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Testing Protocol for DMT Instruments

Power Up Procedure:

- a) Open unit and inspect connections. Ensure all tubing is secure. Check that all cables are properly seated and tied down or strapped together as necessary. Check that **all** screws are in place and snug; this will require the removal of the side pieces to allow the technician access. Correct as needed.
- b) Manually turn the filter wheel. The filter wheel should turn smoothly and should not rub or wobble. Correct as needed.
- c) Power on the instrument. Allow approximately one hour for it to come to temperature.
- d) Access the SETUP menu. On the MISC tab, type "State of Vermont" in the NAME field. In the EXPLORE box, highlight STYLUS and press the OK button to activate the stylus settings. Recalibrate the stylus. Once complete, exit the SETUP menu by pressing the OK button to save the settings. If you exit the SETUP menu using the CANCEL button, none of the changes will be saved.
- e) Enter the TECH screen. Scroll through all of the filter settings to ensure the filter wheel is activating properly.
- f) Detector Burn-in Procedure per NPAS:
 - Adjust the cooler voltage setting to 1.70Vdc +/-0.10.
 - Manually manipulate the detector position to get the detector voltage as low as possible.
 - Adjust the Lamp voltage setting so that the detector voltage displayed is approximately +0.000 +/- 0.100.
 - Note the initial noise of the detector voltage once unit has had a minute to adjust to the adjusted voltages. Noise tolerance at NPAS is +/-0.003 on a detector.
 - Save the voltage settings
 - Allow the instrument to remain powered for four (4) days. Having the instrument in the technician screen during the entire four days is not necessary.
 - After the burn-in period is complete, return to the technician screen and recheck the noise level of the detector.
 - If the detector is going to remain installed in the instrument, adjust the detector voltage to the desired level and proceed with testing as needed. Per VDHL protocol, the detector voltage must read 0.000V with a tolerance of +/- 0.050V. Correct as needed.
- g) While still in the TECH screen, press SET in the RF Sensitivity box to automatically set the RF sensitivity level. Press SAVE to save the settings. Confirm the setting by keying a radio near the instrument. Correct as needed.
- h) Using the large syringe, push 1.5L of air into the breath tube. Monitor the volume of air displayed on the TECH screen. The instrument should read 1.5L +/- 0.2L. If the instrument is out of range, adjust the distance between the "T" fittings on the breath exhaust tubing. Retest until the volume reads appropriately.
- i) Once all the TECH settings are correct re-save every setting. Exit the TECH screen.
- j) Ensure that the dip switches on the embedded pc are correctly toggled. Counting from the back of the instrument to front, dip switches one, two and three must be up and four must be down. Dip switch five controls the screen, if the image on the screen appears to 'wobble', change the dip switch to the opposite position to correct the problem.

- k) Close up the instrument using locking screws on the top four holes. Attach the stylus to the DMT using a locking screw in the center right screw hole nearest the simulator tower. Attach the keyboard to the top of the instrument using sticky back velcro. Wrap a small piece of velcro around the top of the stylus and affix the other side to the front of the instrument so the stylus can rest on the front of the unit.
- l) Retrieve a Guth simulator that has been calibrated to 34.0° C and verified using a NIST traceable thermometer. Allow the simulator to come to temperature, approximately 30 minutes. Attach the temperature cable of the DMT to the BNC connector on the simulator. Adjust the signal out on the simulator until the DMT displays the same temperature as the NIST thermometer.
- m) Calibrate the instrument following the Calibration Protocol using Calibration Solution (0.100 EtOH). During Calibration and Certification, it may be necessary to turn off the simulator temperature monitoring if using Guth 2100 Simulators as these do not have BNC connectors for temperature monitoring. To do this, open the SETUP menu. In the Simulator box, select NONE as the type of simulator. Press OK to exit. Document the room temperature and humidity level at the time of calibration in the communication notebook.
- n) Certify the instrument following the Certification Protocol.
- o) If the instrument is going to be tested in house prior to deployment, an Installation Protocol must be completed. Make sure to turn the simulator temperature monitoring back on prior to Installation. To do this, open the SETUP menu. In the Simulator box, select Guth as the type of simulator. Press OK to exit. Install the instrument using VDH Lab as the site. Use the simulator that was assigned to the instrument in step l and Simulator Solution (0.100 EtOH).

The instrument is now ready for testing and/or field use. If any of the above steps fail or there is any problem with the instrument, the DataMaster Team should be consulted as to the action required. It may be necessary to return an instrument to the manufacture for refurbishment prior to use by VDHL. All adjustments and repairs to an instrument should be documented in the instrument's testing notebook located in the testing binder. All reports generated during the Power Up Procedure should be filed in the power up section of that instrument's testing binder.

Performance Testing

- a) Linearity Test: Four concentrations of EtOH solutions will be used, 0.020, 0.080, 0.160, and 0.400. Each solution will be run using the Accuracy and Precision test (n=10). All four concentrations will be run consecutively and will count as one linearity test. Ten linearity tests will be run on each instrument.
- b) Interference Test: The following concentrations will be tested using the Accuracy and Precision test (n=10).

0.01% Acetone in 0.08% EtOH
 0.01% Acetone in 0.04% EtOH
 0.02% Acetone in 0.04% EtOH
 0.04% MeOH in Water
 0.04% MeOH in 0.08% EtOH
 0.04% Isopropanol in Water
 0.04% Isopropanol in 0.08% EtOH

- c) Low Level Performance: A solution of 0.040EtOH will be tested using the Accuracy and Precision test (n=10) twice.

d) Limited Volume Testing:

Target Volume	Flow (lpm)	Time (sec.)	1	2	3	4	5	6	7	Ave.	% s.d.
1.5 L	8.2	11									
	15	6									
	22.5	4									
2.0 L	10	12									
	15	8									
	24	5									

Pressure: _____ Flow rate +/- _____ time +/- _____

- e) Temperature Monitoring: All heated zones will be monitored for 24 hours using a NIST traceable surface temperature probe to ensure temperature stability.