



ATF-LS-FB29 Quality Control of Instruments and Equipment Maintenance	Published Online: March 2018
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1. Scope

This protocol outlines the frequency and type of maintenance, calibration, and/or verifications that are to be conducted to keep our instruments and equipment in good working order and suitable for use in forensic casework.

2. References

- 2.1. Applied Biosystems™ 3130/3130xl Genetic Analyzers Maintenance, Troubleshooting, and Reference Guide, 2010.
- 2.2. Mettler Toledo® B-S Line of Balances AB-S, PB-S Operating Instructions, 2005.
- 2.3. Hermle Table Top Centrifuge Z 300 Instruction Manual, 2003.
- 2.4. Beckman Coulter® Microfuge® 18 Centrifuge Instruction Manual, 2009.
- 2.5. Fisher Scientific™ Isotemp® Plus and General Purpose Laboratory Freezers Instruction Manual, 2003.
- 2.6. Fisher Scientific™ Isotemp® Plus, Chromatography, and General Purpose Laboratory Refrigerators Instruction Manual, 2004.
- 2.7. Labnet International Digital Dry Bath Models D1100 and D1200 Instruction Manual, 2003.
- 2.8. AirClean® Systems Ductless PCR Workstation Operator's Manual, 2006.
- 2.9. Rainin® Pipet-Lite® Magnetic Assist Pipette User Manual, 2007.
- 2.10. Rainin® Pipet-Lite® XLS+™ Manual Pipettes with RFID Operating Instructions, 2014.
- 2.11. Applied Biosystems™ 7300/7500/7500 Fast Real-Time PCR System Installation and Maintenance Guide, 2006.
- 2.12. Applied Biosystems™ Thermal Cycler Temperature Verification System for GeneAmp® PCR System 9700: Dual 384 Well block User's Manual, 2006.
- 2.13. Applied Biosystems™ GeneAmp® PCR System 9700 Base Module User's Manual, 2010.
- 2.14. Applied Biosystems™ GeneAmp® PCR System 9700 96-Well Sample Block Module User's Manual, 2010.
- 2.15. Eppendorf® Thermomixer® Compact / Thermomixer® Operating Manual, 2008.
- 2.16. Eppendorf® Thermomixer® Comfort / Thermomixer® R Operating Manual, 2007.
- 2.17. Eppendorf® Thermomixer® C Operating Manual, 2014.
- 2.18. Spectroline® Microprocessor-Controlled UV Crosslinkers Select™ XLE-1000 and Spectrolinker™ XL-1000 and XL-1500 Operator's Manual, 2007.
- 2.19. Millipore Milli-Q® Gradient and Milli-Q Gradient A10® User Manual, 2006.
- 2.20. Applied Biosystems™ Veriti™ Thermal Cycler User Guide, 2010.
- 2.21. ATF-LS-FB11 Quantifiler
- 2.22. ATF-LS-FB30 Globalfiler™ PCR Amplification Kit
- 2.23. ATF-LS-FB31 Applied Biosystems™ 3130 Genetic Analyzer

3. Equipment

See individual equipment sections in Appendix A.

4. Safety / Quality Assurance

See individual safety sections in Appendix A.

5. Procedure

5.1. Documentation

5.1.1. All paperwork related to repairs, calibration, and maintenance of instruments shall be kept in the *Maintenance & Repair Log* for each room (lab) and/or electronically.

5.1.2. Performance check paperwork will be kept in the *Maintenance & Repair Log* and/or electronically.

5.1.3. User manuals, ordering/shipping paperwork, and/or warranty paperwork should be stored with the instruments, in the main instrument file, and/or electronically.

5.2. Performance Checks

5.2.1. Unless otherwise stated, the performance check will consist of the listed calibration or a test for function.

5.2.2. A performance check will be conducted on instruments and equipment prior to casework for:

5.2.2.1. New instruments and equipment (when appropriate)

5.2.2.2. Instruments and equipment that have undergone extensive repair and/or maintenance

5.2.3. No equipment or instrument will be used for casework unless it passes its scheduled checks within the stated interval.

5.3. Review

5.3.1. All worksheets and data associated with a calibration, verifications, and/or performance check will be reviewed by a qualified casework analyst and either approved or rejected for use in casework. A second qualified individual will perform and document a review of the data.

5.3.1.1. Approval

5.3.1.1.1. If the calibration, verifications, and/or performance check for a given instrument or equipment meet all of the requirements listed in Appendix A and the work is both technically and administratively sound, that instrument or equipment shall be approved for use in casework.

5.3.1.1.2. If approved, the cover sheet shall be initialed by the approver and reviewer. The packet, including all associated worksheets and data, will be stored in the appropriate log and/or electronically.

5.3.1.1.2.1. Electropherograms may be generated and stored electronically.

5.3.1.2. Rejection

- 5.3.1.2.1. If the calibration, verifications, and/or performance check for a given instrument or equipment does not meet the specific requirements listed in Appendix A, that instrument/equipment will not be used for casework until it passes.
- 5.3.1.2.2. The DNA Technical Leader will be notified.
- 5.3.1.2.3. Further tests will be performed at the discretion of the analyst/DNA Technical Leader to include:
 - 5.3.1.2.3.1. Additional laboratory evaluations and/or;
 - 5.3.1.2.3.2. Contact the manufacturer for repair.

5.4. Maintenance

5.4.1. See Appendix A for instrumentation and/or equipment specific maintenance procedures.

5.5. Maintenance Schedules

Weekly:

- 3130 Genetic Analyzers
- Freezer (large), Isotemp Plus
- Freezer (small), Isotemp
- Heat Block, Accublock Digital
- Milli-Q Water Purification System
- Refrigerator (large), Isotemp Plus
- Refrigerator (small), General Purpose
- Thermomixers

Bi-weekly*:

- UV Crosslinkers
- Monthly:
- 3130 Genetic Analyzers

Quarterly:

- 3130 Genetic Analyzers
- 7500 Real-Time PCR Systems
- 9700 Thermal Cyclers
- Veriti Thermal Cyclers

6-month:

- 7500 Real-Time PCR Systems
- AirClean PCR Workstations

Yearly:

- 3130 Genetic Analyzers
- 7500 Real-Time PCR Systems
- 9700 Thermal Cyclers
- Veriti Thermal Cyclers
- Centrifuges
- Digital Balance
- Pipettes
- Temperature Verification Kit
- Thermometers
- STRmix Software

*- every two weeks

APPENDIX A – Instrument Specific Maintenance Procedures

Instrument: Balance – Digital

Mettler/Toledo® Model #: PB303-S/FACT

1. Equipment
 - 1.1. Disposable gloves
 - 1.2. Eye protection
 - 1.3. Lab coat
 - 1.4. Digital balance
 - 1.5. Calibration weight set
 - 1.6. Forceps

2. Safety
 - 2.1. Lab coat, eye protection, and disposable gloves must be worn at all times while performing this procedure.

3. Frequency
 - 3.1. Performance will be verified using a weight set on an annual basis.

4. Procedure
 - 4.1. Press and hold the *calibration button* to perform the internal calibration.
 - 4.2. To check this calibration, measure each weight three times and record the measurements.
 - 4.3. Calculate and record the average for each weight.
 - 4.4. If any average is outside of the accepted tolerance of $\pm 4\%$, the balance will be repaired or replaced.

5. Documentation
 - 5.1. Records will be maintained in the *Maintenance & Repair Log* and/or electronically.

Instrument: Centrifuge

Hermle Model #: Z300

1. Equipment

- 1.1. Disposable gloves
- 1.2. Eye protection
- 1.3. Lab coat
- 1.4. Centrifuge
- 1.5. NIST Certified Tachometer
- 1.6. Reflective Tape

2. Safety

- 2.1. Lab coat, eye protection, and disposable gloves must be worn at all times while performing this procedure.

3. Frequency

- 3.1. Verify the speed of the centrifuge with a NIST certified tachometer on an annual basis.

4. Procedure

- 4.1. Check the calibration date on the certificate and make sure the NIST certified tachometer has not expired.
- 4.2. Make sure the centrifuge is empty, and then add a piece of reflective tape to the top of the rotor cover so that it is visible through the clear viewing window in the centrifuge lid.
- 4.3. Set the centrifuge for 500 RPM (low setting) and start. Wait approximately one minute for the centrifuge to get up to speed.
- 4.4. Turn on the tachometer and hold it over the viewing window with the laser pointing down into the centrifuge.
- 4.5. Examine the readings for a few seconds. Make sure the readings are within $\pm 10\%$ of the RPM setting.
- 4.6. If the actual speed varies by more than 10% of the set speed, the centrifuge will be repaired or replaced.
- 4.7. Repeat sections 4.1 through 4.5 at 13500 RPM (high setting) for a tube centrifuge or 3500 RPM (high setting) for a plate centrifuge.

5. Documentation

- 5.1. Records will be maintained in the *Maintenance & Repair Log* and/or electronically.

Instrument: Freezer (large) Isotemp® Plus -20° C

Fisher Scientific™ Model #: 13-986-142

1. Equipment

- 1.1. Disposable gloves
- 1.2. Eye protection
- 1.3. Lab coat
- 1.4. Freezer
- 1.5. Thermometer

2. Safety

- 2.1. Lab coat, eye protection, and disposable gloves must be worn at all times while performing this procedure.

3. Frequency

- 3.1. Check the temperature of the freezer weekly.

4. Procedure

- 4.1. Note the temperature of the thermometer in the freezer.
- 4.2. Record the temperature on the log sheet.
- 4.3. If the actual temperature varies more than $\pm 2^{\circ}\text{C}$ from the desired temperature, the freezer will be adjusted to achieve the desired temperature.
- 4.4. If the freezer cannot hold temperature, it will be repaired or replaced.

NOTE: If a problem with a thermometer is suspected, verify the performance of the thermometer against a NIST certified thermometer.

5. Documentation

- 5.1. Current records will be maintained in proximity to the instrument.
- 5.2. Older records will be maintained in the *Maintenance & Repair Log* and/or electronically.

Instrument: Freezer (small), Isotemp®

Fisher Scientific™ Model #: 13-986-154

1. Equipment

- 1.1. Disposable gloves
- 1.2. Eye protection
- 1.3. Lab coat
- 1.4. Freezer
- 1.5. Thermometer

2. Safety

- 2.1. Lab coat, eye protection, and disposable gloves must be worn at all times while performing this procedure.

3. Frequency

- 3.1. Check the temperature of the freezer weekly.

4. Procedure

- 4.1. Note the temperature of the thermometer in the freezer.
- 4.2. Record temperature on the log sheet.
- 4.3. If the actual temperature varies more than $\pm 2^{\circ}\text{C}$ from the desired temperature, the freezer will be adjusted to achieve the desired temperature.
- 4.4. If the freezer cannot hold temperature, it will be repaired or replaced.

NOTE: If a problem with a thermometer is suspected, verify the performance of the thermometer against a NIST certified thermometer.

5. Documentation

- 5.1. Current records will be maintained in proximity to the instrument.
- 5.2. Older records will be maintained in the *Maintenance & Repair Log* and/or electronically.

Instrument: Genetic Analyzer

Applied Biosystems™ Model #: 3130

1. Equipment

1.1. See applicable section in ATF-LS-FB31.

2. Safety

2.1. See applicable section in ATF-LS-FB31.

3. Frequency

3.1. Each Use

3.1.1. Check that the polymer has been on the instrument less than two (2) weeks.

3.1.2. Check that the 1X running buffer has been on the instrument less than 2 days.

3.1.3. Add the number of runs to the Run Count Log.

3.2. Weekly

3.2.1. Change polymer if it has been on the instrument more than two (2) weeks before running samples. Polymer older than two weeks can remain on the instrument as long as no casework samples are run using this polymer. To replace polymer, use the *Replenish Polymer Wizard*. Fill out Polymer Log for the instrument.

3.2.2. Restart computer and instrument.

3.3. Monthly

3.3.1. Run the *Water Wash Wizard*.

3.3.2. Clean the water trap with syringe.

3.3.3. Defragment the computer hard drive.

3.4. Quarterly

3.4.1. Check database and hard disk space.

3.4.2. Ensure the data files have been backed up.

3.5. Yearly

3.5.1. Scheduled preventative maintenance by vendor (Applied Biosystems).

3.6. As needed

3.6.1. A new spatial calibration, spectral calibration, and a performance check will be conducted after the installation of a new capillary array, yearly preventative maintenance, adjustment/replacement of optics/laser, or other extensive vendor maintenance/repair.

3.6.2. A new spectral calibration can be performed if excessive pull-up is noted.

4. Procedure

4.1. Refer to the *Applied Biosystems 3130 Genetic Analyzer Maintenance, Troubleshooting and Reference Guide* for directions on performing calibration and maintenance tasks.

4.2. Performance check procedure

4.2.1. Amplify and genetically type a set of five (5) QC Samples (e.g. NIST 2372) at 500 pg. A positive and negative control sample should also be included.

4.3. Minimum for passing performance check

4.3.1. Positive control must type correctly with an acceptable level of pull-up and no extra true peaks in samples. No true peaks should be observed in negative control sample.

4.3.2. The average RFU/locus for the 5 QC samples should be within 20% of the original NIST SRM baseline.

5. Documentation

5.1. QC records and performance checks will be maintained in the *Maintenance & Repair Log* and/or electronically.

Instrument: Heat Block – Accublock Digital

Labnet International Model #: D1100

1. Equipment

- 1.1. Disposable gloves
- 1.2. Eye protection
- 1.3. Lab coat
- 1.4. Heat Block
- 1.5. Thermometer

2. Safety

- 2.1. Lab coat, eye protection, and disposable gloves must be worn at all times while performing this procedure.

3. Frequency

- 3.1. Check the temperature of the heat block weekly.

4. Procedure

- 4.1. Measure the temperature of the heat block using the temperature verification unit.
- 4.2. Record temperature on the log sheet.
- 4.3. If the actual temperature varies more than $\pm 2^{\circ}\text{C}$ from the desired temperature, the heat block will be adjusted to achieve the desired temperature.
- 4.4. If the heat block cannot hold temperature, it will be repaired or replaced.

5. Documentation

- 5.1. Current records will be maintained in proximity to the instrument.
- 5.2. Older records will be maintained in the *Maintenance & Repair Log* and/or electronically.

Instrument: PCR Workstation – AirClean® 600

AirClean® Systems Model #'s: AC648LFUVC and AC632LFUVC

1. Equipment

- 1.1. Disposable gloves
- 1.2. Eye protection
- 1.3. Lab coat
- 1.4. Pre-Filter(s)
- 1.5. HEPA Filter(s)
- 1.6. PCR Workstation

2. Safety

- 2.1. Lab coat, eye protection, and disposable gloves must be worn at all times while performing this procedure.

3. Frequency

- 3.1. Replace pre-filter(s) every 6 months.
- 3.2. Replace HEPA filter(s) every four (4) years assuming ~100 hours of use per year.

4. Procedure

- 4.1. Refer to the *AirClean Systems Ductless PCR Workstation Operator's Manual* for instructions on replacing the pre-filters and HEPA filters.

5. Documentation

- 5.1. Records will be maintained in the *Maintenance & Repair Log* and/or electronically.

Instrument: Pipettes - P10, P100, P1000

Rainin® Model #'s: L-10, L-100, L-1000

1. Equipment

- 1.1. Disposable gloves
- 1.2. Eye protection
- 1.3. Lab coat
- 1.4. Pipettes

2. Safety

- 2.1. Lab coat, eye protection, and disposable gloves must be worn at all times while performing this procedure.

3. Frequency

- 3.1. Pipettes will be calibrated annually by an appropriate vendor.
- 3.2. The pipettes should be cleaned with 70% ethanol prior to being used for casework.
NOTE: If a pipette is not performing as expected it may be pulled out of service at any time and sent for repair or replacement.

4. Procedure

- 4.1. Contact vendor to schedule service and/or calibration.

5. Documentation

- 5.1. Records will be maintained in the *Pipette Log* and/or electronically.

Instrument: Refrigerator (large) Isotemp® Plus

Fisher Scientific™ Model #: 13-986-120

1. Equipment

- 1.1. Disposable gloves
- 1.2. Eye protection
- 1.3. Lab coat
- 1.4. Refrigerator
- 1.5. Thermometer

2. Safety

- 2.1. Lab coat, eye protection, and disposable gloves must be worn at all times while performing this procedure.

3. Frequency

- 3.1. Check the temperature of the refrigerator weekly.

4. Procedure

- 4.1. Note the temperature of the thermometer in the refrigerator.
- 4.2. Record temperature on the log sheet.
- 4.3. If the actual temperature varies more than $\pm 2^{\circ}\text{C}$ from the desired temperature, the refrigerator will be adjusted to achieve the desired temperature.
- 4.4. If the refrigerator cannot hold temperature, it will be repaired or replaced.

NOTE: If a problem with a thermometer is suspected, verify the performance of the thermometer against a NIST certified thermometer.

5. Documentation

- 5.1. Current records will be maintained in proximity to the instrument.
- 5.2. Older records will be maintained in the *Maintenance & Repair Log* and/or electronically.

Instrument: Refrigerator (small) - General Purpose

Fisher Scientific™ Model #: 97-920-1

1. Equipment

- 1.1. Disposable gloves
- 1.2. Eye protection
- 1.3. Lab coat
- 1.4. Refrigerator
- 1.5. Thermometer

2. Safety

- 2.1. Lab coat, eye protection, and disposable gloves must be worn at all times while performing this procedure.

3. Frequency

- 3.1. Check the temperature of the refrigerator weekly.

4. Procedure

- 4.1. Note the temperature of the thermometer in the refrigerator.
- 4.2. Record temperature on the log sheet.
- 4.3. If the actual temperature varies more than $\pm 2^{\circ}\text{C}$ from the desired temperature, the refrigerator will be adjusted to achieve the desired temperature.
- 4.4. If the refrigerator cannot hold temperature, it will be repaired or replaced.

NOTE: If a problem with a thermometer is suspected, verify the performance of the thermometer against a NIST certified thermometer.

5. Documentation

- 5.1. Current records will be maintained in proximity to the instrument.
- 5.2. Older records will be maintained in the *Maintenance & Repair Log* and/or electronically.

Instrument: Real-Time PCR System

Applied Biosystems™ Model #: 7500

1. Equipment

1.1. See applicable section in ATF-LS-FB11 Quantifiler.

2. Safety

2.1. See applicable section in ATF-LS-FB11 Quantifiler.

3. Frequency

3.1. 3 Months

3.1.1. Background calibration

3.1.2. Restart computer, check hard disk space, and organize data files

3.2. 6 Months

3.2.1. Region of interest (ROI) calibration

3.2.2. Optical calibration

3.2.3. Defragment the computer's hard drive

3.3. Yearly

3.3.1. Scheduled preventative maintenance by vendor (Applied Biosystems)

3.3.2. Pure dye calibration (can be performed by Applied Biosystems)

3.4. As Needed

3.4.1. Replace halogen lamp if decrease in performance is noted.

3.4.2. Clean the heating block if contamination is present.

3.4.3. Call Applied Biosystems for repairs.

3.4.4. A performance check will be conducted after ROI / optical calibration, yearly preventative maintenance, replacement of bulb, or other extensive vendor maintenance.

4. Procedure

4.1. Refer to Applied Biosystems™ 7300/7500/7500 Fast Real-Time PCR System Installation and Maintenance Guide for directions on performing calibration and maintenance tasks.

4.2. Performance check procedure

4.2.1. Run a plate with two columns of standards using a dilution from the NIST SRM 2372, a plate blank, and one NIST SRM 2372 quantification sample run in duplicate.

4.3. Minimum for passing performance check

4.3.1. The NIST SRM 2372 sample must have a quantification value within 15% of the published value (see NIST SRM 2372 paperwork).

4.3.2. The standard curve must meet appropriate requirements (See *ATF-LS-FB-11 Quantifiler* protocol).

4.3.3. Plate blank shall have no detected value or be $< 1 \times 10^{-3}$.

5. Documentation

5.1. Current QC records will be maintained in proximity to the instrument.

5.2. Older QC records and performance checks will be maintained in the *Maintenance & Repair Log* and/or electronically.

Instrument: Temperature Verification Kit

Applied Biosystems™ Serial #: 06C40218 - Eutechs Precision Thermometer (Model: 4500)

Serial #: 507911 - 0.2 mL SmartProbe

- 1. Equipment**
 - 1.1. Disposable gloves
 - 1.2. Eye protection
 - 1.3. Lab coat
 - 1.4. Temperature Verification Kit

- 2. Safety**
 - 2.1. Lab coat, eye protection, and disposable gloves must be worn at all times while performing this procedure.

- 3. Frequency**
 - 3.1. Send out to an appropriate vendor for calibration yearly.

- 4. Procedure**
 - 4.1. Contact vendor to schedule service.

- 5. Documentation**
 - 5.1. Records will be maintained in the *Maintenance & Repair Log* and/or electronically.

Instrument: Thermal Cycler – GeneAmp® PCR System

Applied Biosystems™ Model #: 9700

1. Equipment

1.1. See applicable section in ATF-LS-FB30 Globalfiler™ PCR Amplification Kit.

2. Safety

2.1. See applicable section in ATF-LS-FB30 Globalfiler™ PCR Amplification Kit.

3. Frequency

3.1. 3 Months

3.1.1. Perform temperature verification.

3.1.2. Perform non-conformity test.

3.1.3. Perform the rate test.

3.1.4. Perform the cycle test.

3.2. Yearly

3.2.1. Performance check.

3.3. As Needed

3.3.1. A performance check will be conducted following vendor maintenance.

4. Procedure

4.1. Refer to the *Applied Biosystems GeneAmp PCR System 9700 User's Manual* for directions on performing calibration tests.

4.2. Performance check procedure

4.2.1. Perform all of the above listed calibration tests.

4.2.2. Amplify and genetically type a positive control sample (0.5 ng) and a negative control sample.

4.3. Minimum for passing performance check.

4.3.1. All of the quarterly calibration tests must pass.

4.3.2. Positive control sample must type correctly, electropherogram characteristics (peak heights, inter and intra locus balances, etc.) should be comparable to expected results. No true peaks present in negative control sample.

5. Documentation

5.1. Records and performance checks will be maintained in the *Maintenance & Repair Log* and/or electronically.

Instrument: Thermal Cycler -- Veriti

Applied Biosystems™ Model #: Veriti™

1. Equipment

1.1. See applicable section in ATF-LS-FB30 Globalfiler™ PCR Amplification Kit.

2. Safety

2.1. See applicable section in ATF-LS-FB30 Globalfiler™ PCR Amplification Kit.

3. Frequency

3.1. 3 Months

3.1.1. Perform temperature non-uniformity test.

3.1.2. Perform temperature verification test.

3.1.3. Perform heated cover verification test.

3.1.4. Perform cycle performance test.

3.2. Yearly

3.2.1. Performance check.

3.3. As Needed

3.3.1. A performance check will be conducted following vendor maintenance.

4. Procedure

4.1. Refer to the *Applied Biosystems Veriti Thermal Cycler User's Manual* for directions on performing calibration tests.

4.2. Performance check procedure

4.2.1. Perform all of the above listed calibration tests.

4.2.2. Amplify and genetically type a positive control sample (0.5 ng) and a negative control sample.

4.3. Minimum for passing performance check

4.3.1. All of the quarterly calibration tests must pass.

4.3.2. Positive control sample must type correctly, electropherogram characteristics (peak heights, inter and intra locus balances, etc.) should be comparable to expected results. No true peaks present in negative control sample.

5. Documentation

5.1. Records and performance checks will be maintained in the *Maintenance & Repair Log* and/or electronically.

Instrument: Thermometers

VWR Model #: Various

1. Equipment
 - 1.1. Disposable gloves
 - 1.2. Eye protection
 - 1.3. Lab coat
 - 1.4. Thermometer
 - 1.5. NIST certified thermometer

2. Safety
 - 2.1. Lab coat, eye protection, and disposable gloves must be worn at all times while performing this procedure.

3. Frequency
 - 3.1. Compare to a NIST certified thermometer yearly.

4. Procedure
 - 4.1. Check the calibration date on the certificate and make sure the NIST certified thermometer has not expired.
 - 4.2. Place the NIST certified thermometer and the laboratory thermometer(s) in an oven, refrigerator, or freezer based on the range of the thermometer.
 - 4.3. Let sit for at least 2 hours and then record the temperatures.
 - 4.4. Any laboratory thermometer that differs from the NIST certified thermometer by more than $\pm 1^{\circ}\text{C}$ will be replaced.

5. Documentation
 - 5.1. Records will be maintained in the *Thermometer Log* and/or electronically

Instrument: Thermomixers®

Eppendorf® Model #: Various

1. Equipment

- 1.1. Disposable gloves
- 1.2. Eye protection
- 1.3. Lab coat
- 1.4. Thermometer
- 1.5. Thermomixer

2. Safety

- 2.1. Lab coat, eye protection, and disposable gloves must be worn at all times while performing this procedure.

3. Frequency

- 3.1. Check the temperature of the thermomixer weekly.

4. Procedure

- 4.1. Note the temperature of the thermometer in the thermomixer.
 - 4.2. Record temperature on the log sheet.
 - 4.3. If the actual temperature varies more than $\pm 2^{\circ}\text{C}$ from the desired temperature, the thermomixer will be adjusted to achieve that desired temperature.
 - 4.4. If the thermomixer cannot hold temperature, it will be repaired or replaced.
- NOTE: If a problem with a thermometer is suspected, verify the performance of the thermometer

against a NIST certified thermometer.

5. Documentation

- 5.1. Current temperature records will be maintained in proximity to the instrument.
- 5.2. Older records will be maintained in the *Maintenance & Repair Log* and/or electronically.

Instrument: UV Crosslinker – Spectrolinker™

Spectronics® Corporation Model #: XL-1500

1. Equipment

- 1.1. Disposable gloves
- 1.2. Eye protection
- 1.3. Lab coat
- 1.4. UV crosslinker
- 1.5. Calculator
- 1.6. Timer

2. Safety

- 2.1. Lab coat, eye protection, and disposable gloves must be worn at all times while performing this procedure.

3. Frequency

- 3.1. Evaluate crosslinkers to ensure that the proper energy is being delivered bi-weekly (every two weeks).

4. Procedure

- 4.1. Turn crosslinker on.
- 4.2. Select "Energy" mode and enter "9999"; Hit "Start".
- 4.3. Time how long it takes the crosslinker to deliver this energy (essentially 1.0 J/cm²).
 - 4.3.1. Calculate time for 2.0 J/cm² [i.e. 2*(time for 1.0 J/cm²)].
 - 4.3.1.1. Use this time to crosslink solid items (e.g. tubes, racks, etc.).
 - 4.3.2. Calculate time for 6.0 J/cm² [i.e. 3*(time for 2.0 J/cm²)].
 - 4.3.2.1. Use this time to crosslink liquid reagents (e.g. reagents in conical tubes).
 - 4.4. Visually verify through the front window that all UV bulbs are functioning.
 - 4.5. Record the observed and calculated energy delivery times, and if all bulbs are functioning.

5. Documentation

- 5.1. Current records will be maintained in proximity to the instrument.
- 5.2. Older records will be maintained in the *Maintenance & Repair Log* and/or electronically

Instrument: Water Purification System

Millipore Model #'s: Milli-Q® Gradient A10

Milli-Q® Gradient w/Bio Pak

1. Equipment

- 1.1. Disposable gloves
- 1.2. Eye protection
- 1.3. Lab coat
- 1.4. Water purification system

2. Safety

- 2.1. Lab coat, eye protection, and disposable gloves must be worn at all times while performing this procedure.

3. Frequency

3.1. Weekly

- 3.1.1. Check the resistance (MΩ) of the water. The higher the resistance (MΩ reading), the fewer ions are present to carry the electrical charge.

3.2. As Needed

- 3.2.1. Replace the cartridges and filters when indicated by the water system, and record lot numbers on the *Filter Log sheet*.

4. Procedure

- 4.1. Turn on the water system, and let it run for approximately 5 seconds.
- 4.2. Record the resistance in megaohms (MΩ) on the weekly record sheet.
- 4.3. If the reading is below 17 MΩ, call vendor for service.
- 4.4. Refer to the *Millipore Milli-Q® Gradient and Milli-Q Gradient A10® User Manual* for directions on replacing the cartridges and filters.

5. Documentation

- 5.1. Current records will be maintained in proximity to the instrument.
- 5.2. Older records will be maintained in the *Maintenance & Repair Log* and/or electronically

Instrument: STRmix™ Software

Version #'s: Current

1. Equipment

1.1. Computer loaded with STRmix software

2. Safety

2.1. NA

3. Frequency

3.1. Analyze with STRmix the profiles generated from NIST SRM 2391c A through D as part of the annual processing of the NIST sample set.

4. Procedure

4.1. Run STRmix deconvolution and generate an LR for each sample.

4.1.1. Components A through C are single source samples.

4.1.2. Component D is a mixture of components A and C (do not condition the LR on either contributor).

4.2. The point LR for components A through C should be the same as the previous year.

4.3. Component D mixture proportions should be within 70-80% for the major and 20-30% for the minor.

5. Documentation

5.1. Records will be maintained electronically.