

Breath Testing Equipment Options

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6/09

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Volume Testing of DataMaster DMP

Volume Testing of Drager 9510

Memo from Darcy Richardson regarding Drager 9510

- ① Drager "no moving parts" → alignment (less manipulation; limited maintenance) for set-up
- ② RF interference (occasional)
- ③ interference (acetone) 9.5 (absorption) down + affect Drager
- ④ ethernet card (Drager) NPAS has capability for the
- for website in future
- to do software updates remotely

Breath Testing Equipment Options

DataMaster DMT		Drager 9510	
Pro	Con	Pro	Con
Easy to operate	Instruments have required a <u>large amount of man hours and replacement parts to meet operating standards</u> . See Fleet Service Record for further description. <i>need # and cost of parts?</i>	Easy to operate	<u>Price is expected to be higher</u> than the DMT although this is unknown until we ask for a bid. <i>isales # instrument</i>
Performs well on accuracy and precision testing	DMTs have <u>not met bid specs.</u> <i>? do we not perform accurately?</i>	Performs well on accuracy and precision testing	Software is an unknown element. We have not yet shown them our software protocol.
Performs well on interference testing.	We are still waiting on software after ~3 years. (Final protocol was given to NPAS 07/06) <i>?</i>	Performs well on interference testing.	We do not currently have a working relationship with Drager so customer service is an unknown. (although Massachusetts reports a very positive working experience) <i>biased</i>
Has graphing feature with alcohol and volume display.	NPAS is not forthcoming with new information regarding the DMT or its parts and information received is often conflicting.	Has graphing feature with alcohol and volume display.	<u>Switching to a new manufacturer would likely result in more challenges in court</u> than the DMT has experienced. <i>agree - would cost double in current DMTs</i>

DataMaster DMT		Drager 9510	
Pro	Con	Pro	Con
Long standing relationship with NPAS.	Instruments are not RFI immune. In some agencies this leads to frequent down time. <i>need # and any complaints.</i>	Instrument is RFI immune which means less down time in certain agencies and one less argument in court.	Training materials would need to be prepared. <i>are</i>
We currently have 20 DMT's.	Instruments have many moving parts which <u>have experienced high failure rates</u> in our testing. <i>need # (testing is no thing - are they performing accurately int'l?)</i>	Instrument has no moving parts which will reduce the number of repairs that would be expected.	We would become a two instrument state and until the BACs were completely removed we would have <u>three instruments.</u>
Training materials are already prepared.	Detector voltages on each instrument must be optimized upon receipt. Physical manipulation is often required. <i>so?</i>	Detector and source designed to always properly align when screwed into the sample chamber. Requires no manipulation.	Requested software protocol would need to be updated to reflect what the DMT currently does and take into consideration fuel cell readings.
NPAS is expected to be the low bid.	Instrument are <u>commonly received with missing screws and/or loose connections.</u> <i>need # - the reads affect anything?</i>	Instruments have numerous connections for peripheral computers, projectors or other devices. Would help in training others as well as adding peripherals at a later date.	Instrument purges after each attempt at a breath delivery if delivery drops below minimum. We would need to work with Drager to determine how to show multiple attempts on reports.

DataMaster DMT		Drager 9510	
Pro	Con	Pro	Con
DMT's have not experienced any court challenges as of yet. The transition into the courts has been very smooth. <i>good point</i>	Volume measurement device must be physically manipulated upon receipt to calibrate.	Communication software is complete and ready. Real time ethernet communication is available.	
Our complex software protocol is almost complete after ~3 years of work.	Volume accuracy is effected slightly by pressure.	Volume accuracy meets laboratory requirements and appears to be unaffected by change in pressure.	
Toxicology staff has familiarity with the instruments and how to deal with repairs.	NPAS quality control is questionable. <i>?</i>	Drager has a reputation for high quality in their products.	
Toxicology technician is factory certified on the DMT.	Instruments have continued to require <u>some repair</u> in the field even with less than a year of usage. <i>frequent with few exten</i>	The extent to which the fuel cell is used in analysis of a subject sample can be personalized for the program.	
Would allow state to maintain single instrument status after change over is complete.	Replacement parts often require manipulation especially due to being multiple source parts which may require different settings.	Instrument parts are "plug and play" if replacement is needed.	
Instrument has large touch screen.		Drager manufacturers their own fuel cells.	

DataMaster DMT		Drager 9510	
Pro	Con	Pro	Con
		Due to the lack of manipulation required and the design of the instrument itself, fewer man hours would be anticipated for getting the instrument up and keeping them running.	
		Response time has been quick, often hours after an email is sent. Parts have been delivered quickly. They have been very responsive to questions or concerns since they delivered the unit to test.	<i>complete</i>

IR Only		IR and EC	
Pro	Con	Pro	Con
<p>We are currently using IR only and it is accepted by the courts.</p> <p><i>NPAS is providing</i></p>	<p>The expectation in the not-so-distant future will be dual technology in breath testing and it will be expected that we will move in that direction as well.</p>	<p>The trend in breath testing is to move to dual technology. 3 out of the 4 major manufacturers are now or will be using dual technology soon.</p>	<p>Fuel cell is not yet accepted for evidentiary purposes in VT so we would have to have a Frye or Daubert hearing.</p>
<p>No fuel cells to replace.</p>		<p>Getting EC accepted evidentially will help give the PBT's more credibility in court.</p>	<p>Fuel cells need to be replaced every 4-6 years.</p>
<p>Accurate and Reliable.</p>		<p>Dual technology is less susceptible to interfering compounds.</p>	
		<p>Accurate and Reliable.</p>	

Wet Bath Simulator		Dry Gas Standard	
Pro	Con	Pro	Con
Solution is inexpensive.	Solution concentration depletes with use over time.	Uniform concentration over time which gives a better indication of how the instrument is performing.	More expensive to replace tanks than to replace solution. Would need to determine who would shoulder the cost.
Accepted by the courts.	Chips in the jar or operator error in threading the jar causes solution to deplete even quicker.	Easy to change tanks.	Special permit needed for shipping tanks.
More closely resembles a human breath sample than dry gas.	DM supervisors are not always available to replace solution right away.	Backup tanks and count down of tests remaining should reduce any instrument down-time due to depletion.	Dry gas is not yet accepted in courts and would face challenges.
	Certifying solution is time consuming.	Better suited for usage in the BAT-mobiles than wet bath.	

DataMaster DMT Fleet Service Record Introduction

The following pages describe the work performed on each DMT from the time of receipt to the present. This information does not include the 10 instruments that were returned to NPAS at the beginning of the project for poor performance.

In each case where work was performed on the analytical portion of the instrument or when an instrument had to be returned to the vendor, all testing had to be begun again by Toxicology staff.

DataMaster DMT Fleet Service Record
Complete maintenance log from instrument receipt to present
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102506

- Received 1/2/08, Power-Up passed.
- 3/13/08 PIC processor update (2.04 → 2.05)
- 3/20/08-3/21/08 linearity recoveries trending low. Re-optimized voltages, recalibrated and retested. Still trending low. **Instrument RTV for service 3/24/08.**
- **NPAS service report sites replacement of “Solenoid, 6VDC open frame”. NPAS order #39195. Instrument returned from service 4/17/08.**
- 7/29/08 Power-up passed
- 8/5/08 Reported “Interference Detected” during 0.02 EtOH linearity test.
- 8/6/08 Recalibrated, no further “Interference” issues.
- 10/15/08 **Chopper motor noise, chopper replaced. Filter wheel optical sensor damaged during chopper replacement, sensor also replaced.**
- 10/17/08 Calibrated and Certified
- 10/21/08-10/27/08- Instrument used for Officer Training. Many reports of “Interference Detected” errors during alcohol free samples.
- 10/28/08-10/29/08 Optimized voltages, Calibrated and Certified instrument. Instrument field ready.

102606

- 10/11/07 Instrument received, Power-Up passed. Had to check screen connections due to image “wobble”, received random error “Unable to load image”, 0.162 result out of range high, tested again with 0.082, Passed.
- 10/15/07 Calibrated and Certified
- 10/18/07 Enlarged BNC opening from 5/8 to 3/4 inch to accommodate BNC cable.
- 12/5/07 Performed Toluene Interference testing. During testing blank tests were analyzed. With low air flows of varying volumes, detector noise caused apparent alcohol reading. Lamp voltages were adjusted and apparent alcohol readings observed. Learned voltage optimization techniques. Set voltage level acceptance standards.
- 2/26/08 PIC processor update (2.04 → 2.05)
- 5/08 During Officer Training, instrument reported random errors. Intermittent blank, purge, standard out of range errors and the simulator result drifted wildly. **Instrument RTV for service.**
- **5/08 NPAS service report sites replacement of 5-way valve, tightening of loose IR source mounting screws. NPAS order #39446. Instrument returned from service 6/18/08.**
- Instrument installed in the field 7/1/08.

102708

- 3/29/07 The instrument was received and powered on. The glass in the screen was loose. During A&P tests, results were drifting and the instrument was randomly reporting interference detected.
- 4/1/07 The instrument was found in the morning locked-up, beeping and reporting “Communication Error”. The unit was rebooted which rectified the problem.

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Complete maintenance log from instrument receipt to present
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- 4/3/07 The instrument was recalibrated which did not fix the drifting/interference problems. **The unit was RTV to NPAS for service.**
- 1/2/08 Attempted A&P test for Power-Up, reported Filter Wheel Error. Retried, Power-Up passed.
- 3/13/08 PIC processor update (2.04 → 2.05)
- Instrument completed all testing with no issues.
- **7/8/08 While attempting to optimized voltages for instrument deployment it was found that the detector bias would not adjust down to 80V as necessary for Hamamatsu (HAM) detector. The controller board (PCB) was replaced and voltages adjusted. Next it was discovered that the HAM detector was unstable, the detector was replaced. Then we found filter wheel to be wobbly, the technician adjusted wheel to remove wobble. Upon Power-Up test with new parts in the instrument, we discovered that the new PCB loses RFI settings when the instrument is powered off. Replaced the PCB again. Power-Up passed, the instrument was Calibrated and Certified.**
- During the sample acceptance test portion of the Certification, instrument reported "Suck Back Error". The instrument was retested and was unable to recreate suck back error.

102806

- 10/11/07 Instrument Powered-Up. Had to recalibrate touch screen. When printing calibration factors, instrument reported "Alert: unable to load image". Power-up passed.
- 10/15/07 Calibrated and Certified.
- 10/17/07 Enlarged BNC opening from 5/8 to 3/4 inch to accommodate BNC cable.
- 2/26/08 PIC processor update (2.04 → 2.05).
- Instrument completed all testing with no issues.
- 6/26/08 During field readiness preparation, discovered chopper noise. **Replaced chopper motor.**
- 8/25/08 Agency reported Pump error. Pump error again reported 9/11/08. Upon further inspection and consultation with NPAS, it was determined that the one-way valve on the exhaust port must be in an upright position to allow for proper air flow. The one-way valve on this instrument was nearly horizontal. The valve was repositioned and zip-tied in place per NPAS instruction. All one-way valves in the VT DMT fleet were then inspected to ensure proper positioning.

102906

- 1/2/08 DMT failed Power-Up due to simulator out of range. The instrument was recalibrated and retested. The instrument passed Power-Up
- **2/20/09 The controller board (PCB) was replaced due to undocumented defect. Replacement board was also defective. Third PCB was installed 2/25/08, this PCB was received with the 2.05 PIC already installed. The instrument was Calibrated and Certified.**
- 3/13/08 The technician reportedly changed the PIC from a 2.04 to a 2.05.

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- 3/13/08 The technician reportedly **replaced the entire detector block unit**, prior defect undocumented.
- 5/28/08 **Ribbon cable from RLC to screen replaced** due to damage which caused the images on the screen to jump.
- 7/1/08 While installing instrument, discovered one-way valve on breath tube to be defective; **replaced breath tube**.

103006

- 10/10/07 The instrument was received however the power-up failed because the instrument contained the incorrect software; passwords did not work. Software was transferred from another instrument to this unit which corrected the software.
- 10/11/07 The instrument did not read simulator temperatures correctly. Other simulators and BNC cables were tried, to no avail. NPAS advised that the PCB may be defective. A new PCB was installed and the voltages optimized. Instrument was Calibrated and Certified.
- 10/12/07 Continued to Power-Up test, instrument repeatedly reported "Pump Error". Upon technical review with NPAS, it was determined the surface of the snubber needed to be roughed to prevent sticking. The instrument was again Calibrated and Certified and Power-Up passed.
- 10/17/07 The instrument was tested for volume accuracy. The reported volumes were not within tolerance. The volume measuring system was recalibrated and successfully retested.
- 10/17/07 Enlarged BNC opening from 5/8 to 3/4 inch to accommodate BNC cable.
- 2/26/08 PIC processor update (2.04 → 2.05).
- 3/27/08 While attempting to install the newest version of software, it was discovered that the RLC board was defective. The RLC board would not allow the installation of software. The **RLC board was replaced** with a new board pre-installed with the latest software.
- 5/22/08 Found instrument to be intermittently powering down on its own. Found there to be an intermittent connection in either the **wire harness or the power supply, both were replaced. It was also discovered that many of the VT DMT's did not contain the latest gold AC/DC power harness which would prevent the aforementioned problem. All instruments not containing the gold AC/DC power harness were upgraded.**

103106 Unit retired from service 11/08 due to performance issues.

- 1/3/08 First attempt at Power-Up failed due to filter wheel alignment, internal standard failed.
- 3/13/08 Roughed the surface of the snubber and replaced the PIC processor 2.04 → 2.05.
- 3/30/08 **Replaced the pump** and calibrated the volume measurements.
- 7/29/08 Opened instrument to begin the Power-Up and found a screw out. Upon further inspection it was discovered that the rubber foot which holds the sample chamber to the bas was broken off which led to the screw being out. **The rubber mounting foot for the optical bench was replaced.**

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- 8/5/08 **Replaced the PCB to correct issue with R59.** Monitored RFI over time. Found on 8/13/08 that the instrument had lost RFI sensitivity.
- 9/3/08 **Replaced the PCB again** to correct issue with losing RFI sensitivity.
- 9/8/08 Powered unit off/on and checked RFI. Found instrument had lost sensitivity again. **Unit RTV for service.**
- **NPAS service report #40050 9/15/08 sites replacement of metal work on filter wheel side of filter block to remove piece with movable mount for filter wheel. Replaced front cover for display mounting reasons. Replaced PCB after finding three different components including RFI circuitry with surface mount soldering issues.**
- 10/6/08 Began Power-Up procedure, **found 2 rubber mounting brackets (Feet) attaching the optical bench to the base plate to be broken. The feet were replaced.**
- 10/14/08 Completed Power-Up protocol. During recalibration, it was observed that the **instrument was having difficulty lining up the filter wheel.**
- 10/16/08 **The filter block was removed and realigned and reinstalled.**
- 10/23/08 **Found the filter wheel to be wobbly. Realigned the filter wheel to correct the wobble.**
- 11/13/08 The instrument reported a filter wheel error. **The entire detector block was replaced.**
- During testing the **instrument did not detect acetone at low enough levels.** The instrument was used for training despite interference deficiency. The unit randomly reported interference detected for both breath and simulator samples during training.
- Because of multiple failures, this instrument was **retired from service and RTV** for replacement instrument.

103206

- 2/24/08 First Power-Up failed due to operator error
- 2/26/08 PIC processor update (2.04 → 2.05).
- 2/29/08 Power-Up passed. First attempt at recalibration failed, B3 out of range. Retried the calibration, it was successful. The instrument was Certified.
- 4/8/08 The instrument was found beeping and reporting "Communication Error". The unit was rebooted, error resolved.
- 5/27/08 Instrument emitting chopper wheel noise. **The chopper wheel motor bearing was replaced.** While waiting for replacement part for chopper from NPAS, other parts were borrowed from this unit to replace defective parts in other instruments. The power supply and ribbon cable from the RLC to the screen were replaced.
- 6/5/08 The power cable was replaced with one with gold pins per NPAS upgrade specifications.
- 3/30/09 The detector voltage as reported on RPC's and APM appear to be rising over time. The instrument was brought into the lab and inspected. The technician found the IR source loose but no other significant problems which would

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contribute to the climbing detector voltage. The voltages were reoptimized, the instrument was Calibrated and Certified and returned to the field.

103306 Unit retired from service 1/1/08

- 4/3/07 The instrument was received from NPAS. Unit arrived without current software version. The software was upgraded to current revision. While attempting the Power-Up, the instrument reported a filter wheel error during the diagnostic test. The diagnostic was retested with no further problem.
- 4/4/07 The instrument was recalibrated.
- 4/6/07 The instrument was found to have locked up overnight. The instrument was rebooted with no further errors.
- 4/9/07 The software was upgraded. The instrument locked up overnight again. NPAS was contacted for advice. Email from NPAS on 4/11/07, locking up appears to be a software problem.
- 4/20/07 Received and installed software upgrade.
- 6/4/07 Ran all tests to inspect software. Calibration took 3 attempts to pass. A list was made of the software mistakes and necessary changes.
- 6/12/07 This instrument was used for live subject testing at VPA. Obvious intentional mouth alcohol was not flagged as Invalid Sample. Spoke with NPAS regarding problem. NPAS first suspected debris in sample chamber, upon further inspection this was ruled out.
- 6/29/07 Software inspection found more issues. Testing of instrument and upgrades of software put on hold until Amanda/Darcy back from leave.
- 9/17/07 NPAS sent "housekeeping" software for source code.
- 9/25/07 Spoke w/ NPAS regarding Invalid sample detection. NPAS to enhance invalid sample detection algorithm.
- 10/10/07 Received a second instrument with the same serial number. New unit to be renumbered to 103406.
- 10/17/07 Enlarged BNC opening from 5/8 to 3/4 inch to accommodate BNC cable.
- Upon completion of testing, VDHL decided to retire this unit from service and RTV.

103406

- 10/10/07 The instrument was received and Powered-Up. When printing the calibration factors, and error message reporting "unable to load image" pops up. This instrument came from the manufacturer labeled with a duplicate serial number 103306. This unit was renumbered to 103406 per NPAS.
- Instrument unable to recognize simulator temperatures. **Replaced simulator temperature cable.**
- 10/18/07 Enlarged BNC opening from 5/8 to 3/4 inch to accommodate BNC cable.
- 11/28/07 During interference testing, the instrument reported "filter wheel error". Attempted to rerun test and received a "blank error". Retested and instrument worked ok. During next solution attempt, received additional blank error. Retested, were unable to recreate or diagnose cause for blank error.
- 2/27/08 PIC processor update (2.04 → 2.05).

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- 3/5/08 Instrument reported "filter wheel error" during A&P test. The technician found that the locator pin had walked out of shaft. The **pin was replaced and secured.**
- 3/13/08 The technician replaced the entire filter block assembly. The reason for the replacement was undocumented.
- 3/24/08 The instrument completed testing with no further problems.
- 6/27/08 While field-readying the instrument, phantom alcohol was observed on the graph while no air flow is going through the breath tube. Alcohol levels reach up to 0.003 and drop down again. Also received "Suck Back Error" on sample acceptance test. The breath tube was replaced. All screws and connections were checked for compliance with manufacturer's specification, adjusted detector voltage to within +/-0.050V. Installed final version of software. Recalibrated and certified instrument 6/30/08. Retested instrument 7/3/08. Were unable to recreate phantom alcohol during repeated testing.
- 11/11/08 TSI Simulator out of range
- 2/12/09 TSI Simulator out of range, leaky sim jar.

121506

- 3/10/08 Attempted Power-Up procedure. The DMT reported multiple "filter wheel errors". While attempting to diagnose filter wheel error, the software froze. The instrument did not report filter wheel error during diagnostic check, however it did report it every time the Certification was attempted.
- 3/13/08 **The detector block assembly was replaced.**
- The instrument lost communication with the printer, unit needed to be rebooted in order to print properly. We were unable to recreate this problem.
- Instrument completed testing with no further significant problems.
- 12/29/08 TSI Simulator out of range.

121606

- 7/3/08 The technician installed a new (upgraded) HAM detector per NPAS request.
- 7/16/08 The instrument passed Power-Up. The instrument was Calibrated, Certified and Installed to VDHL.
- 8/13/08 The instrument recovered low during the linearity tests. The voltages were optimized, the instrument was recalibrated and certified and retested.
- 10/08 The instrument completed testing with no further significant problems.

121706

- 7/8/08 The technician installed a new (upgraded) HAM detector per NPAS request.
- 7/29/08 During Power-Up procedure, found the filter wheel to be wobbly.
- 8/4/08 Completed the burn-in time for the new detector. Realigned the filter wheel to remove the wobble. The voltages were optimized and Power-Up passed, the instrument was Calibrated and Certified.
- 10/08 The instrument completed testing with no further significant problems.

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- 11/24/08 TSI All instruments were found to be incorrectly updating installation records. In order to commit the installation to memory, the unit needed to be rebooted. A software patch was installed on all units to correct the glitch.
- 12/5/08 TSI Random communication error, unable to recreate error. Instrument returned to service.
- 01/12/09 TSI Agency reported simulator temperature error, found temperature to be within specification, found solution concentration to be depleted. The simulator solution was replaced.

122106

- 7/8/08 The technician installed a new (upgraded) HAM detector per NPAS request.
- 7/29/08 During Power-Up procedure, found the **filter wheel to be wobbly**.
- 7/30/08 The technician began taking apart the filter block to realign the filter wheel and noticed that the **filter block screws were stripped**.
- 8/6/08 **While replacing the stripped screws on the filter block, one of the screws broke off in the side of the detector block.**
- 8/11/08 **Replaced the side of the detector block containing the broken-off screw end. Realigned filter wheel to remove wobble. Reinstalled filter block.**
- 8/13/08 Power-Up passed, instrument Calibrated and Certified.
- 9/22/08 During installation test it was discovered that the one-way valve in the breath tube was faulty, a "suck-back error" was not reported as it should have been. The **breath tube was replaced**.
- 9/15/08 During testing the instrument reported a "communication error". We were unable to recreate error condition.
- 9/23/08 In order to correct the lack of "suck-back error" reporting, NPAS advised that VDHL must adjust one-way exhaust valve to stand vertically. **VDHL adjusted all one-way exhaust valves and zip-tied them in place per NPAS recommendation.**
- 10/08 Instrument completed testing with no further significant problems.
- 2/4/09 TSI The RPC failed but the Supervisor was unsure why. The RPC was reviewed on site, reason for RPC sample acceptance test failure unclear. Downloaded memory and reviewed, possible software glitch. Sent file to NPAS software programmer for consultation. Scott @ NPAS will review files and respond to possible software glitch. Successfully completed the RPC and returned the instrument to service. NPAS, VDHL and Agency were unable to recreate the glitch. The instrument appears to have randomly not saved a portion of the RPC data. The software programmer did not have a response to problem.

122206

- 7/8/08 The technician installed a new (upgraded) HAM detector per NPAS request.
- 7/29/08 The instrument was opened to complete the inspection portion of the Power-Up and it was discovered that the **filter wheel was wobbly**.
- 8/7/08 The filter wheel was adjusted to correct the wobbly filter wheel.

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Complete maintenance log from instrument receipt to present
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- 9/22/08 Found that recoveries are being incorrectly accepted or rejected at greater than three significant figures, software correction requested.
- 9/22/08 The instrument, without command, changed the expected true value of the simulator solution to 0.60. Upon further inspection, the setup menu is still set to the correct simulator value. Unable to recreate problem on this instrument.
- 10/14/08 Adjusted volume settings to read within tolerance.
- 10/08 Completed testing with no more significant issues.
- 11/28/08 TSI Simulator temperature error. The technician adjusted the temperature signal to read accurately.

122306

- 7/8/08 The technician installed a new (upgraded) HAM detector per NPAS request. The technician also performed a resistor upgrade.
- 8/5/08 Instrument successfully completed Power-Up and was Calibrated and Certified.
- 10/6/08 During interference testing this instrument failed to flag isopropanol as an interferent at acceptable levels. NPAS advised the filters are faulty and must be replaced. **The detector block was replaced.**
- 10/14/08 The unit was again successfully Powered-Up, Calibrated, Certified and tested.
- 12/5/08 While preparing instrument for a training class, the touch screen was discovered to be unresponsive. Upon reboot of the instrument the screen resumed working.
- 12/12/08 Found touch screen unresponsive. Upon reboot of the instrument the screen resumed working.
- 1/26/09 The instrument's memory was erased and new software installed. The voltages were optimized, the unit passed Power-Up and was Calibrated and Certified.
- The instrument completed testing with no further significant issues.

122406

- 7/3/08 The technician installed a new (upgraded) HAM detector per NPAS request. The technician also performed a resistor upgrade.
- 8/6/08 **The technician replaced the PCB per NPAS request.**
- 9/3/08 **The technician again replaced the PCB per NPAS request.**
- 9/9/08 The instrument passed Power-Up and was Calibrated and Certified.
- 9/22/08 The instrument, without command, changed the expected true value of the simulator solution to 0.60. Upon further inspection, the setup menu is still set to the correct simulator value. Unable to recreate problem on this instrument.
- 10/08 Instrument completed testing with no more significant issues.

123006

- 7/3/08 The technician installed a new (upgraded) HAM detector per NPAS request.
- 7/16/08 Instrument passed Power-Up and was Calibrated and Certified.

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- 10/08 Instrument completed testing with no significant issues.
- 12/16/08 TSI Simulator out of range, solution changed.

123106

- 7/16/08 The instrument was Powered-Up, Calibrated and Certified. Four unsuccessful attempts to Install the instrument led the technician to recalibrate the unit. After a successful recalibration and recertification, the unit still failed Installation, despite having changed the simulator solution. The simulator solution was again changed and the instrument finally passed Installation.
- 7/24/08 During linearity, the averages were not within specifications, the 0.4 was low, while the 0.08 and 0.02 were reporting high. The unit was again recalibrated and finally passed first linearity attempt.
- 7/28/08 Noticed on linearity tests that the reported concentration for the simulator solution is rising over successive tests. NPAS was contacted for advice and VDHL was instructed to **RTV the unit for service.**
- 8/18/08 The instrument was received back from service, was Powered-Up and successfully Calibrated and Certified. The volume measurement system was adjusted to read adequately.
- 10/1/08 During interference testing this instrument failed to flag isopropanol as an interferent at acceptable levels. NPAS advised the filters are faulty and must be replaced. **The detector block was replaced.**
- 1/26/09 The instrument's memory was erased and new software installed. The voltages were optimized, the unit passed Power-Up and was Calibrated and Certified.
- 4/22/09 During remote communication testing it was determined that the modem in this unit is faulty. **The modem was replaced.**
- The instrument completed testing with no further significant problems.

123206

- 7/21/08 Found detector voltage greater than normal. The voltages were optimized and the detector was monitored. The detector was found to be unstable and was replaced. Unit had three different detectors installed, all found to be unstable. **The instrument was RTV to NPAS for service 7/28/08.**
- **NPAS Service record reports replacement of a missing screw on the controller PCB. The other reported issues were not repeated during vendor tests.**
- 8/18/08 The instrument was received back from the vendor. During Power-Up it was discovered that the **filter wheel was wobbly**. The technician adjusted the filter wheel to correct the wobble. The instrument was Calibrated and Certified and testing was begun. During first linearity test the instrument reported a "filter wheel error".
- 8/20/08 The technician found **the detector stepper drive slightly loose** on the filter wheel. The unit was tested and appeared to function correctly.
- 8/25/08 The voltages were optimized, the instrument was Calibrated and Certified.

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- 10/08 The instrument completed testing with no more significant issues.
- 11/13/08 TSI Instrument failed to save Installation information.
- 1/14/09 TSI The instrument reported the simulator temperature at 0. **The technician disconnected and reconnected the BNC cable at the controller PCB attachment.** Once reconnected, the technician began a diagnostic check. The instrument reported an error at the filter tests and would not proceed past that point. The instrument reported "detector overflow" error. Upon communication with NPAS, the problem was diagnosed as a failed detector. **A new detector was installed,** the instrument was Calibrated and Certified and reinstalled at it's location.
- 2/4/09 TSI Upon review of the Installation report, it was observed that the detector voltage was not within specification at the time of installation. The agency was notified and the Supervisor performed a diagnostic test, the resulting detector voltage was within specification. The technician went back to the agency and performed a passing Installation.
- 2/13/08 TSI The agency reported another simulator temperature error. The technician **replaced the BNC cable** and the instrument was returned to service.

123306

- 7/16/08 Upon Power-Up, it was noted that the detector appeared rather unstable. **The detector was replaced.**
- 7/22/08 Upon further inspection of the instrument, we discovered **several of the screws holding the detector block and filter wheel were loose and the sample chamber inlet block was loose.** All were tightened and repaired and the instrument Power-Up passed, was Calibrated and Certified.
- 7/28/08 It was noticed during linearity testing that the first sample of the A&P test is consistently lower than all the other samples, but not out of range. We also noticed there to be a change in the time necessary to reach plateau. While troubleshooting we found the simulator inlet hose to be plumbed underneath the inlet block. The tubing was rerouted to avoid the exceedingly hot inlet block. This did not correct the problem of climbing concentrations. **The instrument was RTV for service.**
- 8/18/08 Received the unit back from NPAS. During Power-Up inspection, we found and replaced a missing screw on the controller PCB. The instrument passed Power-Up and was Calibrated and Certified.
- 9/2/08 Instrument reported a random "filter wheel error". We were unable to recreate error and no further errors persisted.
- 10/08 Instrument successfully completed testing with no more significant errors.
- 12/18/08 TSI Simulator out of range, solution replaced.

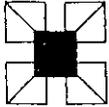
101708

- 12/15/08 The instrument was received as a replacement to #103106. During the Power-Up inspection, the technician diagnosed and corrected a wobbly filter wheel. The one-way valve on the exhaust port was adjusted and zip-tied in place.

DataMaster DMT Fleet Service Record
Complete maintenance log from instrument receipt to present
4/28/2009

The voltages were optimized, Power-Up passed, and the instrument was Calibrated, Certified and Installed.

- 1/26/09 The memory on the instrument was erased and new, current software installed. The instrument was successfully Powered-Up, Calibrated and Certified, however the detector voltages were out of acceptable limits.
- The voltages were adjusted and the instrument was recalibrated and recertified.
- 2/18/09 During interference testing, the instrument was not sensitive enough to interfering compounds. **A detector block containing different filters was installed.**
- 2/23/09 The instrument was Calibrated, Certified and Installed for use as a training instrument. The instrument was still not appropriately aborting interfering compounds.
- 3/11/09 **Installed a new detector block** to correct lack of interference identification and Calibrated unit.
- 3/19/09 During the attempted Certification, the 0.02 EtOH results were unstable. The protocol was aborted and the instruments detector voltage readings were monitored. The detector readings were quite unstable. NPAS advised instability was most likely due to a faulty controller PCB. The VDHL technician decided to replace the detector first to rule out that as a contributing factor. The instrument was recalibrated and Certified and appeared stable. Testing was continued.
- 4/6/09 The instrument reported a "Calibration Check Error" during and A&P test, were unable to recreate error and no further problems were observed. The instrument successfully completed all interference and linearity tests.
- 4/22/09 The instrument was powered on to begin the volume testing. After over two hours of warm-up time, the instrument was reporting the detector voltage to be 0.600mV, which is 6x our acceptable level. NPAS was contacted and VDHL was instructed to change the controller PCB. While waiting for the PCB to arrive, another unit was found to have a defective modem. The modem from this unit was used to replace the modem in the other unit. When the parts arrived, the modem and controller PCB were replaced. The instrument's voltages were optimized and the unit was Calibrated, Certified and Installed for use as a training instrument.



National Patent Analytical Systems, Inc.

Training Topics Covered

VDHL staff attended a training course on the Theory of Operation, Supervisory functions and Maintenance and Repair as it pertains to the DataMaster DMT Infrared Breath Alcohol Analyzer and are authorized to use, maintain and perform repairs on the DataMaster DMT in accordance with the instruction received from National Patent Analytical Systems, Inc.

This training and the work outlined below was conducted January 3 and 4, 2008

by David Radomski, N.P.A.S.

Signature David Radomski Date 2/26/08

NPAS Work Performed

While at VDHL, NPAS staff performed mechanical upgrades as follows:

- DMT # 103306 was retired from testing and service. VDHL will receive a new instrument to replace 103306 due to numerous changes in non-critical mechanical components in newer instruments. All data previously collected on this instrument remains scientifically valid.
- DMT # 103406 received a new detector block assembly while maintaining the same filters and internal standard. Mechanical upgrade does not affect scientific validity of previously collected data. During mechanical upgrade, instrument memory was accidentally erased by NPAS staff. Hard copies of information remain, however electronic copies were lost.
- DMT # 103006 received a new detector block assembly while maintaining the same filters and internal standard. Mechanical upgrade does not affect scientific validity of previously collected data.
- DMT # 102606 received a new detector block assembly while maintaining the same filters and internal standard. Mechanical upgrade does not affect scientific validity of previously collected data.
- DMT # 102806 received a new detector block assembly while maintaining the same filters and internal standard. Mechanical upgrade does not affect scientific validity of previously collected data.
- NPAS informed VDHL of defective 'T' fittings on breath flow detector assemblies. Small imperfections in 'T' fittings causes air turbulence which can affect reported breath volumes. Instruments awaiting new 'T' fittings on breath flow detection assembly. VDHL technician will install new 'T' fittings when received as directed by Dave Radomski from NPAS.

Price List of Warranty Parts Replaced from Instrument Receipt to Present

X= parts for which a price is not available.

Total does not include parts where prices were not available or replacement of entire instruments.

Date	QTY	Part No.	Description	Price	Total
1/25/2008	4	41466	Optical Sensor, Qtz assy	22.05	88.2
	4	41467	Optical Sensor, filter assy	15.81	63.24
3/11/2008	2	41303	Snubber Assy, 2 holer	21.24	42.48
	3	41400	Block fin assy, step/det	837.71	2513.13
	2	41433	Cable assy, dm temp trans coax	14.1	28.2
	2		VT DMT Temp units		0
3/17/2008	1	41248	Pump assy, 12VDC	188.9	188.9
4/17/2008	1	27039	Solenoid, 6VDC open frame	X	
5/23/2008	1	21080	Power supply switcher, 12V, 120W	125.48	125.48
	6	41437	Cable assy, DMT AC/DC Power harness	22.25	133.5
5/28/2008	3	36500	Cable assy, Telpar PR driver	9.38	28.14
	2	41310	Motor assy, 12x20.6mm	75.42	150.84
7/11/2008	2	41601	Detector mtg assy DMT PCB	265.23	530.46
	2	41602	PCB assy, DMT controller	367.5	735
	2	42222	Tube assy, 12VDC breath/sense/41460	X	
	3		Breath tube clip		0
7/29/2008	6	37030	Plate mounts/stud 6/32 7/16 X 13/32 x 1/4		0
7/31/2008	2	41602	PCB Assy DMT controller	367.5	735
8/7/2008	1	41352	Block assy, wheel/det	X	
8/19/2008	2	41602	PCB assy, DMT controller	367.5	735
	16		Microcontroller PCB installation screws		0
9/22/2008	2	42222	Tube assy, 12VDC breath/sense/41460	X	
9/30/2008	1	30532	Block/gear wheel		
	1	41602	PCB assy, DMT controller	389.12	389.12
	1	32643	DMT front panel		
10/7/2008	2	41400	Block fin assy, step/det	837.71	1675.42
10/9/2008	1		Keyboard		0
10/14/2008	1	41310	Motor assy, 12x20.6mm	75.42	75.42
10/15/2008	1	41310	Motor assy, 12x20.6mm	75.42	75.42
10/21/2008	2	41447	Adaptor, simulator connection-VT	X	
10/28/2008	4	29860	Standoff, 2.312", short holddown	6.03	24.12
	10	31775	Screw, #4-40 x .250		0
2/18/2009	1	41400	Block fin assy, step/det	886.99	886.99
4/22/2009	1	41602	PCB assy, DMT controller	389.12	389.12
4/22/2009	1	41603	PCB assy, DMT connector	240.62	240.62
			Total		\$9,853.80

DataMaster DMP (DMT fitted for dry gas)

Received at VDHL March 2009. Serial # 103109

Operator	Date	Room Temp	Humidity
ALB	4/21/2009	71.6	27%

Target Volume	Flow On (lpm)	Time (sec)	1	2	3	4	5	6	7	8	9	10	Average	% s.d.
1.5 L	8.2	11	1.63	1.66	1.59	1.6	1.55	1.62	1.61	1.59	1.62	1.58	1.61	3.03
1.5 L	14.9	6	1.28	1.37	1.39	1.36	1.38	1.32	1.46	1.5	1.37	1.45	1.38	6.61
1.5 L	22.5	4	1.45	1.41	1.35	1.2	1.24	1.39	1.3	1.34	1.36	1.21	1.34	8.55
2.0 L	10.2	12	1.99	1.99	2.07	2.15	2.05	2.07	2.14	2.07	2.05	2.07	2.06	5.23
2.0 L	15	8	1.74	1.72	1.71	1.79	1.93	1.78	1.81	1.91	1.94	1.84	1.81	8.56
2.0 L	23.9	5	1.75	1.59	1.74	1.7	1.74	1.85	1.59	1.7	1.59	1.75	1.69	8.63

Drager 9510

Received at VDHL April 2009. Serial # ARZN-0015

Operator	Date	Room Temp	Humidity												
DMR	4/21/2009	71.6	27%												
ALB	4/22/2009	74.3	23%												
Target Volume	Flow On (lpm)	Time (sec)	1	2	3	4	5	6	7	8	9	10	Average	% s.d.	
1.5 L	8.2	11	1.7	1.7	1.6	1.7	1.6	1.6	1.7	1.6	1.6	1.7	1.6	5.27	
1.5 L	15.3	6	1.8	1.6	1.7	1.5	1.8	1.8	1.7	1.8	1.8	1.6	1.7	11.01	
1.8 L	22.6	5*	1.9	1.8	1.7	1.8	1.8	1.9	1.8	1.9	1.7	1.9	1.8	7.89	
2.1 L	10.5	12	2.2	2.2	2.1	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.2	7.07	
2.0 L	15.2	8	2.1	2.3	2.1	2.3	2.2	2.2	2.2	2.3	2.3	2.3	2.2	8.23	
2.0 L	24.0	5	2.3	2.3	2.3	2.1	2.2	2.1	2.3	2.2	2.1	2.1	2.2	9.43	

* 4 seconds as previously used provided "Blowing time too short message"

VERMONT DEPARTMENT OF HEALTH LABORATORY OFFICE
MEMORANDUM

TO: Alcohol Program Staff
FROM: Darcy Richardson
DATE: March 23rd, 2009
RE: Replacement of BAC DataMasters, Draeger model 9510

Currently we are tasked with replacing the remaining approximately 50 breath testing instruments in use through the state. Two models of instrument are currently available that would suit our needs, the DMT by NPAS and the 9510 by Draeger. In replacing the first 3 counties of Vermont we purchased the DataMaster DMT by NPAS. We own 20 instruments, 17 of which are field ready and are currently in use. Two of the remaining are in laboratory testing and the third is in the process of becoming ready for laboratory testing. At the time of purchase the 9510 was not available.

Since January 12th, 2009 we have had a 9510 unit in house for testing. Accuracy and Precision performance has been equivalent to the DMT. The instrument is user friendly and uses USB keyboards and printers (with the same Windows CE restrictions as the DMT). An additional feature is the virtual keyboard when a physical keyboard is not attached to the instrument. The Alcotest 9510 has connections for many types of equipment. This would allow us to easily add peripherals and would allow us to use projectors directly from the instrument which would greatly aid in training of officers.

Interference testing has shown that the instrument identifies interfering compounds well. Although further testing remains the interferant of concern, methanol, has been tested and is identified every time by the 9510 as an interferant. With the wavelength used for IR, acetone no longer acts as an interferant. The instrument has not accepted a test inappropriately through interference testing. The 9510, unlike the DMT, is radio frequency immune. This is a very valuable feature as we currently have agencies that are experiencing difficulty with multiple RFI interruptions. These interruptions take the instrument out of service and create arguments that we then must address in the court room.

The 9510 is well built with no moving parts. The detector and source line up simply by screwing them into the sample chamber allowing them to be lined up properly every time. Currently we physically manipulate every DMT that arrives in house to ensure that the detector is optimized and adjust voltage settings. We have replaced many filter wheels and chopper wheels in the DMTs we currently own and have often had to replace parts in the DMTs prior to the start of testing. The construction and engineering design of the 9510 would minimize the manipulation and maintenance we would have to perform on the instruments.

The 9510 uses both fuel cell and infrared energy in it's analysis of breath alcohol and appears on the Federal List of Conforming Products. Dual technology currently exists in 2 of the 4 main models of evidential breath alcohol testing equipment. We have recently been informed that NPAS will follow suit with the DMT. This will be a new venture for NPAS and will require a breaking in period. Draeger manufactures their own fuel cells

and have used dual technology in their previous model, the Alcotest 7110. Their experience in this area means that we will not be spending time helping the technology become perfected in a new model.

In March of 2009 I contacted Barbara O'Brien at the Office of Alcohol Testing in Massachusetts. Massachusetts has 475 Draeger 7110 units and is in the process of ordering the 9510 model. They have been extremely pleased with the service they have received from Draeger, indicating that they (Draeger) are "very responsive" and stand by their instrument. They do not currently have their 9510 models in house as they are still determining what their software will be, changing their regulations and writing new software protocols for their 7110 units. She indicated to me that they are the hold-up in receiving new instruments, not the manufacturer. Their experiences with the 7110s have shown them to be extremely low maintenance. Beyond replacing fuel cells in the instrument which is expected, they have had very few repairs on any of their units. She indicated the instruments are "never on the bench" and that the repairs they have had to do amount to new breath tubes which can be performed in the field.

Although testing of the 9510 continues, it is my opinion that the Alcotest 9510 should be purchased for the replacement of the remaining BAC DataMasters in Vermont. This opinion is based on my own testing of the 9510, the design of the instrument, the experience of Massachusetts with Draeger and the experiences of our program with the DMT. Although we expect the Alcotest 9510 to be priced higher than the DMT, I believe that this additional cost will quickly be recouped through the reduced man hours needed to get the instruments field ready and keep them operating. We have already had to repair DMTs in the field in the first months of deployment. We are also still waiting on the software that was requested several years ago. It is my opinion that ordering the Alcotest 9510 over the DataMaster DMT will ultimately result in a quicker deployment and cost saving measures over the upcoming years through reduced numbers of repairs and reduced man hours spent on getting and keeping the instruments field ready.