintenance and configuration tasks.
- 5 Chip presence indicator** – Indicates the presence of a Digital PCR 20K Chip within the QuantStudio™ 3D Instrument. When a chip is loaded within the instrument, the touchscreen displays the chip ID present on the QuantStudio™ 3D Digital PCR Chip Case Lid.

**Note:** If the QuantStudio™ 3D Instrument cannot read the chip ID, then the touchscreen displays the instrument name instead.
- 6 Start Run button** – Touch to image the loaded Digital PCR 20K Chip.

**Note:** The Start Run button is inactive until a Digital PCR 20K Chip has been loaded and a viable destination is available.

## Analyze the chips

### Materials required

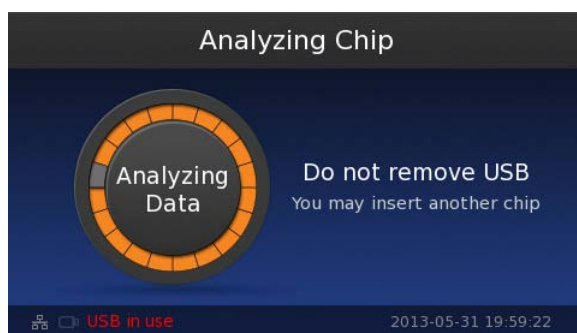
The following materials are required to image loaded Digital PCR 20K Chips on the QuantStudio™ 3D Digital PCR System.

- Prepared Digital PCR 20K Chip (from the previous section)
- Isopropanol
- Gloves, powder-free, nitrile
- Laboratory-grade, lint-free wipes

### Guidelines for high-throughput analysis

For optimal efficiency when running large numbers (>6) of Digital PCR 20K Chips, follow the guidelines below:

- Run the Digital PCR 20K Chips in alphanumeric order (according to chip ID) to help avoid mistakes when entering sample information.
- If you are running multiple chips, you can run the next chip in the series when the touchscreen displays the Analyzing Chip screen.

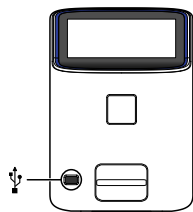


### Image the Digital PCR 20K Chips

1. Set the destination for the imaging data:
  - a. From the Main Menu of the QuantStudio™ 3D Instrument, touch **Destination**.
  - b. In the Destination screen, touch the desired destination for the imaging data. You can configure the QuantStudio™ 3D Instrument to upload the imaging data to a USB drive, a network file server, or the cloud data storage service.



2. If you choose to use a USB drive as a destination for your imaging data, insert the drive into the USB port on the front of the instrument.

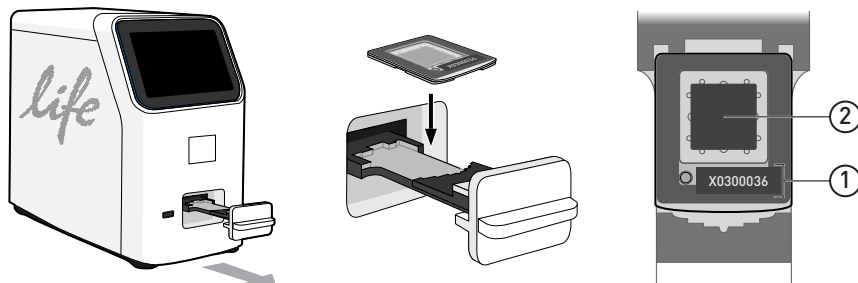


The touchscreen displays the USB drive icon (📁) when the QuantStudio™ 3D Instrument has mounted the USB drive.

3. Open the chip tray and load the Digital PCR 20K Chip face-up into the bay. Confirm that the Digital PCR 20K Chip is correctly aligned within the chip tray, then close it.

**Note:** The chip tray is keyed such that the Digital PCR 20K Chip will only fit in one orientation.

**Note:** The chip tray is fully closed when it is flush with the front of the instrument.



- 1 Orient the chip ID and fill port toward the front of the instrument.
- 2 Confirm that the chip window is clean and correctly aligned to the chip.

The touchscreen illuminates the **Start Run** button and displays the chip ID when it is ready to perform the run. If the QuantStudio™ 3D Instrument cannot read the ID number, the touchscreen displays the instrument name followed by the time and date of the run.

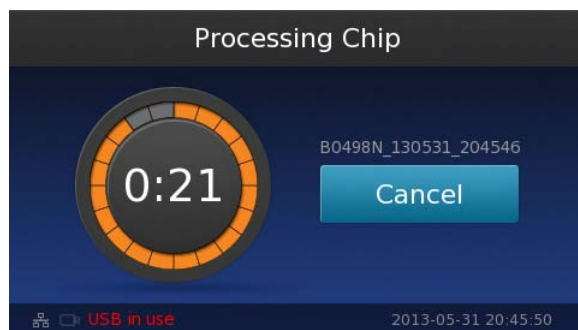


4. In the instrument touchscreen, touch **Start Run**, then wait for the QuantStudio™ 3D Instrument to image the chip.

---

**IMPORTANT!** Do not open the chip tray or remove the USB drive (if present) while the instrument displays the countdown screen. Doing so will invalidate the image data and require you to repeat the run.

---

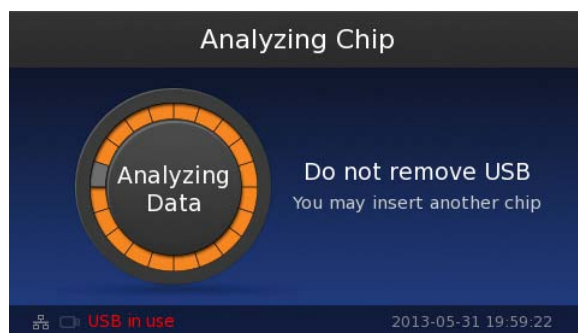


While the instrument images the chip, the touchscreen counts down the time remaining in the run.

**Note:** While the run is in progress, you can stop the run at any time by touching **Cancel**.

**Note:** The touchscreen reports the QuantStudio™ 3D Instrument status as "USB in use" while the instrument writes the results to the USB drive.

5. When the touchscreen displays the Analyzing Chip screen, open the chip tray and remove the Digital PCR 20K Chip. Store or discard it as desired.

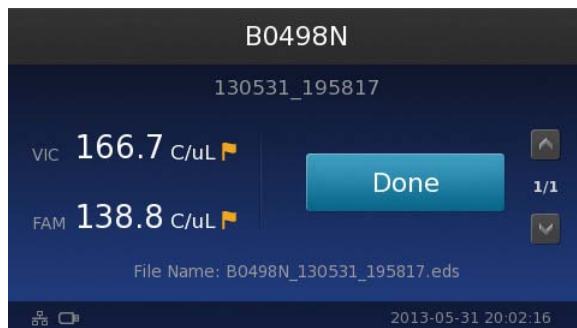


You can read another Digital PCR 20K Chip without waiting for the analysis to complete. To begin the next run, load the chip and touch **Start Run** as described in step 3.

**Note:** Running chips in rapid succession will not compromise the ongoing analysis; however, the QuantStudio™ 3D Instrument performance may slow slightly as more chips are read.

The QuantStudio™ 3D Instrument displays the results of the chip analysis after it has processed the imaging data and transferred the results to the selected destination.

6. After reviewing the results of the run, touch **Done** to close the results screen.



If the analysis of the imaging data produced a  (red) for either probe (FAM<sup>™</sup> or VIC<sup>®</sup> dye), visually inspect the chip for problems and read the chip again.

**Note:** If the run fails because the instrument is unable to read the Digital PCR 20K Chip, touch **Done**, then touch **Start Run** again to repeat the reading. If the run fails repeatedly, discard the chip and prepare a replacement.

After a Digital PCR 20K Chip has been read:

- You run the imaged Digital PCR 20K Chip again for up to 1 hour after thermal cycling.
- If you read multiple Digital PCR 20K Chips in rapid succession, touch the scroll buttons ( ) to review the results of the previously imaged chips.
- The QuantStudio<sup>™</sup> 3D Instrument retains a copy of the analyzed data for the imaged Digital PCR 20K Chip that you can access from the Run History screen.

**Note:** The results will remain in the QuantStudio<sup>™</sup> 3D Instrument cache for approximately 300 readings. After 300 chips, the instrument removes the oldest data file in the cache to store each new reading.

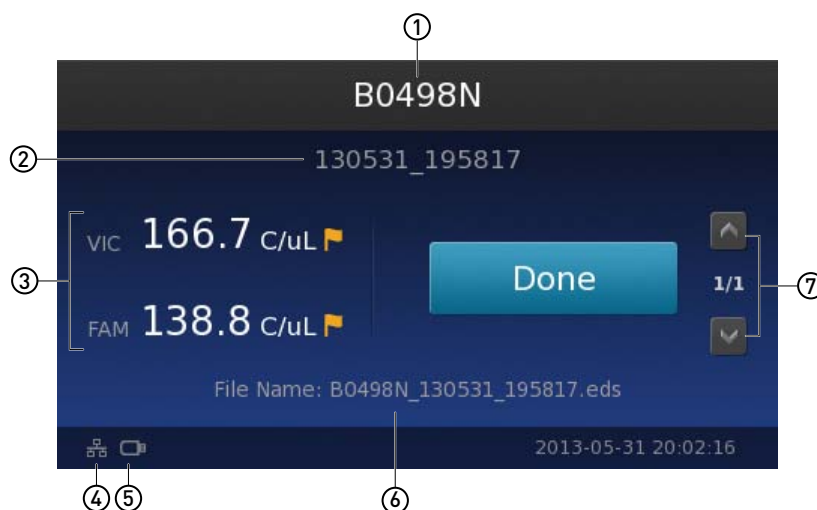
## Analyzing the data

### About the analysis

After the QuantStudio<sup>™</sup> 3D Digital PCR Instrument images a Digital PCR 20K Chip, the instrument performs an initial evaluation of the raw data to determine the viability of the collected data. During the analysis, the instrument identifies the wells within the captured images and performs a quality assessment of the composite results to determine whether the instrument has collected usable data. If the imaging data pass the initial quality assessment, the QuantStudio<sup>™</sup> 3D Instrument calculates the estimated concentration of the nucleic acid sequence targeted by the FAM<sup>™</sup> and VIC<sup>®</sup> dye-labeled probes. The resulting data are reported in copies per  $\mu\text{L}$  along with the results of the quality assessment displayed using colored flags.

## About the results screen

The QuantStudio™ 3D Digital PCR Instrument displays a summary of the imaging data after each successful run. For each QuantStudio™ 3D Digital PCR 20K Chip imaged, the instrument displays the following information:



- ① **Chip ID** – Displays the ID number of the Digital PCR 20K Chip. If the instrument cannot read the chip ID, the touchscreen displays the instrument name followed by the time and date of the run.
- ② **Time/date stamp** – Displays the date and time of the run in <yymmdd>\_<hhmmss> format.
- ③ **FAM/VIC copy number estimate** – Displays the estimated concentration in copies per  $\mu\text{L}$  calculated from the fluorescence signal associated with the amplification of the nucleic acid sequence targeted by the FAM™ and/or VIC® dye-labeled probes.  
Beside the copy number estimate, the QuantStudio™ 3D Instrument displays a flag icon, color-coded to indicate the status of the preliminary analysis of the image data for the associated probe.
- ④ **Network status icon** – Represents the status of the QuantStudio™ 3D Instrument network connection:
  - – Wired (Ethernet) connection selected; connected to network.
  - – Wired (Ethernet) connection selected; no connection available.
  - – Wireless connection selected; connected to network.
  - – Wireless connection selected; no connection available.
- ⑤ **Data destination icon** – Represents the selected data destination:
  - – Cloud destination selected.
  - – USB drive destination selected.
- ⑥ **File name** – Name of the experiment (.eds) file created for the imaged Digital PCR 20K Chip.
- ⑦ **Scroll buttons** – Allow you to display the results of previously imaged Digital PCR 20K Chips when running them in a series.

## About data quality flags

Data quality flags generated and displayed by the software are a measure of the overall chip quality, based on well quality thresholds and other data analysis characteristics.

**Note:** For more information on quality assessment in the software, see the *QuantStudio™ 3D AnalysisSuite™ Software Help*.

In order, from high quality to low quality:

-  (green) – Review of the analysis results is not required. This flag is shown if the data meets all quality thresholds.
-  (yellow) – Review of the analysis results is suggested. This flag is shown if the:
  - Instrument cannot clearly identify the population of unamplified wells (sigma separation < 5).
  - Distribution of unamplified wells on the chip is not uniform (uniformity assessment < 0.99).
  - Sample concentration is outside the optimal range (200-2000 copies/μL) currently defined by the Life Technologies chip quality metrics.
-  (red) – Review of the analysis results is strongly suggested. If necessary, reimage the Digital PCR 20K Chip or rerun the sample. This flag is shown if the total number of filled wells is < 5000 or the percentage of low quality wells (those with well quality < 0.5) is > 15%.

## About the data files

For each QuantStudio™ 3D Digital PCR 20K Chip it reads, the QuantStudio™ 3D Digital PCR Instrument stores the processed imaging data and the results of the preliminary analysis to a single experiment (.eds) file.

The instrument names each experiment file uniquely by combining the ID of the chip and the date/time of the run according to the following formula:

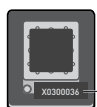
BO498N\_130531\_195817.eds

  
①

  
②

  
③

- ① **Chip ID** - The label applied to the QuantStudio™ 3D Digital PCR Chip Case Lid that uniquely identifies the Digital PCR 20K Chip to which it is applied.



Chip ID

**IMPORTANT!** If the instrument cannot read the ID of a loaded chip, then it uses the instrument name instead to name the file.

- ② **Date stamp** – The date at which the Digital PCR 20K Chip was run, expressed in the "yyymmdd" format where *yy* is the last two digits of the year, *mm* is the numerical order of the month, and *dd* is the day of the run.
- ③ **Time stamp** – The time at which the Digital PCR 20K Chip was run, expressed in the "hhmmss" format where *hh* is the hour (in 24-hour format), *mm* is the minutes, and *ss* is the seconds.

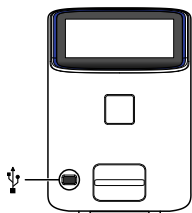
**Note:** In the example shown above, the file name indicates that the file contains data for chip BO498N which was run at 7:58 pm on May 31, 2013.

Following an image analysis, the QuantStudio™ 3D Instrument transfers the experiment (.eds) file for the QuantStudio™ 3D Digital PCR 20K Chip to the selected destination *and* saves a copy of the file locally to the instrument. You can access *and/or* download the experiment (.eds) files of previous runs from the Run History screen.

## Transfer the results

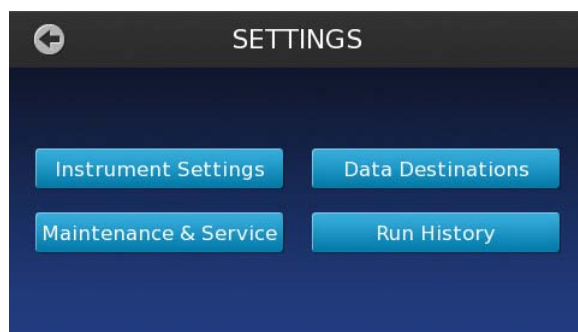
If a data transfer is unsuccessful, you can use the QuantStudio™ 3D Instrument Run History screen to transfer experiment files to a USB drive for manual upload to the QuantStudio™ 3D AnalysisSuite™ Software. Under normal conditions, the instrument automatically transfers the results for each imaged chip immediately following the analysis (to the cloud storage service, network file server, or USB drive); however, if the network connection fails or if the USB drive is full, you can transfer the files manually as follows to make them available for secondary analysis.

1. Insert a USB drive into the port on the front of the QuantStudio™ 3D Instrument.



2. In the touchscreen, touch  in the Main Menu.
3. In the Settings Menu, touch **Run History** to view the results for the past experiments.

**Note:** The QuantStudio™ 3D Instrument can store up to 300 experiment files before it begins purging the files from memory. When the instrument reaches the limit, it replaces the oldest file in the cache with the data from the current run.



4. In the Run History screen, touch the entry of the experiment that you want to transfer or view.



The Run History screen displays the data transfer status next to each file in the instrument memory:

- **Pass** – The instrument successfully transferred the file to the selected destination.
  - **In Progress** – The instrument is either processing the imaging data for the associated file, or transferring the file to the selected destination.
  - **Export Failed** – The instrument was unable to transfer the results to the selected destination.
  - **Run Failed** – The instrument was unable to process the imaging data for the chip.
5. In the Results Details screen, touch **Export**, then touch **Export** again to transfer the file to the USB drive.



6. When finished, touch the back arrow several times to return to the Main Menu, then remove the USB drive from the instrument.

After exporting experiment (.eds) files to the USB drive, you can upload them to the cloud for analysis using the QuantStudio™ 3D AnalysisSuite™ Software.

## Using the QuantStudio™ 3D AnalysisSuite™ Software

After the analyzed imaging data has been transferred to the QuantStudio™ 3D AnalysisSuite™ Software, you can log into the software to perform the secondary analysis as described below.

### Computer requirements

The QuantStudio™ 3D AnalysisSuite™ Software is accessed as a web-based application that is optimized for use with the Microsoft® Windows® 7 operating system running the following Internet browsers:

- Google® Chrome™ v21 or later
- Microsoft® Internet Explorer® v10.0 or later

## Access the software from a cloud account

When deployed in cloud configuration, the AnalysisSuite™ Software is accessed as a web-based application that can be run using any compatible web browser (see “Computer requirements” on page 8).

To access the software from a cloud account:

1. Confirm that your computer has a network connection.

**Note:** If your computer does not have a network connection, contact a Life Technologies Sales Representative (see “Obtaining support” on page 105) for information on available AnalysisSuite™ Software deployment options.

2. Open a browser window and go to **<https://apps.lifetechnologies.com/quantstudio3d>**.

**Note:** Using your browser settings, confirm that cookies and Javascript are turned on for the website to function correctly. If you cannot access the website, then contact Life Technologies Customer Support or email **[Servicedesk@lifetech.com](mailto:Servicedesk@lifetech.com)**.

3. Select to **Launch QuantStudio™ 3D AnalysisSuite™ Cloud Software**.

**Note:** You can also access the software from the Software Downloads page (see “Obtaining support” on page 105).

4. Sign into the software using your Life Technologies user name and password, or follow the instructions to create a new user account.

**Note:** If you cannot sign in to the software, contact Life Technologies Customer Support or email **[Servicedesk@lifetech.com](mailto:Servicedesk@lifetech.com)**.

## Obtaining information from the Help system

The QuantStudio™ 3D AnalysisSuite™ Software features a Help system that describes how to use each feature of the user interface. You can use the Help system to find topics of interest by:

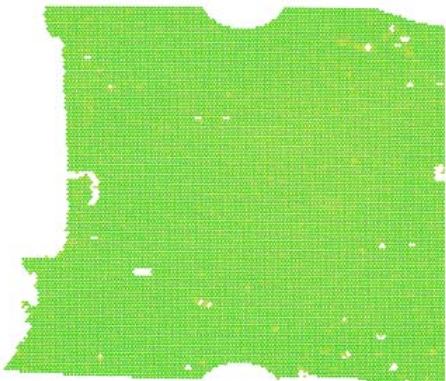
- Reviewing the table of Contents in the sidebar
- Searching for a specific topic – Enter your search term in the Search field in the upper right, then click **Enter**. The search results will appear under the Search tab in the sidebar.

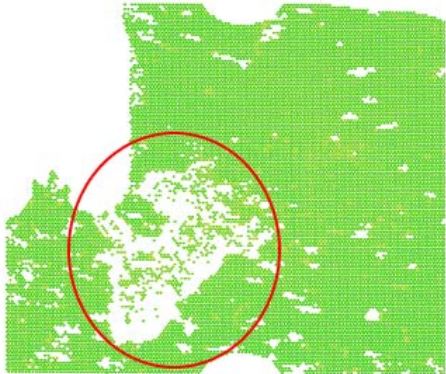
To access the Help system click  **Help** from any screen.

## Troubleshooting chip images using the Chip View

The following table summarizes some of the more common problems that can affect imaging of Digital PCR 20K Chips.

**Note:** In the examples shown below, the conditions triggered a data flag in the Digital PCR 20K Chip and the conditions were diagnosed using the Chip View of the AnalysisSuite™ Software.

| Observation                                                                                         | Possible Cause                                                               | Action                                                                                                                                                  |
|-----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Chip view</p>  | Debris or other contaminants are present on the Chip Sealant during imaging. | No action required.<br><br>The AnalysisSuite™ Software can compensate for small quantities of debris or other contaminants on the Digital PCR 20K Chip. |

| Observation                                                                                                                                                                                              | Possible Cause                                                                                                                                                                                                                                                                  | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Chip view</p>                                                                                                        | <p>A bubble was present in the Sample Loading Blade when it was used to apply the PCR reaction to the Digital PCR 20K Chip.</p>                                                                                                                                                 | <p>If possible, use the AnalysisSuite™ Software to filter the low quality data points, or discard the chip and run the sample again.</p> <p>When loading the Sample Loading Blades:</p> <ul style="list-style-type: none"> <li>• If you are using a manual pipette, pipette to the first stop.</li> <li>• If you are using an electronic pipette, decrease your pipetting speed.</li> <li>• If a bubble does form in the Sample Loading Blade, gently tap it to remove bubble before loading.</li> </ul>                                                                                                                                                                                                                                                  |
| <p>Chip view</p>  <p>Chip view</p>  | <ul style="list-style-type: none"> <li>• Excess PCR reaction was present on the Digital PCR 20K Chip after loading it with the Sample Loading Blade.</li> <li>• The Sample Loading Blade was drawn across the chip too quickly or at an angle shallower than 70-80°.</li> </ul> | <p>If possible, use the AnalysisSuite™ Software to filter the low quality data points, or discard the chip and run the sample again.</p> <p>To prevent leaving excess PCR reaction on the Digital PCR 20K Chips:</p> <ul style="list-style-type: none"> <li>• Confirm that the heated block used to load Digital PCR 20K Chips is set to 40±1°C.</li> <li>• Make sure to wait 20 seconds after loading a Digital PCR 20K Chip before pre-wetting it with Immersion Fluid.</li> <li>• Make sure to install the Tilt Base to the GeneAmp® PCR System 9700. You must thermal cycle the Digital PCR 20K Chips at a 11° angle.</li> <li>• Make sure to draw the Sample Loading Blade across the chip slowly (&gt;10 seconds) and at a 70-80° angle.</li> </ul> |

| Observation                                                                                         | Possible Cause                                                                                                                                                                                                                                                                                                                                                                          | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Chip view</p>   | <ul style="list-style-type: none"> <li>The Digital PCR 20K Chip leaked during thermal cycling or imaging.</li> <li>A large bubble was present in the chip (insufficient Immersion Fluid).</li> <li>Immersion Fluid was not applied to the chip immediately after loading (evaporation of the PCR reaction).</li> <li>Excess Immersion Fluid is present on the Chip Case Lid.</li> </ul> | <p>If present, remove excess Immersion Fluid from the chip lid and run the chip again.</p> <p>If possible, use the AnalysisSuite™ Software to filter the low quality data points.</p> <p>Make sure to apply Immersion Fluid to each chip immediately after loading it with PCR reaction.</p> <p>To minimize leakage, when sealing each Digital PCR 20K Chip:</p> <ul style="list-style-type: none"> <li>Wear correctly fitted gloves to prevent the glove material from snagging during lid application.</li> <li>Make sure that the Chip Case Lid is correctly aligned to the Chip Case.</li> <li>Firmly press all four corners when applying the Chip Case Lid.</li> <li>Cure the Chip Sealant under ultraviolet light for at least 30 seconds.</li> </ul> |
| <p>Chip view</p>  |                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |



# Maintenance

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**IMPORTANT!** This chapter contains all user service procedures for the QuantStudio™ 3D Digital PCR Instrument. Procedures other than those described in this document must be performed by a qualified Life Technologies Service Engineer.

---

## Cleaning the chip tray and sample block

If a QuantStudio™ 3D Digital PCR 20K Chip leaks during thermal cycling or during a run, perform the following procedure to eliminate any residual contaminants from the QuantStudio™ 3D Instrument chip tray or the GeneAmp® PCR System 9700.

### Materials required

- Cotton or nylon swabs and lint-free cloths
- Deionized water
- Isopropanol
- Pipette (100-μL) with pipette tips
- Powder-free gloves
- Safety glasses
- Tissue, lint-free



## Clean the chip tray or sample block



**CAUTION! PHYSICAL INJURY HAZARD.** Do not remove the covers to the QuantStudio™ 3D Instrument or GeneAmp® PCR System 9700. There are no components inside the instruments that you can safely service yourself. If you suspect a problem, contact a Life Technologies Service Representative.



**CAUTION! PHYSICAL INJURY HAZARD.** During instrument operation, the sample block can be heated to 100°C. Before performing the following procedure, be sure to wait until the sample block reaches room temperature.



**CAUTION!** Before using a recommended decontamination method other than that here, contact Life Technologies that the proposed method will not damage the equipment.

**IMPORTANT!** Wear powder-free gloves when you perform this procedure.

1. Power off and unplug the QuantStudio™ 3D Instrument or GeneAmp® PCR System 9700.
2. Open the QuantStudio™ 3D Instrument chip tray or open the GeneAmp® PCR System 9700 heated cover to expose the sample block.
3. If you are cleaning the GeneAmp® PCR System 9700, remove the Chip Carriers and QuantStudio™ Thermal Pad from the sample block.
4. If the contamination remains, clean the chip tray or sample block using isopropanol:
  - a. Pipet a small volume of 10% isopropanol solution onto surface that contacts the consumable, then use a cotton swab to scrub the surface.
  - b. Pipet a small volume of deionized water onto surface, then use a cotton swab to scrub the surface.
  - c. Use a lint-free cloth to absorb the excess deionized water.

**IMPORTANT!** Always use deionized water to rinse after cleaning with isopropanol solution.

5. Close the heated cover or chip tray, then plug in and power on the QuantStudio™ 3D Instrument or GeneAmp® PCR System 9700.

## Configure the instrument settings

After placing the QuantStudio™ 3D Digital PCR Instrument, prepare it for use by configuring the system settings for your region as explained below.

### Set the instrument name

1. From the Main Menu of the touchscreen, touch , then touch **Instrument Settings**.
2. In the Instrument Settings menu, touch **Instrument Name**.



3. In the Instrument Name screen, touch the Instrument Name field, enter up to a 16-character name for the instrument, then touch  to save the setting.



---

**IMPORTANT!** The instrument name is an alphanumeric string used to identify the QuantStudio™ 3D Instrument on the network. The instrument name:

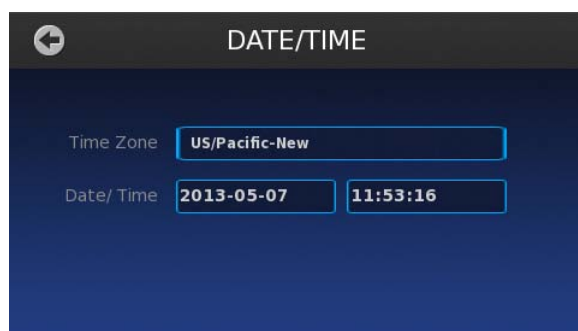
- Can be up to 16 characters long.
  - Must consist of alphabetic and numeric characters.
  - Can contain hyphens, but not as the first or last characters in the name.
  - Cannot include spaces or special characters ( ; : " < > \* + = \ | ? , ).
- 

4. Touch  when done to save the setting, then touch  again to return to the Main Menu.

## Set the date and time

**Note:** If connected to a network, the QuantStudio™ 3D Instrument can automatically acquire the date and time settings via Network Time Protocol (NTP).

1. From the Main Menu of the touchscreen, touch , then touch **Instrument Settings**.
2. In the Instrument Settings screen, touch **Date/Time**.
3. Set the date, time, and time zone:
  - a. Touch the **Time Zone** field, then select the correct continent and region from the lists.
  - b. Touch the **Date** field, enter the current date, then touch **Enter**.
  - c. Touch the **Time** field, enter the appropriate time units, then touch **Enter**.





4. Touch  when done to save the setting, then touch  again to return to the Main Menu.

## Returning your QuantStudio™ 3D Instrument for service

Before returning your QuantStudio™ 3D Digital PCR Instrument for service, transfer any experiment (.eds) files from the instrument as explained in “Transfer the results” on page 66. This practice ensures that you will not lose data when the QuantStudio™ 3D Instrument is serviced.

To return your instrument for service:

1. Contact your local customer care center or technical support group to obtain a copy of the Certificate of Instrument Decontamination, a service notification, a service call number, and packaging (if required).
2. Decontaminate the QuantStudio™ 3D Instrument.

---

**IMPORTANT!** If the chip tray becomes contaminated with radioactivity, use a commercially available decontaminant to remove the contamination. If the tray cannot be decontaminated, the instrument cannot be returned to Life Technologies for service.

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3. Complete and sign a copy of the Certificate of Instrument Decontamination.
4. Fax the Certificate of Instrument Decontamination to the customer care center.
5. Pack the QuantStudio™ 3D Instrument in the provided packaging, without any accessories or power cords. Include a hard copy of the Certificate of Instrument Decontamination in the box.  
**Note:** Repairs for instruments without the Certificate of Instrument Decontamination are delayed.
6. Affix the provided postage to the box, then ship the instrument to the designated facility.

The repair process requires 2 to 3 weeks.

## Replace the instrument fuses

If the fuses of your QuantStudio™ 3D Digital PCR Instrument fail, perform the following procedure to replace them.

### Materials required

- Fuses, 1.6A, Time-Lag T, 250VAC, 5 × 20-mm (2)
- Safety glasses
- Powder-free gloves
- Screwdriver, flathead

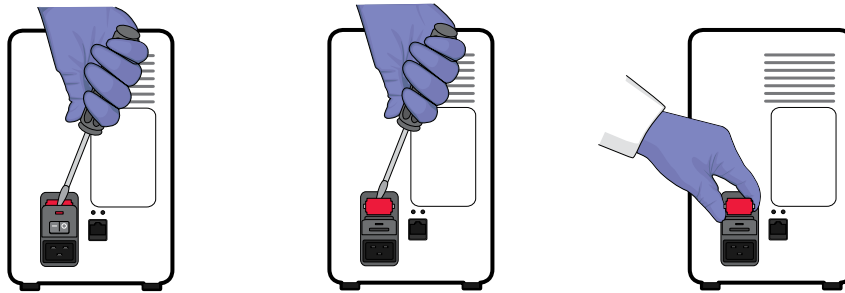


## Replace the fuses

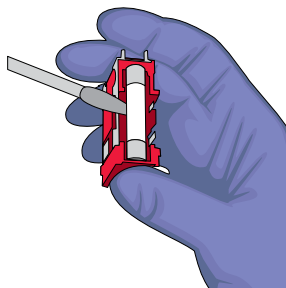


**CAUTION! FIRE HAZARD.** For continued protection against the risk of fire, replace fuses only with listed and certified fuses of the same type and rating as those currently in the QuantStudio™ 3D Instrument.

1. Power off, then unplug the QuantStudio™ 3D Digital PCR Instrument.
2. Using a flat-head screwdriver, pry open the fuse door, and remove the fuse holder.



3. Remove each fuse from its fuse holder and inspect it for damage. Carbon typically coats the inside of failed fuses.



4. Replace each failed fuse with a 1.6A, Time-Lag T, 250VAC, 5 × 20-mm Fuse.

**Note:** The voltage and amperage ratings are on the fuse holder.

5. Install the fuse holder.
6. Plug in, then power on the QuantStudio™ 3D Instrument. The installation is successful if the instrument powers on.

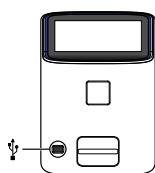
**Note:** Fuse failure can result from fluctuations in the supplied power to the QuantStudio™ 3D Instrument. To prevent further failures, consider installing an electrical protective device, such as a UPS or surge protector.

## Update the instrument firmware

You can download QuantStudio™ 3D Digital PCR Instrument firmware updates directly from the service section of the Life Technologies website. After obtaining a firmware update, transfer the update to the QuantStudio™ 3D Digital PCR Instrument using a USB drive.

## Update the firmware

1. Download the firmware update:
  - a. Go to [www.lifetechnologies.com/support/software/](http://www.lifetechnologies.com/support/software/)
  - b. In the Software Downloads page, select Applied Biosystems® QuantStudio™ 3D Digital PCR System Software from the menu.
  - c. In the Software Downloads page for your QuantStudio™ 3D Digital PCR Instrument, click **Updates - Patches**.
  - d. Download the QuantStudio™ 3D Instrument firmware to a USB drive.
2. Plug the drive into the USB port on the front of the QuantStudio™ 3D Instrument.



3. From the Main Menu of the touchscreen, touch , then touch **Maintenance & Service**.
4. In the Maintenance & Service screen, touch **Software Update** then wait while the QuantStudio™ 3D Instrument scans the USB drive for the firmware update.
5. In the Software Upgrade screen, touch **OK** to proceed with the update. Allow the QuantStudio™ 3D Instrument to complete the update.

---

**IMPORTANT!** Do not remove the USB drive from the QuantStudio™ 3D Instrument until after the update is complete.

---

6. After the upgrade is complete and the QuantStudio™ 3D Instrument restarts, confirm the success of the firmware update:
  - a. Unplug the USB drive from the instrument.
  - b. Touch , then touch **Maintenance & Service**.
  - c. In the Maintenance & Service screen, touch **Software Update** to view the software version number to confirm that the firmware has been upgraded.
7. When you are finished, touch **Cancel**, then touch  to return to the Main Menu.

## View the instrument log

You can use the QuantStudio™ 3D Digital PCR Instrument touchscreen to view and export a log that summarizes the past 6 months of instrument activity. For each event, the log provides a description of the activity and the date/time when it occurred.

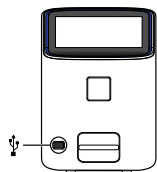
**Note:** The information conveyed in the instrument log is used primarily by Life Technologies support as a resource for troubleshooting instrument errors. If the QuantStudio™ 3D Instrument encounters an error during operation, the log is written to the experiment (.eds) file, which can be exported and sent to Life Technologies. If



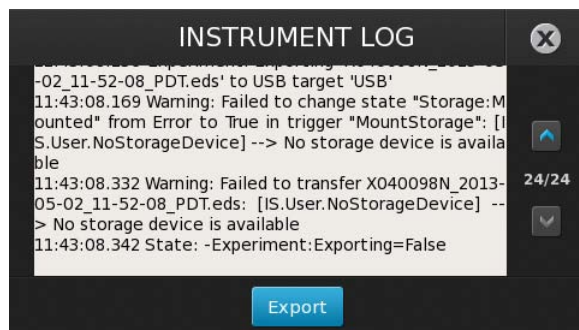
the instrument does not generate a file, then you can export the instrument log for distribution as explained below.

## View the log

1. From the Main Menu of the touchscreen, touch , then touch **Maintenance & Service**.
2. In the Maintenance & Service screen, touch **View Log**.
3. In the Instrument Log screen, review the records of interest.
4. (Optional) Export the system log to a USB drive:
  - a. Plug the drive into the USB port on the front of the QuantStudio™ 3D Instrument.



- b. In the Instrument Log screen, touch **Export**, then wait for the instrument to export the log to a text file on the drive.



5. When you are finished, touch , then touch  to return to the Main Menu.



# Networking

---

**IMPORTANT!** This document *does not* provide adequate detail to integrate the QuantStudio™ 3D Instrument into all possible network architectures. Because your laboratory network can contain advanced features (such as firewalls), Life Technologies recommends that you consult a network administrator before connecting your instrument.

---

## Networking overview

After installing the QuantStudio™ 3D Digital PCR Instrument and the QuantStudio™ 3D AnalysisSuite™ Software, you can connect the QuantStudio™ 3D Instrument to a local area network to enhance its functionality. When connected to a network, the QuantStudio™ 3D Instrument can upload data directly to the QuantStudio™ 3D AnalysisSuite™ Cloud Software or to a Windows®-based or SAMBA file server, for later import by the AnalysisSuite™ Software.

**Note:** The QuantStudio™ 3D Instrument supports a wired network connection without any additional hardware other than what is shipped with the instrument. The instrument can be configured for wireless networking through the installation of a wireless dongle, which is sold separately by Life Technologies.

### About the network port and wireless adapter

The QuantStudio™ 3D Instrument is designed to integrate into a standard Local Area Network (LAN), both wired and wireless. The instrument features a Gigabit Ethernet port that provides direct connection to a network via a shielded cat 6 Ethernet cable, or wireless communication via a dongle sold with the QuantStudio™ 3D Instrument.

The instrument supports the following networking technologies and standards:

- Communication via Transmission Control Protocol (TCP) over Internet Protocol (IPv4).
- Internet and local host name lookups via standard Domain Name Service (DNS).
- Local server lookups via Windows Name Service (WINS) (optional).
- Automatic configuration of IP, DNS, and WINS settings via Dynamic Host Configuration Protocol (DHCP), or manual configuration via the QuantStudio™ 3D Instrument touchscreen.
- Automatic data transfer to the QuantStudio™ 3D AnalysisSuite™ Cloud Software using the Hypertext Transfer Protocol over a Secure Socket Layer (HTTPS), or data export to a local Windows®-based or SAMBA file server over the Server Message Block (SMB) protocol.
- Date and time synchronization via Network Time Protocol (NTP).

The wireless dongle sold with the QuantStudio™ 3D Digital PCR Instrument can be installed to an internal USB port behind the rear panel to enable wireless network

connectivity. See the product documentation accompanying the adapter for the network requirements, specifications, and product details.

## Networking guidelines and best practices

- We recommend that you consult a network administrator before connecting the QuantStudio™ 3D Instrument to your laboratory network.
- We recommend that you name the QuantStudio™ 3D Instrument uniquely. While not critical to network function, unique instrument names can aid with sample tracking and instrument troubleshooting.

**Note:** The serial number of the QuantStudio™ 3D Instrument is the default instrument name. The QuantStudio™ 3D Instrument does not test the uniqueness of the instrument name when it is set.

- Name QuantStudio™ 3D Instruments using numbers and letters. The instrument name can include hyphens, but not as the first or last character.

## Connect the instrument to the network

### Network setup workflow

#### Start



If dynamic network configuration via DHCP is not available, or if you are uncertain, collect the required network information.



Connect the QuantStudio™ 3D Instrument to the network and power on the instrument.



If dynamic network configuration is not available, configure the QuantStudio™ 3D Instrument TCP/IP settings for static IP operation.



Create the network data destination(s) to which the QuantStudio™ 3D Instrument will transfer results.



Test the network connection by imaging an empty QuantStudio™ 3D Digital PCR 20K Chip and confirming that the resulting experiment (.eds) file appears at the specified data destination.



#### Finish

---

**IMPORTANT!** The QuantStudio™ 3D Instrument is factory-configured for DHCP operation (automatic addressing); network configuration is necessary only if your does not support dynamic network configuration.

---

## Materials required

| Connection | Materials                                                                                                                                |
|------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Wired      | CAT6 Ethernet cable of sufficient length with RJ45 connectors (for a 1000Mbit/s network connection or a CAT5 for a 100Mbit/s connection) |
| Wireless   | SparkLAN WUBR-170GN 802.11n Single-Band Wireless Dongle (PN 4483658)                                                                     |

## Required network information

Before beginning the installation, collect from a network administrator your network policy for obtaining IP addresses (DHCP or static IP).

If your network requires a static IP address assignment, also obtain the:

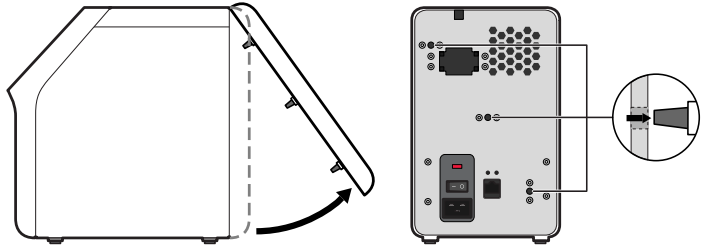
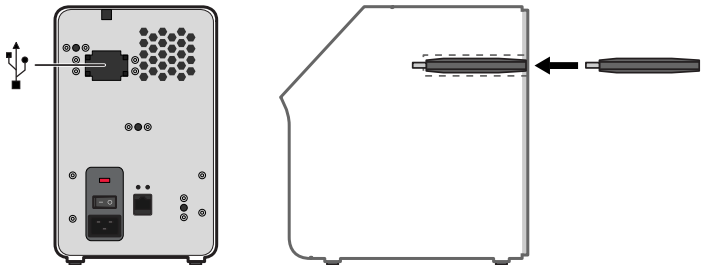
- Static IP address for the QuantStudio™ 3D Instrument
- Subnet mask (if applicable)
- Gateway address (if applicable)
- Internet domain name
- Domain Name Server address(es)
- Windows® domain (if applicable)
- WINS server address(es) (if applicable)

If connecting your instrument to a wireless network, obtain the following information for the local wireless hotspot:

- Wireless local area hotspot name
- Security policy requirement for the wireless hotspot (WPA, WEP, or WPA2)
- Network credentials for the wireless hotspot (password and user account if necessary)

## Connect the QuantStudio™ 3D Instrument to a network

### 1. Prepare the physical connection to the network:

| Connection | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Wired      | <ol style="list-style-type: none"> <li>1. Power on the QuantStudio™ 3D Instrument.</li> <li>2. Connect one end of a standard category-6 Ethernet cable to the RJ-45 port on the back panel of the instrument and the other end to an open network port.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Wireless   | <ol style="list-style-type: none"> <li>1. If required for network setup, record the wireless dongle's MAC address, which is located on the underside of the device.</li> <li>2. Power off and unplug the QuantStudio™ 3D Instrument.</li> <li>3. Turn the QuantStudio™ 3D Instrument over, then use your fingers to carefully pry open the rear panel.</li> </ol> <p><b>IMPORTANT!</b> The rear panel is secured to the instrument by three pegs that require significant force to decouple. If necessary, insert a flathead screwdriver into the slot at the base of the panel to pry it from the instrument chassis.</p>  <ol style="list-style-type: none"> <li>4. Turn the instrument over, then uncap the wireless dongle and insert it into the USB port <i>within</i> the instrument. When the device is seated within the USB port, firmly push on the wireless dongle to ensure that it is plugged in completely. The internal USB port is accessed through a small opening in the instrument chassis.</li> </ol>  <ol style="list-style-type: none"> <li>5. Reattach the rear panel to the instrument chassis, then plug in and power on the QuantStudio™ 3D Instrument.</li> </ol> |

### 2. From the Main Menu of the touchscreen, touch , then touch **Instrument Settings**.

3. Choose the appropriate option:

| If connecting your instrument to a...                                                                                                              | Action                                                                                                                                                             |
|----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Wired network that supports DHCP                                                                                                                   | Network setup is complete.<br><b>Note:</b> The QuantStudio™ 3D Instrument is pre-configured for DHCP operation and automatically joins the network when connected. |
| <ul style="list-style-type: none"> <li>Wireless network</li> <li>Wired network with specific requirements (such as static IP operation)</li> </ul> | Go to step 4.                                                                                                                                                      |

4. In the Instrument Settings screen, touch **Network Setup**, then touch **Edit** in the network setup screen.



5. (Wireless connection only) If you are connecting your instrument to a wireless network:

- In the Network Setup screen, touch **Change Connection Type**.
- In the Choose Connection Type screen, touch **Wireless** .
- In the Available Wireless Network screen, touch the desired wireless hotspot.

**Note:** The signal strength of a wireless hotspot is indicated by the number of bars present in the wireless icon (). The presence of a lock icon () indicates that the hotspot is secure (WPA, WEP, or WPA2).

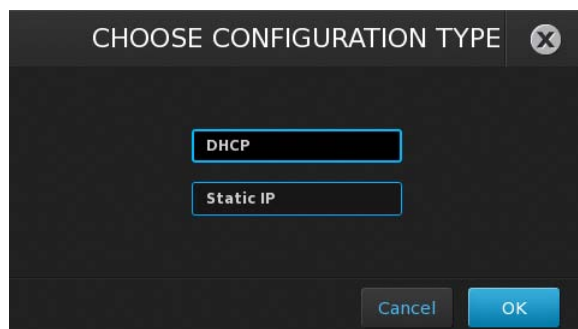


- d. If your selected wireless hotspot is secure, enter the required authentication information (user name/password), then touch **OK**.



If connecting your instrument to a network that supports DHCP, network setup is complete. Otherwise, go to the next step to configure the TCP/IP settings for the instrument.

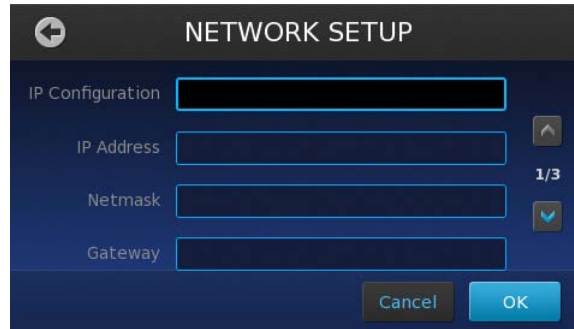
6. Set the internet protocol (TCP/IP) properties for the QuantStudio™ 3D Instrument:
  - a. In the Network Setup screen, touch **Edit Settings**.
  - b. In the Network Setup settings, touch the **IP Configuration** field, touch the setting appropriate for your network (Static IP or DHCP), then touch **OK**.
    - **Static IP** – Select if you have a static IP address to assign to the instrument.
    - **DHCP** – Select to allow your network DHCP server to automatically assign an IP address to the instrument.



- c. If you elected to assign a static IP to the instrument, touch the following fields and enter the:

- **IP Address** – Enter the static IP address for the instrument.
- **Netmask** – Enter a subnet mask for the network if applicable.
- **Gateway** – Enter a default gateway for the network if applicable.

**Note:** For each setting, touch the associated field, then enter the setting using the keypad and touch **Enter** to accept the value.



The screenshot shows the 'NETWORK SETUP' screen with a back arrow in the top left. Under the 'IP Configuration' section, there are four input fields: 'IP Address', 'Netmask', and 'Gateway'. To the right of these fields is a vertical stack of three small square buttons with up, down, and left arrows. A '1/3' indicator is visible between the 'Netmask' and 'Gateway' fields. At the bottom right are 'Cancel' and 'OK' buttons.

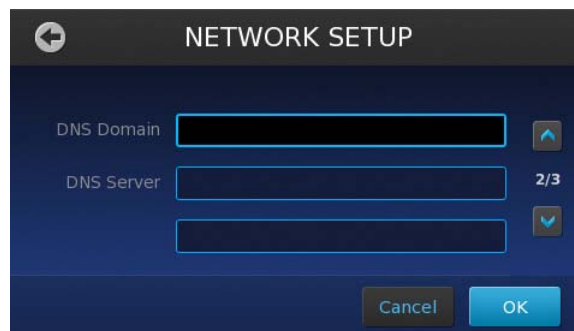
- d. Touch , then configure the domain name service (DNS) settings:

- **DNS Domain** – Enter the domain name of the DNS server that you want the instrument to use.
- **DNS Server** – Enter the IP addresses for the primary (top) and secondary (bottom) DNS servers.

---

**IMPORTANT!** DNS settings are required if you:

- Specify the QuantStudio™ 3D AnalysisSuite™ Cloud Software as a data destination.
  - Want to use Network Time Protocol (NTP) for instrument date/time synchronization.
- 



The screenshot shows the 'NETWORK SETUP' screen with a back arrow in the top left. Under the 'DNS' section, there are two input fields: 'DNS Domain' and 'DNS Server'. To the right of these fields is a vertical stack of three small square buttons with up, down, and left arrows. A '2/3' indicator is visible between the 'DNS Domain' and 'DNS Server' fields. At the bottom right are 'Cancel' and 'OK' buttons.

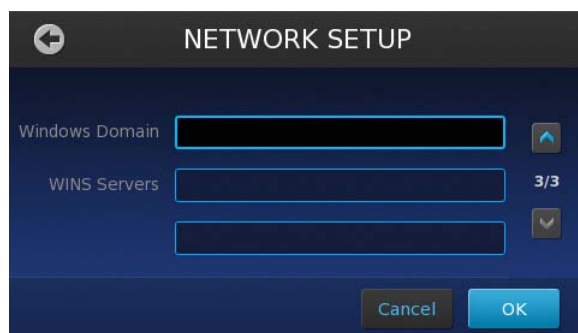
- e. Touch , then configure the Windows Internet Naming Service (WINS) settings:
- **Windows Domain** – Enter the domain name of the WINS server.
  - **WINS Server** – Enter the IP addresses for the primary (top) and secondary (bottom) WINS servers.

---

**IMPORTANT!** WINS may be required if you specify a file server as a data destination.

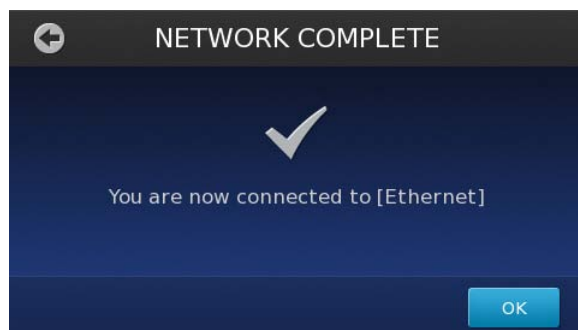
---

**Note:** During operation, the instrument attempts to resolve WINS names to IP addresses using the server specified in the top-most field. If unavailable, the instrument uses the server specified in the bottom-most field.



- f. When you are finished configuring your network settings, touch **OK**.

The touchscreen displays "Network Complete" when the instrument successfully connects to the network.



7. In the Network Complete screen, touch **OK**, then touch  to return to the Main Menu.

After the instrument has successfully connected to the network, the Network Setup screen displays the details of the network connection.

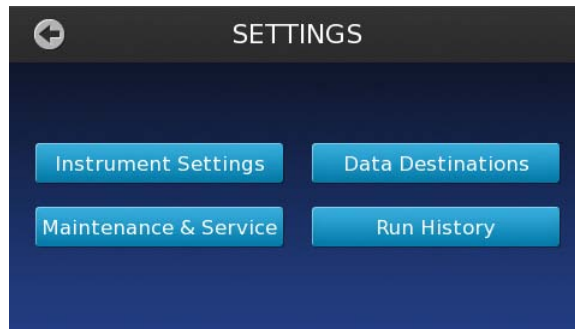


**Note:** If your wireless hotspot performs MAC filtering, you can obtain the Media Access Control (MAC) address of the QuantStudio™ 3D Instrument on the label of the wireless dongle that you installed in step 1.

## Create a network destination to receive run data

The following procedure allows you to create network data destinations to receive experiment (.eds) files generated by the QuantStudio™ 3D Instrument. You can create data destinations for the QuantStudio™ 3D AnalysisSuite™ Cloud Software for direct upload, or for local Windows®-based or SAMBA file servers for later import. You can create an unlimited number of destinations and select from them prior to each run.

1. From the Main Menu of the touchscreen, touch .
2. In the Settings menu, touch **Data Destinations**.



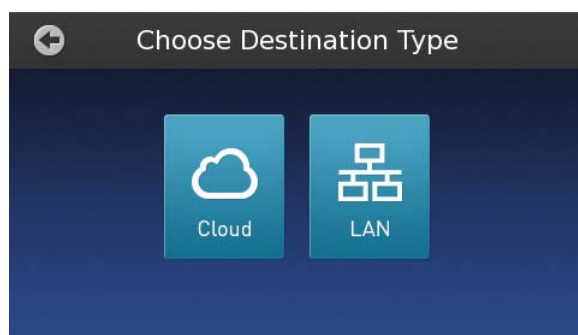
3. In the Edit Destinations screen, touch **Add** to add a data destination.

**Note:** To edit an existing destination, touch the name of the destination.



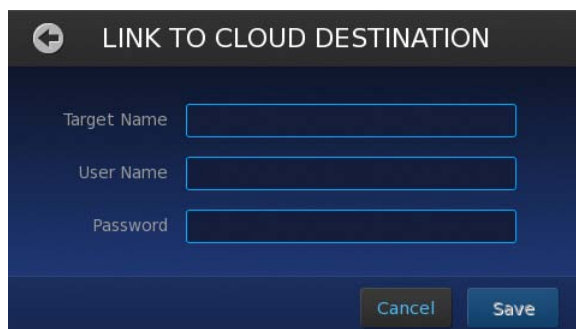
4. In the Choose Destination Type screen, touch the desired network destination:

-  **Cloud** – Touch to specify a QuantStudio™ 3D AnalysisSuite™ Cloud Software data destination.
-  **LAN** – Touch to specify a network file server data destination.



5. Touch each field, enter the appropriate data for the destination, then touch **Save**.

- Cloud data destination fields:
  - **Target Name** – Enter a name to identify the cloud data destination.  
**Note:** The target name appears within the Destination Selection and Export screens.
  - **User Name** – Enter the user name that the instrument should use when authenticating to the AnalysisSuite™ Cloud Software.
  - **Password** – Enter the password that the instrument should use when authenticating to the AnalysisSuite™ Cloud Software.



- LAN data destination fields:
  - **Target Name** – Enter a name to identify the LAN data destination.  
**Note:** The target name appears within the Destination Selection and Export screens.
  - **Server** – Enter the path of the file server using the following syntax:  
`smb://servername/share[/path]`  
 where `[/path]` is optional.
  - **User Name** – Enter the user name that the instrument should use when authenticating to the file server.
  - **Password** – Enter the password that the instrument should use when authenticating to the file server.

6. Repeat step 3 to step 5 to add additional data destinations as needed.  
 Upon saving the data destination, the QuantStudio™ 3D Instrument automatically attempts to connect to the specified location. The instrument saves the destination only if the connection is successful.
7. When you are finished adding data destinations, touch to return to the Main Menu.



# Parts and Materials

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## How to order from the Life Technologies website

You can order materials and accessories from Life Technologies by ordering directly from the Life Technologies online store.

**Note:** Product availability and pricing may vary according to your region or country. Online ordering through Life Technologies is not available in all countries. Contact your local Life Technologies representative for help.

To order through the website, we recommend the following browsers and Adobe® Reader® versions to use the Life Technologies website:

| Operating system    | Microsoft® Internet Explorer® | Apple® Safari®  | Mozilla® Firefox® | Adobe® Reader® |
|---------------------|-------------------------------|-----------------|-------------------|----------------|
| Microsoft® Windows® | v6.x or later                 | v2.0.4 or later | v2.x or later     | v4.0 or later  |
| Apple®              | n/a                           |                 |                   |                |

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**IMPORTANT!** Confirm that cookies and Javascript are turned on for the website to function correctly.

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- To order assays and reagents:
  - a. Go to **www.lifetechnologies.com**
  - b. Under “I Want to Buy,” select the product of interest.
- To order instrument parts and accessories:
  - a. Go to **www.lifetechnologies.com**
  - b. Click **Parts and accessories**.
  - c. Select the desired components, the complete the order as instructed.



## Kits, consumables, and accessories

| Part number | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4485507     | QuantStudio™ 3D Digital PCR 20K Chip Kit, 12-pack <ul style="list-style-type: none"> <li>QuantStudio™ 3D Digital PCR 20K Chip (12)</li> <li>QuantStudio™ 3D Digital PCR Chip Case Lid (12)</li> <li>QuantStudio™ 3D Digital PCR Sample Loading Blade (12)</li> <li>QuantStudio™ 12K Flex OpenArray® Immersion Fluid (3)</li> <li>QuantStudio™ 12K Flex OpenArray® Immersion Fluid Tip (3)</li> </ul>                                                                 |
| 4482603     | QuantStudio™ 3D Digital PCR 20K Chip Kit and Master Mix <ul style="list-style-type: none"> <li>QuantStudio™ 3D Digital PCR 20K Chip (96)</li> <li>QuantStudio™ 3D Digital PCR Chip Case Lid (96)</li> <li>QuantStudio™ 3D Digital PCR Sample Loading Blade (96)</li> <li>QuantStudio™ 12K Flex OpenArray® Immersion Fluid (24)</li> <li>QuantStudio™ 12K Flex OpenArray® Immersion Fluid Tip (24)</li> <li>QuantStudio™ 3D Digital PCR Master Mix, 1.5 mL</li> </ul> |
| 4485510     | QuantStudio™ 3D Digital PCR 20K Chip Spares Kit <ul style="list-style-type: none"> <li>QuantStudio™ 3D Digital PCR Chip Case Lid (12)</li> <li>QuantStudio™ 3D Digital PCR Sample Loading Blade (12)</li> </ul>                                                                                                                                                                                                                                                      |
| 4485513     | QuantStudio™ 3D Digital PCR Accessories Kit for GeneAmp® PCR System 9700 <ul style="list-style-type: none"> <li>QuantStudio™ 3D Digital PCR Chip Carrier for Dual Flat Block GeneAmp® PCR System 9700 (2)</li> <li>QuantStudio™ 3D Digital PCR Thermal Pad for Dual Flat Block GeneAmp® PCR System 9700 (2)</li> </ul>                                                                                                                                               |
| 4482592     | QuantStudio™ 3D Digital PCR Chip Loader                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 4482710     | QuantStudio™ 3D Digital PCR Master Mix Kit, 1.5 mL                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 4483658     | QuantStudio™ 3D Digital PCR Chip Loader                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 4485718     | QuantStudio™ 3D Digital PCR Master Mix Kit, 5 mL                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 4485813     | QuantStudio™ 3D Digital PCR UV Kit <ul style="list-style-type: none"> <li>AAAA Batteries for UV-Curing Stylus (6)</li> <li>UV-Activated Chip Sealant Syringe and tips</li> <li>UV-Curing Stylus for Chip Sealant</li> <li>UV-Curing Stylus Stand</li> </ul>                                                                                                                                                                                                          |
| 4484475     | QuantStudio™ 3D Digital PCR UV Sealant Kit <ul style="list-style-type: none"> <li>UV-Activated Chip Sealant Syringe and tips</li> </ul>                                                                                                                                                                                                                                                                                                                              |
| 4486414     | QuantStudio™ 3D Tilt Base for Dual Flat Block GeneAmp® PCR System 9700                                                                                                                                                                                                                                                                                                                                                                                               |



## General-use materials and consumables

**Note:** The following materials, which are used in the preparation and use of QuantStudio™ 3D Digital PCR 20K Chips and the QuantStudio™ 3D Digital PCR Instrument, can be obtained from major laboratory suppliers (MLS).

| Part number | Description                                  | Source |
|-------------|----------------------------------------------|--------|
| —           | Isopropanol                                  | MLS    |
| —           | Gloves, powder-free, nitrile                 | MLS    |
| —           | Heated block (capable of maintaining 40±1°C) | MLS    |
| —           | Laboratory-grade, lint-free wipes            | MLS    |
| —           | Microcentrifuge                              | MLS    |
| —           | Pipette tips, 10 to 1000 µL                  | MLS    |
| —           | Pipettes, P10 to P1000                       | MLS    |
| —           | Vortexer                                     | MLS    |
| —           | Water, DNase-free, sterile-filtered          | MLS    |



# Specifications and Layout

|                                                                   |    |
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## Component dimensions and weights

Ensure that the installation site bench space can accommodate the system component dimensions and weight.

**Table 2** Uncrated dimensions and weights

| Component                                            | Height               | Length (depth)                    | Width                | Weight                |
|------------------------------------------------------|----------------------|-----------------------------------|----------------------|-----------------------|
| QuantStudio™ 3D Instrument                           | 21 cm<br>(8.3 in)    | 23.3 cm<br>(9.2 in)               | 13.5 cm<br>(5.3 in)  | 2.4 kg<br>(5.3 lbs)   |
| QuantStudio™ 3D Digital PCR Chip Loader              | 11 cm<br>(4.3 in)    | 27 cm<br>(10.6 in) <sup>[1]</sup> | 14 cm<br>(5.5 in)    | 3.0 kg<br>(6.1 lbs)   |
| Dual Flat Block GeneAmp® PCR System 9700 (assembled) | 26.0 cm<br>(10.0 in) | 41.0 cm<br>(16.0 in)              | 28.0 cm<br>(11.0 in) | 11.8 kg<br>(26.0 lbs) |

<sup>[1]</sup> Length increases to 38 cm (14.9 in) when open.

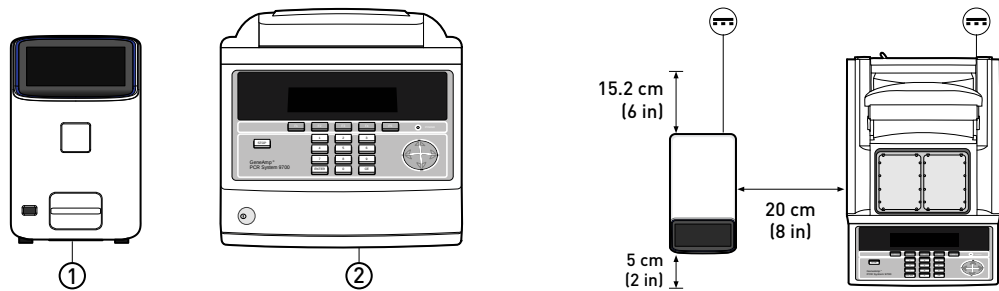
**Table 3** Crated dimensions and weights

| Component                                       | Height                 | Length (depth)      | Width                | Weight              |
|-------------------------------------------------|------------------------|---------------------|----------------------|---------------------|
| QuantStudio™ 3D Instrument, crated              | 29.5 cm<br>(11.625 in) | 23.8 cm<br>(9.4 in) | 33.0 cm<br>(13.0 in) | 3.2 kg<br>(7.0 lbs) |
| QuantStudio™ 3D Digital PCR Chip Loader, crated | 11 cm<br>(4.3 in)      | 27 cm<br>(10.6 in)  | 14 cm<br>(5.5 in)    | 3.0 kg<br>(6.1 lbs) |

| Component                                    | Height              | Length (depth)    | Width             | Weight            |
|----------------------------------------------|---------------------|-------------------|-------------------|-------------------|
| GeneAmp® PCR System 9700 Base Module, crated | 26.0 cm (10.0 in)   | 41.0 cm (16.0 in) | 28.0 cm (11.0 in) | 8.6 kg (19.0 lbs) |
| Dual Flat Sample Block Module, crated        | 29.5 cm (11.625 in) | 23.8 cm (9.4 in)  | 33.0 cm (13.0 in) | 3.2 kg (7.0 lbs)  |

## QuantStudio™ 3D Digital PCR System layout and connections

The QuantStudio™ 3D Digital PCR Instrument and the GeneAmp® PCR System 9700 can be placed on separate benches or collocated as shown in the following figure. If you place the units adjacent to one another, provide at least 20 cm (8 inches) clearance between them to allow for heat dissipation.



① QuantStudio™ 3D Digital PCR Instrument    ② Dual Flat Block GeneAmp® PCR System 9700

## Instrument clearances

The instruments require the following additional clearances:

**IMPORTANT!** For safety, the outlet used to power the instruments must be accessible at all times.

| Component                                | Top               | Front             | Sides            | Back             |
|------------------------------------------|-------------------|-------------------|------------------|------------------|
| QuantStudio™ 3D Instrument               | 30.48 cm (12 in.) | 30.48 cm (12 in.) | 15.2 cm (6 in.)  | 15.2 cm (6 in.)  |
| QuantStudio™ 3D Digital PCR Chip Loader  | 25.4 cm (10 in.)  | 15.2 cm (6 in.)   | 15.2 cm (6 in.)  | 25.4 cm (10 in.) |
| Dual Flat Block GeneAmp® PCR System 9700 | 20.38 cm (8 in.)  | —                 | 20.38 cm (8 in.) | 20.38 cm (8 in.) |



## Electrical specifications



**WARNING!** For safety, the power outlet used for powering the instrument must be accessible at all times. In case of emergency, you must be able to immediately disconnect the main power supply to all the equipment. Allow adequate space between the wall and the equipment so that the power cords can be disconnected in case of emergency.

**IMPORTANT!** Use only the approved power supply provided by Life Technologies to power the QuantStudio™ 3D Digital PCR Chip Loader.

- Electric receptacle is required
- Mains AC line voltage tolerances must be up to  $\pm 10\%$  percent of nominal voltage

**Note:** Place the instrument power receptacle on an electrical circuit that is not shared with electrically noisy devices or devices that can cause power surges, such as refrigeration units.

The following table provides electrical specifications for the instrument and associated devices. For all indicated input voltages, a 15A circuit is required.

| Device                                   | Rated voltage              | Rated frequency | Rated current | Rated power |
|------------------------------------------|----------------------------|-----------------|---------------|-------------|
| QuantStudio™ 3D Digital PCR Instrument   | 100–240 VAC <sup>[1]</sup> | 50/60 Hz        | 150 mA        | 10 VA       |
| QuantStudio™ 3D Digital PCR Chip Loader  | 12 VDC                     | –               | –             | 2.5 A max   |
| Dual Flat Block GeneAmp® PCR System 9700 | [2]                        |                 |               |             |

<sup>[1]</sup> If the supplied power fluctuates beyond the rated voltage, a power line regulator may be required. High or low voltages can adversely affect the electronic components of the instrument.

<sup>[2]</sup> See the *GeneAmp® PCR System 9700 Base Module User's Manual* (Pub. no. 4303481) for the GeneAmp® PCR System 9700 electrical requirements.

## Environmental requirements

Ensure that the installation room is maintained under correct environmental conditions.

**Note:** See the *GeneAmp® PCR System 9700 Base Module User's Manual* (Pub. no. 4303481) for the GeneAmp® PCR System 9700 environmental requirements.

| Condition         | Acceptable Range                                                |
|-------------------|-----------------------------------------------------------------|
| Installation site | Indoor use only                                                 |
| Altitude          | Located between sea level and 2000 m (6500 ft.) above sea level |
| Humidity          | 20%–80% (noncondensing)                                         |



| Condition        | Acceptable Range                                                                                                                                                                                                                                                                                                                                             |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Temperature      | 15°C to 30°C (60°F to 85°F)                                                                                                                                                                                                                                                                                                                                  |
| Thermal output   | During operation the net thermal output, based on the actual current draw of the QuantStudio™ 3D Instrument, is expected to be approximately 12 W (41 BTU/hr).                                                                                                                                                                                               |
| Vibration        | Ensure the instrument is not adjacent to strong vibration sources, such as a centrifuge, pump, or compressor. Excessive vibration will affect instrument performance.                                                                                                                                                                                        |
| Pollution        | <p>The instrument has a Pollution Degree rating of II. The instrument may only be installed in an environment that has nonconductive pollutants such as dust particles or wood chips. Typical environments with a Pollution Degree II rating are laboratories and sales and commercial areas.</p> <p>The noise output of the instrument is 0 dB at idle.</p> |
| Other conditions | <p>Ensure the room is away from any vents that could expel particulate material on the system components.</p> <p>Avoid placing the instrument, computer, and UPS unit adjacent to heaters, cooling ducts, or in direct sunlight.</p>                                                                                                                         |

## Network requirements

The QuantStudio™ 3D Digital PCR Instrument supports IPv4 TCP/IP communication and provides two methods for integrating the device into a local area network (LAN):

- The fast Ethernet adapter (10/100 Mbps) with a RJ45-type connector on the rear panel of the QuantStudio™ 3D Instrument allows you to connect the device directly to a standard network port using a standard Category 5 Ethernet cable of the required length.
- An optional IEEE 802.11b/g/n Wireless Dongle connected to the QuantStudio™ 3D Instrument enables a connection to compatible wireless hotspots.

**Note:** See the documentation accompanying the Wireless Dongle for compatibility information.

The QuantStudio™ 3D Digital PCR Instrument requires the following if connected to a network:

- The room where the QuantStudio™ 3D Instrument will be deployed must contain at least one active network jack.
- If the QuantStudio™ 3D Instrument will be located more than 10 feet from the network jack, you must provide a shielded category 6 Ethernet cable of sufficient length.
- If dynamic network configuration is not available, a static IP address must be reserved for the QuantStudio™ 3D Instrument.
- The configured DNS server must resolve internet domain names (such as "apps.lifetechnologies.com/quantstudio3d/" and "pool.ntp.org"). The names of any local file servers used as data destinations must also be available through DNS, or optionally WINS.



- If the QuantStudio™ 3D Instrument will transfer experiment (.eds) files directly to the QuantStudio™ 3D AnalysisSuite™ Software, then the instrument must have outbound Internet access through port 443/HTTPS to [apps.lifetechnologies.com/quantstudio3d/](https://apps.lifetechnologies.com/quantstudio3d/).
- If the QuantStudio™ 3D Instrument will use Network Time Protocol (NTP) for date/time synchronization, the instrument must have outbound Internet access through port 123/UDP to the server pool at [pool.ntp.org](https://pool.ntp.org).
- If the QuantStudio™ 3D Instrument will transfer experiment (.eds) files to a Windows®-based or SAMBA file server, network credentials must be provided for authentication.

In addition to the requirements above, if the QuantStudio™ 3D Instrument will be connected to a wireless network, the access point must support:

- IEEE 802.11b/g/n wireless standards
- WEP, WEP-Enterprise, WPA- Personal, or WPA2-Personal security



# Safety



**WARNING! GENERAL SAFETY.** Using this product in a manner not specified in the user documentation may result in personal injury or damage to the instrument or device. Ensure that anyone using this product has received instructions in general safety practices for laboratories and the safety information provided in this document.

- Before using an instrument or device, read and understand the safety information provided in the user documentation provided by the manufacturer of the instrument or device.
- Before handling chemicals, read and understand all applicable Safety Data Sheets (SDSs) and use appropriate personal protective equipment (gloves, gowns, eye protection, etc). To obtain SDSs, see the “Documentation and Support” section in this document.

## Symbols on this instrument

Symbols may be found on the instrument to warn against potential hazards or convey important safety information. In this document, the hazard symbol is used along with one of the following user attention words:

- **CAUTION!** – Indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.
- **WARNING!** – Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.
- **DANGER!** – Indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury.

| Symbol | English                                                                       | Français                                                                                     |
|--------|-------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
|        | Caution, risk of danger<br>Consult the manual for further safety information. | Attention, risque de danger<br>Consulter le manuel pour d'autres renseignements de sécurité. |
|        | Ultraviolet light                                                             | Rayonnement ultraviolet                                                                      |
|        | Protective conductor terminal (main ground)                                   | Borne de conducteur de protection (mise à la terre principale)                               |

| Symbol                                                                            | English                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Français                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>Do not dispose of this product in unsorted municipal waste</p> <p> <b>CAUTION!</b> To minimize negative environmental impact from disposal of electronic waste, do not dispose of electronic waste in unsorted municipal waste. Follow local municipal waste ordinances for proper disposal provision and contact customer service for information about responsible disposal options.</p> | <p>Ne pas éliminer ce produit avec les déchets usuels non soumis au tri sélectif.</p> <p> <b>CAUTION!</b> Pour minimiser les conséquences négatives sur l'environnement à la suite de l'élimination de déchets électroniques, ne pas éliminer ce déchet électronique avec les déchets usuels non soumis au tri sélectif. Se conformer aux ordonnances locales sur les déchets municipaux pour les dispositions d'élimination et communiquer avec le service à la clientèle pour des renseignements sur les options d'élimination responsable.</p> |

## Conformity symbols

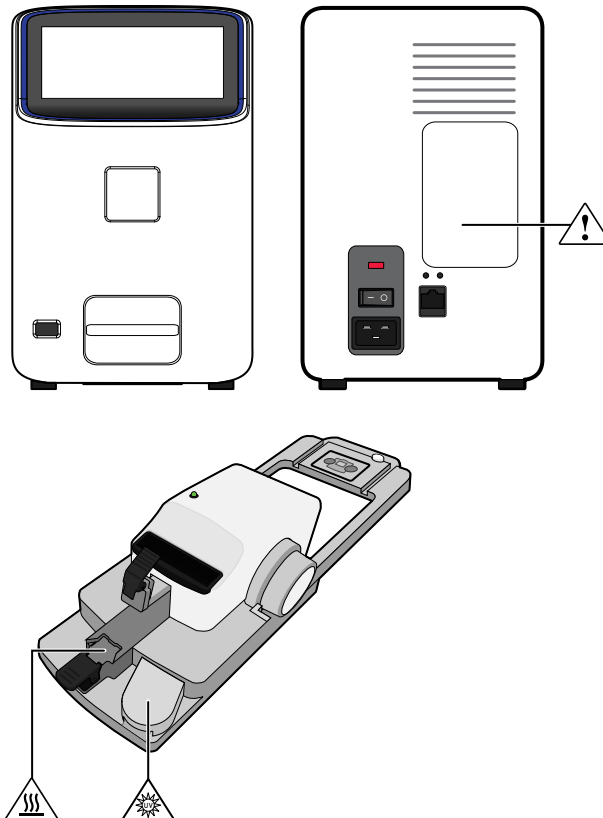
| Conformity mark                                                                     | Description                                                                                         |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
|  | Indicates conformity with safety requirements for Canada and U.S.A.                                 |
|  | Indicates conformity with European Union requirements for safety and electromagnetic compatibility. |
|  | Indicates conformity with Australian standards for electromagnetic compatibility.                   |

## Safety alerts on this instrument

Additional text may be used with one of the symbols described above when more specific information is needed to avoid exposure to a hazard. See the following table for safety alerts found on the instrument.

| English                                                                                                                                                                             | French translation                                                                                                                                              | Location on Instrument |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
|  <b>CAUTION! Hazardous chemicals.</b> Read the Safety Data Sheets (SDSs) before handling.          | <b>ATTENTION! Produits chimiques dangereux.</b> Lire les fiches signalétiques (FS) avant de manipuler les produits.                                             | Rear instrument panel  |
|  <b>CAUTION! Hazardous waste.</b> Refer to SDS(s) and local regulations for handling and disposal. | <b>ATTENTION! Déchets dangereux.</b> Lire les fiches signalétiques (FS) et la réglementation locale associées à la manipulation et à l'élimination des déchets. |                        |

### Location of safety alerts on the instrument



## Safety information for instruments not manufactured by Life Technologies Corporation

Some of the accessories provided as part of the instrument system are not designed or built by Life Technologies Corporation. Consult the manufacturer's documentation for the information needed for the safe use of these products.

### Instrument safety

#### General



**CAUTION! Do not remove instrument protective covers.** If you remove the protective instrument panels or disable interlock devices, you may be exposed to serious hazards including, but not limited to, severe electrical shock, laser exposure, crushing, or chemical exposure.

#### Electrical



**WARNING! Fuse Installation.** Before installing the instrument, verify that the fuses are properly installed and the fuse voltage matches the supply voltage. Replace fuses only with the type and rating specified for the unit. Improper fuses can damage the instrument wiring system and cause a fire.



**WARNING! Ensure appropriate electrical supply.** For safe operation of the instrument:

- Plug the system into a properly grounded receptacle with adequate current capacity.
- Ensure the electrical supply is of suitable voltage.
- Never operate the instrument with the ground disconnected. Grounding continuity is required for safe operation of the instrument.



**WARNING! Power Supply Line Cords.** Use properly configured and approved line cords for the power supply in your facility.



**WARNING! Disconnecting Power.** To fully disconnect power either detach or unplug the power cord, positioning the instrument such that the power cord is accessible.

## Cleaning and decontamination



**CAUTION! Cleaning and Decontamination.** Use only the cleaning and decontamination methods specified in the manufacturer's user documentation. It is the responsibility of the operator (or other responsible person) to ensure the following requirements are met:

- No decontamination or cleaning agents are used that could cause a HAZARD as a result of a reaction with parts of the equipment or with material contained in the equipment.
- The instrument is properly decontaminated a) if hazardous material is spilled onto or into the equipment, and/or b) prior to having the instrument serviced at your facility or sending the instrument for repair, maintenance, trade-in, disposal, or termination of a loan (decontamination forms may be requested from customer service).
- Before using any cleaning or decontamination methods (except those recommended by the manufacturer), users should confirm with the manufacturer that the proposed method will not damage the equipment

## Safety and electromagnetic compatibility (EMC) standards

The instrument design and manufacture complies with the standards and requirements for safety and electromagnetic compatibility as noted in the following table:

### Safety

| Reference                                                                | Description                                                                                                                                                                                  |
|--------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EU Directive 2006/95/EC                                                  | European Union "Low Voltage Directive"                                                                                                                                                       |
| CSA C22.2 No. 61010-1<br>IEC 61010-1<br>UL 61010-1<br>IEC/CSA/UL 61010-1 | <i>Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements</i>                                                              |
| IEC 61010-2-010 <sup>[1]</sup>                                           | <i>Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 2-010: Particular requirements for laboratory equipment for the heating of materials</i> |

<sup>[1]</sup> Applies only to the QuantStudio™ 3D Digital PCR Chip Loader.

### EMC

| Reference             | Description                                                                                                               |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------|
| Directive 2004/108/EC | European Union "EMC Directive"                                                                                            |
| EN 61326-1            | <i>Electrical Equipment for Measurement, Control and Laboratory Use – EMC Requirements – Part 1: General Requirements</i> |
| FCC Part 18 [47 CFR]  | U.S. Standard "Industrial, Scientific, and Medical Equipment"                                                             |

| Reference         | Description                                                                                                                                                   |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AS/NZS 2064       | <i>Limits and Methods of Measurement of Electromagnetic Disturbance Characteristics of Industrial, Scientific, and Medical (ISM) Radiofrequency Equipment</i> |
| ICES-001, Issue 3 | <i>Industrial, Scientific and Medical (ISM) Radio Frequency Generators</i>                                                                                    |

Environmental  
design

| Reference            | Description                                                                 |
|----------------------|-----------------------------------------------------------------------------|
| Directive 2002/96/EC | European Union “WEEE Directive” – Waste electrical and electronic equipment |

## Chemical safety



**WARNING! GENERAL CHEMICAL HANDLING.** To minimize hazards, ensure laboratory personnel read and practice the general safety guidelines for chemical usage, storage, and waste provided below, and consult the relevant SDS for specific precautions and instructions:

- Read and understand the Safety Data Sheets (SDSs) provided by the chemical manufacturer before you store, handle, or work with any chemicals or hazardous materials. To obtain SDSs, see the “Documentation and Support” section in this document.
- Minimize contact with chemicals. Wear appropriate personal protective equipment when handling chemicals (for example, safety glasses, gloves, or protective clothing).
- Minimize the inhalation of chemicals. Do not leave chemical containers open. Use only with adequate ventilation (for example, fume hood).
- Check regularly for chemical leaks or spills. If a leak or spill occurs, follow the manufacturer’s cleanup procedures as recommended in the SDS.
- Handle chemical wastes in a fume hood.
- Ensure use of primary and secondary waste containers. (A primary waste container holds the immediate waste. A secondary container contains spills or leaks from the primary container. Both containers must be compatible with the waste material and meet federal, state, and local requirements for container storage.)
- After emptying a waste container, seal it with the cap provided.
- Characterize (by analysis if necessary) the waste generated by the particular applications, reagents, and substrates used in your laboratory.
- Ensure that the waste is stored, transferred, transported, and disposed of according to all local, state/provincial, and/or national regulations.
- **IMPORTANT!** Radioactive or biohazardous materials may require special handling, and disposal limitations may apply.



**WARNING! HAZARDOUS WASTE (from instruments).** Waste produced by the instrument is potentially hazardous. Follow the guidelines noted in the preceding General Chemical Handling warning.

## Biological hazard safety



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**WARNING! Potential Biohazard.** Depending on the samples used on this instrument, the surface may be considered a biohazard. Use appropriate decontamination methods when working with biohazards.

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**WARNING! BIOHAZARD.** Biological samples such as tissues, body fluids, infectious agents, and blood of humans and other animals have the potential to transmit infectious diseases. All work should be conducted in properly equipped facilities using the appropriate safety equipment (for example, physical containment devices). Safety equipment also may include items for personal protection, such as gloves, coats, gowns, shoe covers, boots, respirators, face shields, safety glasses, or goggles. Individuals should be trained according to applicable regulatory and company/ institution requirements before working with potentially biohazardous materials. Follow all applicable local, state/provincial, and/or national regulations. The following references provide general guidelines when handling biological samples in laboratory environment.

- U.S. Department of Health and Human Services, *Biosafety in Microbiological and Biomedical Laboratories (BMBL)*, 5th Edition, HHS Publication No. (CDC) 21-1112, Revised December 2009; found at:  
[www.cdc.gov/biosafety/publications/bmb15/BMBL.pdf](http://www.cdc.gov/biosafety/publications/bmb15/BMBL.pdf)
  - World Health Organization, *Laboratory Biosafety Manual*, 3rd Edition, WHO/CDS/CSR/LYO/2004.11; found at:  
[www.who.int/csr/resources/publications/biosafety/Biosafety7.pdf](http://www.who.int/csr/resources/publications/biosafety/Biosafety7.pdf)
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# Documentation and support

## Obtaining SDSs

Safety Data Sheets (SDSs) are available from [www.lifetechnologies.com/support](http://www.lifetechnologies.com/support).

**Note:** For the SDSs of chemicals not distributed by Life Technologies Corporation, contact the chemical manufacturer.

## Obtaining Certificates of Analysis

The Certificate of Analysis provides detailed quality control and product qualification information for each product. Certificates of Analysis are available on our website. Go to [www.lifetechnologies.com/support](http://www.lifetechnologies.com/support) and search for the Certificate of Analysis by product lot number, which is printed on the box.

## Obtaining support

For the latest services and support information for all locations, go to:

[www.lifetechnologies.com/support](http://www.lifetechnologies.com/support)

At the website, you can:

- Access worldwide telephone and fax numbers to contact Technical Support and Sales facilities
- Search through frequently asked questions (FAQs)
- Submit a question directly to Technical Support ([techsupport@lifetech.com](mailto:techsupport@lifetech.com))
- Search for user documents, SDSs, vector maps and sequences, application notes, formulations, handbooks, certificates of analysis, citations, and other product support documents
- Obtain information about customer training
- Download software updates and patches

## Limited product warranty

Life Technologies Corporation and/or its affiliate(s) warrant their products as set forth in the Life Technologies' General Terms and Conditions of Sale found on Life Technologies' website at [www.lifetechnologies.com/termsandconditions](http://www.lifetechnologies.com/termsandconditions). If you have any questions, please contact Life Technologies at [www.lifetechnologies.com/support](http://www.lifetechnologies.com/support).

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