Vermont Department of Health Laboratory

DataMaster DMT Technical Manual

DataMaster DMT Technical Manual

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National Patent Analytical Systems, Inc 10/31/07

Voltage Settings / Adjustments on the DataMaster DMT

Since the early days of the Verifier and the DataMaster, a primary objective was to maximize optical efficiency in the system so as to obtain maximum detector signal without overdriving the IR source or the detector's thermo-electric cooler. If either or both required substantial electric current to operate within acceptable parameters, excessive heat and undue wear and tear on circuit components would be the result. Systemic optical efficiency was the result of a number of variables.

First and foremost is the narrow bandwidth of the IR filters which is something that will not be compromised as it affords us the specificity to ethanol that the DataMaster is known for.

The sensitivity of a given PbSe detector to the amount of incident IR energy is also a big consideration. Many improvements have been made by the various manufacturers of the detectors to improve this sensitivity.

The efficiency of converting electrical energy (current/power) into IR energy by the source is another variable. For years, a simple kanthal coil has been used in the DataMaster with good reliability and decent efficiency. Very recently, a source has been specified for use, primarily in the DMT that incorporates a parabolic back reflector which greatly increases the amount of IR energy out with a given amount of power applied.

The remaining variables deal primarily with alignment, cleanliness and other related issues. System noise is kept to a minimum if ample signal can be obtained reducing the amount of gain (electronic) needed to produce the required signal levels. If gain must be increased due to low signal, this would also increase the amount of system noise.

Voltage settings in DataMasters up to this point have involved, among other things, setting the detector bias voltage to 120 Vdc, setting the cooler to the voltage level stated on the tag attached to the detector cable and then adjusting the IR source intensity to the needed level such that the output detector voltage (MTR) was somewhere around 0.000. The 120 Vdc bias is required with a 3mm x 3mm detector element. The cooler voltage was the level required in order to operate the detector at a temperature around zero degrees C. The IR source voltage would be a level that varied from a low level of around 1.5 Vdc in a very efficient system to something around 3.5 Vdc or more in a system with low efficiency. If the source voltage would approach 4 Vdc, this would be considered high.

Voltage settings in the DMT have been changed slightly due to a noticeable increase in efficiency across the board. Additionally, a change to a 2 mm x 2 mm PbSe detector was made due to the fact that the 2 mm x 2 mm detector is more readily available and there is no measurable difference in the sensitivity or performance in the two detectors. The 2 mm x 2 mm detector requires only a bias voltage of 80 Vdc.

In the DMT, aside from the RFI sensitivity adjustment, there are only three voltage settings that can be made and this is done using digital potentiometers via the Technician Mode screen. These are settings for the detector bias, TE cooler and IR source (lamp) intensity. The procedure for setting these voltages is as follows:

Set the bias to 80 Vdc for a 2 mm x 2 mm detector or 120 Vdc if 3 mm x 3 mm. This information should appear on the tag attached to the detector cable. The tolerance on this setting is ±5 Vdc.

Start with a cooler voltage of 1.5 Vdc and a lamp voltage of 1.5 Vdc. See what the detector voltage is at these settings. If the detector voltage is more negative negative than -.100, contact NPAS. If it is between -0.100 and +0.100, leave these settings as is. If the detector voltage is > 0.100, increase the cooler voltage no more than 0.1 Vdc. If this is enough to bring the detector voltage down to the acceptable range, save these settings. If not, increase the Lamp voltage no more than 0.1 Vdc. If this is enough to bring detector voltage within range, save these settings. If not, go back to the cooler and increase it no more than, 0.1 Vdc. Continue this alternating the increase of no more than 0.1 V dc of the cooler and lamp voltages until the detector voltage is within range. Remember to save these settings.

If you get to the point that both the lamp and cooler are around 2.0 V dc and the detector voltage is still not down to around zero, increase the lamp only. The maximum allowable lamp voltage for the IR source is 3.0 Vdc. If it is required to set the lamp above 2.6 Vdc to get the detector voltage within range, the unit more than likely requires service.

Any questions regarding these instructions can be directed to NPAS at 800-800-8143.

Ays 4/19/11

The “Filter Agreement” concept as it pertains to analytical principles incorporated in the DataMaster DMT breath test instrument.

Calibrating a DMT involves introducing known standards of water vapor and either wet or dry ethanol vapor. The purpose is twofold. First, the error in quantifying the ethanol, pre-calibration, as evidenced in the discrepancy between the known ethanol concentration (Ca) and that analyzed and displayed by the instrument upon introduction of that standard, is normalized to the known (Ca) by dividing the known value (Ca) into the reported (resulting in CAL). Second, by knowing that a true ethanol standard, free of any potential interfering substances, is introduced during the calibration procedure, the instrument determines the relative measurement of the ethanol sample when analyzing the vapor at each of the three narrow bandpass filter wavelengths (ref: a21, a31), thereby allowing subsequent analyses to be qualified as either containing or being free of interfering substance(s).

Water vapor is introduced so as to allow the amount evident at each of the filter wavelengths to be subtracted from all analyses thereafter. This water vapor concentration will be constant regardless of the ethanol concentration of the sample so a straight subtraction will suffice (ref: b1, b2, b3).

For discussion of the basic concept, we will discuss using 2 of the three filters (3.44 and 3.37 microns) and calibrating with water and ethanol. As stated above, water is introduced to determine the amount to be subtracted at 3.44μ and 3.37μ. These will not be the same value as water absorbs IR energy to a greater degree at 3.37μ than at 3.44μ. With the water content accounted for, the relative absorption by ethanol between 3.37μ and 3.44μ is determined. Since ethanol absorbs approximately 20% more IR energy at 3.37μ than that at 3.44μ, we would expect a21 to be in the neighborhood of 1.2 as a21 is defined as the value of ethanol measured at 3.37μ with respect to that at 3.44μ. As each IR filter has slightly different transmittance characteristics (center wavelength and half peak bandwidth), albeit within the published filter specifications, each instrument must be calibrated to determine the specific calibration factors for the use of those filters in a specific instrument. Those calibration factors are the characteristic values for that particular instrument. The a21 value is used on subsequent analyses do determine the presence (or absence) of an interfering substance.

This is done by first determining the concentration of the sample as analyzed at the 3.44μ filter. The 3.37μ filter is then inserted into the optical path and the sample is analyzed at that wavelength. The result analyzed at 3.44μ is multiplied by a21. The result at 3.37μ is subtracted from this product of the value at 3.44μ x a21. If the difference is ≤ the filter agreement threshold (default 0.005) then the sample is said to be free from an interfering substance. This is because the relative absorption seen between 3.37μ and 3.44μ for this sample is the same as that for the ethanol standard used to calibrate the instrument. When a substance other than ethanol, but still absorbing IR energy in the 3.4μ region, is added to the sample, a disagreement becomes evident in the value at 3.37μ with the result from 3.44μ x a21. The greater the concentration of the interference, or the less like ethanol (a21), the greater the discrepancy becomes.

As some allowance for variation between the values (3.44μ x a21 and 3.37μ) is necessary due to expected variability in any measurement (+/-0.002 for each measurement) the question arises as to at what level the discrepancy becomes significant and scientifically and legally of importance. The limit for the filter agreement threshold is 0.005. What this means is that once the discrepancy between the value at 3.37μ and the value at 3.44μ x a21 ≥ 0.005, the sample is said to contain an interfering substance.

The following is an explanation of what might happen if the sample were to contain acetone in addition to ethanol. Lets assume the ethanol concentration of the sample as measured at 3.44μ was 0.160. Knowing that ethanol absorbs approximately 20% more energy at 3.37μ, we would anticipate the result at 3.37μ to be 0.160 X 1.2 = 0.192. If acetone is also a component of the sample, it would be useful to know the characteristics of acetone at 3.44μ and 3.37μ. Test data has shown that acetone absorbs 2 to 3 times the amount of IR energy at 3.37μ than it does at 3.44μ (again, independent of the concentration). For this discussion we will use a 2:1 ratio. Assume a contribution of 0.010 at 3.44μ. Since we expect in this example 2X that concentration at 3.37μ, the value would be 0.020. If we add these concentrations of acetone to the ethanol portion we would see:

Reading at 3.44μ = 0.100 (etoh) + 0.010 (ace) = 0.110 total concentration

Reading at 3.37μ = 0.120 (etoh) + 0.020 (ace) = 0.140 total concentration

When multiplying the result at 3.44μ by a21 we see:

0.110 x 1.2 = 0.132

Comparing this to the result at 3.37μ we see:

0.132 – 0.140 = -0.008

This exceeds the "filter agreement threshold", (preset at 0.005) by 0.03. This test would result in the message of "interference detected" if the software were designed to handle the discrepancy in this manner.

If the contribution by acetone were 0.005 at 3.44μ in the above example, the amount at 3.37μ would be expected to be 2X or 0.010. This, added to our base ethanol concentration would yield:

Reading at 3.44 = 0.100 (etoh) + 0.005 (ace) = 0.105 total concentration

Reading at 3.37 = 0.120 (etoh) + 0.010 (ace) = 0.130 total concentration

When multiplying the result at 3.44μ by a21 we see:

0.105 x 1.2 = 0.126

Comparing this to the result at 3.37μ we see:

0.126 – 0.130 = -0.004

This would be below the set filter agreement threshold (0.005) an in this instance, the final result would be a reported ethanol concentration of 0.105.

The explanation above is repeated except filter 2 (3.37μ) is replaced with filter 3 (3.50μ) and a21 is replaced with a31.

The filter agreement threshold will be adjustable. This settable level (2-10) implying, when referring to g/210l units of measurement, an adjustable threshold of between 0.002 g/210L and 0.010 g/210L will pertain to the difference in the calculated concentration at filter 1 (3.44μ) and filter 2 (3.37μ) or the difference in the calculated concentration at filter 1 and filter 3 (3.50μ). The selected filter agreement threshold will be the absolute value for sample concentrations measured at filter 1 of up to 0.100 g/210L. For values at or greater than 0.100 g/210L the threshold will be a percentage of the analyzed concentration at 3.44μ:

Filter Agreement if 3.44μ ≥ 0.100 g/210L = (Int x 0.001) x (value at filter 1 / 0.100)
Where Int is the set filter agreement threshold value from 2 to 10

If the difference when comparing the results of 3.44μ and 3.37μ OR when comparing the results of 3.44μ and 3.37μ exceeds the threshold, a non-specific to ethanol sample is said to have occurred.

An additional filter agreement threshold calculation will also be employed where the threshold outlined above is not exceeded but the difference in the 2 calculated differences (filter 1-2 and filter 1-3) when combined reaches a level defined as:

For filter 1 measured concentrations of up to 0.100 g/210L
Diff filter 1-2 plus Diff filter 1-3 ≥ (Int x 0.001) ~~x (7/5) = .007~~ ≥ 0.007
For concentrations measured at filter 1 of 0.100 g/210L or greater,
(Int x 0.001) x (value at filter 1 / 0.100) x (7/5)

SH
Per DR @ NPAS
1/2000

P 3 of 4

See table below for example of thresholds with INT set to 5

Value @ Filt 1	Filter I1-2I Diff	Filter I1-3I Diff	Combined Diff I1-2I/I1-3I
0.025	0.0050	0.0050	0.0070
0.050	0.0050	0.0050	0.0070
0.075	0.0050	0.0050	0.0070
0.100	0.0050	0.0050	0.0070
0.150	0.0075	0.0075	0.0105
0.200	0.0100	0.0100	0.0140
0.250	0.0125	0.0125	0.0175
0.300	0.0150	0.0150	0.0210
0.350	0.0175	0.0175	0.0245
0.400	0.0200	0.0200	0.0280
0.450	0.0225	0.0225	0.0315
0.500	0.0250	0.0250	0.0350
0.550	0.0275	0.0275	0.0385
0.600	0.0300	0.0300	0.0420

Enter Int Thrshld
(2-10)
5

Separate worksheet allows changing Threshold setting to see limits.

National Patent Analytical Systems, Inc.

Explanation of the INVALID SAMPLE message and the DataMaster DMT

12/14/07

Measurements of the alcohol concentration during breath sample delivery are taken every 250 milliseconds (4x per second).

A "positive slope" is defined as a comparison of a 2 consecutive point average to the previous where the trend is not in the negative direction. Both conditions of a positive change and no change are considered a positive slope.

The message "INVALID SAMPLE" will be produced while the instrument detects at least the minimum rate of airflow during sample delivery if:

There are three consecutive comparisons of two point averages where the trend is in the negative direction (values are decreasing) after seeing first a minimum of six positive comparisons of two point averages.

Or

Any final result ≥ 0.060 g/210 l is less than 95% of any previous high reading during that successfully delivered sample.

Or

Any final result ≥ 0.003 g/210 l but < 0.060 g/210 l is lower than any previous high reading during that successfully delivered sample by at least 0.003 g/210 l.

Harnois, Steven

From: Bolduc, Amanda
Sent: Tuesday, March 17, 2009 7:45 AM
To: Harnois, Steven
Subject: FW: resistor upgrade

Procedure to Add 10K Resistor ...

Here is the electronic copy of the resistor upgrade document

-----Original Message-----
From: Scott Marhefka [mailto:eng@npas.com]
Sent: Thursday, June 05, 2008 10:57 AM
To: Bolduc, Amanda
Cc: Drawbaugh, Bob; Harnois, Steven; Richardson, Darcy
Subject: resistor upgrade

Hello Everyone,

Attached is the info on updating the controller board.
--
Scott Marhefka
National Patent Analytical Systems
2090 Harrington Memorial Road
Mansfield, OH 44903

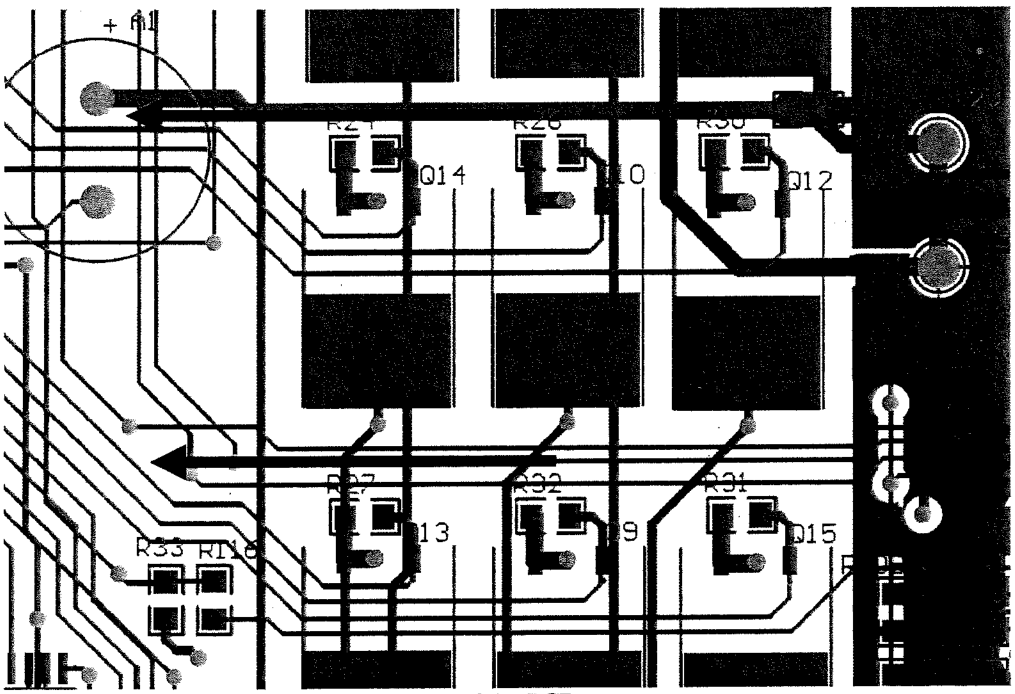
email: eng@npas.com
phone: (419) 526-6727

Procedure to Add 10K Resistor to RFI Circuitry when Detection Problem Exists

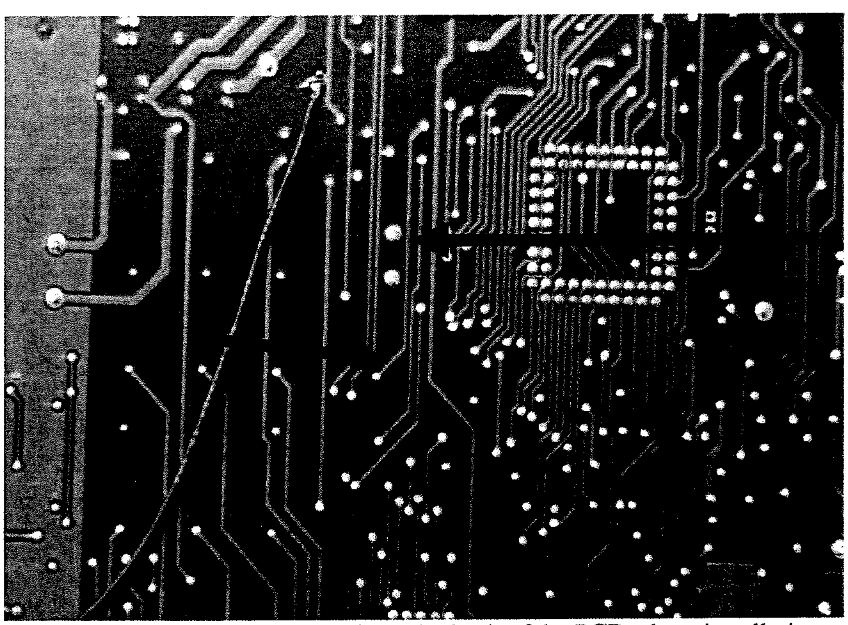
This procedure is to explain where to install the 10k resistor necessary for those DMT Controller PCB's (NPAS p/n 41602) that have been found to exhibit the inability to save the RFI detection setting established in the TECH screen functions of the Datamaster DMT. To date, not all PCB's have manifested this error, but as a precautionary step all new 41602 PCBs using bare-board 32557 rev B *only* will have this update applied to them.

1. Remove DMT Controller (p/n 41602) PCB from lid of dmt.

2. Locate the two nodes as pictured in the photos below, remove solder preparing holes for resistor installation.

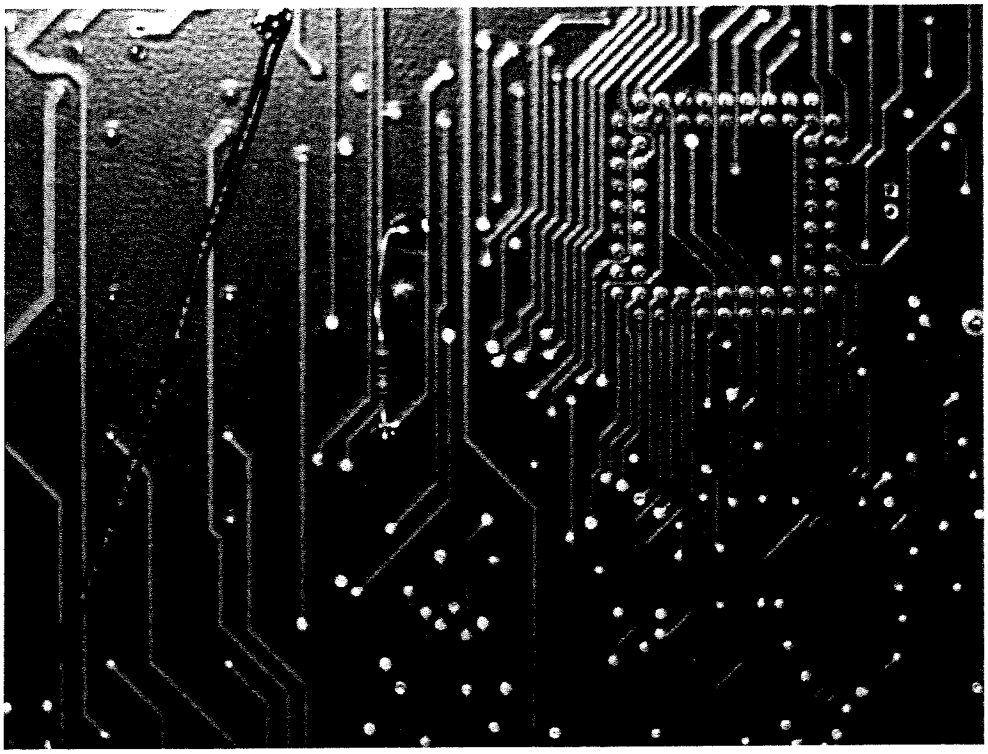


**Circuit Diagram is viewed from the top of the PCB.
***Arrows denote placement of resistor leads to perform RFI circuitry fix.



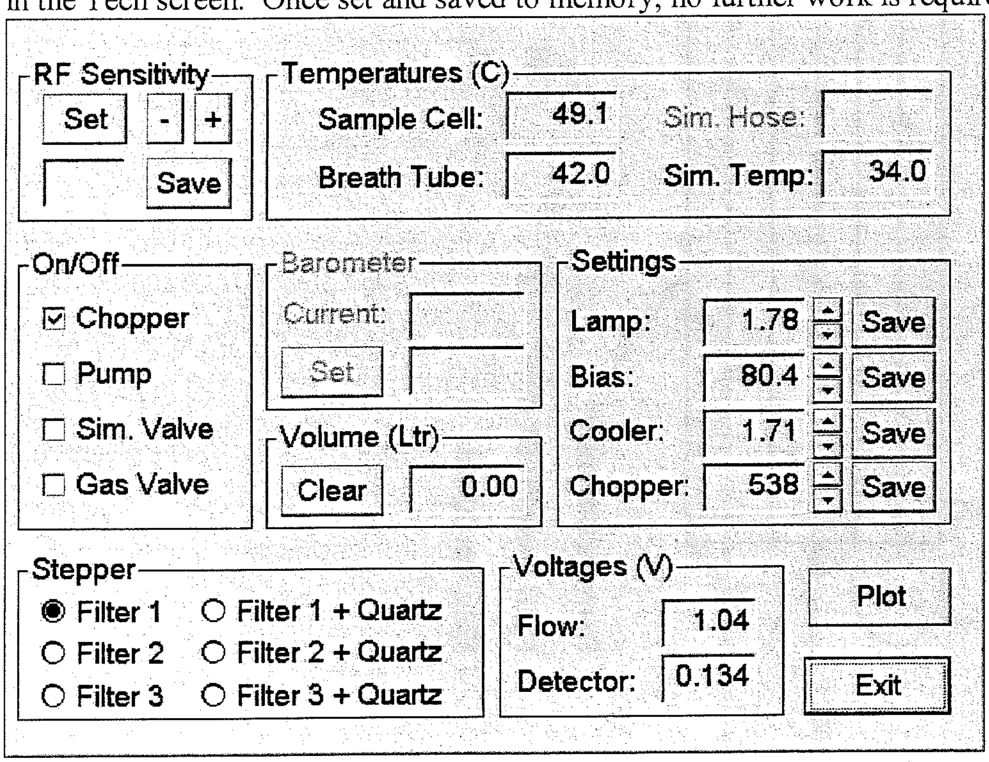
**Picture of actual PCB is done from the back of the PCB where installation needs to take place.

3. Proceed to install the 10k resistor in the two holes.

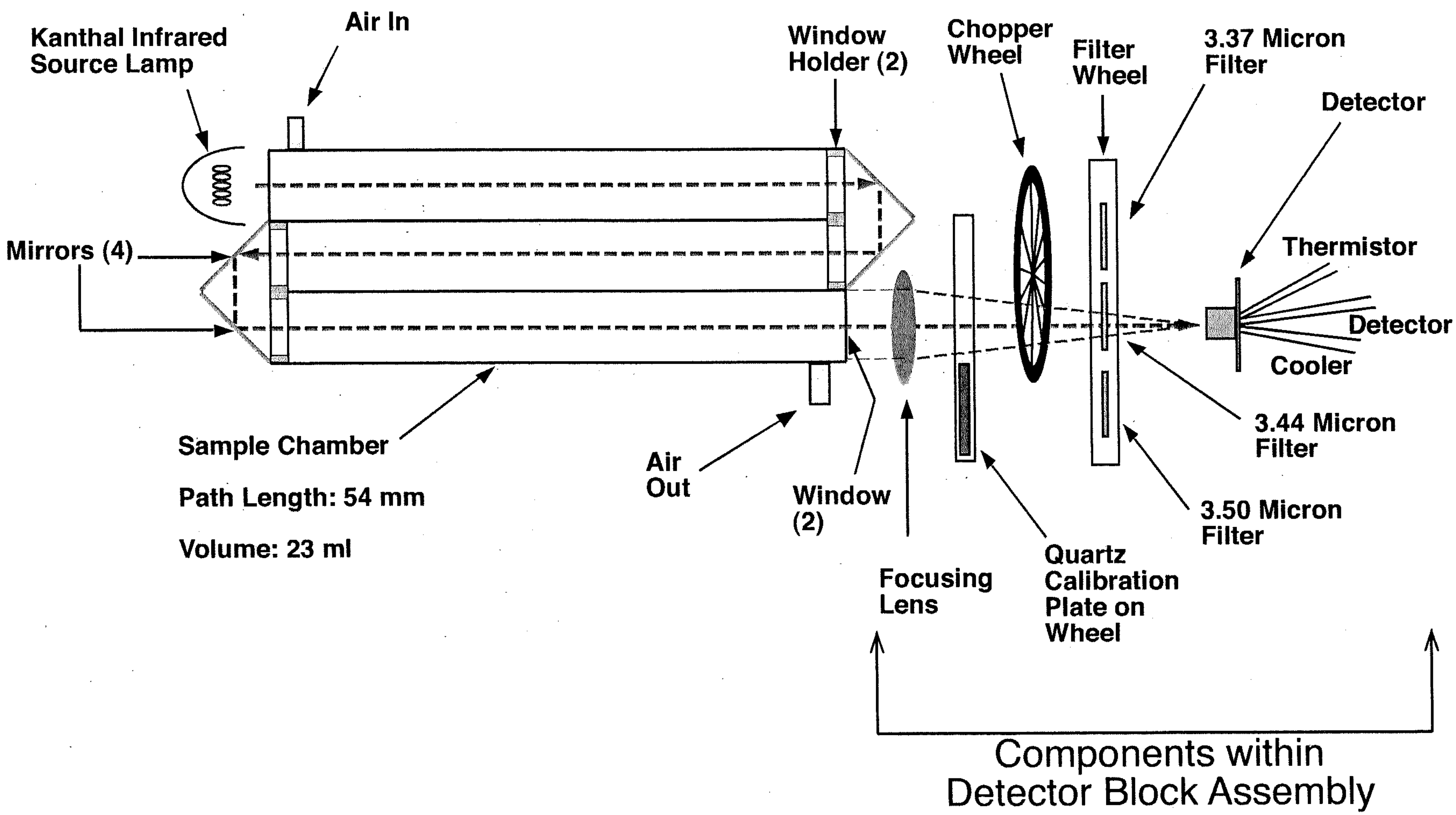


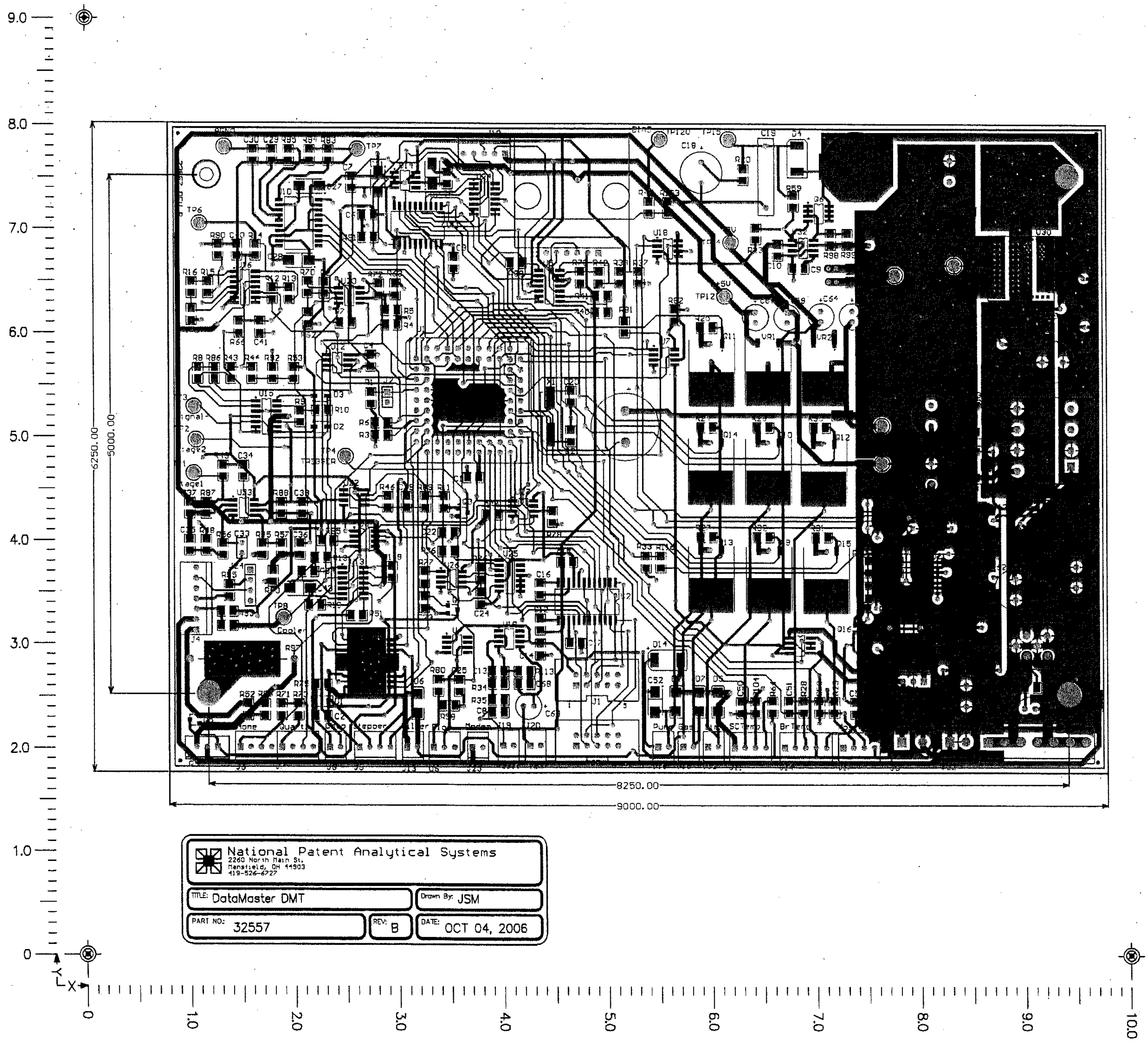
4. Reinstall the Controller board.

5. Upon initial power up after the installation of the resistor it will be necessary to reset the RFI detection level in the Tech screen. Once set and saved to memory, no further work is required with this circuit.

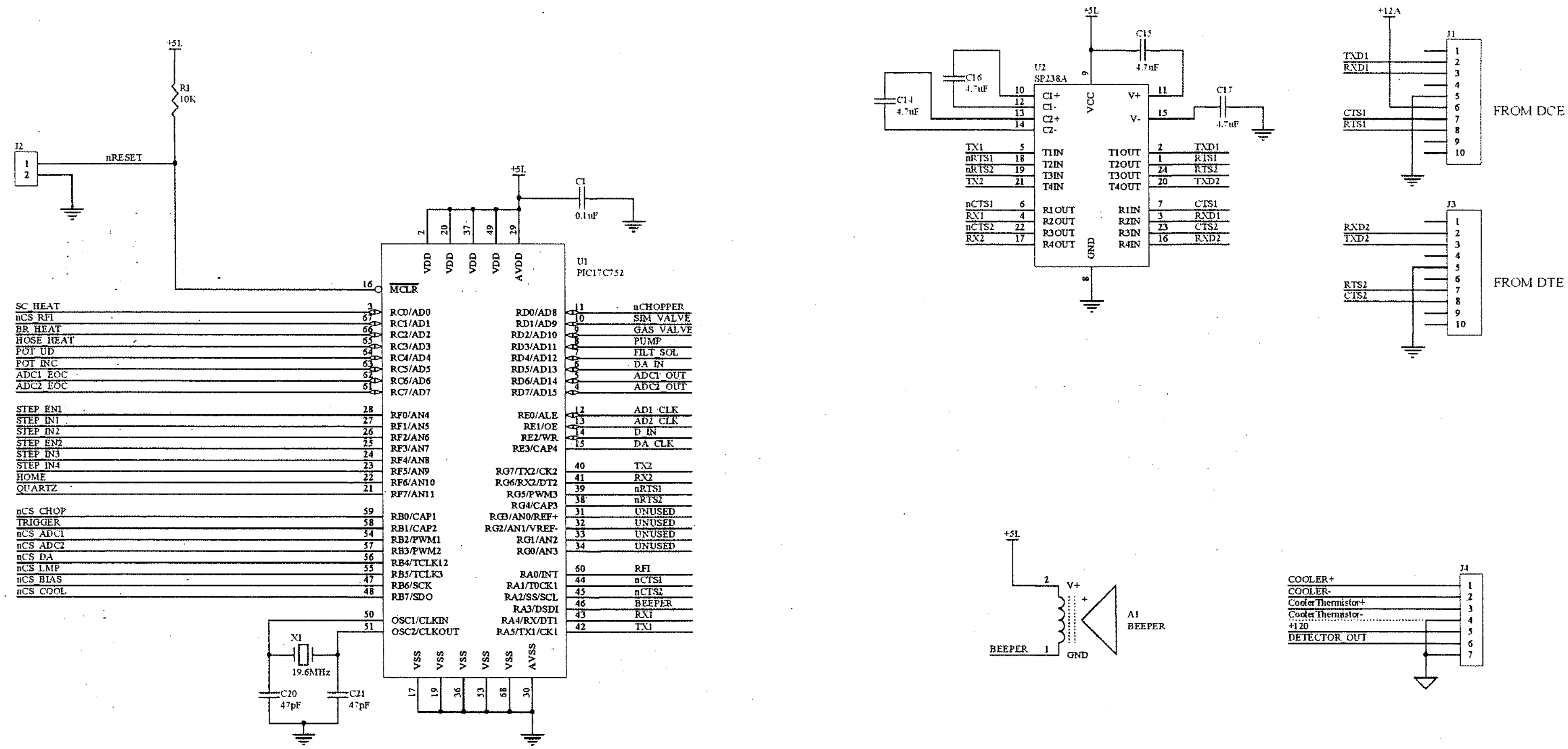


DATAMASTER DMT OPTICAL BENCH



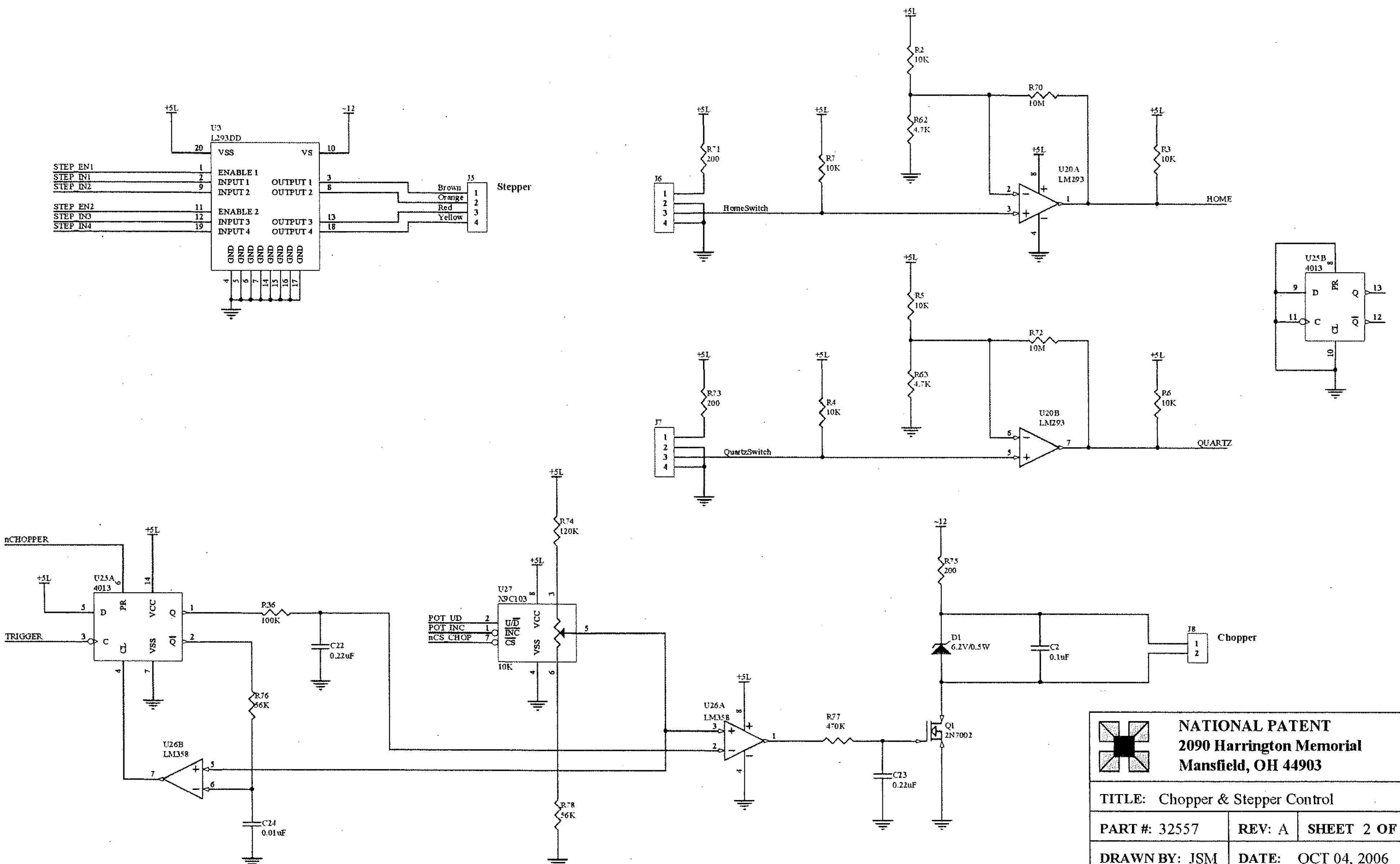


National Patent Analytical Systems 2260 North Main St. Mansfield, OH 44903 419-526-6727		
TITLE: DataMaster DMT		Drawn By: JSM
PART NO: 32557	REV: B	DATE: OCT 04, 2006

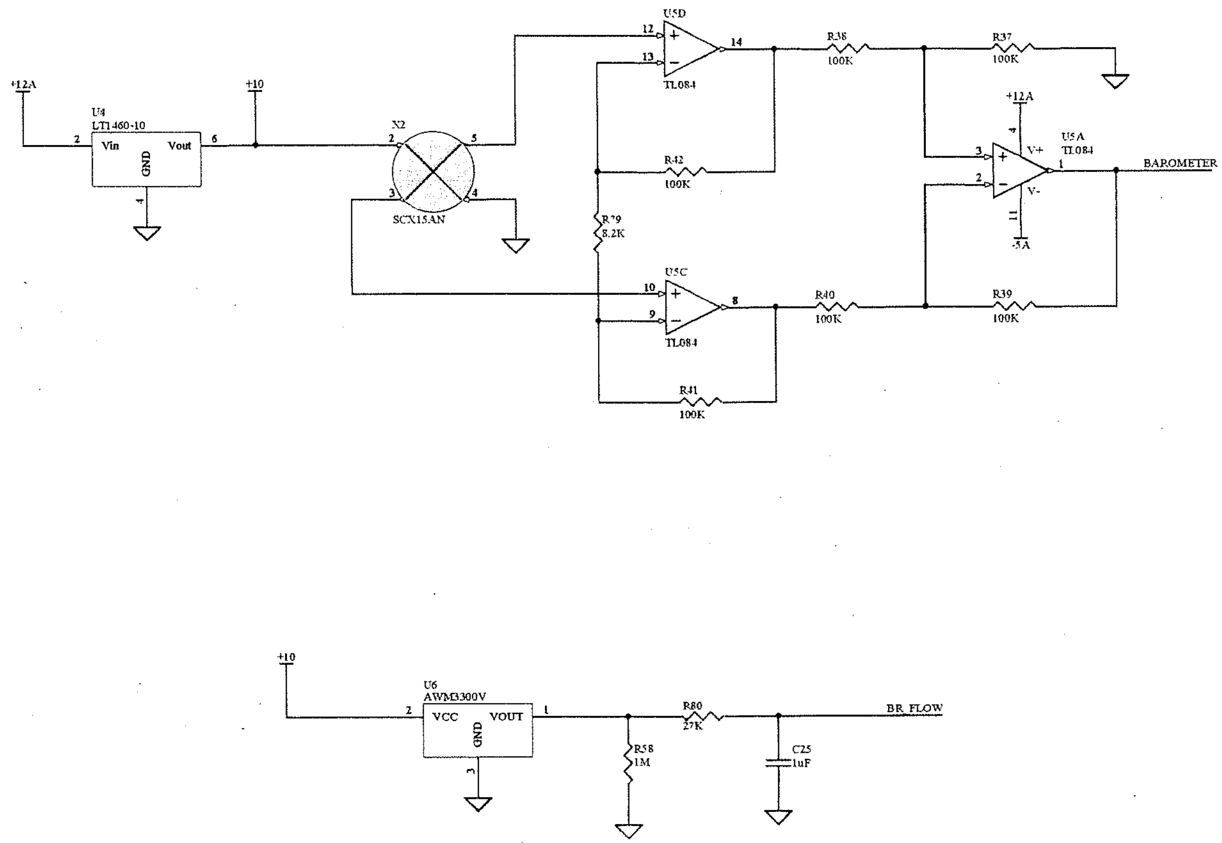


NATIONAL PATENT
2090 Harrington Memorial
Mansfield, OH 44903

TITLE: DMT Controller Board		
PART #: 32557	**REV:** A	**SHEET** 1 **OF** 12
DRAWN BY: JSM	**DATE:** OCT 04, 2006	

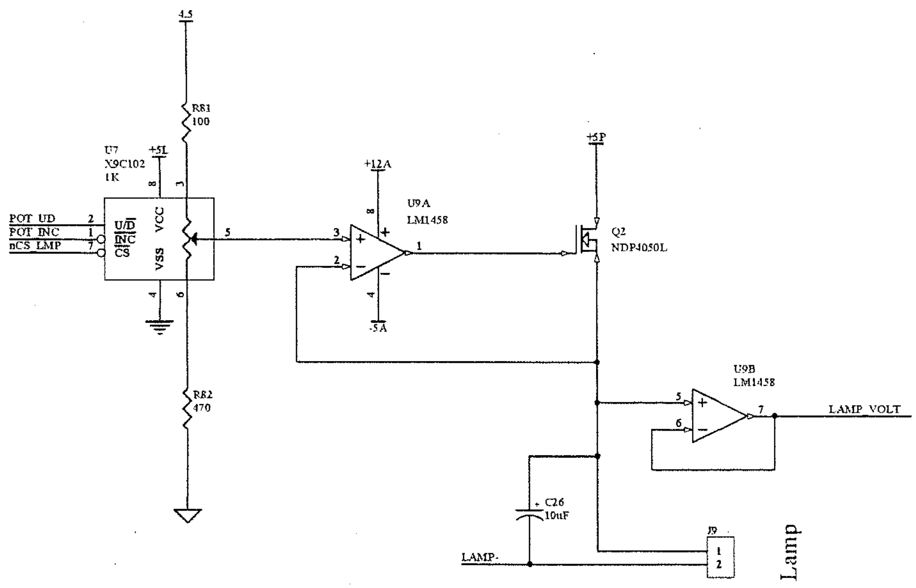


NATIONAL PATENT **2090 Harrington Memorial** **Mansfield, OH 44903**		
TITLE: Chopper & Stepper Control		
PART #: 32557	**REV:** A	**SHEET** 2 **OF** 12
DRAWN BY: JSM	**DATE:** OCT 04, 2006	

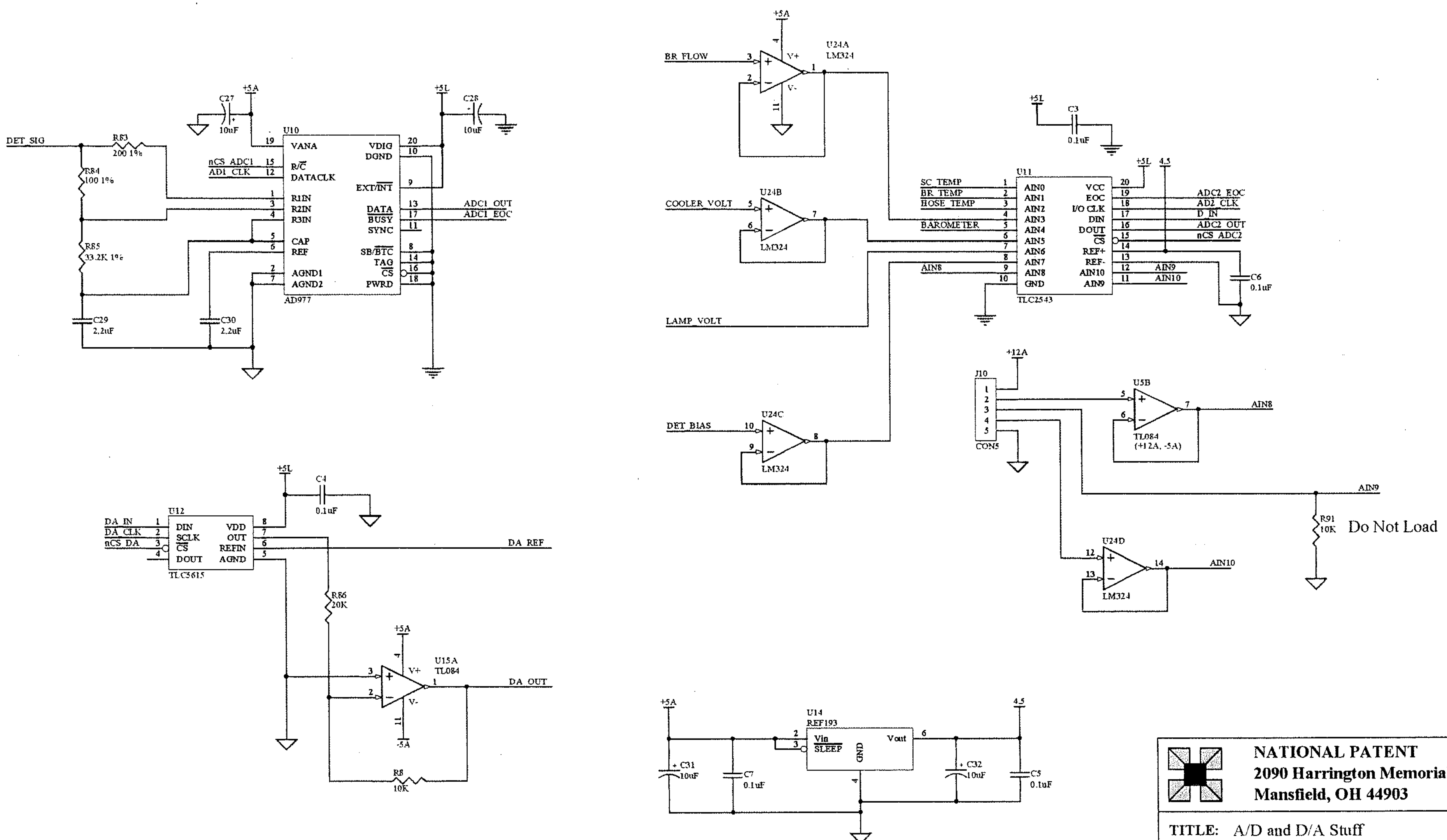


NATIONAL PATENT
2090 Harrington Memorial
Mansfield, OH 44903

TITLE: Breath Flow Rate & Barometric Pressure		
PART #: 32557	**REV:** A	**SHEET** 3 **OF** 12
DRAWN BY: JSM	**DATE:** OCT 04, 2006	

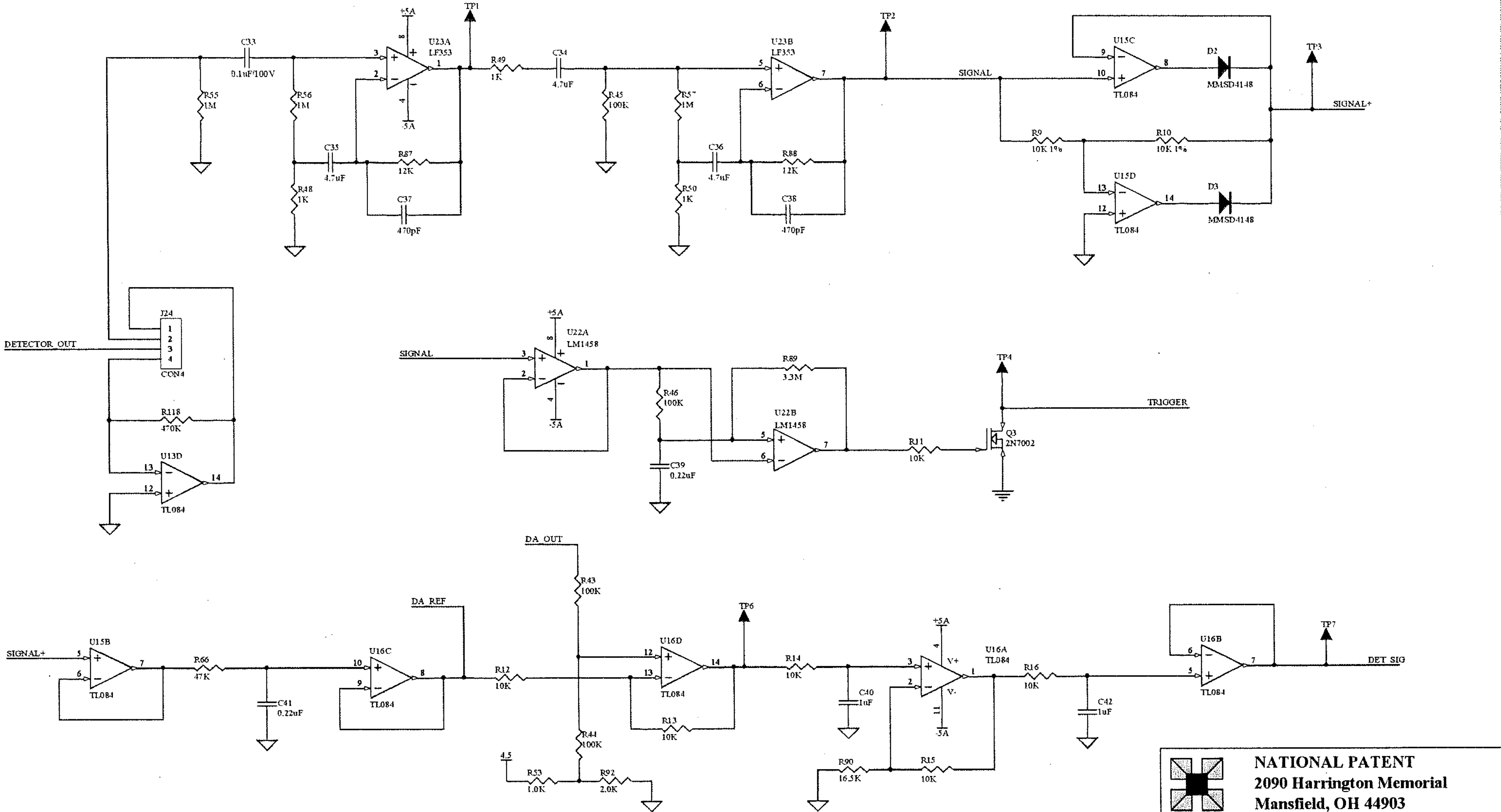


NATIONAL PATENT 2090 Harrington Memorial Mansfield, OH 44903		
TITLE: Lamp Supply		
PART #: 32557	REV: A	SHEET 4 OF 12
DRAWN BY: JSM	DATE: OCT 04, 2006	

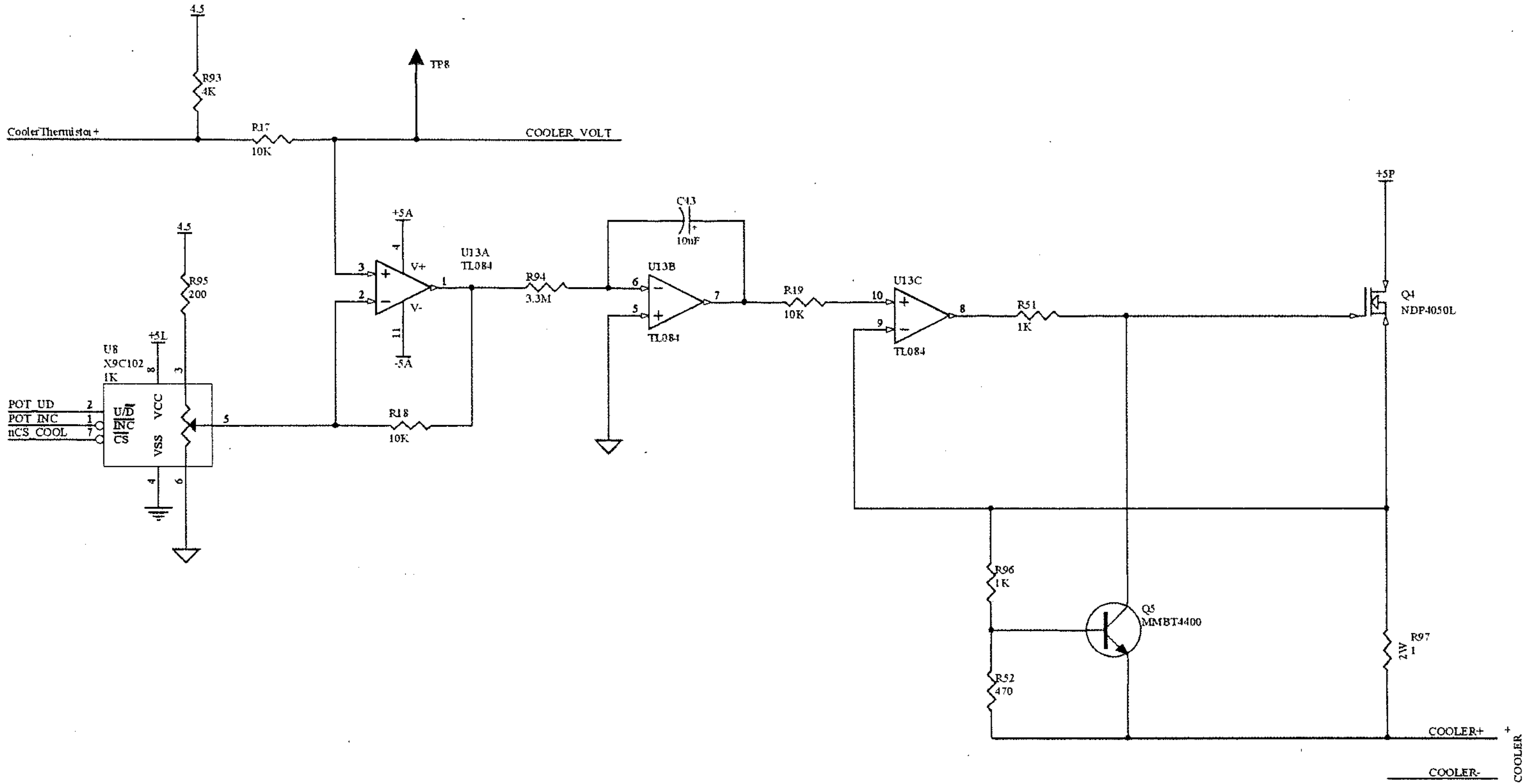


NATIONAL PATENT
2090 Harrington Memorial
Mansfield, OH 44903

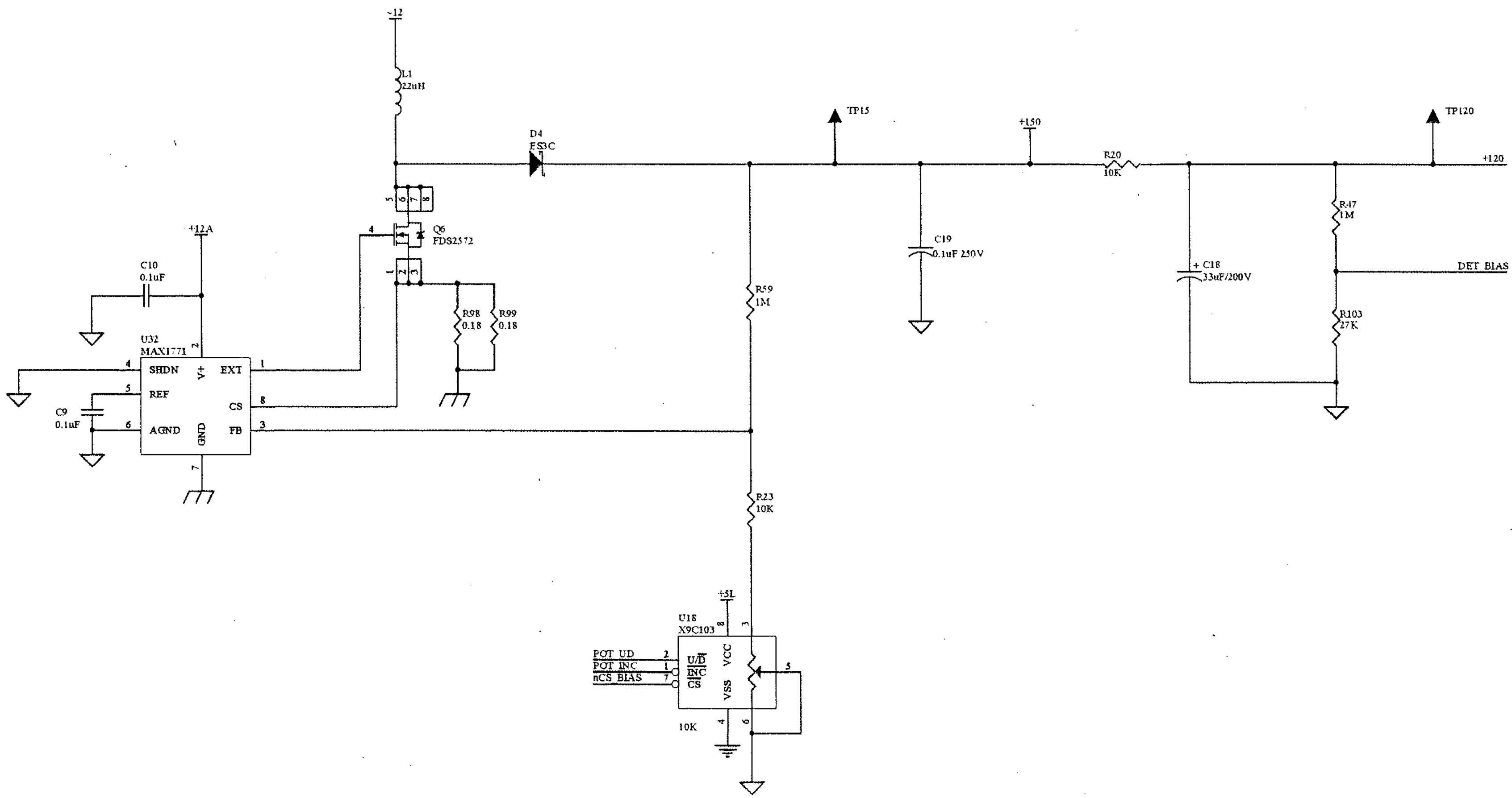
TITLE: A/D and D/A Stuff	
PART #: 32557	**REV:** A — **SHEET** 5 **OF** 12
DRAWN BY: JSM	**DATE:** OCT 04, 2006



NATIONAL PATENT **2090 Harrington Memorial** **Mansfield, OH 44903**	
TITLE: Detector Signal Processor	
PART #: 32557	**REV:** A — **SHEET** 6 **OF** 12
DRAWN BY: JSM	**DATE:** OCT 04, 2006

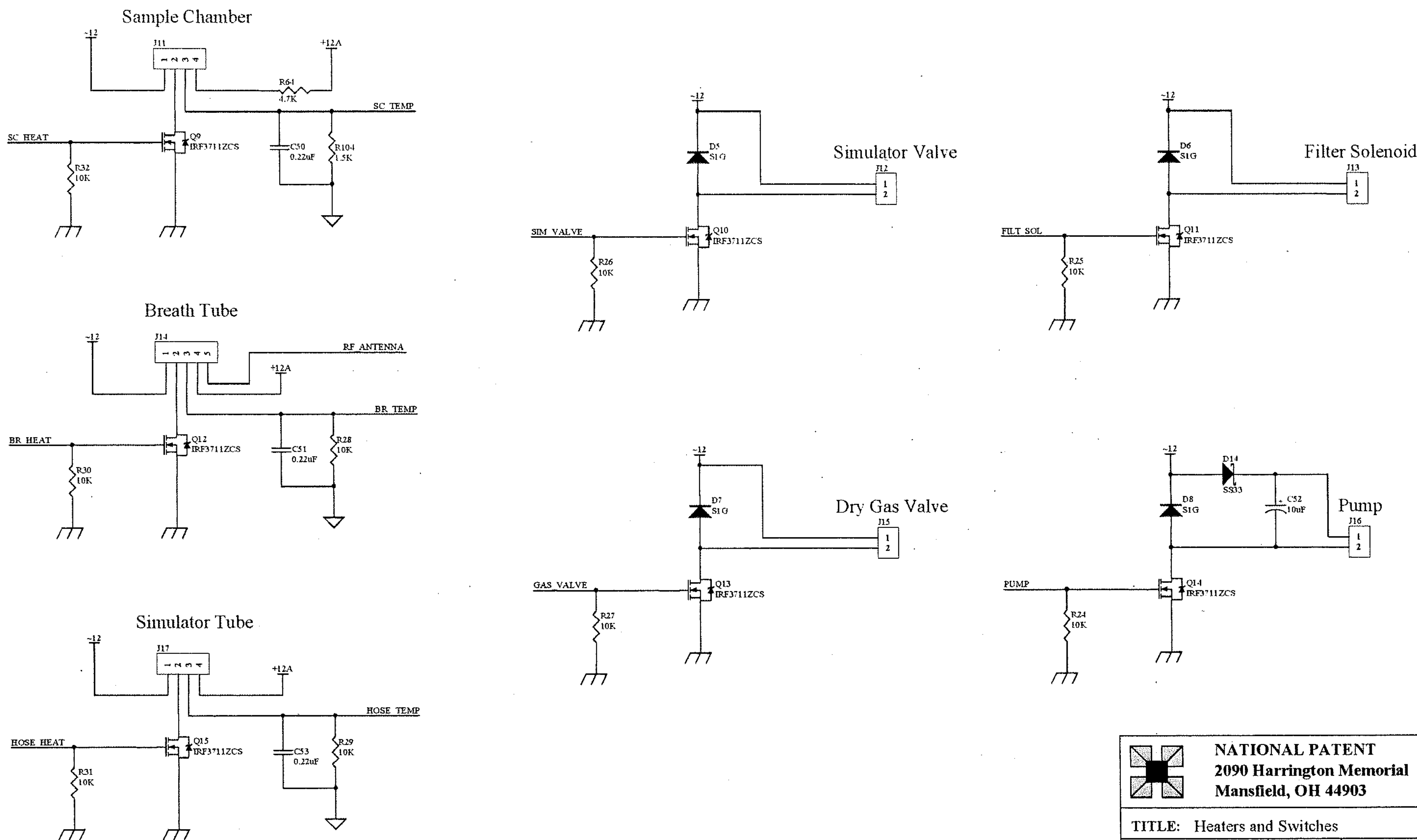


NATIONAL PATENT 2090 Harrington Memorial Mansfield, OH 44903	
TITLE: Cooler Control	
PART #: 32557	REV: A — SHEET 7 OF 12
DRAWN BY: JSM	DATE: OCT 04, 2006



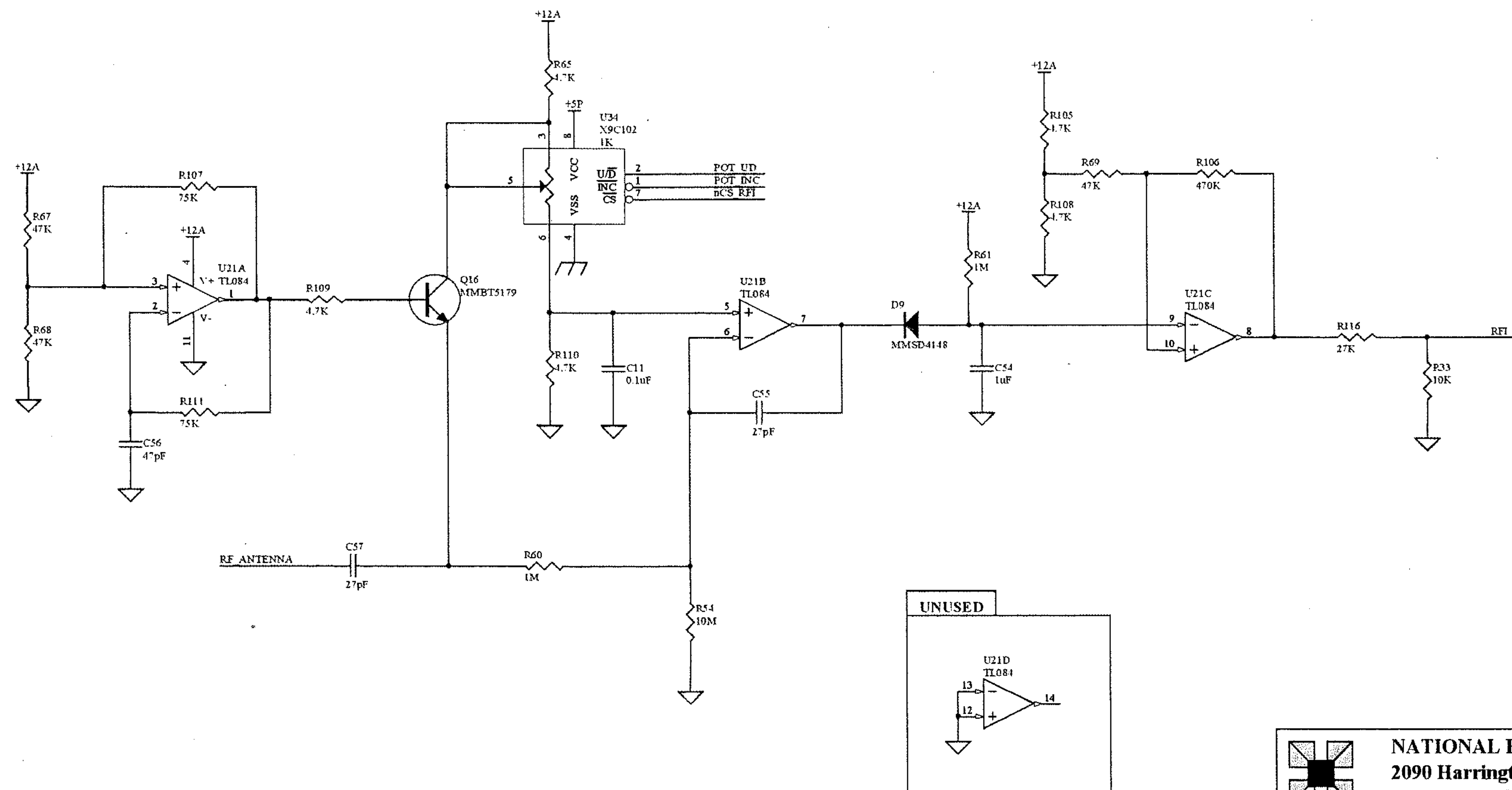
NATIONAL PATENT
2090 Harrington Memorial
Mansfield, OH 44903

TITLE: Detector Bias Supply	
PART #: 32557	REV: A · SHEET 8 OF 12
DRAWN BY: JSM	DATE: OCT 04, 2006



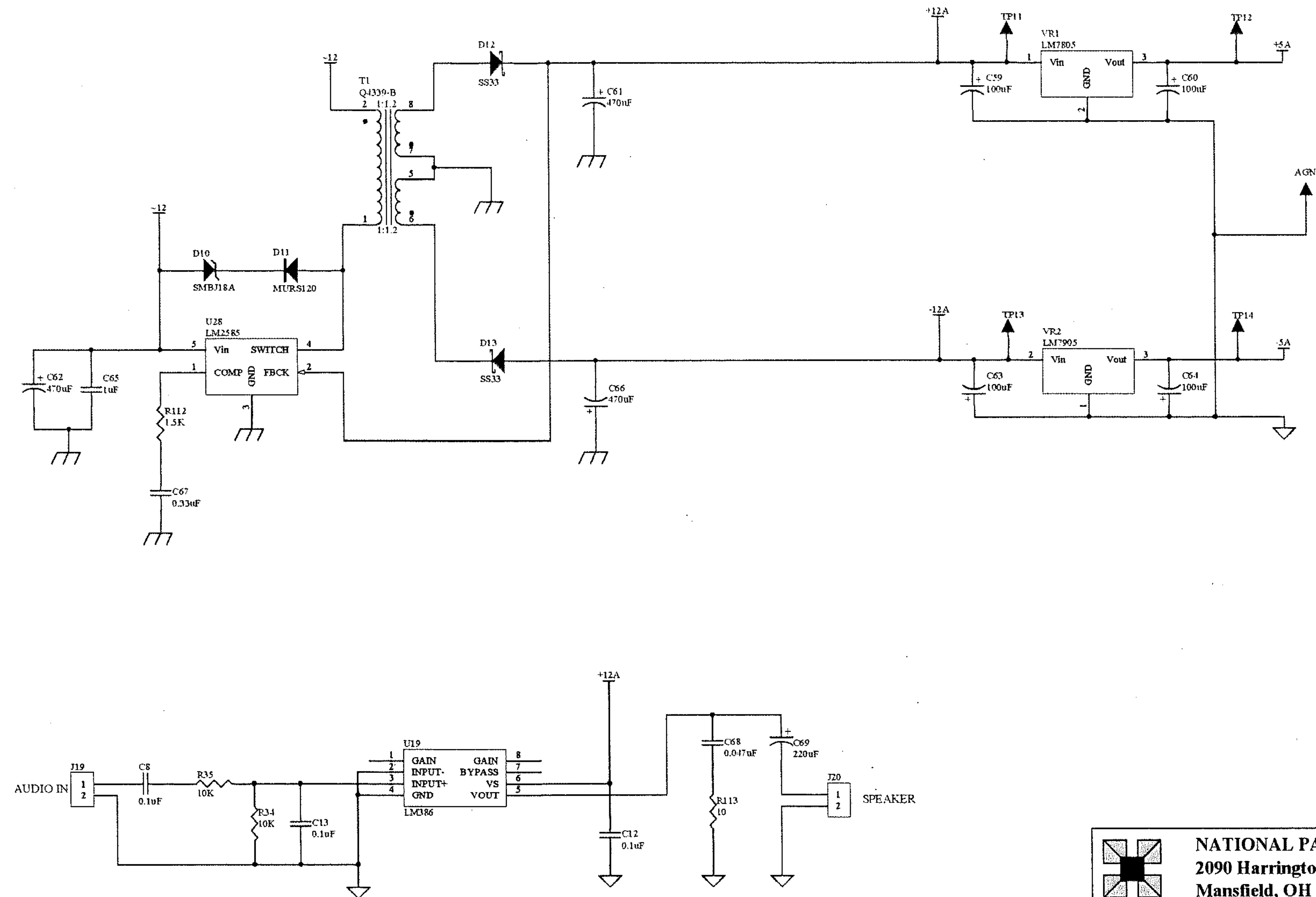
NATIONAL PATENT
2090 Harrington Memorial
Mansfield, OH 44903

TITLE: Heaters and Switches		
PART #: 32557	REV: A	SHEET 9 OF 12
DRAWN BY: JSM	DATE: OCT 04, 2006	

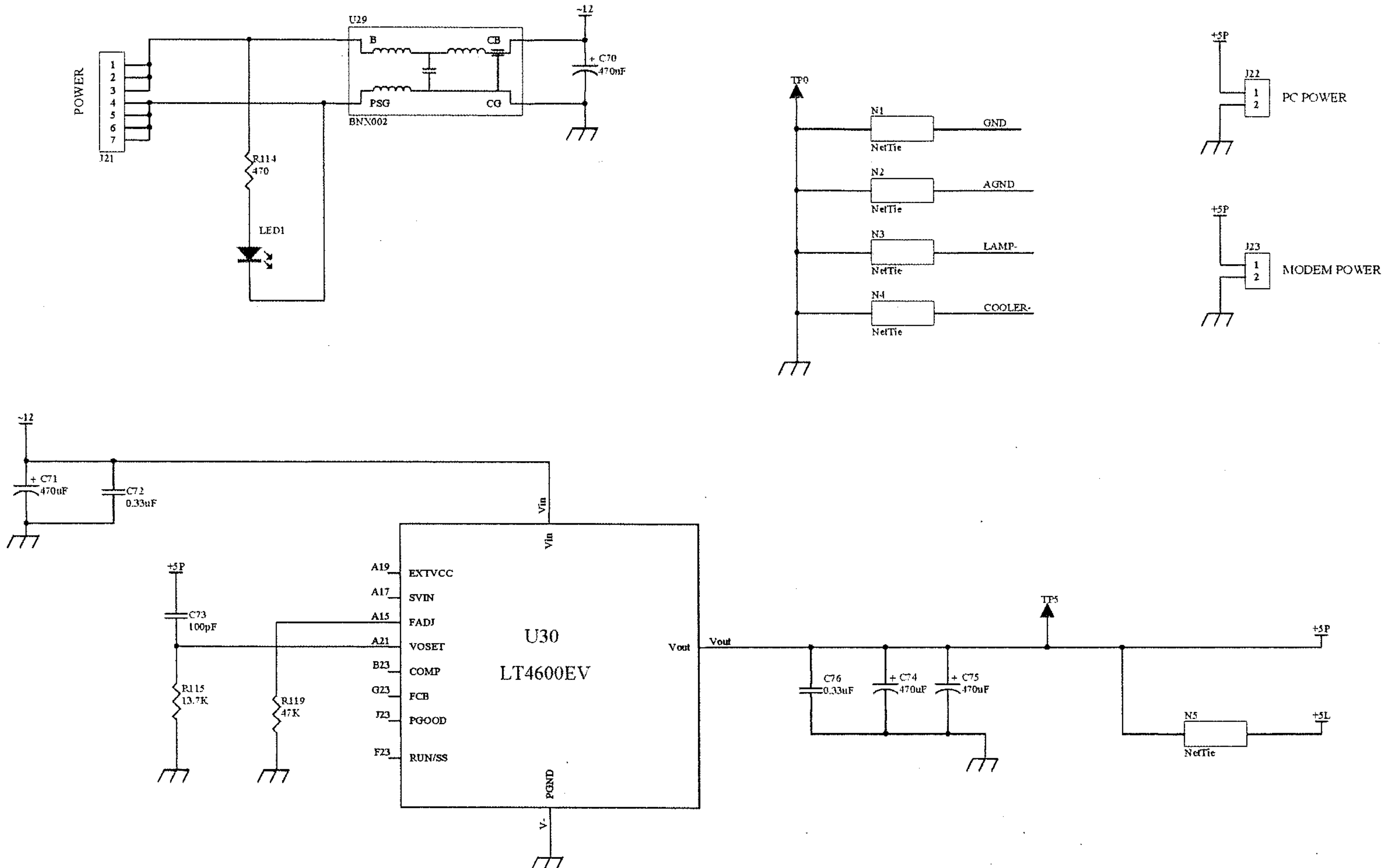


NATIONAL PATENT
2090 Harrington Memorial
Mansfield, OH 44903

TITLE: DMT RF Detector		
PART #: 32557	**REV:** A	**SHEET** 10 **OF** 12
DRAWN BY: JSM	**DATE:** OCT 04, 2006	



NATIONAL PATENT **2090 Harrington Memorial** **Mansfield, OH 44903**		
TITLE: Power Connections		
PART #: 32557	**REV:** A	**SHEET** 11 **OF** 12
DRAWN BY: JSM	**DATE:** OCT 04, 2006	



NATIONAL PATENT 2090 Harrington Memorial Mansfield, OH 44903		
TITLE: DMT Power Supply		
PART #: 32557	REV: A	SHEET 12 OF 12
DRAWN BY: JSM	DATE: OCT 04, 2006	

Harnois, Steven

From: Bolduc, Amanda
Sent: Tuesday, March 17, 2009 7:49 AM
To: Lab_Alc
Subject: FW: Parts List

DataMaster DMT recommended spa...

Found this in my old email folder. We should go over this ASAP

-----Original Message-----
From: Harnois, Steven
Sent: Monday, July 14, 2008 7:30 AM
To: Drawbaugh, Bob; Bolduc, Amanda; Richardson, Darcy
Subject: FW: Parts List

I have to talk to Dave and see if this is what they are recommending we have on hand, or just a list of parts, I also need to find out Pricing for all of this stuff. Just taking a quick look at this list and it looks to me as if it is a spare DMT, without the case, much more then I think we need on hand, or want to spend.

Steve

Steven Harnois
State of Vermont
Agency Of Human Services
Department of Health
Public Health Electronics Technician
195 Colchester Avenue
Burlington, Vermont 05401
Phone (802) 863 7641
Fax (802) 863 7632
E Mail: Sharnoi@vdh.state.vt.us

-----Original Message-----
From: Dave Radomski [mailto:dmr@npas.com]
Sent: Thursday, July 10, 2008 3:17 PM
To: Harnois, Steven
Subject: Parts List

Steve,

Look this over and see if I'm missing anything.

Dave

1of2

DataMaster DMT recommended spare parts list 7/10/08

Part#	Description
21080	12 VDC Switching Power supply
30320	Cable Tie Holder W/ Adhesive
31360	Rubber Bumper W/ Washer (foot)
31473	Mica insulator
37030	Optical Bench Mount #6-32
37101	X-Scale Mini Embedded Controller
41145	FET Source/Cooler Cable Assembly
41248	12 VDC Pump Assembly
41278	Embedded to Controller DB-9 Cable Assembly
41279	DMT Modem Ribbon Cable Assembly
41284	DMT Modem Power Cable Assembly
41436	DMT Embedded Controller Power Cable Assembly
41505	DMT 12 VDC 5-Way Valve Assembly
41602	DMT Controller PCB Assembly
41603	DMT Connector PCB Assembly
26002	CPC QD Fitting Male
30277	CPC QD Fitting Female
31588	On-Off-On Switch
41151	Heated Simulator Tubes Receptacle Cable Assembly
41152	Heated Breath Tube Receptacle Cable Assembly
41277	DMT Simulator Temperature Ribbon Cable Assembly
41435	DMT AC Receptacle Cable Assembly
41437	DMT AC/DC Power Harness Assembly
43360	8.4" LCD Display Assembly
41139	Flat Cap Sample Chamber Assembly
41275	Flow Sensor Module Assembly
41303	DMT Snubber
41400	Stepper/Detector Block Final Assembly
41503	Check Valve Assembly
41601	DMT Detector Mounting Assembly
41630	Lamp Assembly TO-8 Package
41351	Chopper/Lens Block Sub-Assembly
41352	Wheel/Detector Block Sub-Assembly
41310	DMT Chopper Motor Assembly
41311	Stepper Motor Assembly
41344	Filter Wheel Locking Solenoid Assembly
41340	Geared Filter Wheel Assembly
41341	Geared Quartz Wheel Assembly
41466	Quartz Wheel Optical Sensor Assembly
41467	Filter Wheel Optical Sensor Assembly

Harnois, Steven

From: Harnois, Steven
Sent: Thursday, July 24, 2008 3:43 PM
To: Lab_Alc

Steven Harnois
State of Vermont
Agency Of Human Services
Department of Health
Public Health Electronics Technician
195 Colchester Avenue
Burlington, Vermont 05401
Phone (802) 863 7641
Fax (802) 863 7632
E Mail: Sharnoi@vdh.state.vt.us

-----Original Message-----
From: Service Dept. [mailto:service@npas.com]
Sent: Thursday, July 24, 2008 3:28 PM
To: Harnois, Steven
Subject: second try

Detector Burn-in Procedure:
-After the detector assembly is installed, power on the instrument.
-Enter the tech screen and adjust the cooler voltage setting to 1.70Vdc +/-0.10.
-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.
-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.

Harnois, Steven

From: Harnois, Steven
Sent: Wednesday, July 30, 2008 3:13 PM
To: Lab_Alc
Subject: FW: 7/30/08 Phone Call

Steven Harnois
State of Vermont
Agency Of Human Services
Department of Health
Public Health Electronics Technician
195 Colchester Avenue
Burlington, Vermont 05401
Phone (802) 863 7641
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-----Original Message-----
From: Dave Radomski [mailto:dmr@npas.com]
Sent: Wednesday, July 30, 2008 3:11 PM
To: Harnois, Steven
Subject: Re: 7/30/08 Phone Call

Steve

The purpose of the ambient zeroing is to accommodate for long term drift in the output of the detector which is something that is a characteristic of PbSe and other types of detectors. The initial set-up of the detector voltage is designed to put the detector output somewhere around zero volts. In fact, the DMT can easily zero out a detector voltage in the approximate range of -.300 to + .800. A drift over the long term (more than 15 minutes or so) of a couple hundred millivolts is not concern.

Dave
On Jul 30, 2008, at 11:07 AM, Harnois, Steven wrote:

> David,
>
> Please respond to our phone call today about detector voltage.
>
> Thanks, Steve
>
> Steven Harnois
> State of Vermont
> Agency Of Human Services
> Department of Health
> Public Health Electronics Technician
> 195 Colchester Avenue
> Burlington, Vermont 05401

Phone (802) 863 7641
Fax (802) 863 7632
E Mail: Sharnoi@vdh.state.vt.us

Harnois, Steven

From: Harnois, Steven
Sent: Wednesday, July 30, 2008 3:19 PM
To: Lab_Alc
Subject: FW: Controller Boards

Steven Harnois
State of Vermont
Agency Of Human Services
Department of Health
Public Health Electronics Technician
195 Colchester Avenue
Burlington, Vermont 05401
Phone (802) 863 7641
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-----Original Message-----
From: Service Dept. [mailto:service@npas.com]
Sent: Wednesday, July 30, 2008 3:17 PM
To: Harnois, Steven
Subject: Re: Controller Boards

Steve,
The original reason we added the wiring was to remove noise being generated on the ground lines from the heaters turning on and off. We took the grounds from critical components like the lamp and separated them from direct connection to the ground of the heaters. When the current version of the board was implemented Scott incorporated that design change into the layout so that the wires and cuts no longer needed done because it was actually part of the design of the board to keep those things separated.

Chris

Harnois, Steven wrote:

> Chris,
>
> Could you please tell us more about the wire going from the Front to the Back of the controller board and what was done so that has been removed from the newer rev board.
>
> Thanks, Steve
>
> Steven Harnois
> State of Vermont
> Agency Of Human Services
> Department of Health
> Public Health Electronics Technician

195 Colchester Avenue
Burlington, Vermont 05401
Phone (802) 863 7641
Fax (802) 863 7632
E Mail: Sharnoi@vdh.state.vt.us

-----Original Message-----
From: Service Dept. [mailto:service@npas.com]
Sent: Wednesday, July 30, 2008 11:19 AM
To: Harnois, Steven
Subject: Controller Boards

Steve,
I'm sending you two replacement Controller Boards to replace the two I had just recently sent to you. They are the same revision boards as the ones you just received however there is a resistor value that was incorrect. The resistor number is R86. Currently, there is a 20k resistance value installed, and that needs changed to a 10k. I will be sending these boards out today, July 30 2008.

Also, regarding the RFI issue you mentioned on the phone, I have not seen the issue yet except on the old version of the controller board, however I have seen the new boards "settle in" after burn-in requiring the RFI setting to be redone and then be fine throughout the rest of the testing and QC process. We are watching that circuit because of the past issues we had already felt to be dealt with and I will keep you posted on whats going on as I find new developments.

Chris

National Patent Analytical Systems, Inc.

Amanda Bolduc
Vermont Department of Health
195 Colchester Ave. PO Box 1125
Burlington, VT 05402-1125

6/11/09

Hi Amanda,

According to the manufacturer of the detectors, Hamamatsu, they began applying a "thermal process to improve stability of device performance". They identified detectors with and without this application as follows:

P/N	Qty	S/N	Thermal process
P9696-02SPL6435	500p	579-365	no
P9696-02SPL7862	237p	640-990	no
P9696-02SPL7862	438p	266-	yes

The "process" was implemented due to the fact that some (not all) of the detectors were exhibiting a measurable drift in the detector output that, if sufficient enough, would cause status messages to be produced by the DMT and preclude the running of those tests.

With the drift concern addressed, we have noticed better stability of detector voltages over the burn in period here. Since there is a certain amount of drift in the output of the overall system (as evidenced by the use of the ambient zeroing routine) the question "what is too much drift?" can only be answered as: "a level in the positive direction which causes Filter 1, 2 or 3 won't zero or a level in the negative direction which produces an internal standard error. A variation of up to +/- .2 volts or so in the detector voltage relative to an original set point is viewed as insignificant. General guidelines, but not absolute limits for the detector voltage would be anywhere in the range of -0.3 to +0.8 volts. Any given instrument may or may not produce a status message operating at these limits. If a status message is not produced, the instrument will function accurately as intended.

It is not necessary, nor is it advisable, to put specific limits on what is an acceptable detector voltage drift level. Identifying the drift trend of a particular detector could assist in identifying one that may produce a status message at some future point. Our position is that the adoption of any other policy is simply not warranted and potentially too constrictive.

We understand that you have incorporated a check to ensure the detector voltage is within 0.3 volts of zero. While we certainly have no issue with this, it must be noted that this range is reduced from the limits built into the instrument ensuring proper operation and increases the liklihood of not using, as is, an instrument in proper working order. Drift is normal in any infrared system and must be accommodated. While we did see a number of detectors from a batch exhibiting a larger than desired drift, very few were actually drifting to the point where they produced a status message and in no event would the integrity of any given test have been jeopardized.

If you have any additional questions, please let me know.

Regards,

Po Box 1435, 2090 Harrington Memorial Road Mansfield, Ohio 44901
Phone 1-419-526-6727 Fax 1-419-526-9446

Dave Radomski,
N.P.A.S.

National Patent Analytical Systems, Inc.

Service Memo

To: All Concerned

July 10, 2009

Subject: 5 Way Valve Update

We believe we have found a very simple solution to the issue of sticking 5 way valves that has surfaced intermittantly and has been very pesky to completely resolve. The reason this has been so difficult is that we were never able to fully identify the cause. Based on our recent engineering work it appears that the primary cause is residual magnetism in the structure of the solenoid that drives the 5 way valve. While the force of the return spring is over 125 grams pressure, the residual opposing magnetism can be as high as 30 or more grams pressure in a few solenoids. This combined with the other normal sources of friction can be sufficient, in some cases, to cause sticking. This varies from batch to batch depending on the composition of the steel used for the solenoid frame and core. This is not within our control.

I should note that the issue of a sticking 5 way does not present a problem with a test because there can never be a test if this conditions is present since the breath sample is vented to the outside and the reading will typically be .000. It can also result in a "pump error" in which case there is no test.

The solution is to provide for an air gap between the core and the guide structure of the solenoid which can be easily done with a very thin washer. We are suggesting a .006 thick Kapton washer that we will provide on request (at no charge) to any and all DataMaster users. It is our part no 34582 and we life tested this concept to 5000 cycles. We are suggesting that it be placed on all 5 way valve solenoid core stems regardless of wether or not that valve has stuck. It is a simple, fast and convenient fix that can be done on the next visit to the instrument. We do not suggest that a special effort be made to do this update unless there is an immediate issue with this problem on any given instrument. I should have these available the first part of next week.

In order to install simply remove the 5 way from the base (use caution as the lamp transistor that is mounted to the block will be warm), unscrew the nylon acorn nut from the front of the core stem and then pull out the core. Slide the washer over the core stem to the base of the stem and reassemble all. There should be no need to readjust anything although we suggest that a simulator be run after reassembly to insure that all is well. The time required should be less than 5 minutes.

John Fusco

Order 80 7/14/09 Per BD

2090 Harrington Memorial Road, Mansfield, Ohio 44901 Ph 419-526-6727 Fax 419-526-9446
jd@npas.com

Harnois, Steven

From: John Fusco [jd@npas.com]
Sent: Wednesday, September 15, 2010 9:25 AM
To: Harnois, Steven; Bleskacek Jim; Karin (DPS); John Christy; Lee Lisa (DCJS)
Subject: Service Center Alignment Fixture

Hi

We are sending you a fixture (NPAS Part no 41421) to assist your service people in aligning the chopper wheel and the chopper wheel collar. The fixture will self align the chopper wheel to the collar. This is a free item and is going out to all DMT service centers. Our recent engineering evaluations indicated that the centering of the collar to the wheel is important to the longevity of the chopper motor wear. This has been visually aligned in the past and this procedure was not always adequate resulting in an imbalance of the wheel on the motor and leading to premature wear of the motor along with possible eventual failure. While this is not something that will affect the results of any test, it can mean replacement of the motor.

IF you have instruments currently in service, we are suggesting that this alignment be checked with the fixture at the next certification or service of the instrument. It only need be checked one time as the alignment will stay correct as long as the wheel and the collar are not disassembled. Changing the motor will not affect the alignment and a good alignment should greatly reduce the probability of a chopper motor change.

The use of the fixture should be obvious to the techs. They need to remove the motor from the block, along with the chopper wheel assembly. Loosen the nut that retains the chopper to the collar and place the chopper wheel and collar into the fixture. Align the collar to the chopper wheel by seating both into the fixture and retighten the nut. Reinstall the motor and Chopper wheel into the block.

If they have any questions have the call Chris.

John Fusco
National Patent Analytical Systems, Inc.
jd@npas.com
Phone 419+526-6727 Fax 419+526-9446

From:	Dave Radomski [dmr@npas.com]
Sent:	Friday, December 17, 2010 4:12 PM
To:	Bolduc, Amanda
Subject:	Airflow
Attachments:	DataMaster DMT Airflow Sensing Technique.docx; ATT134770.txt; DMTAirflow ◇ Layer-1 ◇ 2X.pdf; ATT134771.txt

DataMaster DMT Airflow Sensing... ATT134770.txt (108 B) DMTAirflow ? Layer-1 ? 2X.pdf ... ATT134771.txt (66 B)

See if this works.

Honeywell

Installation Instructions for the AWM3000 Series Microbridge Mass Airflow Sensors

ISSUE 2

PK 88671

⚠ WARNING

PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

GENERAL INFORMATION

AWM3000 Series Microbridge Mass Airflow Sensors operate on the theory that airflow directed across the surface of a sensing element causes heat transfer. Output voltage varies in proportion to the mass of air or other gas flowing through a given sensor's inlet and outlet ports. Current sink/source. Maximum current ratings are 10 mA sinking and 20 mA sourcing, governed by an LM224 operational amplifier in the final stage of the instrumentation amplifier.

MEDIA CONTAMINATION

Media flowing through the sensor should be free of condensing moisture and particulate contaminants. An inexpensive 5 micron filter upstream of the sensing element substantially reduces the risk of damage due to contaminants.

CLEANING

Cover the ends of the ports when cleaning. Certain solvents may attack the epoxy used to seal the chip tubes to the ceramic substrate.

⚠ CAUTION

CLEANING DAMAGE

- DO NOT USE ultrasonics when cleaning. Ultrasonic cleaning may damage the sensor's microstructure.
- Solvent cleaning may attack the epoxy that seals the chip tube. Do not use III Tri-chloroethane, methylene chloride, methyl pyrrolidone, or any oxidizing type acid such as formic acid.

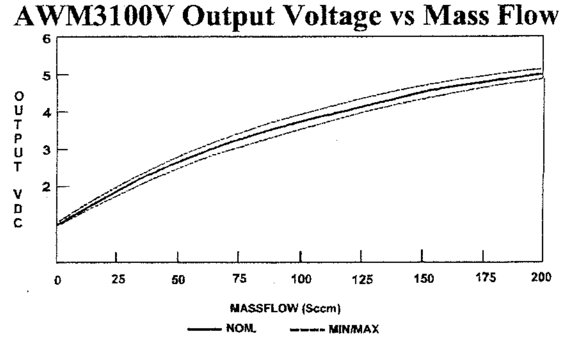
Failure to comply with these instructions may result in product damage.

SOLDERING INSTRUCTIONS

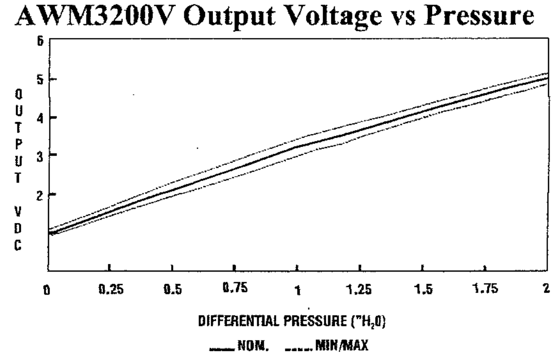
Please note: sensor should be securely attached to printed circuit board before soldering.
Hand soldering: Use temperature controlled soldering iron with 3,2 mm (1/8 in.) diameter tip. Set temperature at 400 °C [750 °F]. Hold tip on terminal for 5 seconds maximum. Use Type R flux rosin core solder and hand clean after soldering.
Wave soldering: Set solder temperature at 250 °C [480 °F) maximum. Run belt at minimum of 1.54 m [5 ft] per minute. Cover tube ends when cleaning.

OUTPUT CURVES

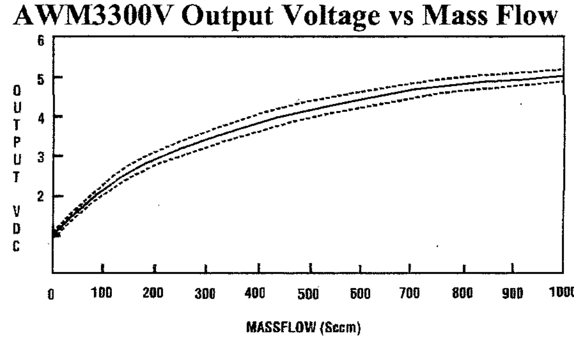
AWM3100V Output Voltage vs Mass Flow



AWM3200V Output Voltage vs Pressure



AWM3300V Output Voltage vs Mass Flow



SPECIFICATIONS

Type	AWM3100V	AWM3150V	AWM3200V	AWM3300V
Recommended excitation	10 ± 0.01 Vdc	10 ± 0.01 Vdc	10 ± 0.01 Vdc	10 ± 0.01 Vdc (2)
Power consumption	50 mW	50 mW	50 mW	50 mW
Output voltage @ laser trim point	5.00 Vdc @ 200 sccm	1.5 Vdc @ 5 sccm	5.00 Vdc @ 2" H_2O	5.00 Vdc @ 1000 sccm
Null voltage	1.00 ± .05 Vdc	1.00 ± .10 Vdc	1.00 ± .08 Vdc	1.00 ± .10 Vdc
Null voltage shift @ -25 °C to 85 °C [-13 °F to 185 °F]	± 25 mV	± 75 mV	± 25 mV	± 25 mV
Output voltage shift -25 °C to 25 °C [-13 °F to 77 °F] 25 °C to 85 °C [77 °F to 185 °F]	 -5% Reading +6% Reading	 -5% Reading +6% Reading	 +24% Reading -24% Reading	 -5% Reading (4) +6% Reading
Repeatability and hysteresis, max.	± 0.50% reading	± 1.0% reading	± 0.50% reading	± 1.0% reading (3)
Maximum Response Time	3.0 msec	3.0 msec	3.0 msec	3.0 msec (1)
Operating Temperature range:	-25 °C to 85 °C [-13 °F to 77 °F]	-25 °C to 85 °C [-13 °F to 77 °F]	-25 °C to 85 °C [-13 °F to 77 °F]	-25 °C to 85 °C [-13 °F to 77 °F]
Storage Temperature range:	-40 °C to 90 °C [-40 °F to 194 °F]	-40 °C to 90 °C [-40 °F to 194 °F]	-40 °C to 90 °C [-40 °F to 194 °F]	-40 °C to 90 °C [-40 °F to 194 °F]
Termination (2,54 mm [0.100 in] centers)	0,635 mm [0.025 in] square	0,635 mm [0.025 in] square	0,635 mm [0.025 in] square	0,635 mm [0.025 in] square
Weight	10,8 g [0.381 oz]	10,8 g [0.381 oz]	10,8 g [0.381 oz]	10,8 g [0.381 oz]
Shock rating (5 drops, ea. of 6 axes)	100 g peak	100 g peak	100 g peak	100 g peak
Maximum Overpressure	25 psi	25 psi	25 psi	25 psi (5)

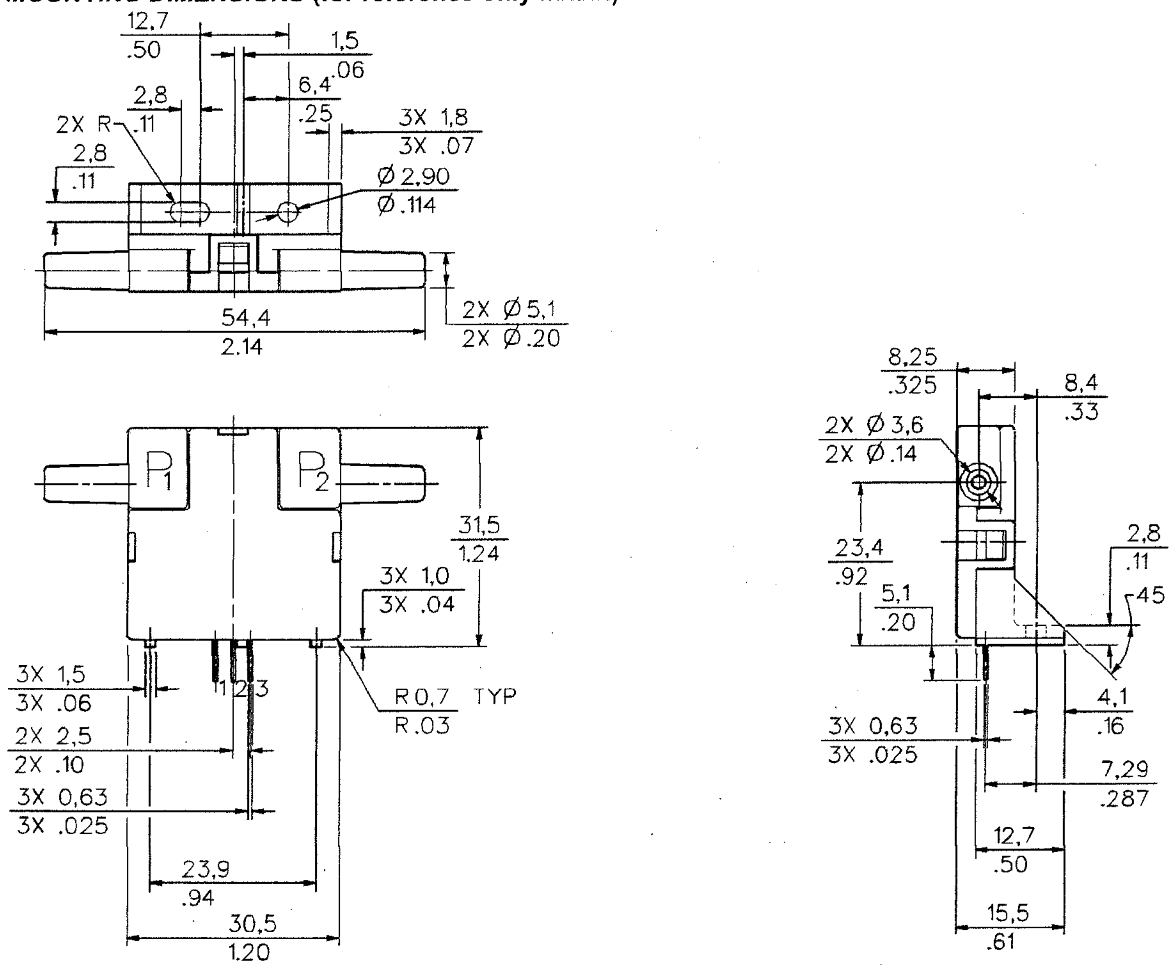
1. Response time typically 1 ms from 10% to 90%. Initial warm-up time for signal conditioned circuitry is 1 minute maximum
2. Output voltage is ratiometric to supply voltage.
3. Repeatability and hysteresis tolerances reflect inherent inaccuracies of the measurement equipment.
4. Temperature shifts in differential pressure devices are mostly due to the density change of the gas over temperature.
5. Maximum flow rate to prevent damage to sensing element (includes flow pulse) is 5 LPM.

OUTPUT FLOW VS. INTERCHANGEABILITY

AWM3100V			AWM3150V			AWM3200V			AWM3300V		
Flow sccm	Nom. Vdc	Tol. (2 ± Vdc	Flow sccm	Nom. Vdc	Tol. (2) ± Vdc	Pressure in H_2O	Nom. Vdc	Tol. (2) ± Vdc	Flow sccm	Nom. Vdc	Tol. (2) ± Vdc
200	5.00	0.15	30	3.75	0.70	2.00	5.00	0.15	1000	5.00	0.15
175	4.80	0.16	20	2.90	0.45	1.75	4.59	0.15	900	4.90	0.16
150	4.50	0.17	10	1.95	0.20	1.50	4.16	0.16	800	4.80	0.17
125	4.17	0.18	5	1.50	0.07	1.25	3.70	0.20	700	4.66	0.18
100	3.75	0.19	4	1.40	0.08	1.00	3.25	0.22	600	4.42	0.19
75	3.27	0.19	3	1.30	0.08	0.75	2.65	0.22	500	4.18	0.20
50	2.67	0.17	2	1.20	0.07	0.50	2.15	0.19	400	3.82	0.21
25	1.90	0.13	1	1.10	0.06	0.25	1.55	0.11	300	3.41	0.19
0	1.00	0.05	0	1.00	0.05	0.00	1.00	0.08	200	2.96	0.17
									100	2.30	0.14
									0	1.00	0.10

The unique design of the microbridge mass airflow sensor accommodates your special requirements. Custom laser trimming and flow channel dimensioning can conform performance characteristics to specific applications. Please contact your Honeywell sales office for assistance.

MOUNTING DIMENSIONS (for reference only mm/in)



DESCRIPTION

Catalog Listing	Flow Range
AWM3100V	+200 sccm / + 0.2 in H_2O full scale
AWM3150V	+30 sccm / + 1 in H_2O full scale
AWM3200V	+ 60 sccm (± 20 sccm) + 2 in H_2O full scale
AWM3300V	+1000 sccm / 1.3 in (± 0.1 in) H_2O full scale

OUTPUT CONNECTIONS

Pin 1	Output voltage
Pin 2	+ Supply voltage
Pin 3	Ground

Note: Positive flow direction is defined as proceeding into Port 1 (P1) and out of Port 2 (P2), and results in a positive output.

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

For application assistance, current specifications, or name of the nearest Authorized Distributor, contact a nearby sales office. Or call:

1-800-537-6945 USA
1-800-737-3360 Canada
1-815-235-6847 International
FAX
1-815-235-6545 USA
INTERNET
www.honeywell.com/sensing
info.sc@honeywell.com

Honeywell

Automation and Control Products
Honeywell
11 West Spring Street
Freeport, Illinois 61032

www.honeywell.com/sensing

PK 88671-2-EN IL50 GLO 0902 Printed in USA

DataMaster DMT Airflow Sensing Technique

The DMT incorporates a Honeywell AWM3300V mass airflow sensor. It is a device that operates on the theory that airflow directed across the surface of a sensing element causes heat transfer. Output voltage varies in proportion to the mass of air or other gas flowing through a given sensor's inlet and outlet ports.

The AWM3300V has an output voltage of 1Vdc under no airflow conditions and 5Vdc under maximum airflow of 1 liter per minute.

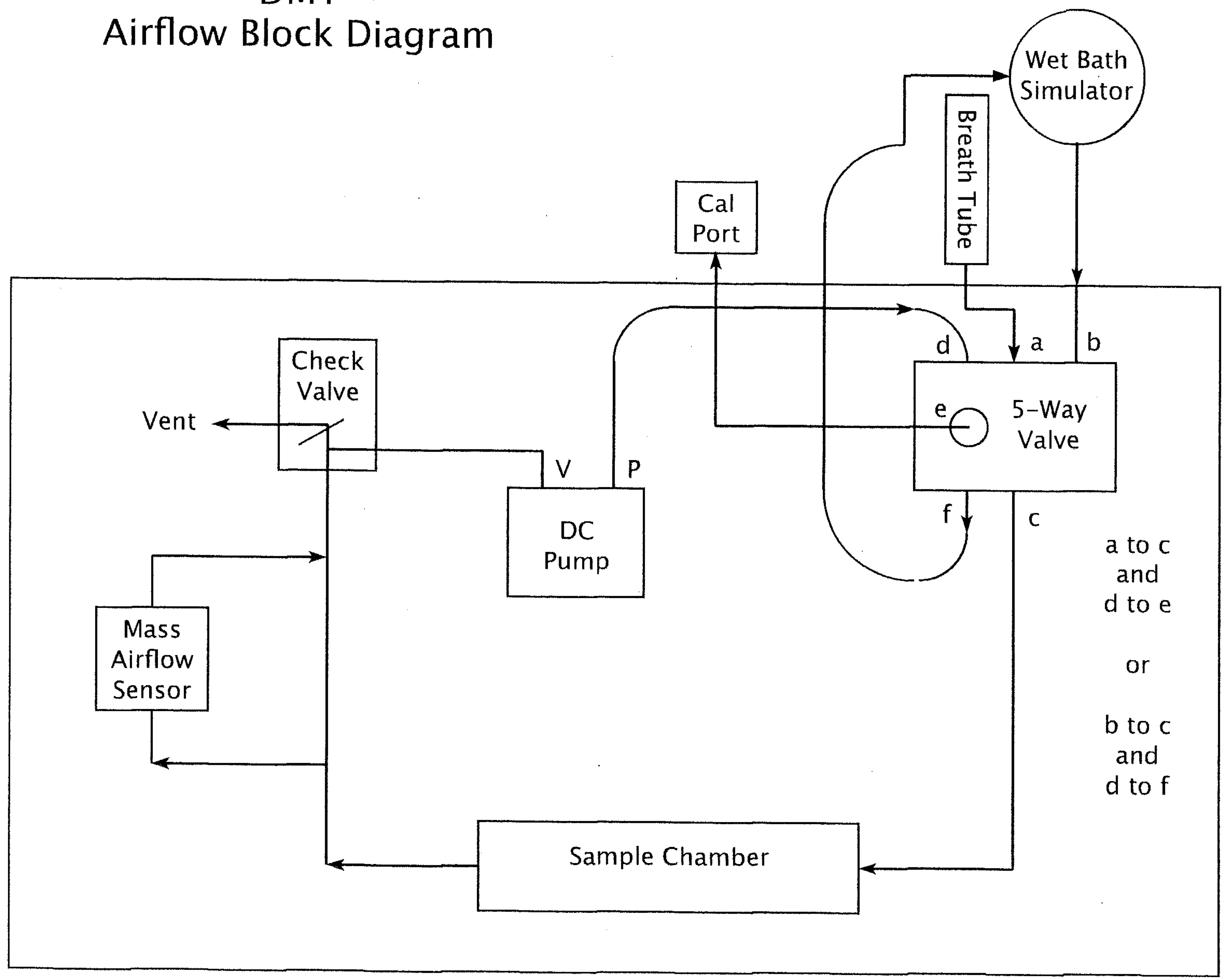
As the airflow through the DMT can exceed flow rates of 30 liters per minute, the airflow through the sensor is scaled down such that when 1 liter per minute is passing through the sensor, approximately 70 liters per minute is passing through the DMT sample chamber.

This scaling down is achieved with a standard bypass system where the flow sensor is configured in a parallel path with the main airflow passage and the connective tubing between the flow sensor ports and the main pathway is a smaller diameter than the tubing in the main pathway.

The instantaneous flow rate through the DMT in liters per minute (y) is calculated by applying the voltage from the airflow sensor (x) to the following formula:

$$y = 2.5263*x^2 + 2.0857*x - 4.5474$$

DMT
Airflow Block Diagram



National Patent Analytical Systems, Inc.

Development Notification Advisory February 9, 2011

To all DMT Users.

Purpose and Scope of this document: The purpose of this communication is to keep DMT users and prospective users abreast of our development work on the DMT Family of Alcohol Breath Analyzers. This document is intended to be advisory in nature only and any users or prospective users who would like to explore further the items noted may contact our development engineering department for more information.

A mandatory change that CSA wants us to implement is the addition of a protective covering for the incoming AC power conductors. This is necessary to maintain our CSA approval even though the instrument was originally approved by CSA without it. This will be implemented on all production DMTs.

The fuel cell analytical system option has entered the final stages of development as the first instruments are out of production and undergoing extensive testing and QC analysis. One area that has undergone modification is the power source to the fuel cell itself that is also a common source to other areas of the electronics. The sensitivity of the signal from the fuel cell has led us to revisit this with an eye toward further decreasing the potential for any noise in this circuit. It is being changed to capacitors of the same value that are more effective with respect to higher frequency noise filtration. This change is also in keeping with our ongoing conversion of this board to fully surface mount technology as the older capacitors are not conducive to this mounting style. Since this change is fully compatible with older instruments, and will be incorporated into all production boards, we are noting that it is one that users may wish to incorporate into older versions of the boards when instruments are down for either maintenance or recertification since the effects of additional noise filtration are beneficial, regardless.

Even though this modification is simple, fast and inexpensive, it does require surface mount equipment to resolder and realizing that our customers are typically not equipped with this technology, we will make converted boards available to all customers for all DMTs regardless of age at no cost. You only need to cycle all boards through us.

There are no accuracy or software implications concerning this change, and there are no implications regarding DOT approvals.

An internal printer has been added to the DMT and will be available in production versions later this year. It is the same printer that is used on the cdm.

John Fusco
President

Po Box 1435, 2090 Harrington Memorial Road Mansfield, Ohio 44901
Phone 1-419-526-6727 Fax 1-419-526-9446

Harnois, Steven

From: Service [service@npas.com]
Sent: Wednesday, March 16, 2011 1:49 PM
To: Bolduc, Amanda
Subject: Bad chip lot number on dmt controller boards

Amanda,

Here is the information on the digital pots on the Controller PCB:

1. The top line of printing on the IC will say X9C102S. That part regardless of good or bad will be the same on all the chips.

2. The second line of printing of the bad lot will say "V002" This is a date of manufacturing code placed at the original factory.

We have NOT found 100% of these particular ones to be bad, but the ones that did fail all came from that same date code range. The only sure-fire way to know was to place the chips on the board and test functionality. This one failing on you is my fault. I apparently missed testing the RFI circuitry when getting them ready to ship after the other updates were performed.

Board designators and their related circuits are listed below:

U7 - Lamp circuit
U8 - Cooler circuit
U18 - Detector Bias Circuit
U27 - Chopper circuit
U34 - RF Detector circuit

Thanks,

Chris