**QuantStudio™ 7 Flex Instrument Procedure**

1. **PRINCIPLE:**
   1. The QuantStudio™ 7 Flex Real-Time PCR instrument is used for quantitative and qualitative detection of target nucleic acid, including endpoint analysis and melting curve analysis. The instrument collects raw fluorescence data following each extension step of the PCR. A data collection point, or read, on the QuantStudio™ 7 Flex System consists of three phases:
      1. **Excitation:** The instrument illuminates all wells of the plate within the instrument, exciting the fluorophores in each reaction.
      2. **Emission:** The instrument optics collect the residual fluorescence emitted from the wells of the plate. The resulting image collected by the device consists only of light that corresponds to the range of emission wavelengths.
      3. **Collection:** The instrument assembles a digital representation of the residual fluorescence collected over a fixed time interval. The software stores the raw fluorescent image for analysis.
   2. After a run, the QuantStudio software uses calibration data (ROI, background, uniformity, dye, and normalization) to determine the location and intensity of the fluorescent signals in each read, the dye associated with each fluorescent signal, and the significance of the signal.
      1. In addition, there is a separate Genotyper software (provided by the vendor) that is used for analysis of genotyping assays.
   3. The instrument supports the following filter sets and dyes:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Filter set | Color | Excitation wavelength | Emission wavelength | Supported Dye |
| x1-m1 | Blue | 470±15 | 520±15 | FAM™ and SYBR® Green dyes |
| x2-m2 | Green | 520±10 | 558±12 | JOE™, HEX™, TET™, and VIC® dyes‡ |
| x3-m3 | Yellow | 549.5±10 | 586.5±10 | Cy®3, NED™, and TAMRA™ dyes |
| x4-m4 | Orange | 580±10 | 623±14 | ROX™ and Texas Red® dyes |
| x5-m5 | Red | 640±10 | 682±14 | Cy®5 and LIZ® dyes‡ |
| x6-m6 | Deep red | 662±10 | 711±12 | None supplied by Life Technologies |

1. **PROCEDURE FOR OPERATION:**
   1. Turning on the instrument:
      1. Locate the power switch on the left rear of the instrument and switch it to the ON position. Wait for it to start. The QuantStudio™ 7 Flex System is ready to use when the touchscreen displays the Main Menu.
         1. On the associated computer desktop, open the QuantStudio 7 Flex System Software.
   2. Making a Template:
      1. Make sure the instrument is switched ON. Start the computer and click on the appropriate test template from the template file.
      2. To make a template, click on the QuantStudio 7 Flex icon on the computer desktop. Click on Setup > Experiment Properties > and select Experiment Setup. Alternatively, click on QS7 Flex and select from a premade template.
      3. Define targets, clicking on **New** tab to add additional targets. Select the Passive reference (most tests will have ROX). Add controls under the sample area and click on **New** tab to add additional controls or samples.
      4. On left, click on **Assign**. In the plate, enter the targets and controls or samples.
      5. On the left, click on **Run Method**. Enter the run protocol. Click on **File** and save as template.
      6. To run an experiment, see individual protocols.
      7. After run is complete, the QuantStudio 7 Flex can be powered down by pressing the power button on the lower left of the touch screen on the instrument.
   3. Set the default folder for opening files on the QuantStudio 7 Flex Software.
      1. Open the software on the computer.
      2. At the top left of the screen, select **Tools > and Preferences**. Then, select the **Folder Settings** tab at the top left of the screen.
      3. Under the **Data** section, click **Browse**.
      4. Select **Computer** at the far-left bottom.
      5. Enter the following file path: “C:\Applied Biosystems\QuantStudio Real-time PCR Software\User files”
      6. Add a new folder.
      7. Click **Select Folder** at the bottom right. Pick the folder for the current year and then select **OK**.
   4. Find the template location
      1. The file path is “C:\Program files x86\Applied Biosystems\QuantStudio Real-time PCR Software\Templates”
      2. Select **Templates**.
      3. Create a new folder called “RIH Templates”
   5. Shutting down the instrument:
      1. After a run is complete, the QuantStudio 7 Flex can be powered down.
      2. To power down the instrument, if the touchscreen is not blank, touch the power button symbol on the lower left of the touch screen to place the instrument in stand-by mode.
      3. To switch off the instrument completely, toggle the power button on the left back of the instrument.
      4. If the QuantStudio™ 7 Flex System will not be used for a week or there is a plan to move the instrument, power down and turn off the instrument. See p. 126 of Appendix D of the User Manual for additional details.
2. **QC AND MAINTENANCE:**
   1. After each protocol run:
      1. Remove plate from machine by clicking on **Instrument** on the top of the screen and then **Instrument Console**. Click **Open Door**, remove plate, and then click on **Close Door**. Alternatively, click on the touch screen **Door** icon to open and close the instrument door.
      2. Power down the instrument by pressing the power button on the lower left of the touch screen on the instrument.
   2. Weekly:
      1. Check the computer disc space. If necessary, archive or back up your experiment files and instrument settings.
      2. Power off the computer that controls the instrument. Wait 30 seconds, and then turn the computer back on.
      3. Clean the surface of the instrument with a lint-free cloth.
   3. Monthly:
      1. Perform background calibration. Remove background plate from freezer and thaw 30 minutes in the dark. Use the plate within 2 hours of defrosting it. Vortex plate and centrifuge 2 minutes at <1500 rpm. Make sure all liquid is at the bottom of the well. Do not allow the bottom of the plate to become dirty, as it can contaminate the sample block.
         1. Click on **Instrument Console** and select the instrument icon.
         2. Click on **Manage Instrument>** **Maintenance>** **Background>** then **Start Calibration**.
         3. Click **Next** and enter the reagent information. Load the plate onto the instrument by pressing the **Open Door** icon, making sure the plate position A1 is in the top left corner of the plate adaptor. Close the door by pressing the **Close Door** icon.
         4. From the setup tab, select “Check the box when the background calibration plate has been loaded”, then click **Next**> **Start Run**.
         5. When the run is complete, the Analysis status will either say **Passed** or **Failed**.
         6. If plate passed, click **Next**. Download results to QC folder on Quantstudio 7 Flex computer by clicking **Print Report** and select the save icon. Name the report using the format YYYYMMDD\_Background.
         7. A failed run indicates that one or more wells produced spectra that deviate significantly from the other wells on the plate. Select the QC tab to review the quality check summary. See page 71 of the Maintenance and Administrative Guide for more information.
         8. Unload the calibration plate. From the **Background Calibration** Screen, click **Finish** to complete the calibration. Then, click **Yes** when prompted to save the results.
      2. Run disc cleanup and defragmentation.
      3. Perform instrument Self-Test by selecting **Tools** from the main touch screen of the instrument. Select **Run Self-Test** and **Start Self-Test**. If the run does not pass, contact Life Technologies. Touch **Home** to return to the main menu. Download results to QC folder on Quantstudio 7 Flex computer desktop by clicking **Print Report** and select the save icon. Name the report YYYYMMDD\_Self Test.
      4. Clean the block cover and block as follows:
         1. Put the QuantStudio Flex 7 in Standby mode and switch off the machine using the power switch on the back of the instrument.
         2. Open the front door. Using the tab lever, pull the top cover out. Use an alcohol prep pad and wipe the surface. DO NOT GET ALCOHOL ON THE OPTICS. If there is debris in the optic area, use canned air to blow it out. Return the block cover by pushing it back into the slot.
         3. Using the tab lever, pull out the block drawer. Lift out the block and place on flat surface. Moisten a CleanTips© Swab with 70% Ethanol and clean each well. Allow to airdry and return block to the block drawer.
   4. Every 6 months (May and November): *Perform all calibrations in order listed*.
      1. ROI (region of interest) calibration.
         1. A region of interest (ROI) calibration maps the positions of the wells on the sample block of the instrument. The software uses the ROI calibration data to associate increases in fluorescence during a run with the wells on the plate. The instrument uses a set of optical filters to distinguish the fluorescence emissions gathered during runs. The software generates a calibration image for each filter to account for minor differences in the optical path. An ROI calibration passes if the collected image for each filter distinguishes all wells of the ROI plate. Each well in the image must be distinct and visible at the same luminosity relative to the other wells in the image.
         2. Remove ROI plate from freezer and thaw at room temperature for 30 minutes in the dark. Use the plate within 2 hours of defrosting it. Do not allow the bottom of the plate to become dirty, as it can contaminate the sample block.
         3. Vortex plate for 5 seconds and centrifuge for 2 minutes at <1500 rpm. Make sure all of the liquid is at the bottom of the well. If not, re-centrifuge at a higher speed for a longer period of time.
         4. Click on **Instrument Console**> **Manage Instrument**> **Maintenance>** **ROI>** **and Start Calibration**.
         5. Click **Next**, and then follow the instructions for preparing for the calibration.
         6. Load the plate onto the instrument by pressing the **Open Door** icon, making sure the plate position A1 is in the top left corner of the plate adaptor. Close the door by pressing the **Close Door** icon.
         7. From the bottom of the **Setup Tab**, enter the lot number and expiration date of the plate, then select “Check box when ROI calibration plate has been loaded”. Click **Next>** then **Start Run**.
         8. When the analysis is complete and the Analysis screen is displayed, select each filter from the Filter Set drop down list. Then, confirm that the corresponding ROI Image displays a green circle around each well area.
         9. Confirm the calibration data.

1) “Passed” indicates viable calibration data. Click **Next**.

2) “Failed” indicates there is no viable or usable data. See page 70 in the Maintenance and Administration Guide for troubleshooting. If the run failed, the QC tab can provide information regarding the cause of the failure.

3Download results to QC folder on Quantstudio 7 Flex computer desktop by clicking **Print Report** and select the **Save** icon. Name the report using the format YYYYMMDD\_ROI.

Passing Image Failing Image



* + - 1. Unload the plate by pressing the **Open Door** icon and store the plate in the dark at room temperature until you are ready to perform the uniformity calibration. Close the tray door. Click **Finish** > then **Yes** to save.
    1. Background calibration
       1. Remove background plate from freezer and thaw for 30 minutes in the dark. Use the plate within 2 hours of defrosting it. Vortex plate and centrifuge for 2 minutes at <1500 rpm.
       2. Click on **Instrument Console** and select the instrument icon.
       3. Click on **Manage Instrument**> **Maintenance>** **Background>** then **Start Calibration**. If you are already on the **Maintenance** screen, click on the background directly.
       4. Click **Next**, enter the reagent lot number and expiration date, and load the plate onto the instrument.
       5. From the setup tab, select “Check the box when the background calibration plate has been loaded”. Then, click **Next>** and **Start Run**.

1) When the run is complete, the Analysis status will either say “Passed” or “Failed”. Select the QC tab to review the quality check summary. See page 71 of the Maintenance and Administrative Guide if run failed. Download results to QC folder on Quantstudio 7 Flex computer desktop by clicking **Print Report** and select the **Save** icon. Name the report using the format YYYYMMDD\_Background.

* + - 1. Unload the calibration plate. From the Background Calibration Screen, click **Finish** to complete the calibration. Then, click **Yes** when prompted to save the results.
    1. Uniformity calibration.
       1. Use the ROI plate from Step 1 above. If not thawed, remove from freezer and thaw at room temperature for 30 minutes. Vortex plate for 5 seconds and then centrifuge for 2 minutes at <1500rpm. Do not allow the bottom of the plate to become dirty, as it can contaminate the sample block. Use the plate within 2 hours of defrosting it. If you are already on the **Maintenance** screen, click on the **Uniformity** directly.
       2. From the Home Tab, click on **Instrument Console**, and then click **Manage Instrument**.
       3. Start the calibration by clicking on **Maintenance>**. Then, click on **Uniformity>** and **Start Calibration**.
       4. Click **Next**, and then prepare the calibration as instructed on the screen. Enter reagent lot number and expiration date for the ROI plate on the bottom of the Setup Tab.
       5. Load the plate onto the instrument by pressing the **Open Door** icon, making sure the plate position A1 is in the top left corner of the plate adaptor. Close the door by pressing the **Close Door** icon.
       6. From the setup tab, select “Check the box when ROI calibration plate has been loaded”. Then, click **Next>** **Start Run**.
       7. When the run is complete, confirm the status of the calibration from the Analysis screen.

1) “Passed” indicates viable data. Click on **Next**.

2) “Failed” indicates no data or unusable date. See page 72 of the Maintenance and Administrative Guide for troubleshooting. If the run failed, the QC tab can provide information regarding the cause of the failure.

3) Unload the calibration plate by clicking on the **Open Door** icon. Remove plate and click on the **Close Door** icon. Click **Finish.**, Click **Yes** to save the results to QC folder on the Quantstudio 7 Flex computer desktop by clicking **Print Report**. Select the **Save** icon. Name the report using the format YYYYMMDD\_Uniformity.

* + 1. Dye calibration
       1. Dye calibration utilizes a collection of spectral profiles that represent the fluorescence signature of each dye standard. When the software extracts the dye calibration data, it evaluates the fluorescence signal generated by each well in terms of the collective spectra for the entire calibration plate. Dye spectra are generally acceptable if they peak within the same filter as their group, but diverge slightly at other wavelengths.

Acceptable Unacceptable



* + - 1. Remove the dye calibration plates (FAM, VIC, ROX, NED, TAMARA, SYBR) from the freezer and thaw at room temperature in the dark for 30 minutes. Vortex the plate for 5 seconds, then centrifuge for 2 minutes at <1500rpm. Use the plate within 2 hours of defrosting it. Do not allow the bottom of the plate to become dirty, as it can contaminate the sample block. The plates are good for at least 3 freeze/thaw cycles or until the expiration date.
      2. From the **Home Tab**, click on **Instrument Console**, and then click **Manage Instrument**. If you are already on the **Maintenance** screen, click on the **Dye** option directly.
      3. Start the calibration by clicking on **Maintenance**, then click **Dye**. From the Dye Calibration Screen, select **System Dye Calibration**, and then click **Start Calibration**.
      4. From the Dye Calibration screen, select the dye to calibrate from the *Dye Name drop down list*, and then perform the calibration as instructed. Enter the reagent lot number and expiration date for the dye plate on the bottom of the Setup tab screen.
      5. Open the tray door using the **Open Door** icon and load the dye plate, making sure the plate position A1 is in the top left corner of the plate adaptor. Close the door by pressing the **Close Door** icon.
      6. Start the calibration by selecting “Check the box when the dye calibration plate has been loaded”. Then, select **Next>** **Start Run**.
      7. When the run is complete, from the **Analysis Tab**, select the **Plate Layout Tab**. For each spectrum, confirm the peak is within the detectable range of the QuantStudio 7 Flex, free of irregular spectral peaks, and present at the correct filter for the dye. (See example above).
      8. Select the QC tab and review the analysis status of the calibration.

1) “Passed” indicates the run produced viable data. Click **Next>** **Finish>** and then **Yes** to save to the QC folder on the Quantstudio computer.

2) “Failed” indicates the run did not produce data or has unusable data. See page 73 of the Maintenance and Administrative Guide for troubleshooting. If the run failed, the QC tab can provide information regarding the cause of the failure.

3) Unload the calibration plate by clicking on the **Open Door** icon. Remove the current plate, load the next plate, and close the tray door. Repeat the calibration for each of the remaining dyes. Save results in the QC folder on the QuantStudio 7 Flex computer desktop by clicking **Print Report** and select the **Save** icon. Name the report using the format YYYYMMDD\_DyeName.

* + 1. Normalization Calibration
       1. Remove the Normalization Plates (FAM/ROX and VIC/ROX) from the freezer and thaw at room temperature for 30 minutes in the dark. Vortex plate for 5 seconds and then centrifuge for 2 minutes at <1500 rpm. Use the plate within 2 hours of defrosting it. Do not allow the bottom of the plate to become dirty, as it can contaminate the sample block.
       2. From the Instrument Console, click on **Manage Instrument**.
       3. To start the calibration, click on **Maintenance>** **Normalization>** and **Start Calibration**. If you are already on the **Maintenance** screen, click on **Normalization** directly.
       4. From the **Normalization Screen**, select the reporter/passive dye combination that you are calibrating, and then perform the calibration as instructed. Enter in the reagent lot number and expiration date on the bottom of the **Setup Tab** screen.
       5. Open the tray door using the **Open Door** icon and load the dye plate, making sure the plate position A1 is in the top left corner of the plate adaptor. Close the door by pressing the **Close Door** icon.
       6. Start the calibration by selecting “Check the box when the normalization calibration plate has been loaded”. Click **Next**, then **Start Run**.
       7. Select the QC tab and review the analysis status of the calibration.

1) “Passed” indicates the run produced viable data. Click **Next>** **Finish>**.Then, **Save** results to the QC folder on the Quantstudio 7 Flex computer desktop by clicking **Print Report.**Select the **Save** icon. Name the report using the format YYYYMMDD\_NormalizationDyeName.

2) “Failed” indicates the run did not produce data or has unusable data. See page 74 of the Maintenance and Administrative Guide for troubleshooting. If the run failed, the QC tab can provide information regarding the cause of the failure.

* + - 1. Unload the normalization plate by clicking on the **Open Door** icon. Remove the current plate, load the next plate, and close the tray door. Repeat the normalization procedure for the remaining plate.
    1. Clean the block cover and block as follows:
       1. Put the QuantStudio Flex 7 in Standby mode and switch off the machine using the power switch on the back of the instrument.
       2. Open the front door. Using the tab lever, pull the top cover out. Use an alcohol prep pad and wipe the surface. DO NOT GET ALCOHOL ON THE OPTICS. If there is debris in the optic area, use canned air to blow it out. Return the block cover by pushing it back into the slot.
       3. Using the tab lever, pull out the block drawer. Lift out the block and place on flat surface. Add DI water into each well and pipette it back out. Allow block to dry.

7. If you suspect fluorescence contamination in the block:

* + - 1. Open the QuantStudio software and connect to the instrument using the instrument tab.
      2. On the main screen, click on **Quick Start**.
      3. Under Select Instrument Template, click on **Browse** and open the QS7 Flex folder under template folder.
      4. Select the template QS7\_96-well\_Presence-Absence\_Post\_20ul\_Template.
      5. Start run. It will take about 2 minutes. Click on **OK** at the end of the run.
      6. Click on plate view. If you see readings of 500,000 or above, click on the individual well to see which ones are affected.

1. **Note**: the orientation of the block is upside down. The block is labeled A1.
   * + 1. Save run in QC folder in the appropriate year/month subfolder.
       2. Pipette water into the wells of interest. Using an alpha mini swab, clean wells as above. Pipette out any remaining liquid. For persistent contamination, pipette 10% bleach into the well, followed by 3 water washes using a pipette.
       3. Run the above program from steps 5a-5g to make sure the contamination is removed.
       4. Return block to the drawer as in step 4c.
   1. As needed:
      1. RNase P instrument verification test
         1. Perform the RNase P instrument verification test after moving the instrument to another location or as needed to confirm the function of the instrument. The RNase P plate is preloaded with the reagents necessary for the detection and quantitation of genomic copies of the human RNase P gene (a single-copy gene encoding the RNase moiety of the RNase P enzyme). Each well contains: PCR master mix, RNase P primers, FAM™ dye-labeled probe, and a known concentration of human genomic DNA template. The RNase P plate contains five replicate groups of standards (1250, 2500, 5000, 10000, and 20000 copies), two unknown populations (5,000 and 10,000 copies), and a no template control (NTC). See diagram on page 61 of the Maintenance and Administration Guide for diagram of plate.
         2. Make sure all calibrations have been performed beforehand. Remove RNase P Instrument Verification Plate from the freezer and thaw at room temperature for 5 minutes in the dark. Run the RNase P plate within 30 minutes of thawing it. The RNase P plate is a single use only. Discard plate after run and make sure another plate is ordered.
         3. Vortex the plate for 5 seconds and then centrifuge for 2 minutes at <1500rpm. Do not allow the bottom of the plate to become dirty, as it can contaminate the sample block.
         4. From the **Home tab**, click **Instrument Console>** then **Manage Instrument**. If you are already on the **Maintenance** screen, click on the **RNase P** option directly.
         5. Click on **Maintenance>** **RNase P Run>** **Start RNase P Run>** and **Next**.
         6. Enter the reagent lot number and expiration date on the bottom of the **Setup Tab** screen.
         7. Open the tray door using the **Open Door** icon and load the RNase P plate, making sure the plate position A1 is in the top left corner of the plate adaptor. Close the door by pressing the **Close Door** icon.
         8. From the **Overview** screen, select “Check the box when the RNase P plate has been loaded”. Then, click **NEXT>** then **Start Run**.
         9. When the run is complete, confirm the status of the run:

1) “Passed” indicates QuantStudio 7 Flex passed the RNase P run.

2) “Failed”: review the data for outliers. The software may have included outliers that caused the initial analysis to fail. Error may cause some wells to be amplified insufficiently or not at all. These wells typically produce Ct values that differ significantly from the average for the associated replicate wells and result in erroneous measurements.

* + - 1. From the amplification plot, select **Ct vs. Well** from the **Plot Type** menu.
      2. Confirm the uniformity of each replicate population on the plate by comparing the groupings of Ct values. From the **Plate Layout**, select the wells containing Unknown Population A and confirm that the Ct values of the replicates are equivalent.

1) If an outlier is present, select the corresponding well of the plate layout, then click **Omit** to remove the well from the analysis. If the total number of outliers for the replicate population exceeds the limit in the table below, repeat the test using another RNase P plate.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Maximum number of outlier wells that can be removed | | | | |
| Sample block | Unknown population A | Unknown population B | Standards | No template controls |
| 96 well plate | 6 | 6 | 1 | 0 |

* + - 1. Repeat step k. for each replicate population on the plate.
      2. Review the **Results Table** tab, looking for quality flags generated by the test. Troubleshoot each well that generated a flag as explained in “RNase P test troubleshooting” on page 75 of the Maintenance and Administration Guide.

• AMPNC – Amplification in negative control

• BADROX – Bad passive reference signal

• BLFAIL – Baseline algorithm failed

• CTFAIL – CT algorithm failed

• EXPFAIL – Exponential algorithm failed

• HIGHSD – High standard deviation in replicate group

• NOAMP – No amplification

• NOISE – Noise higher than others on the consumable

• NOSIGNAL – No signal in well

• OFFSCALE – Fluorescence is off scale

• OUTLIERRG – Outlier in replicate group

• SPIKE – Noise spikes

• THOLDFAIL – Thresholding algorithm failed

* + - 1. If you omitted outliers, click **Reanalyze**. If the RNase P run “Failed” after performing the above steps, repeat the RNase P test using a different RNase P plate. If the problem persists, contact Life Technologies.
      2. Review the standard curve from the **Standard Curve** tab. Click the upper left corner of the plate layout to select all wells. Confirm that the R2 value is ≥0.990. If the value is ≤0.990, repeat the test using a different RNase P plate. If the problem persists, contact Life Technologies.

1) Click **Finish**, then **Yes** to save the test to the QC folder on the Quantstudio 7 Flex desktop by clicking **Print Report**. Select the **Save** icon. Name the report using the format YYYYMMDD\_RNaseP.

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1. **REPLACING THE HALOGEN LAMP**
   1. The QuantStudio 7 Flex Software can display the following warnings before or during the experiment:
      1. The lamp current is below acceptable level at the start of the run.
         1. Replace the halogen lamp as described below.
      2. The QuantStudio 7 Flex Software stopped the run because the lamp current decreased below the acceptable level during the run.
         1. Click “OK”, and then replace the halogen lamp.
      3. The lamp usage exceeds 2000 hours at the start of the run.
         1. Replace the lamp and perform all of the calibrations for the 6-month interval in the order listed, as well as the RNase P instrument verification test.
   2. Viewing the lamp status:
      1. From the QuantStudio 7 Flex Software home tab, click **Instrument Console.**
      2. Click on the instrument, and then review the lamp life in the Maintenance Info Screen. If over 2000 hours, replace the halogen lamp.
   3. Replace the halogen lamp:
      1. From the Main Menu of the *instrument* touchscreen, touch **Tools**, and then touch **Record Lamp Installation.**
      2. Touch the **Name** field and enter the serial number of the lamp, then touch **Done**, **Save,** then **OK**. When asked to confirm lamp replacement, touch **OK**.
      3. Power off and unplug the QuantStudio 7 Flex instrument, then allow to cool for 15 minutes.
      4. Open the access door.
      5. Slide the lamp release lever downward and firmly grasp the lamp, lifting up and out of the slotted mount.
      6. Install the new halogen lamp by fitting it into the slotted mount, then sliding the lamp downward. Slide the lamp release lever upward.
      7. Close the access door.
      8. Plug in the QuantStudio 7 Flex instrument. Turn on the switch in back.
      9. After replacing the lamp, perform the required calibrations. When you start the ROI calibration, look through the grating near the back to confirm the lamp is illuminated.
2. **TROUBLESHOOTING:**
   1. For troubleshooting, refer to the Maintenance and Administration Guide.
3. **CONTACT INFORMATION:**
   1. 1-800-955-6288, select Technical Service
4. **ATTACHMENTS:**
   1. QuantStudio 7 Maintenance Form
5. **REFERENCES:**
   1. QuantStudio™6 and 7 Flex Real-Time PCR Systems Maintenance and Administration Guide.
6. **REVISIONS:**
   1. 1/15/2020: Formatting and updated footer with new laboratory name.
   2. 7/6/2021: Added instructions for cleaning the block and block cover.