PATHOLOGY & LABORATORY MEDICINE SERVICE

Equipment Maintenance version 1

General Procedure # GEN00026

Purpose:

A preventive maintenance schedule has proven to extend the life of an instrument. A typical laboratory will keep analytical instruments operating for several hours a day. Normal wear and tear of mechanical parts occurs while the instruments are running. Maintaining instrument electronics are as important as the mechanical parts. A laboratory that maintains a preventive maintenance schedule reduces down time and maximizes sample load.

Scope:

All Laboratory Equipment

Process:

Instruments covered under a service agreement are automatically placed into a preventive maintenance schedule. Customers are reminded about the schedule well in advance of the due date, giving ample time to plan and minimize down time. Service engineers are trained to uncover potential problems as well as questioning the customer about the performance of the instrument. This simple schedule will keep instruments operating at optimal performance.

Equipment that does not have a service agreement can also schedule preventive maintenance visits. Maintenance contracts with service vendors on instruments out of warranty are the responsibility of Biomedical Engineering Department. Section supervisors work with the Biomedical Shop foreman to insure each contract is met. In-house maintenance by Biomedical Engineering technicians is performed on a scheduled basis and includes service on centrifuges and water baths. Biomedical Engineering arranges for servicing of pipettes (e.g. see attachment A), microscopes and Biological/Chemical Safety Hoods by outside vendors.

Refrigerators and freezers are serviced by Heating and Refrigeration section of the Engineering Department.

Attachments:

Attachment A. Chemistry Procedure 1.12 Pipette Precision and Accuracy

References:

1. VAMHCS Medical Equipment Management Plan, 512-138/ENG-006, July 2017
2. Work Order Requests for Inspections, Maintenance, and Repair of Facilities, Utilities, and Equipment, 512-138/ENG-021, March 2015

	VETERANS ADMINISTRATION MARYLAND HEALTH CARE SYSTEM BALTIMORE DIVISION 10 NORTH GREENE STREET BALTIMORE, MD 21201	**GEN00026.1**

DATE ADOPTED	*Author of Procedure/Policy*	Chief of Service
09/15/2015	Karla Peralta, BS MT (ASCP)	Signature: Dong H. Lee M.D.

Policy/Procedure(s) Retired:		Date retired:

Review Date	Version Number	Signature of reviewer
11/13/17	1	

REVISION HISTORY

Date revised	Revision #	Changes made	Signature
11/12/17	N/A	Reformatted, changed document control number from GEN00027, updated references.	

Beckman Synchron 880i
1.12 Pipette Precision and Accuracy

Prepared by	Date Adopted	APPROVED BY
John Coulter	August 2009	

Review Date	Version Number	Signature

Policy Retired:	

1.12 PRECISION AND ACCURACY CHECKS OF SEMI-AUTOMATIC PIPETS AND PIPETTORS

I. Intended Use

The Chemistry section has semi-automatic pipettes checked for precision and accuracy twice annually by an outside contractor. This procedure is intended to be supplemental to the twice annual checks, for example, in the event that a new semi-automatic pipette is received, or troubleshooting must take place if calibration is suspect. Any pipette / pipettor / measuring device that does not meet accuracy criteria will be immediately taken out of service for repair. Any device found to be un-repairable will be discarded. All glassware used in the lab will be Class A certified accurate. The only acceptable use of less accurate plastic graduated cylinders is measuring total volumes of 24 hour urine specimens or preparation of buffer / diluent solutions where exact accuracy is not critical. All other uses of plastic measuring devices are not permitted. Plastic measuring devices may have up to a +/- 3% variance from the stated volume. Beckman Coulter does not recommend routine protocol for testing individual instrument pipettes. See letter dated Dec. 27, 2009.

II. Principle

Precision will be checked by weighing ten (10) aliquots of water dispensed with the pipette. New pipettes will be checked using thirty (30) aliquot data points before being placed into service. Mean, standard deviation, and coefficient of variation of the weights will be calculated. Accuracy will be checked by calculating the volume from the mean value for the weighing using the known density of water at specific temperatures.

III. Equipment

A. Mettler Balance
B. Class S Weights
C. PC – Excel software

IV. Disposable

A. Receiving Vessel
B. Disposable Pipette Tips

V. Procedure

Pipettes are checked for precision and accuracy *after* cleaning and lubrication.

A. At least one hour prior to beginning the calibration procedure, all materials to be used, including the water, should be assembled and allowed to equilibrate to room temperature. The balance should be energized.
B. The calibration of the balance should be confirmed with Class S weights.
C. Weigh the receiving vessel and record the weight.
D. Pipette an aliquot of water into the receiving vessel.
E. Weigh the vessel and record the weight.
F. Repeat steps 5 and 6 until ten aliquots have been weighed. Use a fresh pipette tip each time.

G. Measure the temperature of the water.

VI. Calculations

A. Use the Excel Program in the computer, located in the QC section of Chemistry to calculate. The file name for pipette calibrations is "Pipette.XLS". Follow spreadsheet and enter data, including the water density correction factor for the temperature at the time the weights were recorded. This will calculate the mean, SD., CV, and % delivery of the pipette. See attached example.

B. Acceptability of tolerance limits will follow the guidelines published in the Artel Lab Report, Issue 5. A copy labeled Table 1 is reproduced below..

http://www.artel-usa.com/uploadedFiles/resources/Lab_Reports/Lab Report Issue 5_19A3230C_Setting Tolerances for pipettes in the laboratory.pdf

Table 1: Artel's suggested initial tolerance limits

Pipette Volume, µL		Relative Error		Absolute Error	
Nominal	Setting	Inaccuracy ± %	CV %	Inaccuracy ± µL	STD µL
2	2.0 1.0 0.2	2.0 4.0 20.0	1.0 2.0 10.0	0.04	0.02
2.5	2.5 1.0 0.2	2.0 5.0 25.0	1.0 2.5 12.5	0.05	0.025
10	10 5 1	2.0 4.0 20.0	1.0 2.0 10.0	0.20	0.10
20	20 10 2	2.0 4.0 20.0	1.0 2.0 10.0	0.4	0.2
50	50 25 5	2.0 4.0 20.0	1.0 2.0 10.0	1.0	0.5
100	100 50 10	2.0 4.0 20.0	1.0 2.0 10.0	2.0	1.0
200	200 100 20	2.0 4.0 20.0	1.0 2.0 10.0	4.0	2.0
500	500 250 50	2.0 4.0 20.0	1.0 2.0 10.0	10.0	5.0
1000	1000 500 100	2.0 4.0 20.0	1.0 2.0 10.0	20.0	10.0
2000	2000 1000 200	2.0 4.0 20.0	1.0 2.0 10.0	40.0	20.0
2500	2500 1000 500	2.0 5.0 10.0	1.0 2.5 5.0	50.0	25.0
5000	5000 2500 500	2.0 4.0 20.0	1.0 2.0 10.0	100.0	50.0

Temperature of Test Media (Water)	Water Density Correction Factor
Degrees C:	
17	1.001
18	1.001
19	1.002
20	1.002
21	1.002
22	1.002
23	1.003
24	1.003
25	1.003
26	1.003
27	1.004

Degrees F	
63	1.001
64	1.001
65	1.002
66	1.002
67	1.002
68	1.002
69	1:002
70	1.002
71	1.002
72	1.002
73	1.002
74	1.00
75	1.003
76	1.003
77	1.003
78	1.003
79	1.003
80	1.003

ATTACHMENT A

VAMC-Balt.-Chem

Example of "Pipette.xls" worksheet:

Pipette Calibration

Pipette ID:	96-04 Oxford	100-1000mcL
Expected Pipette Volume:	100	m c L
Observed Delivery =	99.82%	(Acceptable Range 99 - 101 %)
Observed CV =	4.71%	(Acceptable Range 0 - 5%)
Analyzed by:		
On:		
Data Collected by:		
On:		
Observed Temperature:	21	deg Centigrade
Expected Density of H2O:	0.998230	g/mL (from Handbook of Chemistry & Physics, p. F-4))
Expected NBS weight:	100g	
Observed NBS weight:	100.003g	

Observation	Weight mg	Increment mg
1	1.8600	0.1000
2	1.9600	0.0900
3	2.0500	0.1000
4	2.1500	0.1000
5	2.2500	0.1000
6	2.3500	0.1000
7	2.4500	0.1000
8	2.5500	0.1000
9	2.6500	0.1000
10	2.7500	0.1000
11	2.8600	0.1100

Number	Mass 10	Volume 10
Mean	0.1000	0.0998
Std Dev	0.0047	0 .0047
Min	0 .0900	0.0898
Max	0.1100	0.1098

Reviewed by:_____ Date: _____