OPERATING INSTRUCTIONS
FOR

FIBEROPTIC

DISPLACEMENT MEASUREMENT SYSTEMS

mDMS, mcDMS and muDMS

Model Serial Nos.

PHILTEC, INC. www.philtec.com

Precision Dynamic Measurements

Description

mDMS ... mini-Displacement Measurement Systems with Type D fiberoptics are microprocessor-based systems for providing linearized outputs of distance using RS-232 protocol. They are comprised of:

- Reflectance Dependent Fiberoptic Light Guides To Develop Analog Input Signals
- Digital Processing Units with storage capacity for 25 calibrations
- RS232 output
- AC/DC Power Supply

Power Requirements
Single Channel:
12 VDC @ 350mA

Power & serial communications are handled via a Y cable that is included with the sensor.

muDMS ... mini-Displacement Measurement Systems with Type D fiberoptics are microprocessor-based systems for providing linearized outputs of distance using USB 2.0 protocol. They are comprised of:

- Reflectance Compensated Fiberoptic Light Guides To Develop Analog Input Signals
- Digital Processing Units with storage capacity for 25 calibrations
- USB output on mini-USB connector
- USB output locking adapter cable, mini-USB to standard USB
- Locking Weathertight Connector with AC/DC Power Supply
- Optional Analog Voltage Outputs on BNC Connectors

Power Requirements
Single Channel: 12 VDC @ 350mA

Optional Analog Outputs for muDMS Units

Model muDMS-A

With Option A, muDMS units are provided with two user selectable voltage outputs having a span of 0 to 4.1 volts full scale. These are provided on the BNC connectors labelled A1 and A2 as shown here.

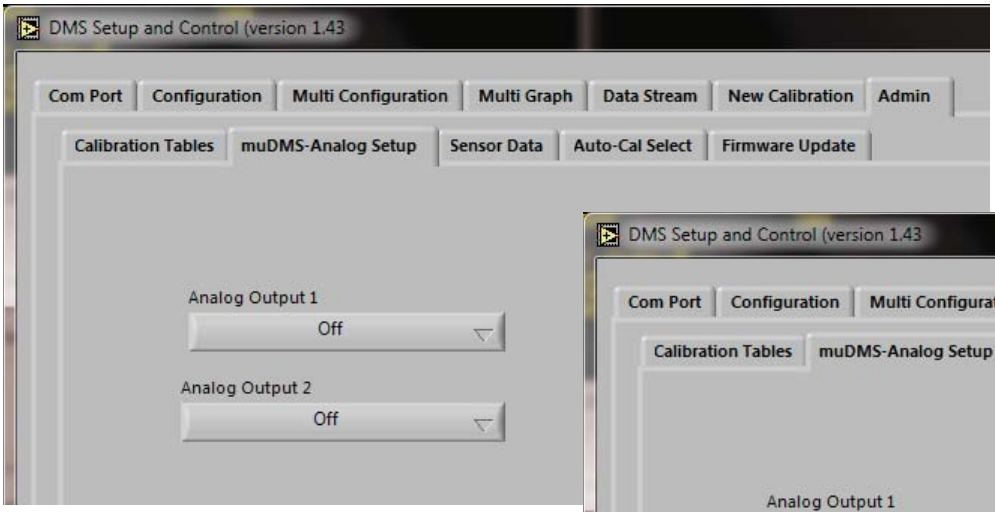
- The sensor runs in USB communication when the DMS Control Software is opened.
- Analog outputs and speed are selected using the Control Software
- Analog outputs turn on when the Control Software is closed.

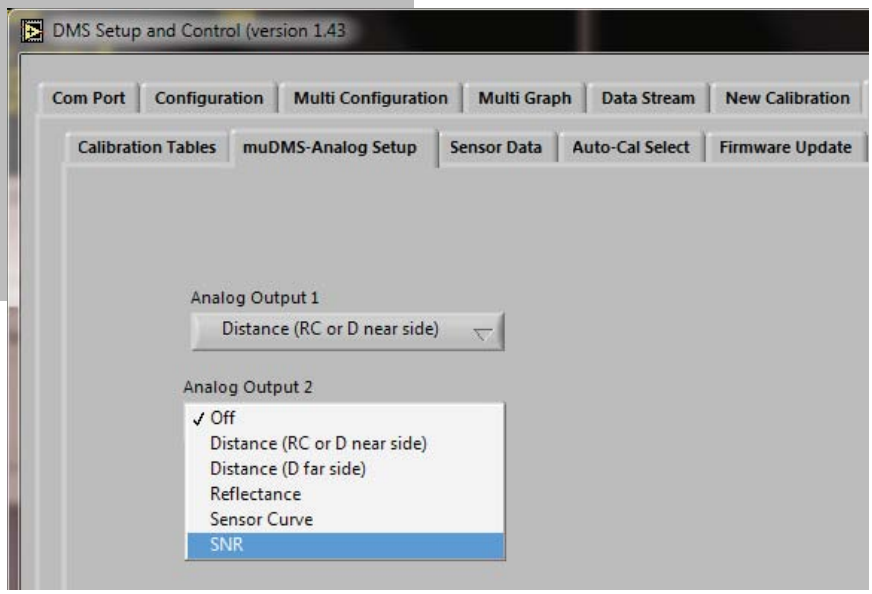
Optional Analog Outputs for muDMS Units
SETUP & CONFIGURATION

Go to the Admin Tab/ muDMS-Analog Setup to setup the analog outputs for measurements.

1. ***Temperature:*** Use the slide controls to set the temperature of the electronics. For best accuracy with slow speed applications, allow the unit to reach steady state temperature prior to making any measurements. This can take 15 - 30 minutes. If the heater is not needed it can be turned off (set to 0) to reduce power consumption.

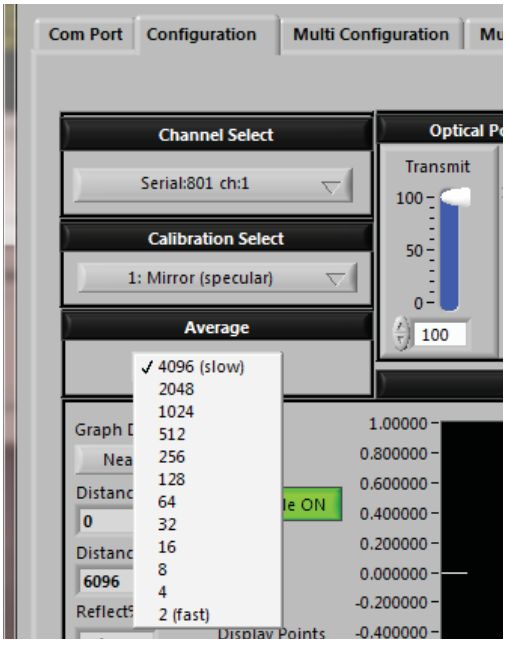
2. The analog outputs are in the Off state by Default***.***





3. Use the drop-down menus to select the analog outputs desired***. Most users will select***

- ***A1 = Distance and***
- ***A2 = SNR***



4. Return to the **Config Tab** and select the speed for the analog outputs**.** At the fastest speed selector (2), the analog outputs will run at 2000 samples per second when both are chosen. If only one analog output is active, it will run at 5000 samples per second at the fastest speed selector.

At 4096 averages, the analog bandwidth is 2.5 samples per second.

5. Return to the Com Port Tab and close the com port to activate the analog outputs.

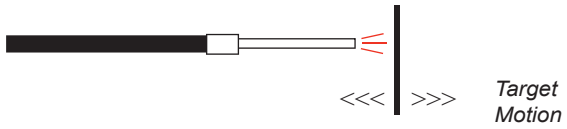
Note: Reopening the com port will stop the analog outputs.

IMPORTANT:

1. Sensor tips and fiberoptic cables are provided in a variety of sizes and materials, some of which are rugged and others which are very fragile. It is important to handle sensor tips and cables with care, as they are not subject to warranty if damaged.

2. Always ensure that the sensor tip, target area and optical path are clear and clean. Accurate motion amplitude measurements are dependent upon the precise reflection of rays of light from target surfaces. Lint, dirt, or debris particles can obstruct, diffract or reflect light rays in unpredictable directions, thereby compromising the achievable accuracy of these devices. Sensor tips can be cleaned with alcohol and a soft cloth or tissue.

D Type Sensors are recommended when the target moves along the axis of the sensor; i.e., single axis vibration where the target reflectivity is constant.



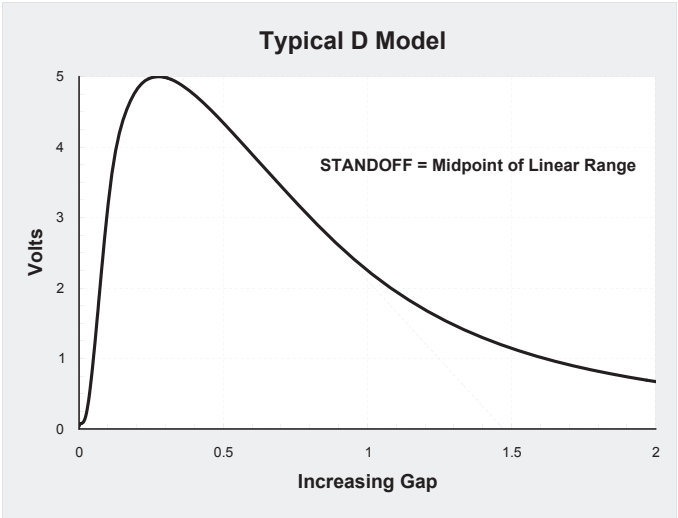
OPERATING PRINCIPLE

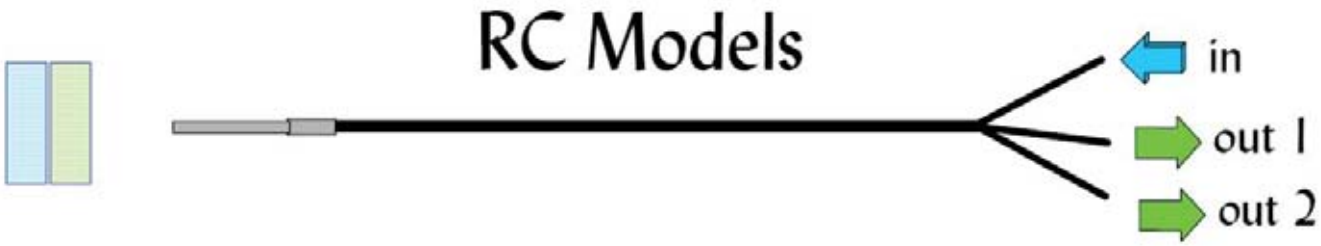
Philtec uses glass fibers in all of its sensors. The fiber optic cable is bifurcated inside the sensor, where one glass fiber bundle is used to deliver light to the target, and the other receives light reflected back from the target. The two bundles are mixed randomly in the tip of the probe for most D models. The model D171 uses two half moon shaped bundles arranged side-by-side.

The intensity of the reflected light is precisely measured and compared to stored calibration data with 24 bit resolution.

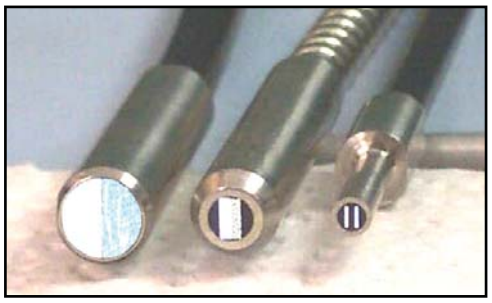
The return signal intensity varies with distance to the target and also with target reflectance variations. Therefore, these devices are most commonly used where the target reflectance remains fixed, such as in single axis stroke, displacement or vibration parallel to the axis of the sensor. Precise scaling of the reflectance dependent signal amplitude is accomplished by capturing and setting the optical peak power level with the DMS.

D type sensors provide an output proportional to distance and reflectance of the target. The output function is double-valued: Near Side operation gives highest resolution; Far Side operation gives moderate sensitivity with larger operating range.





RC OPERATING PRINCIPLE. One fiber bundle sends light to the target, two other bundles receive light reflected back from the target. The transmit bundle is randomly mixed with one receive bundle in the tip of the probe. The two receive bundles are arranged adjacent to one another as shown here. The light intensity in the two receivers are processed ratiometrically in the DMS, compared with 24 bit resolution to stored calibration data. This ratiometric function provides the distance measure which is independent of target reflectance variations; i.e., **reflectance compensated.**



IMPORTANT:

Always ensure that the sensor tip, target area and optical path are clear and clean. Accurate motion amplitude measurements are dependent upon the precise reflection of rays of light from target surfaces. Lint, dirt, or debris particles can obstruct, diffract or reflect light rays in unpredictable directions, thereby compromising the achievable accuracy of these devices. Sensor tips can be cleaned with alcohol and a soft cloth or tissue.

SENSOR TIP FIXTURING and ALIGNMENT

1) ALIGN THE SENSOR TIP

RC sensors have adjacent fiber bundles in the face of the sensor. Note there is an alignment flat on the casing to aid with alignment. The flat is ground parallel to the split between the adjacent fiberoptic bundles.

Depending upon the application, there may be a preferred orientation for best performance. For example:

- If the target is cylindrical, it is usually best to mount the sensor with the X axis parallel to the cylindrical axis
- If there is lateral motion, it may be preferrable for the direction of motion to be parallel to the x axis
- The sensor is 10 times more sensitive to tilt about the Y axis than the X axis. If tilt is directional, orient the sensor so that the target pivots about the sensor's X axis.
- If targets are discontinuous, voltage spiking at the leading and trailing edges of the parts will occur when the direction of travel is parallel to the X axis. The voltage spiking is eliminated when the direction of parts travel is parallel to the Y axis.
- For smooth and continuous flat surfaces, sensor tip orientation is not critical.

2) MOUNT THE SENSOR, so that the tip is perpendicular to the target surface.

NOTE: The collar and tip are not necessarily exactly parallel to each other. For factory calibrations the tip is clamped square to the target whenever possible. For best accuracy, clamp to the probe tip and not to the collar.

Calibrations

Two factory calibrations are provided with each sensor channel: a mirrored (specular) target and a dull (diffuse) target. The calibration data is stored on board each sensor in separate calibration tables. Hard copies of each calibration chart are provided under separate enclosure.

Additional calibrations (up to 25) can be stored per channel.

Communication

Communication with sensors is conducted thru RS232 or USB ports. Multiple RS232 units can be daisy-chained together.

The RS232 pins are standard:

From a PC:
Pins 1, 7 & 9 = not connected
Pin 2 = Receiver
Pin 3 = Transmitter
Pins 4, 6 & 8 = connected all together
Pin 5 = Ground

(From the DMS: pin 2 = transmit; pin 3 = receive)

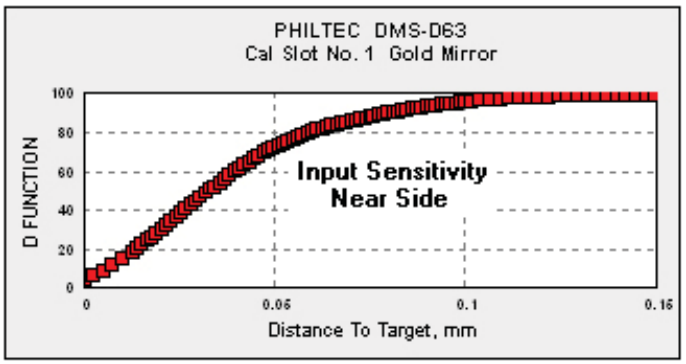
Temperature Stabilization

The amplifier is equipped with a temperature stabilization feature.
Procedure - Apply power to the sensor and allow the amplifier time to reach thermal equilibrium, about ½ hour or more. Increase the Set Temperature 2 - 3 degrees above the equilibrium temperature. The amplifier temperature will be maintained at the set temperature ± 0.1 °C.

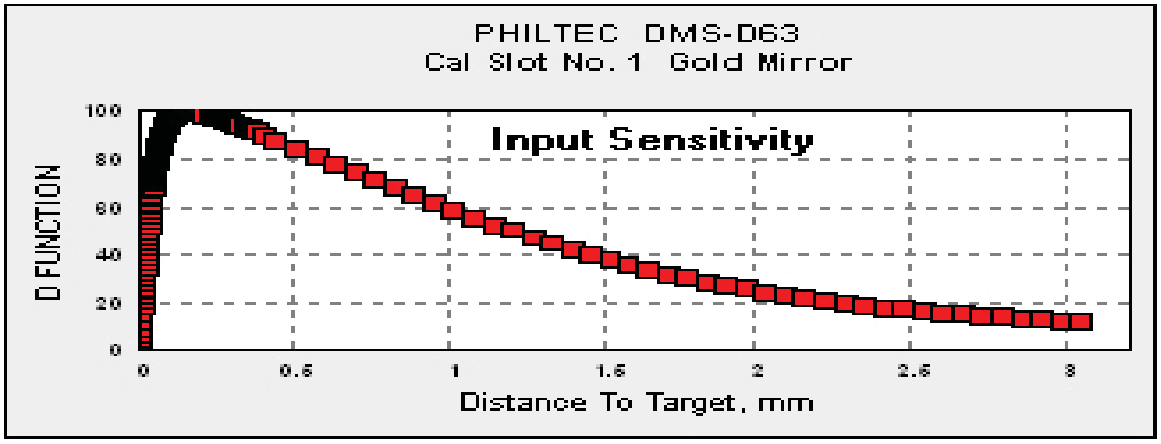
Notes:
1. If the amplifier temperature creeps above the set temperature by more than 0.1 degree, further increase the set temperature to reach a stable and controllable temperature set point.
2. This heater circuit has limited heat flow capacity. If the active temperature drops below the set temperature, which may happen when the ambient temperature drops significantly, reset the control to 2-3 degrees above the lowered equilibrium temperature.
3. The sensor should be kept thermally isolated from its mounting base.

OPERATING RANGES AND GAPS

Calibration data is stored on-board each sensor. This means the sensor can be gapped for measurements anywhere within the sensor's total operating range.



As with all type D fiberoptics, optimum performance is achieved where signal-to-noise is greatest; i.e., where the D function has the steepest slope (greatest sensitivity). A sensitivity chart is included with every sensor calibration showing its D function vs. Distance. When optimum performance is desired, refer to that chart to determine the optimum gap settings.

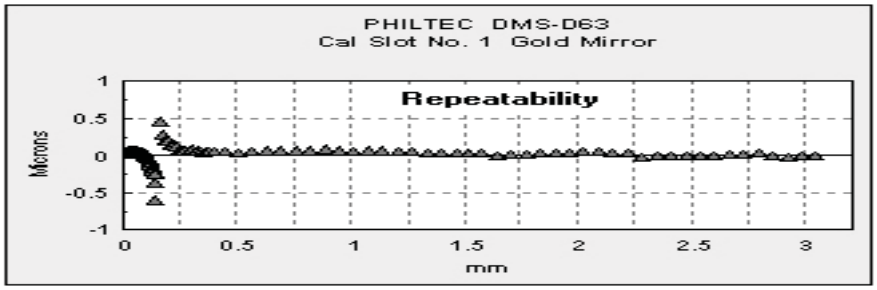


FACTORY CALIBRATIONS AND ACCURACY

Each sensor is been calibrated using a 0.2 micron accuracy linear air bearing stage.

Procedure

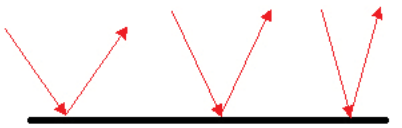
1. Mount the target on the stage table.
2. Mount the sensor off the stage table. The target moves during calibration. The sensor is stationary.
3. Begin with the sensor making light contact with the target.
4. Move the stage with target away from the sensor in small steps covering the total operating range.
5. After each step move, a) the stage position is read from the stage encoder and b) the sensor outputs are read. These two data are stored in the designated calibration slot.
6. Then, without disturbing the setup, the stage is moved back to its original position using the same steps. This time, the stage position is read from the sensor at each calibration step.
7. Repeatability is a measure of the accuracy of the sensor. A chart is prepared for each sensor calibration, where the repeatability data is graphed over the sensor's operating range. These charts graph the difference between the stored calibration (data moving away from the sensor) and the read data on the return moves.



REFLECTIVE NATURE OF THE TARGET SURFACE

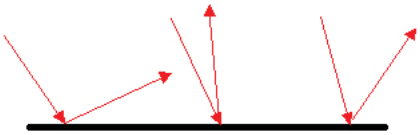
1. Specular Targets...*A mirror surface calibration should be used when making measurements to mirrored surfaces.*

A factory supplied calibration to a specular target is stored in cal slot #1, where the target is a front surface mirror.This calibration should be used if the target surface is any highly polished, mirrored, glossy or very shiny (specular) target. Thin transparent materials require their own calibration, which should be stored in a separate slot.


SPECULAR REFLECTION

2. Diffuse Targets... The surface looks dull rather than shiny. *A diffuse surface calibration should be used when making measurements to diffuse surfaces.*

A factory supplied calibration to a diffuse reflector is stored in cal slot #2, where the target surface is anodized aluminum. With diffuse surfaces, reflected light rays travel randomly varying path lengths back into the sensor tip. Reflectance compensation does not correct for random scattering of light rays, which can lead to measurement errors.


DIFFUSE REFLECTION

So, for diffuse target surfaces, which include anything with a dull, flat or matte finish, as well as those with machined, honed or ground finishes:

- Use the diffuse calibration or
- Calibrate the system to the target material and store in a separate cal slot.

MATERIAL	% REFLECTANCE
Gold Mirror	**100**
Mirror Polished Aluminum	**85 - 90**
Mirror Polished Stls Stl	**60 - 70**
Brushed Aluminum	**40 - 50**
Copper Clad PC Board	**45**
Finely Ground Steel	**30 - 35**
Anodized Aluminum	**20 - 25**
Silver Paint, Glossy	**15 - 20**
Photo Paper, High Gloss	**15**
inkjet Paper, Bright White	**7 - 8**
Fiberglass, Glossy	**7**
Black Plastic, Glossy	**6**
Black Matte Finish	**3**
Column of Water	**2**
Flat Black Rubber	**1**

The table here shows the relative reflectance of some common materials.

Operation

1. ***Apply power to the sensor***.

2. ***Load into PC & Execute*** the DMS Control Software provided. The sensors will first go thru an initialization routine. During this process, in addition to many other checks, the software reads and copies all of the calibration tables from the sensor.

3. ***Allow the sensors time to reach thermal equilibrium,*** app. 20 minutes. For example, in a factory environment, where the air temperature has been around 24 C, the sensor temperatures rise to about 32 C. Therefore, the heater controls should be set to 2-3° C higher in each sensor. They are very stable at this set point.

NOTE: The temperature set point may require higher or lower set temperatures depending upon the factory temperatures in winter and summer months.

The Set Temperature should be 2 - 3 degrees above the equilibrium temperature. The amplifier temperature will be maintained at the set temperature ± 0.1 °C. If the amplifier temperature creeps above or below the set temperature by more than 0.1 degree, change the set temperature to reach a stable temperature set point.

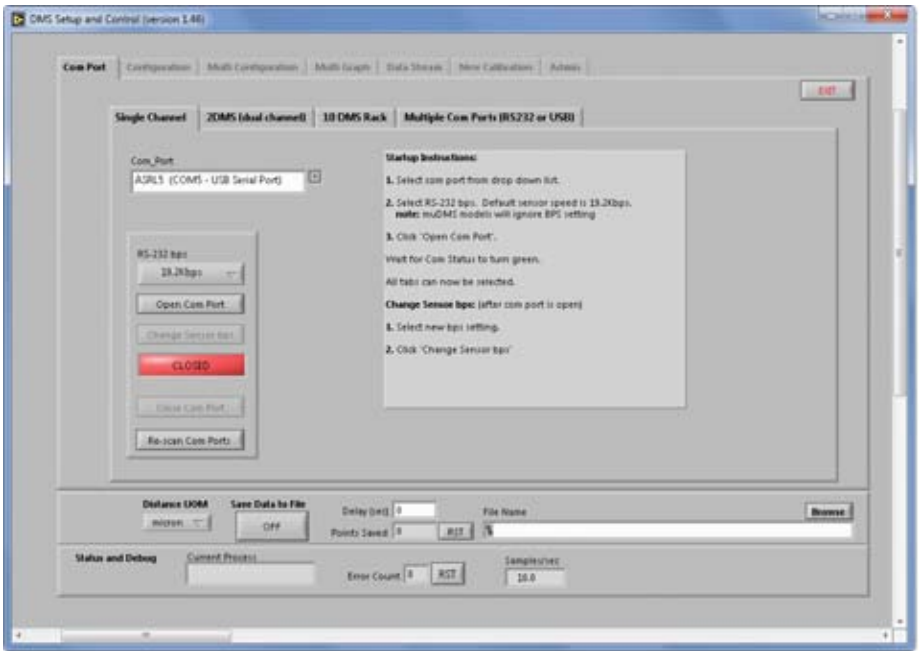
4. The sensors are now ready to make measurements.

DMS Control Software

The DMS Control Software opens at the **Com Port** tab.

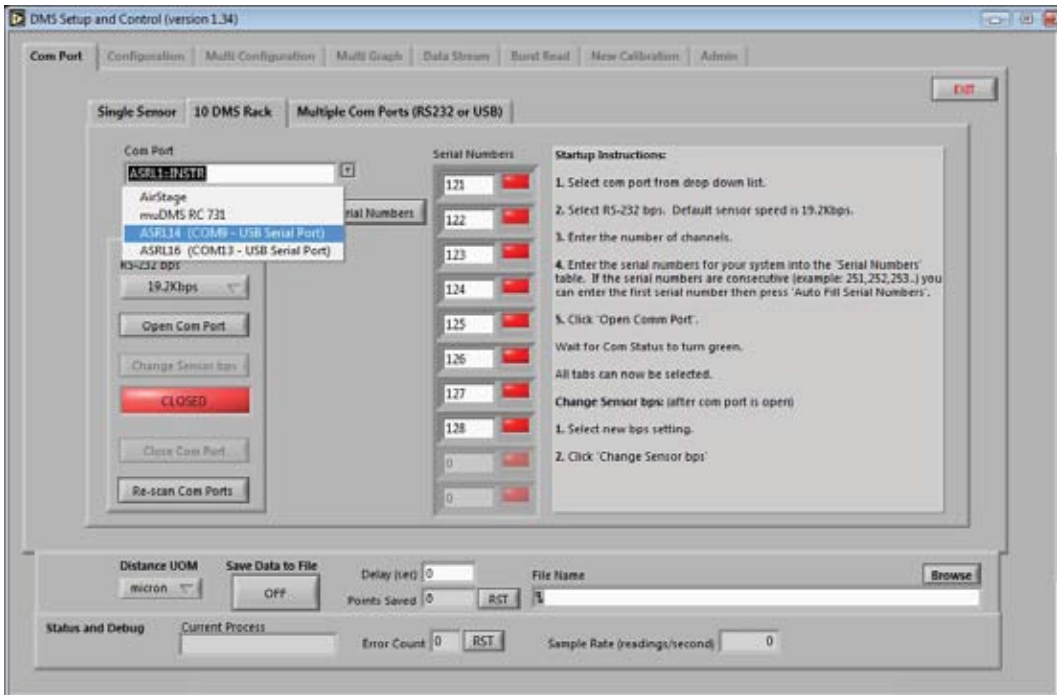
Opening One Sensor

1. To open a single sensor, go to “Single Channel” tab and
For RS232 sensors, select the com port from the drop down list.
For USB sensors, find the sensor serial number from the drop down list.
2. Click Open Com Port



Opening Multiple RS232 Sensors on One Com Port

1. At the **"10DMS Rack"** tab select the com port from the drop down list.
2. At "Number of Channels, enter the number of sensors to open.
3. Enter the sensor serial numbers
4. Click Open Com Port

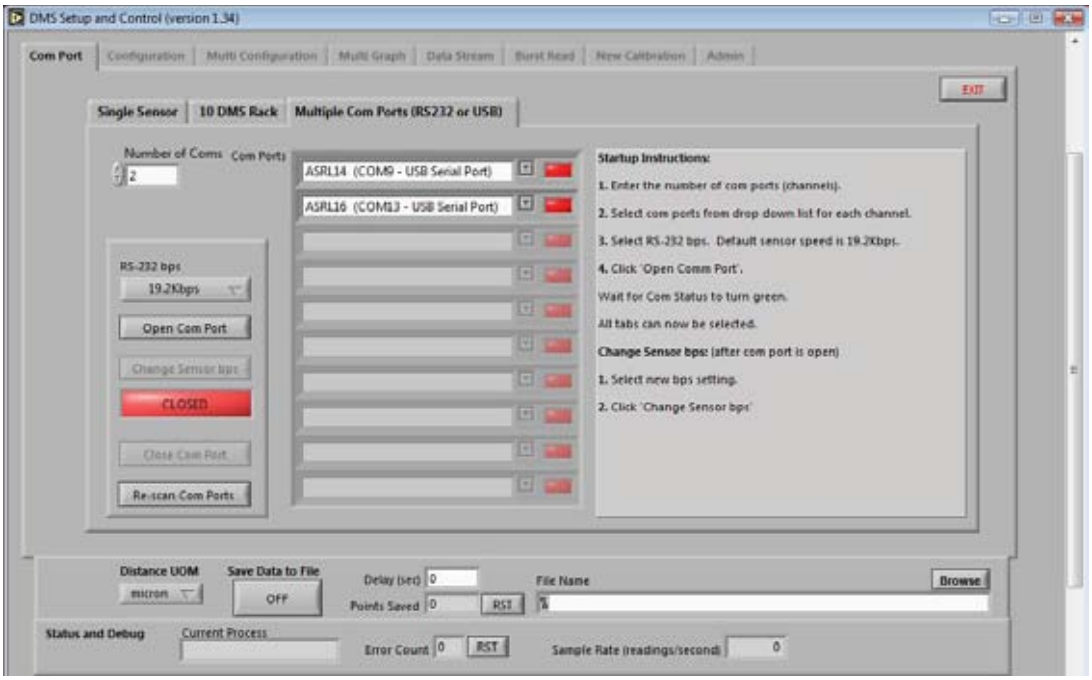


Opening Multiple Sensors on Multiple Com Ports

1. At the **"Multiple Com Ports"** tab enter the number of com ports to open.
2. At "***Com Ports***", in each open window, select a port from the drop down list.
3. Click Open Com Port

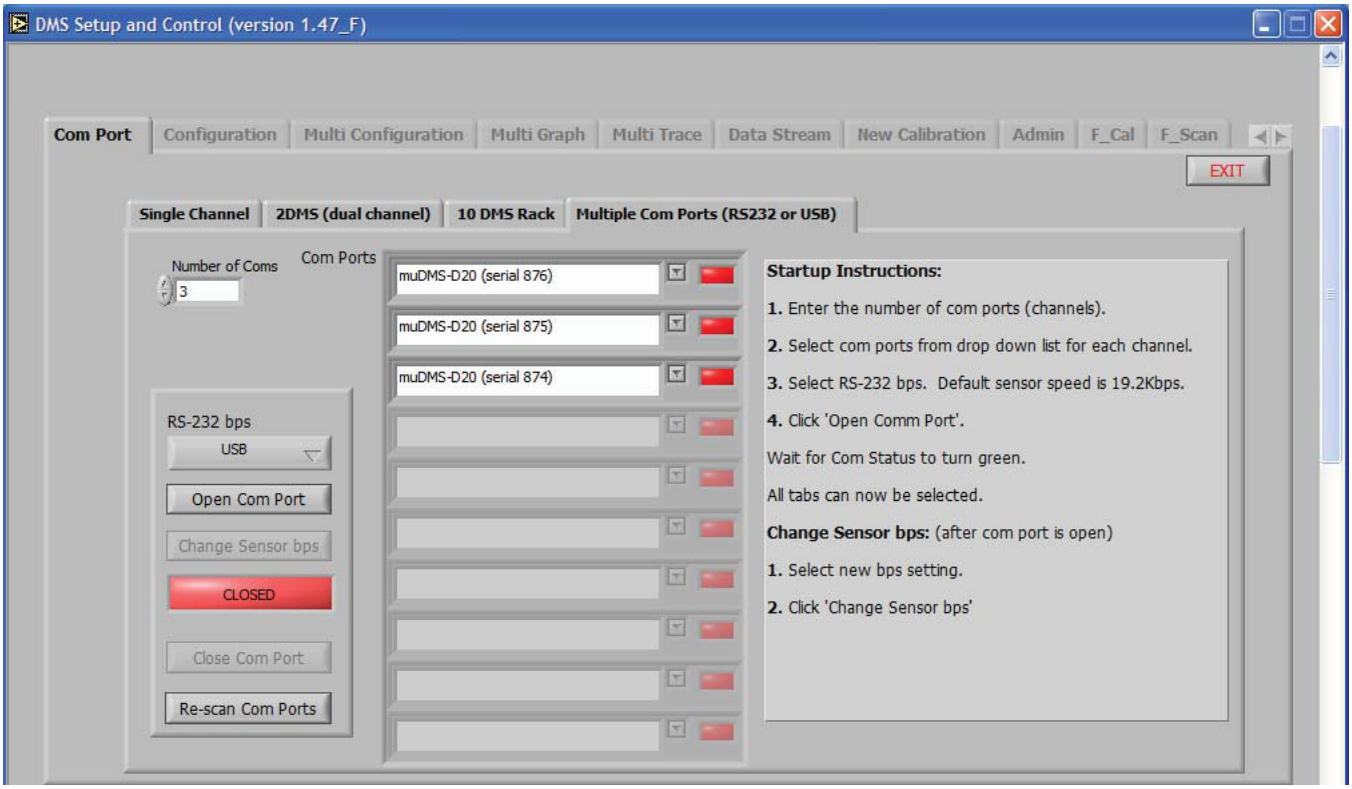
NOTE

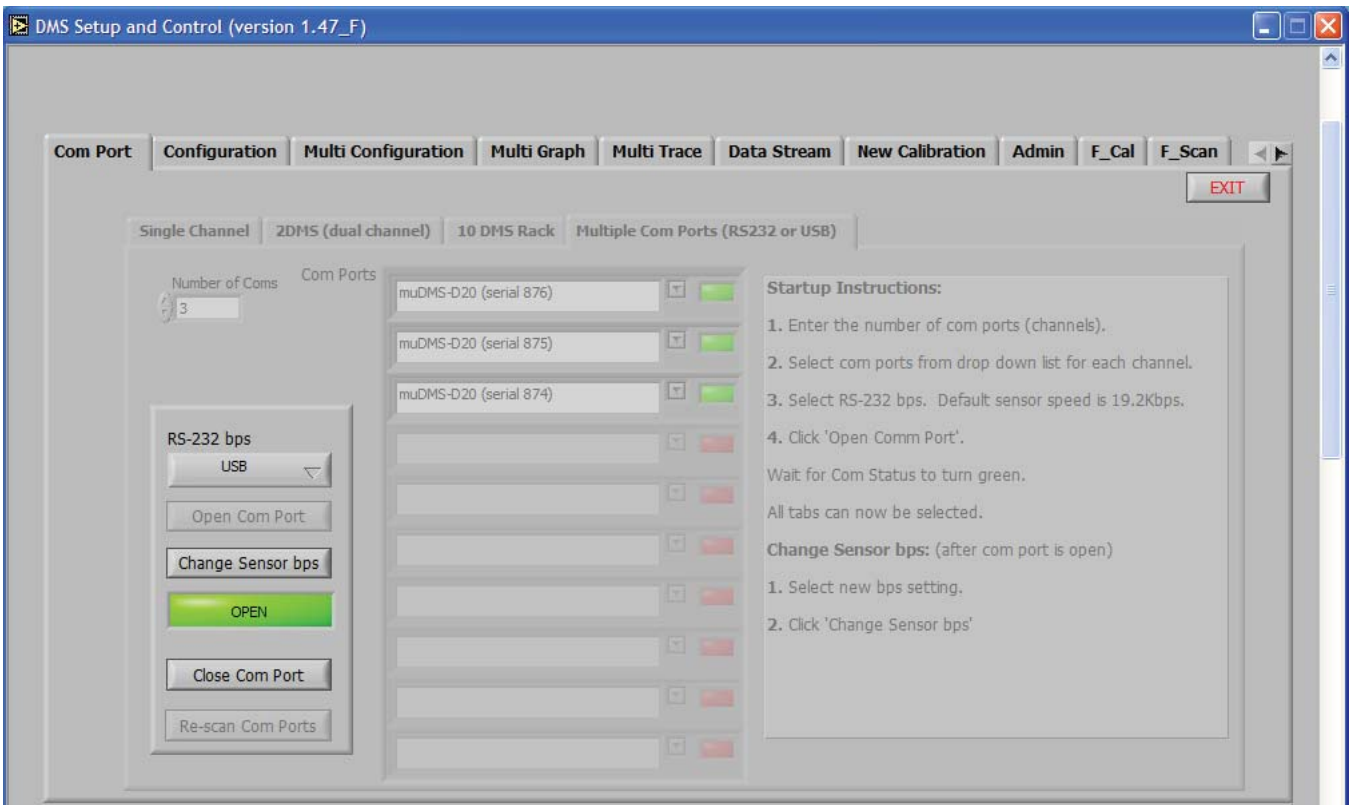
Each com port can only open one sensor in this mode.



Opening Multiple USB Sensors on One USB Port

1. Any standard USB Hub can be used to multiplex USB sensors thru one USB port.
2. At “Number of Channels, enter the number of sensors to open.
3. Enter the sensor serial numbers
4. At RS232 bps select USB
5. Click Open Com Port. All green lights indicate the sensors are communicating with the PC.





SETUP & CONFIGURATION

Use the Configuration Tab to setup the sensor for measurements. The sensor should be fixtured in place perpendicular to the target to be measured. *Click the Title Bar of each section for instructions.*

NOTE:

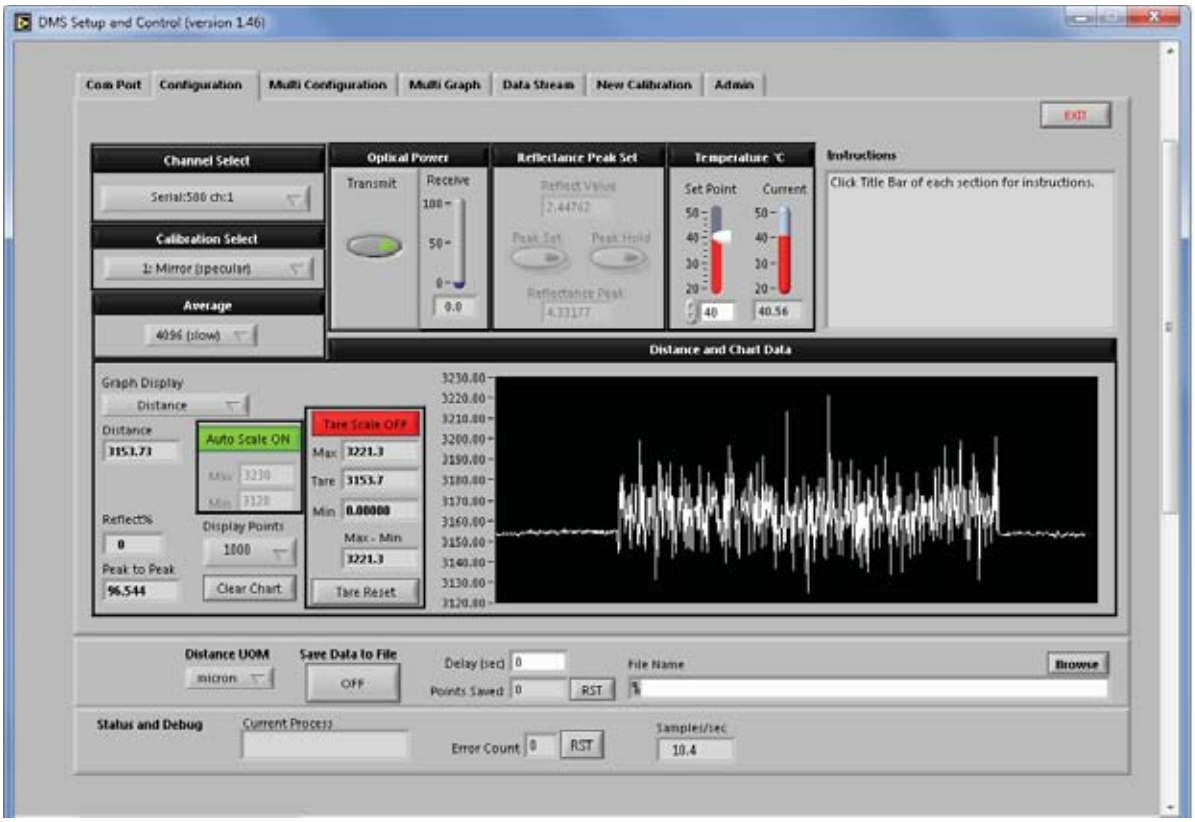
The software will recognize the type sensor. If the sensor is a RC type, the Reflectance Peak Set block will be locked out. The Reflectance Peak Set block becomes active when the sensor selected is a D type.

1. ***Temperature:*** Use the slide controls to set the temperature of the electronics. For best accuracy with slow speed applications, allow the unit to reach steady state temperature prior to making any measurements. This can take 15 - 30 minutes. If the heater is not needed it can be turned off (set to 0) to reduce power consumption.

2. ***Channel Select***: select the sensor channel or the sensor serial number.

3. Calibration Select: choose the appropriate calibration data table for the target to be measured.

4. ***Optical Power* :..** read *Receive Power.* Most applications will run with 100% transmit power. Move the sensor thru its operating range and note the highest Receive Power**.** For mDMS and mcDMS units the LED power is adjustable in 4 steps: 0, 33, 66 & 100. For muDMS units the LED power is continuously adjustable. The sensor will function normally with 1% or higher signal power.



5. For D models: ***Reflectance Peak Set:*** With the optical peak power maximized at step 3, the sensor must be scaled (calibrated) to the reflectance of the target to be measured. There are two methods:

- Manual - Adjust the sensor gap for maximum 'Reflect Value' and press 'Peak Set'. This will lock in the reflectance value in the 'Reflectance Peak' window.

- AutoPeak - Press 'Peak Hold' and move the sensor tip slowly thru the peak reflectance value. The reflectance peak will be captured and held in the 'Reflectance Peak' window.

6. After setting the reflectance peak value, reset the operating gap to the desired starting point for measurements.

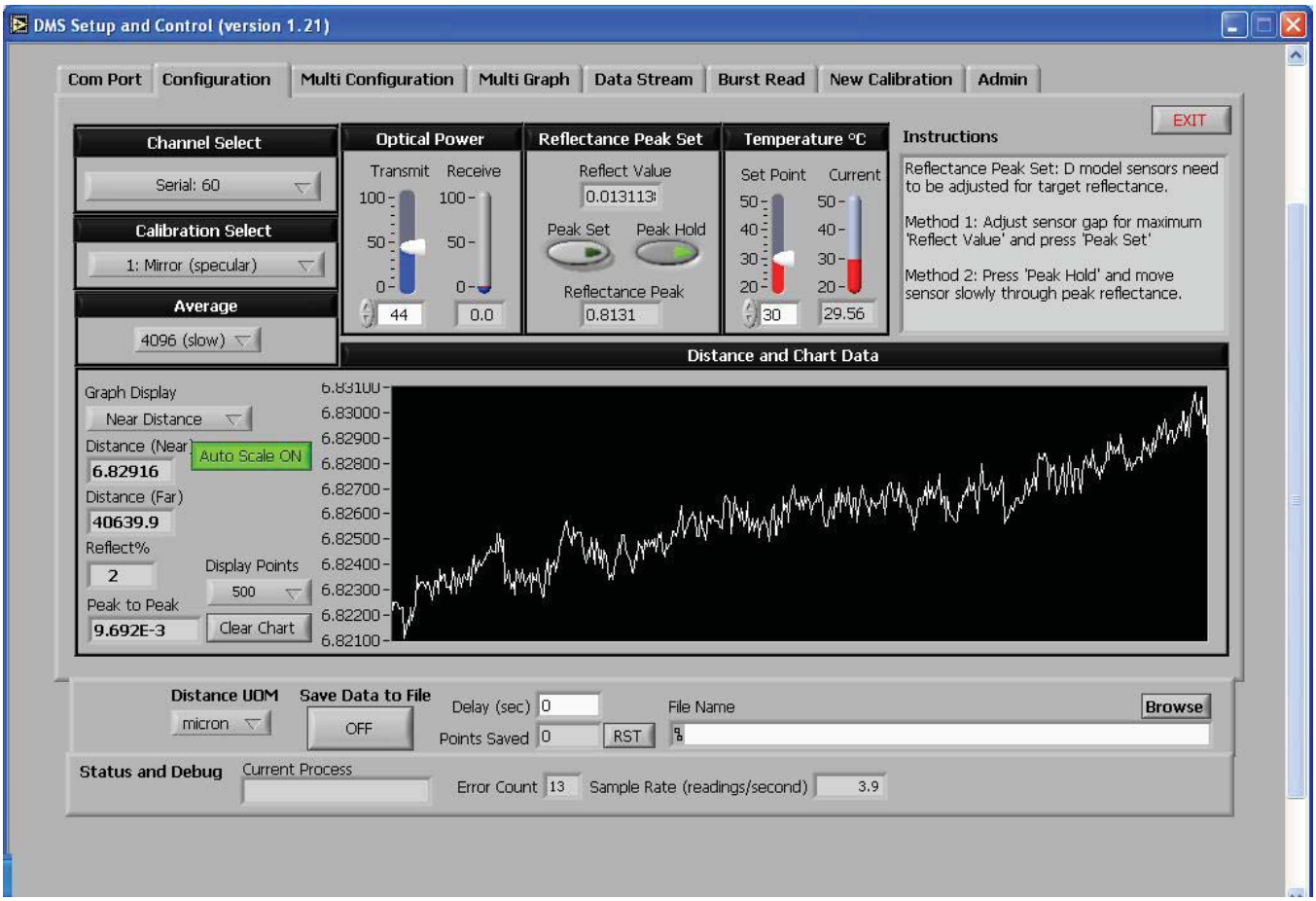


Chart Data

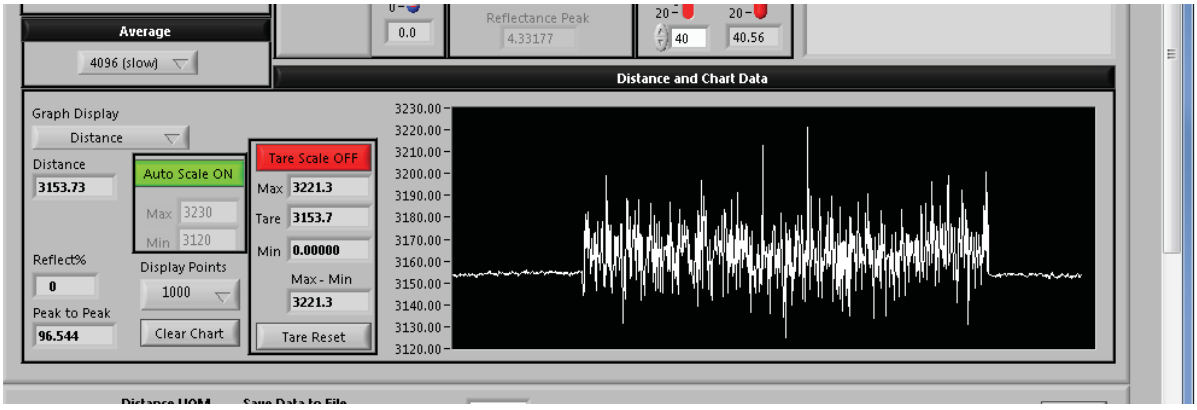
This live graph displays data with selectable point density from 50 - 4000 points on an autoscaling chart.

AUTOSCALING

The chart can be cleared at any time and it will restart autoscaling the current input data. Autoscaling can be turned off at any time. When autoscaling is off, the minimum and maximum points are displayed. The user can enter any value in the min-max windows.

PEAK-TO-PEAK

Peak-to-peak displays the difference between the maximum and the minimum value of the points displayed on the live chart. If 50 points are displayed, this is the pk-pk reading of 50 points. If 4000 points are displayed, it is the pk-pk reading of 4,000 points. If the chart is reset this value resets.



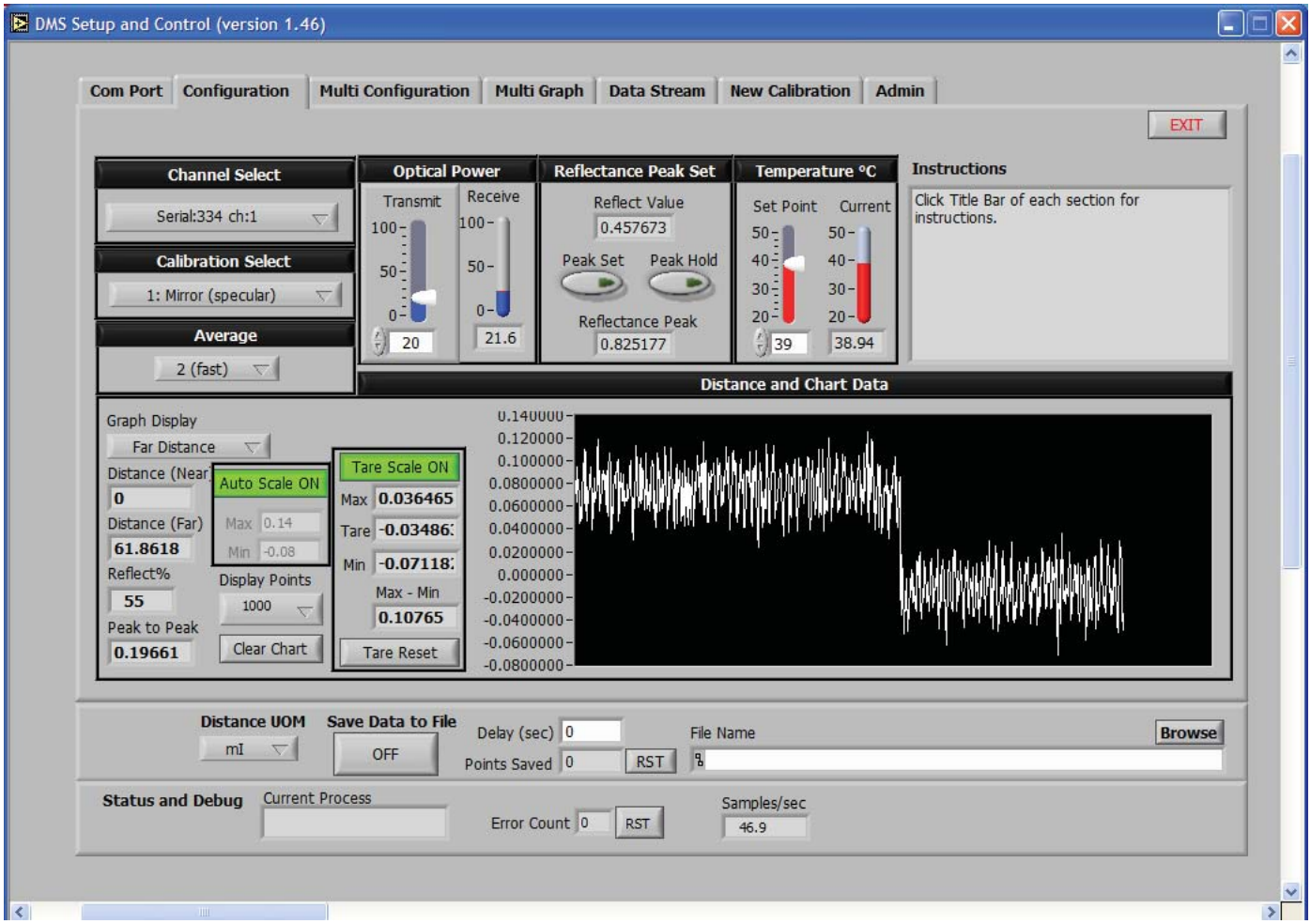
TARED READINGS

A Tare Function is included in the Live Chart Display.

- In the TARE WINDOW click ‘Tare Reset’ to activate tared readings.
- With Tare Scale ON, the live chart displays the tared values.
- With Tare Scale OFF, the live chart displays the untared values.
- The Tare Window displays the Maximum and Minimum tared values as well as the Max.-Min. difference (pk-pk tared reading).
-

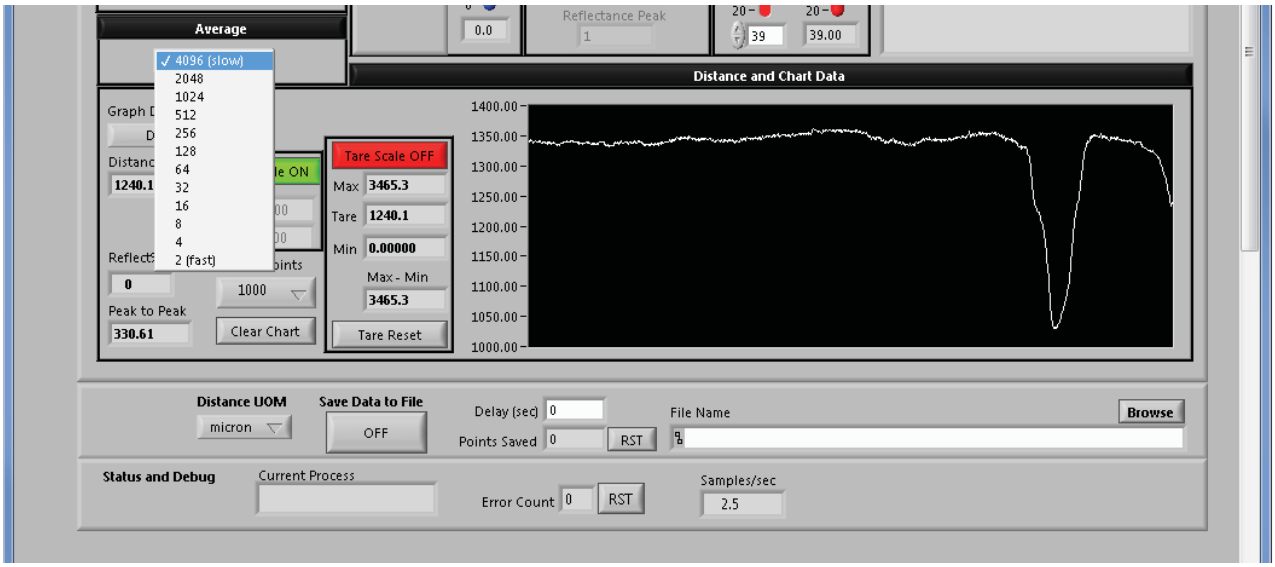
Max - Min is the pk-pk value of the tared readings. This value holds until the tare is reset.

Note: *Tare Reset can onlt be done at the Configuration Tab.*



AVERAGE

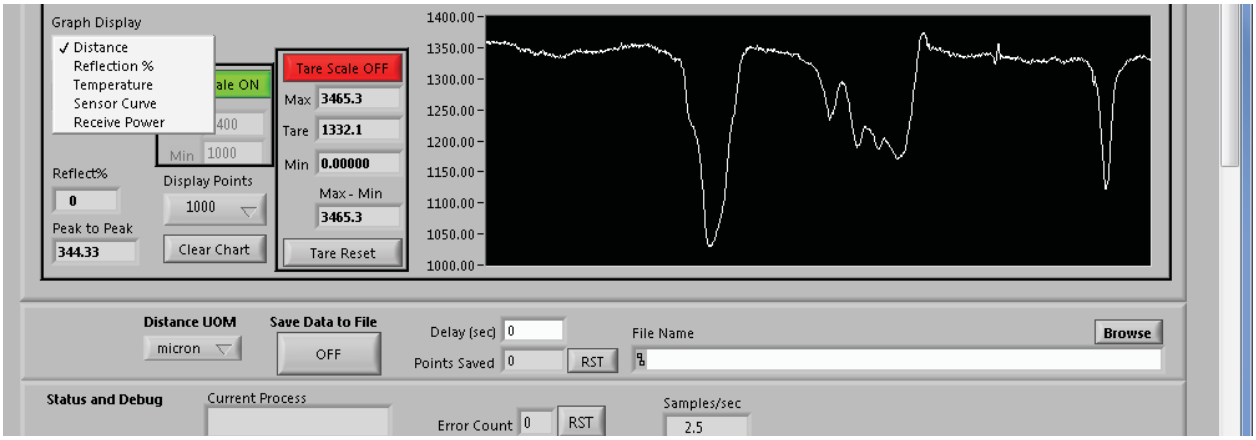
All DMS sensors have an internal sampling rate of 10 KHz. The average filter controls how many readings the sensor will average together before sending the results to the serial port. Higher averages will slow down sensor response and increase resolution. The actual sample rate (readings/second) is displayed below the live chart. The maximum achievable data rate is limited by the serial connection. At the slowest speed (4096), the sample rate is approximately 0.4 seconds per data point. At the fastest speed (2), the sample rate is 200 microseconds per point. For the very highest speed, use the Data Stream tab.



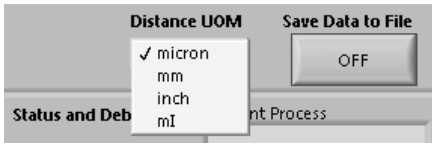
GRAPH DISPLAY

At Graph Display, select one parameter to chart from the drop-down list:

- Distance - select units of measure at Distance UOM*
- Reflection % -compares the target material to the reflectivity of the calibration table selected
- Temperature - sensor amplifier temperature, °C
- Sensor Curve - raw sensor curve generally used for factory diagnostics
- Receive Power - the amount of optical power received from a target



* Select Distance UOM (*Units of Measure)*:
microns or mm (millimeters), or inch or mI (milliInches)



SAVING DATA TO FILE

There is a common interface at each tab for saving data to a file. Click **Browse** to name a data file. NOTE: *Use the file extension (.txt)*. Use Excel to open the text file.

- **Delay** - dial in the number of seconds desired between data points. Default = 0 seconds
- **ON/OFF** - Click the OFF button to start taking data. The button state will change to ON. The # of points saved is accumulated in the *Points Saved* window. Click the ON button to stop recording data. The button state will change to OFF. Data collection can be restarted by pressing the ON/OFF button again, and the data will be added to the same data file.

The table below shows a sample of the data recorded. Note the column headings give the sensor serial number and channel number.

- Time Stamp - An absolute time stamp: the # days starting 01/01/2000
- Delta T - The amount of time between successive data points, accurate to approx. 1 microsecond
- Raw Sensor Output - A factory diagnostic
- Signal Power - % Optical Power returned from the target
- Temperature - Amplifier temperature, °C
- RC/D Near Distance - Distance for an RC sensor or the Near Side for a D sensor
  units of measure = previous set from live graph
- D Far Side Distance - Distance on the Far Side for a D sensor
  units of measure = previous set from live graph
- Reflect Percent - reflectivity of the target material compared to the calibration table selected

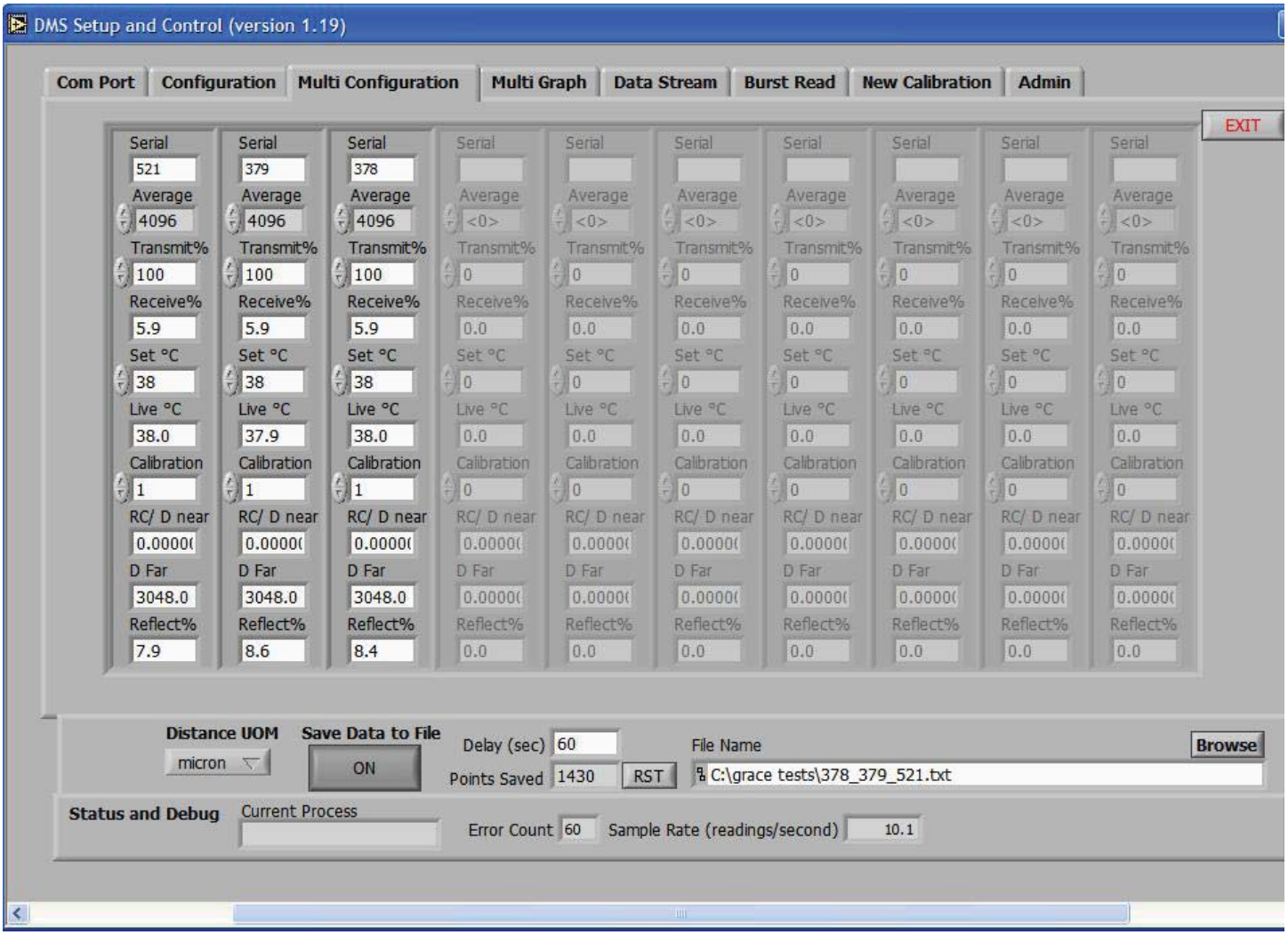
Note: Time stamping data points enables post processing applications such as fft analysis.

start:1/1/2000	679 / 1	679 / 1	679 / 1	679 / 1	679 / 1	679 / 1	679 / 1
Time Stamp (days)	Delta T (sec)	Raw Sensor Output	Signal Power	Temperature	RC/D near Distance	D far side Distance	Reflect Percent
3092.415247	0.019584	3.630522	10.588235	27.75	3175	0	69.230766
3092.415258	0.017856	3.630842	10.588235	27.75	3175	0	69.230766
3092.415317	0.021408	3.631108	10.588235	27.8125	3175	0	69.230766
3092.415318	0.018912	3.63085	10.588235	27.8125	3175	0	69.230766
3092.41533	0.021936	3.630989	10.588235	27.75	3175	0	69.230766
3092.415341	0.019872	3.631088	10.588235	27.8125	3175	0	69.230766

MULTI-CHANNEL CONFIGURATION

The ***Multi Configuration*** tab simultaneously displays data from as many as 10 sensor channels. For single channel units, only one column is active. At this tab you can control or set the following individual sensor variables:

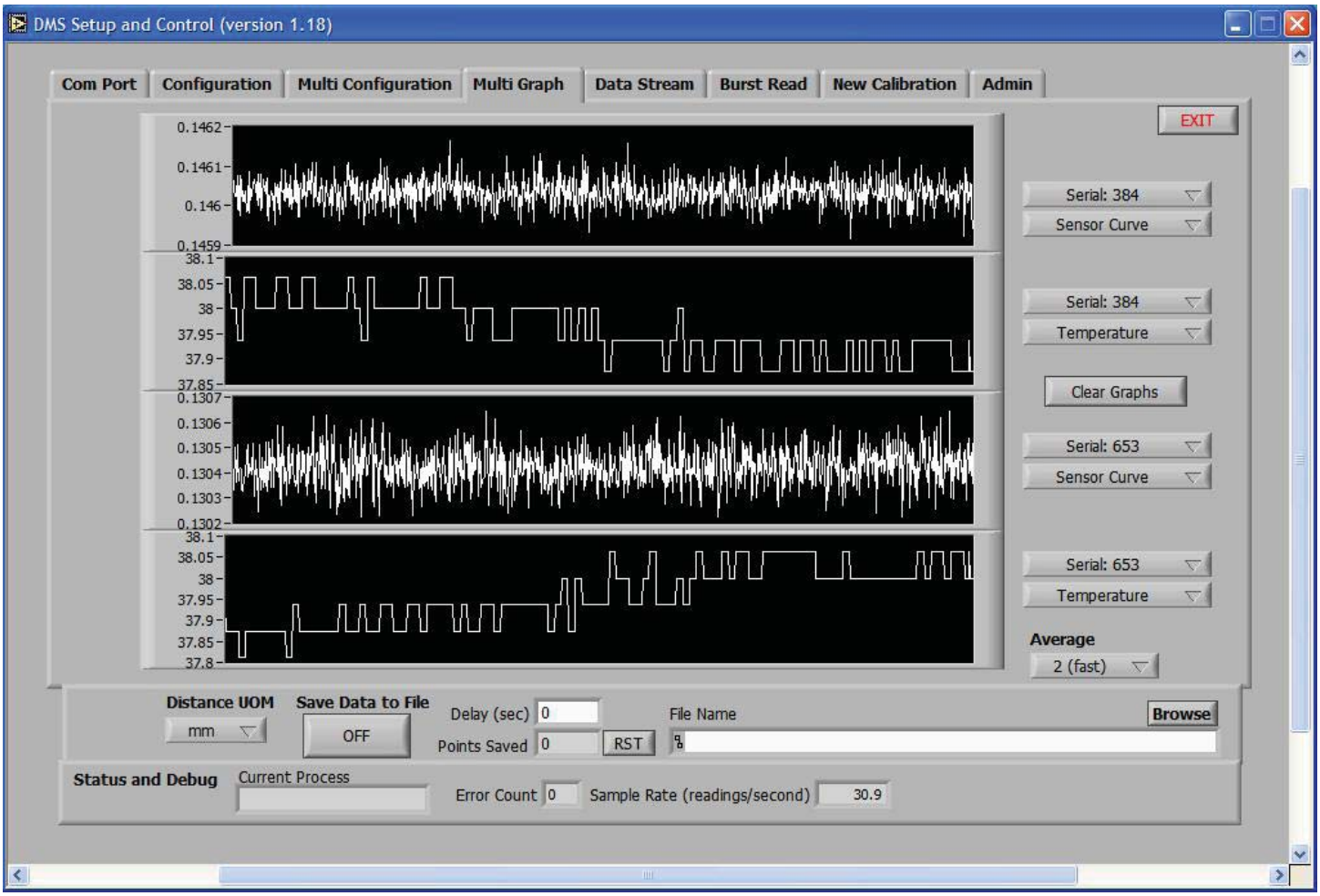
- data average
- transmit power
- amplifier set temperature
- calibration slot



MULTI-CHANNEL GRAPH

The ***Multi Graph*** tab simultaneously displays four live autoscaling charts.. The charts display 1000 points when fully loaded. Data averaging can be controlled and units of measure selected.

Each chart has drop down menus for
» selection of sensor
» selection of displayed parameter



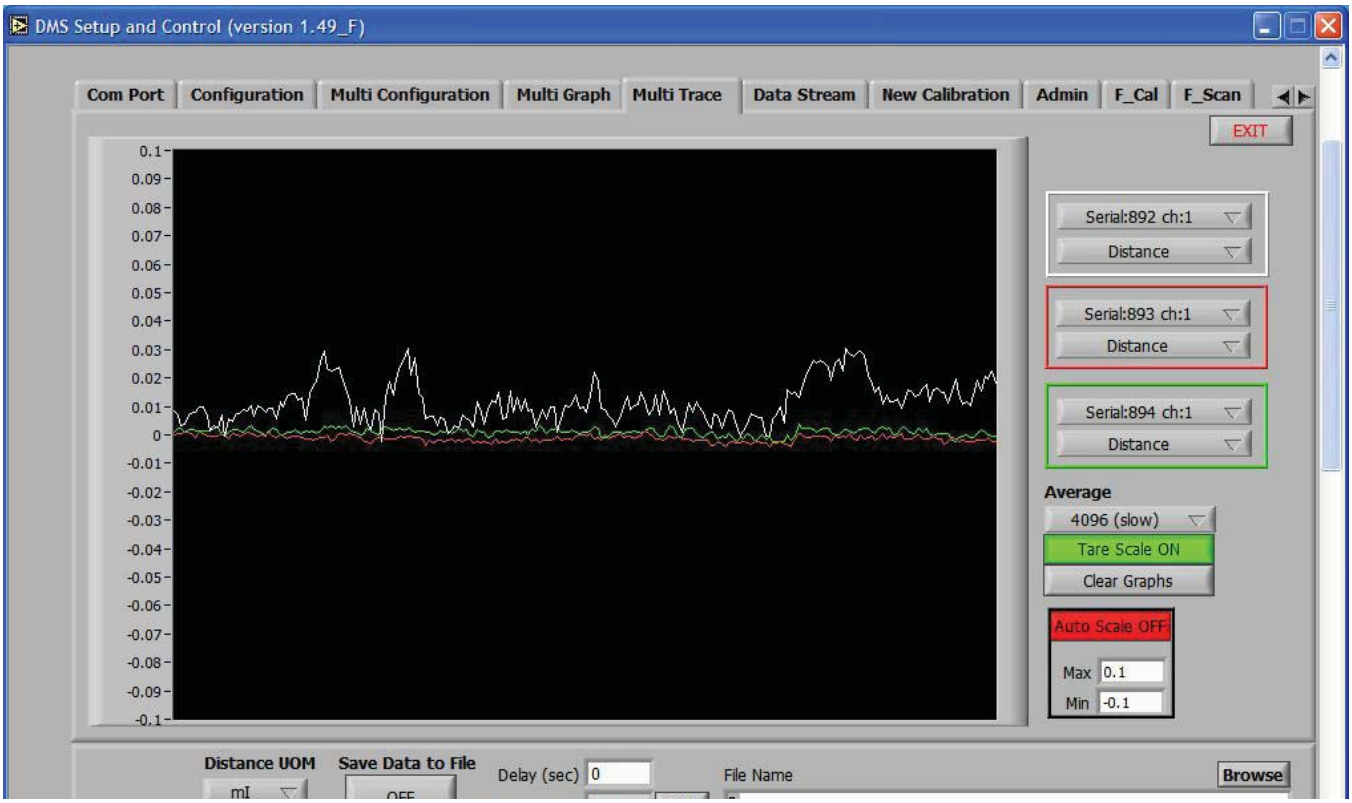
MULTI-TRACE

The ***Multi Trace*** tab simultaneously displays three live autoscaling charts with Tared or Non-Tared Readings. The charts display 1000 points when fully loaded. Data averaging can be controlled and units of measure selected. *NOTE: Tare Reset can only be done at the Configuration Tab.*

Each chart has drop down menus for

» selection of sensor

» selection of displayed parameter

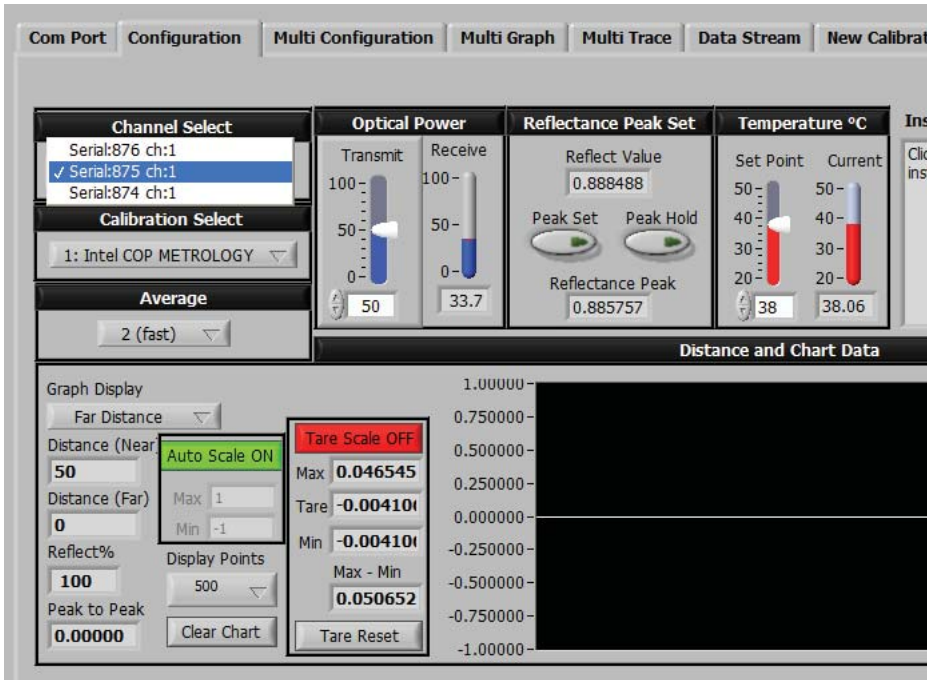


EXAMPLE: SETUP PROCEDURE

1. Use the Config Tab to setup each sensor prior to using Multi Trace

2. At Channel Select pick a sensor
   a) Set The Optical Peak
   b) Reset the Tare

3. Repeat For Each Sensor



DATA STREAM

The ***Data Stream*** mode enables continuous recording of data at high speeds.
Default presets include:

- Time Stamp
- Reflectivity
- Temperature

For USB units, 5000 readings per second will be achieved as follows:

- set stream average to 1 (fast)
- deselect the Reflectivity and Temperature presets

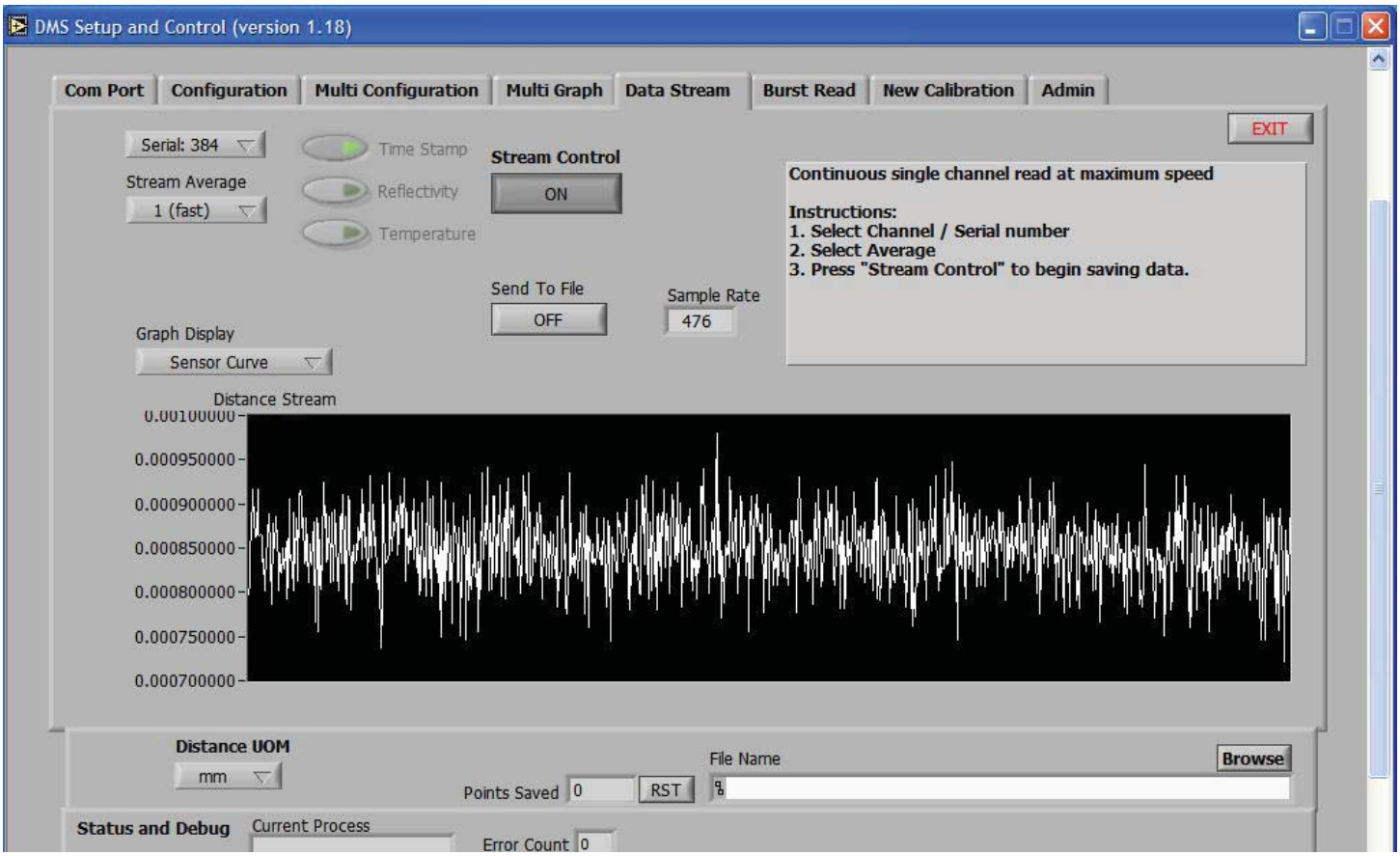
For RS232 units, 5000 readings per second will be achieved as follows:

- set the BPS to 115.2 Kbps
- set stream average to 1 (fast)
- deselect the Time Stamp, Reflectivity and Temperature presets

- Click the ***Stream Control*** Button to begin saving data

  Note: If you have not preselected a file, you will be instructed to browse to a file for saving the data. *Use the file extension .txt when naming the file.*

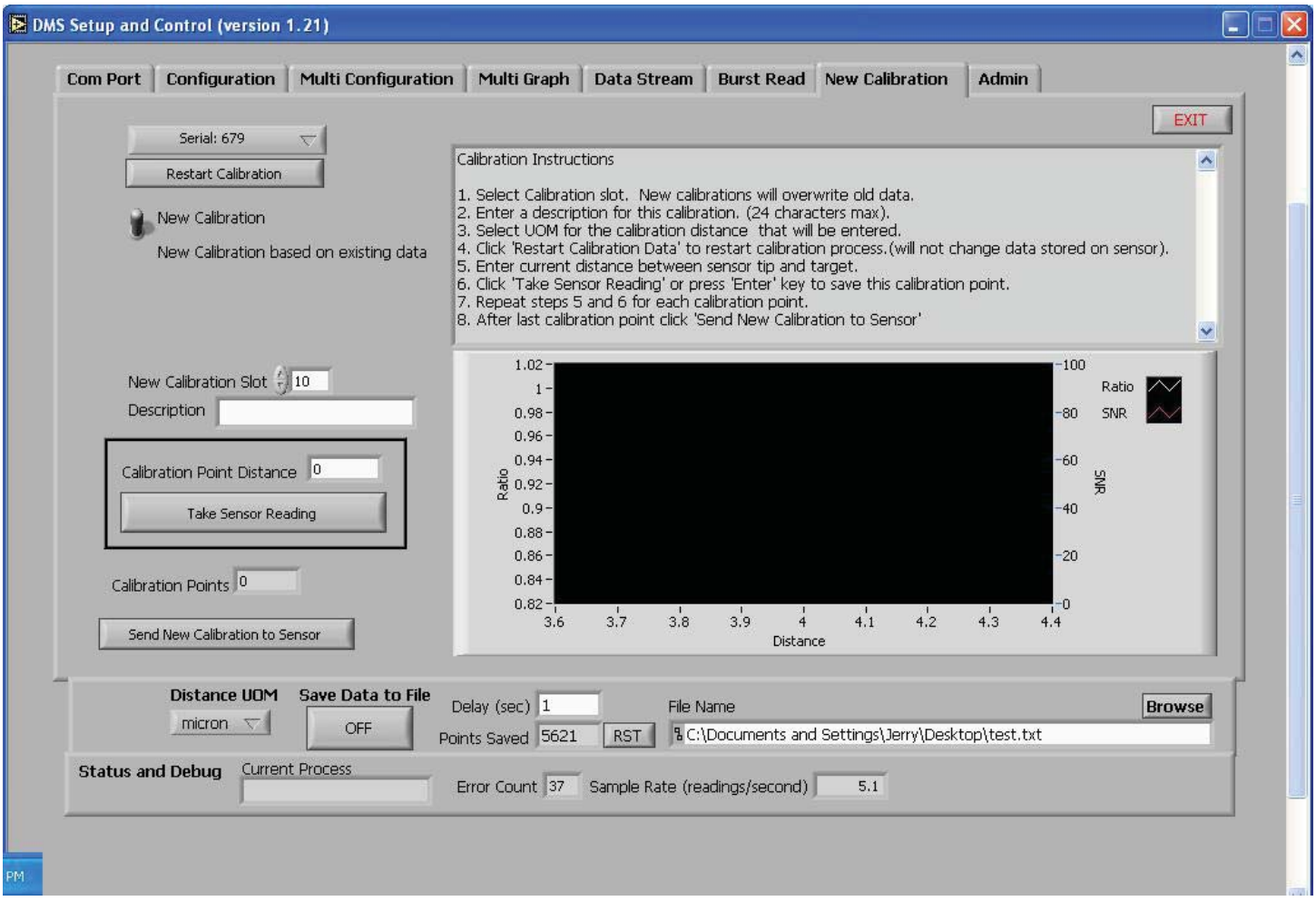
As data is streaming to the file:
a) ***Points Saved*** ... accumulates the total number of readings
b) ***Sample Rate*** ... displays the active number of readings per second



NEW CALIBRATION

The ***New Calibration*** tab can be used to create a new calibration for the sensor.

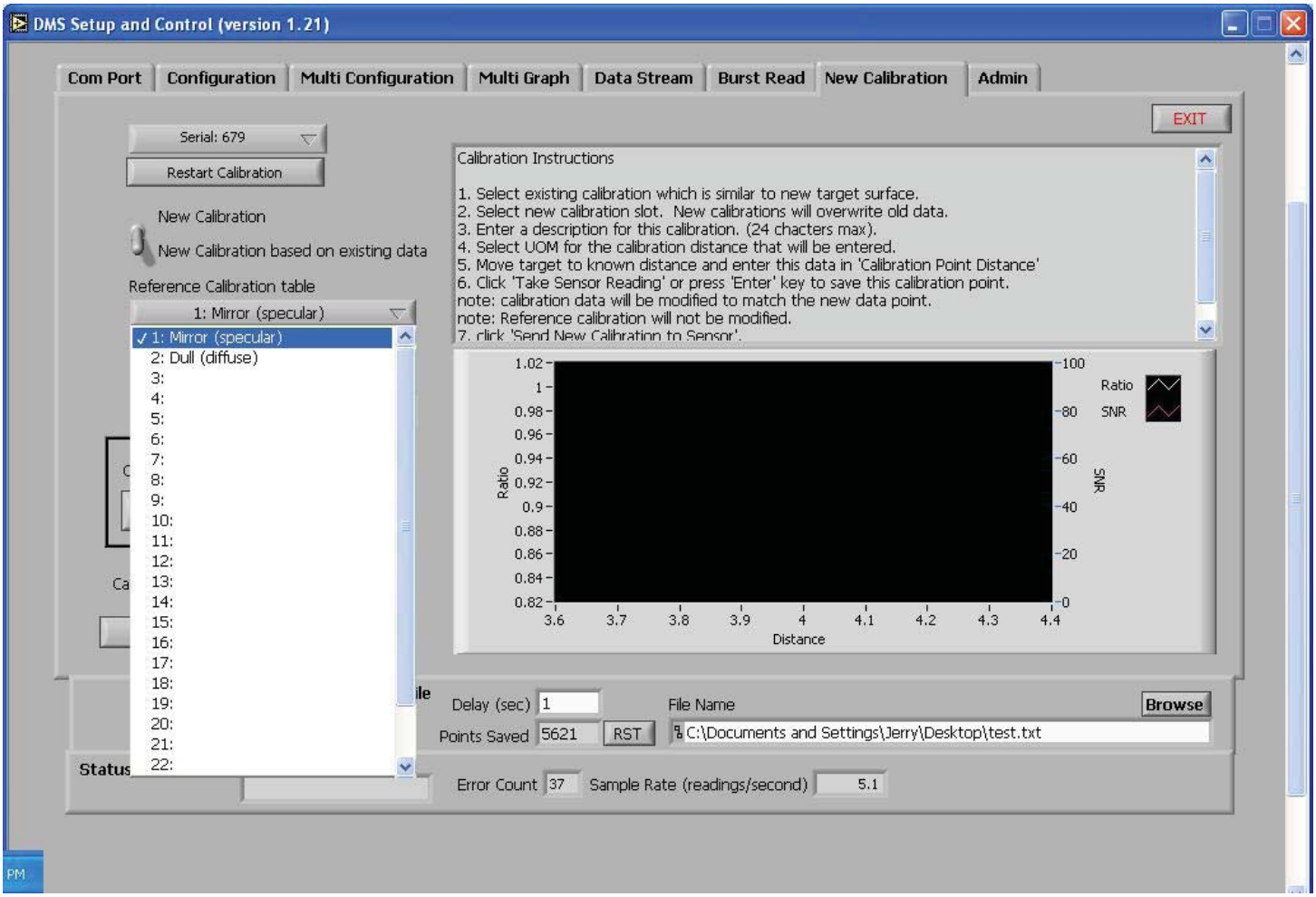
- At ***New Calibration Slot***, select the calibration slot to be used
- At ***Description***, enter a description of the calibration
- At ***Distance UOM***, select the units of measure that will be used for the calibration distance
- Click Restart Calibration
- At ***Calibration Point Distance***, enter the current distance between the sensor and the target
- Click ***Take Sensor Reading***
- Repeat the previous 2 steps until the calibration is completed
- Click “Send New Calibration To Sensor”



NEW CALIBRATION BASED ON EXISTING DATA

The ***New Calibration*** tab can also be used to rescale an existing calibration. Only one data point is required for scaling. Digital sensors are normally provided with two calibration tables: mirror and diffuse targets. Select the table which best fits a new target. For best accuracy, pick a scaling distance that is in the middle of the range of operation for the application.

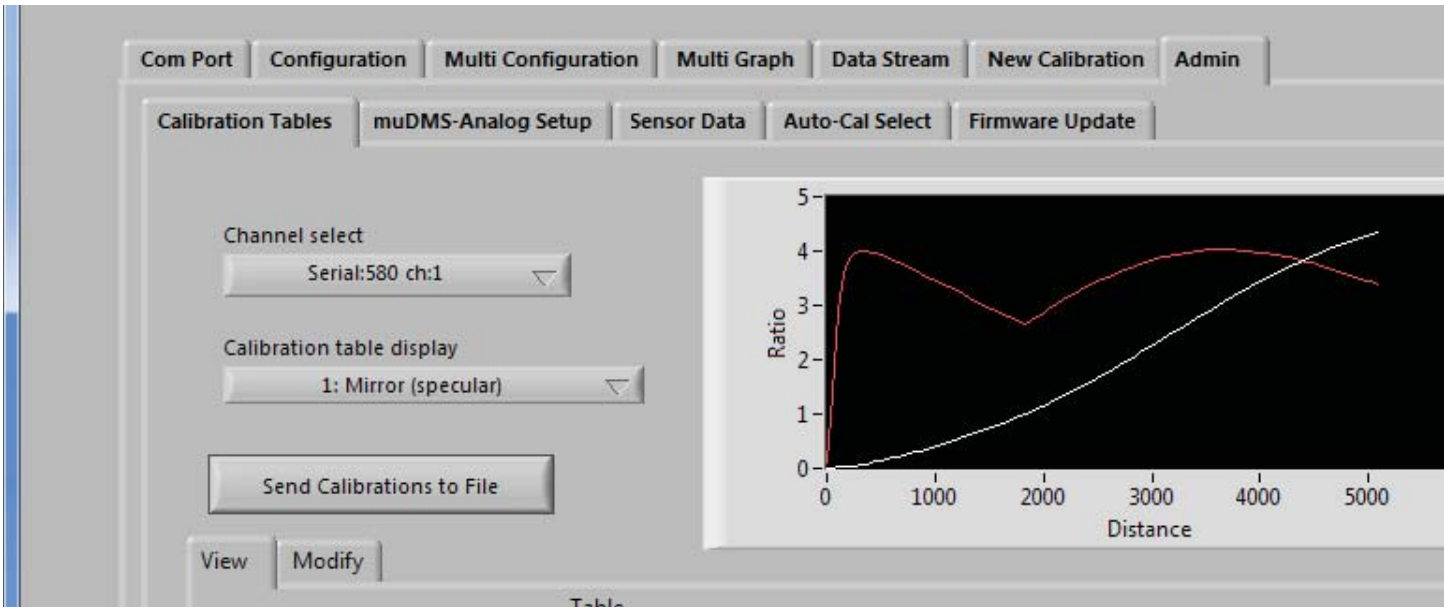
- At ***Reference Calibration Table***, select the reference table
- At ***New Calibration Slot***, select the calibration slot to be used
- At ***Description***, enter a description for the calibration
- At ***Distance UOM***, select the units of measure that will be used for the calibration distance
- At ***Calibration Point Distance***, enter the scaling distance between the sensor and the target
- Click ***Take Sensor Reading***
- Click "***Send New Calibration To Sensor***"



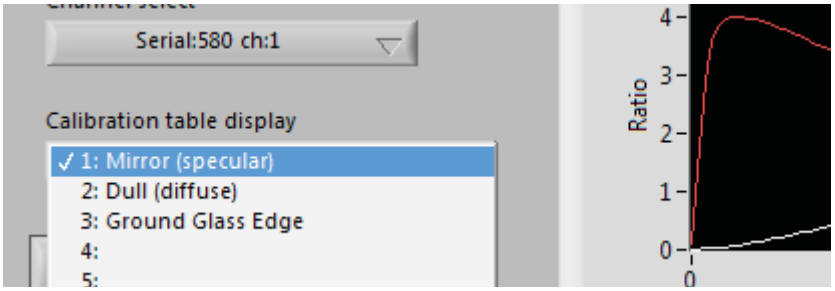
ADMIN - CALIBRATION TABLES

The ***Admin-Calibration Tables*** tab allows the user to inspect the stored calibration data in chart view and tabular forms.

Click on "***Send Calibrations To File"*** to create a text file of a calibration table.

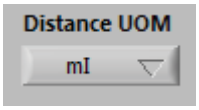


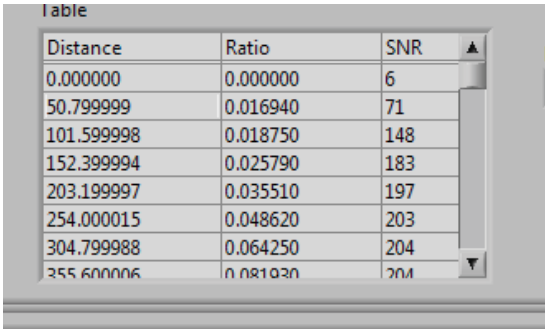
Calibration Table Display - Use this drop-down menu to select a calibration table for viewing and editing.



A calibration table includes three columns of data:

1. Distance - units are selectable at the UOM button
2. Ratio - the raw (unscaled) sensor output function
3. SNR - a measure of the signal strength/target reflectance

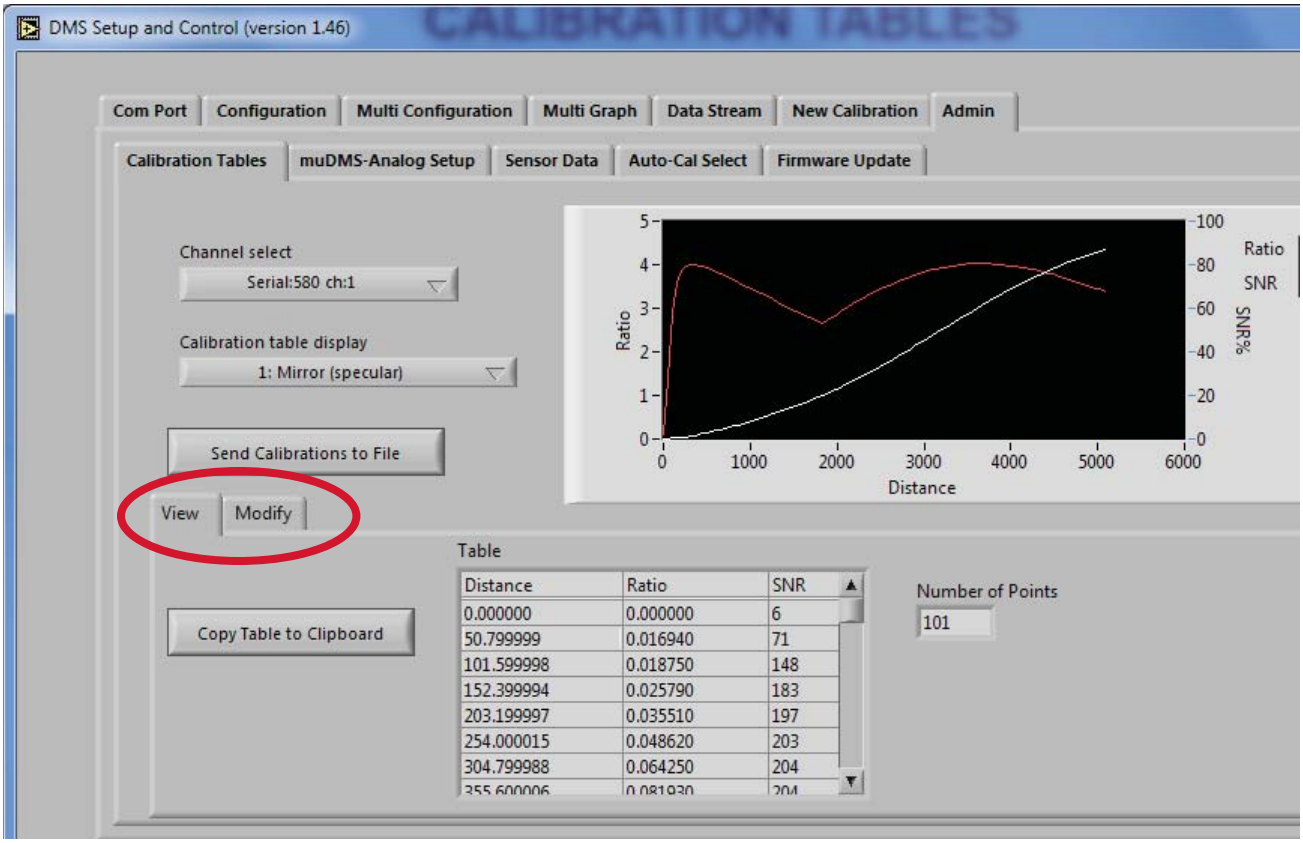




CALIBRATION TABLES - EDITING

There are two sub-tabs: View and Modify.

In the View Tab calibration tables can be sent to a file or they can be copied to a clipboard.

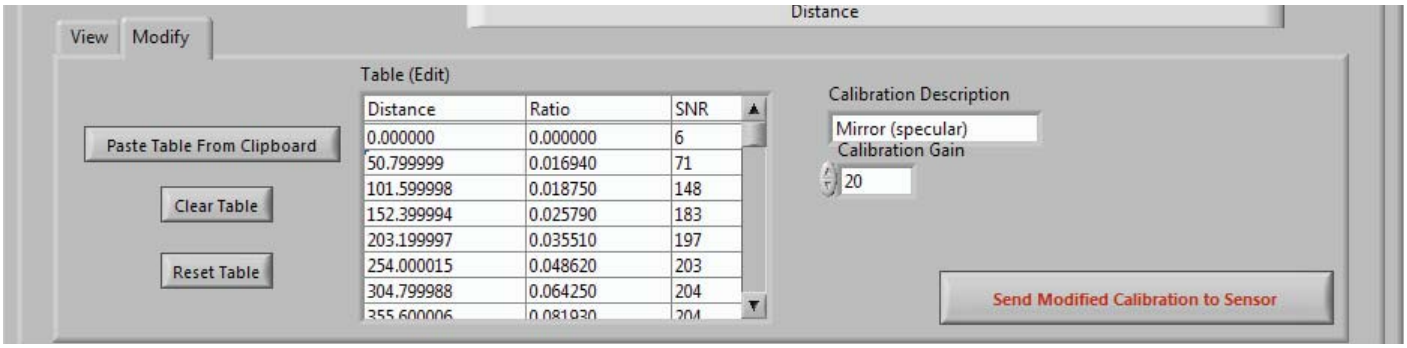


In the Modify Tab

- Calibration tables can be pasted from the clipboard
- The Calibration Description can be edited
- The Cal Table can be reset to original values if an error has been made
- The Calibration Gain (Sensor Gain) can be entered if known.

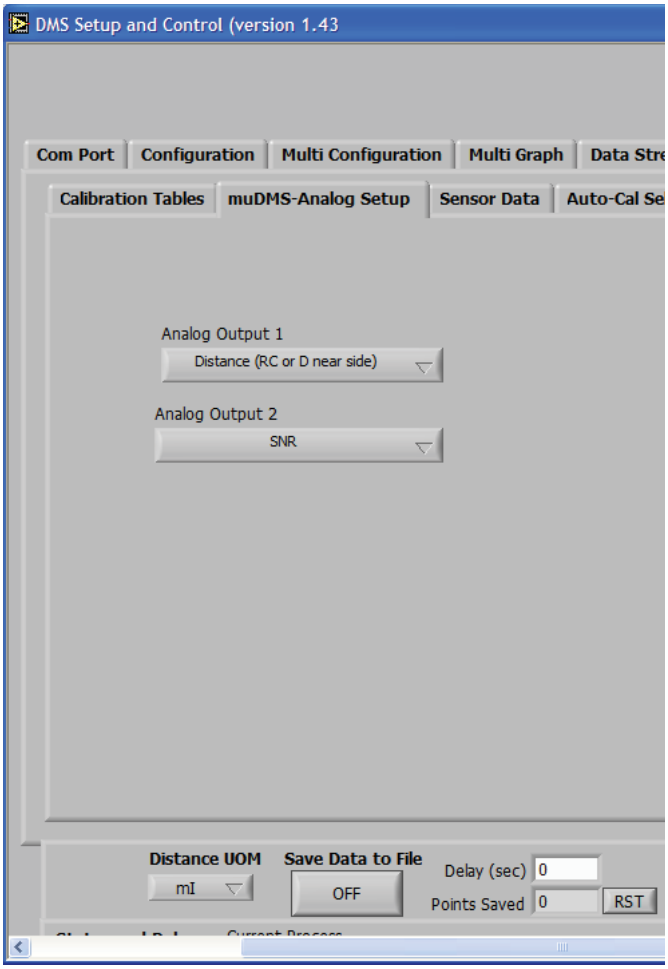
Sending Modified Calibration To Sensor

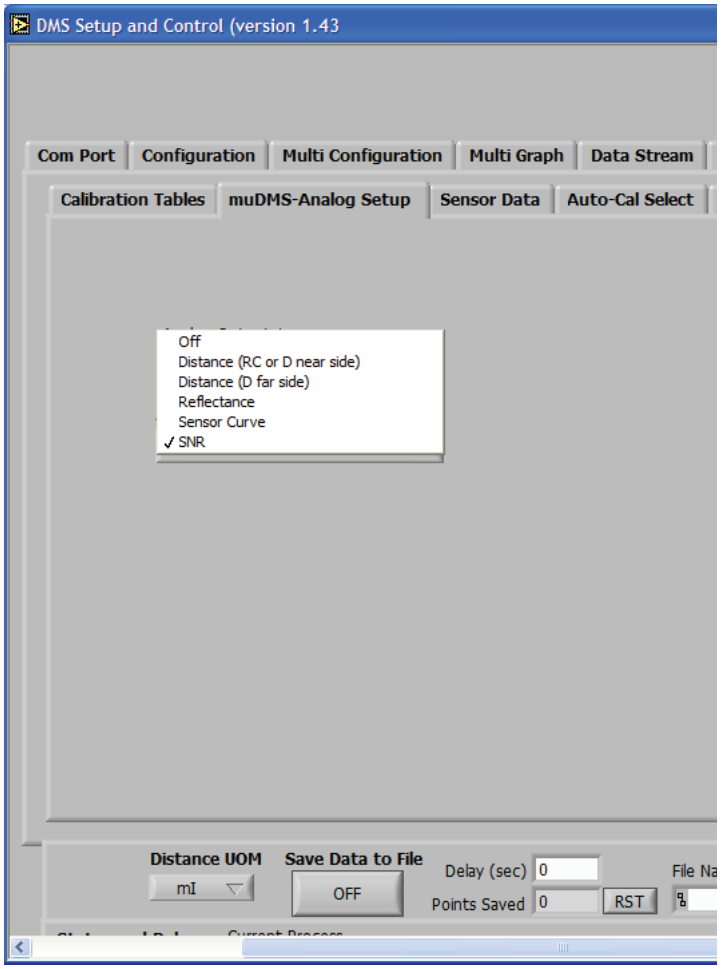
Before sending a calibration to the sensor, you must select a slot from the Calibration Table Display drop-down menu. That is where the modified calibration will be stored.



ADMIN - muDMS-Analog Setup

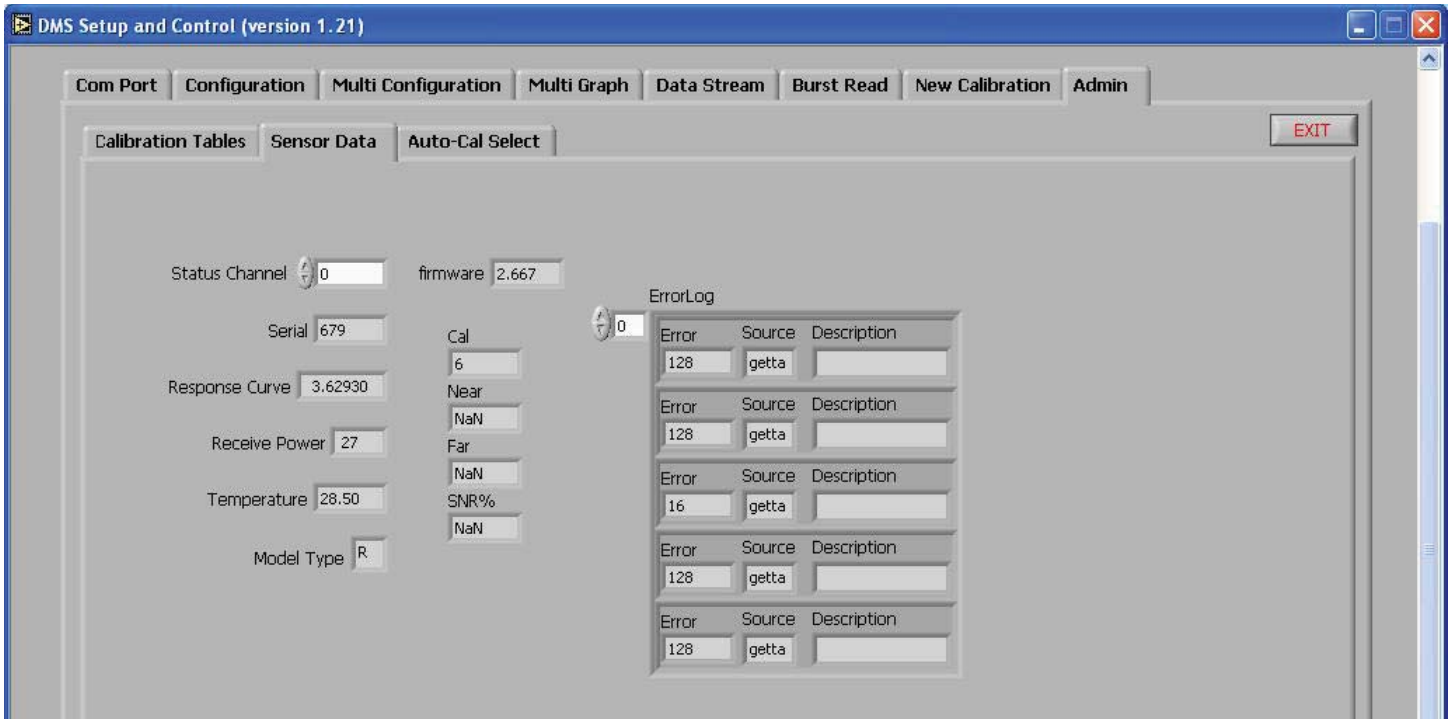
The ***Admin-muDMS-Analog Setup*** tab is set at the factory as shown here: Distance on BNC # 1 and SNR on BNC #2. The analog outputs can be reset by the user by selecting the desired output from the dropdown menus.





ADMIN - SENSOR DATA

The ***Admin-Sensor Data*** tab is used to view sensor information for factory diagnostic purposes.

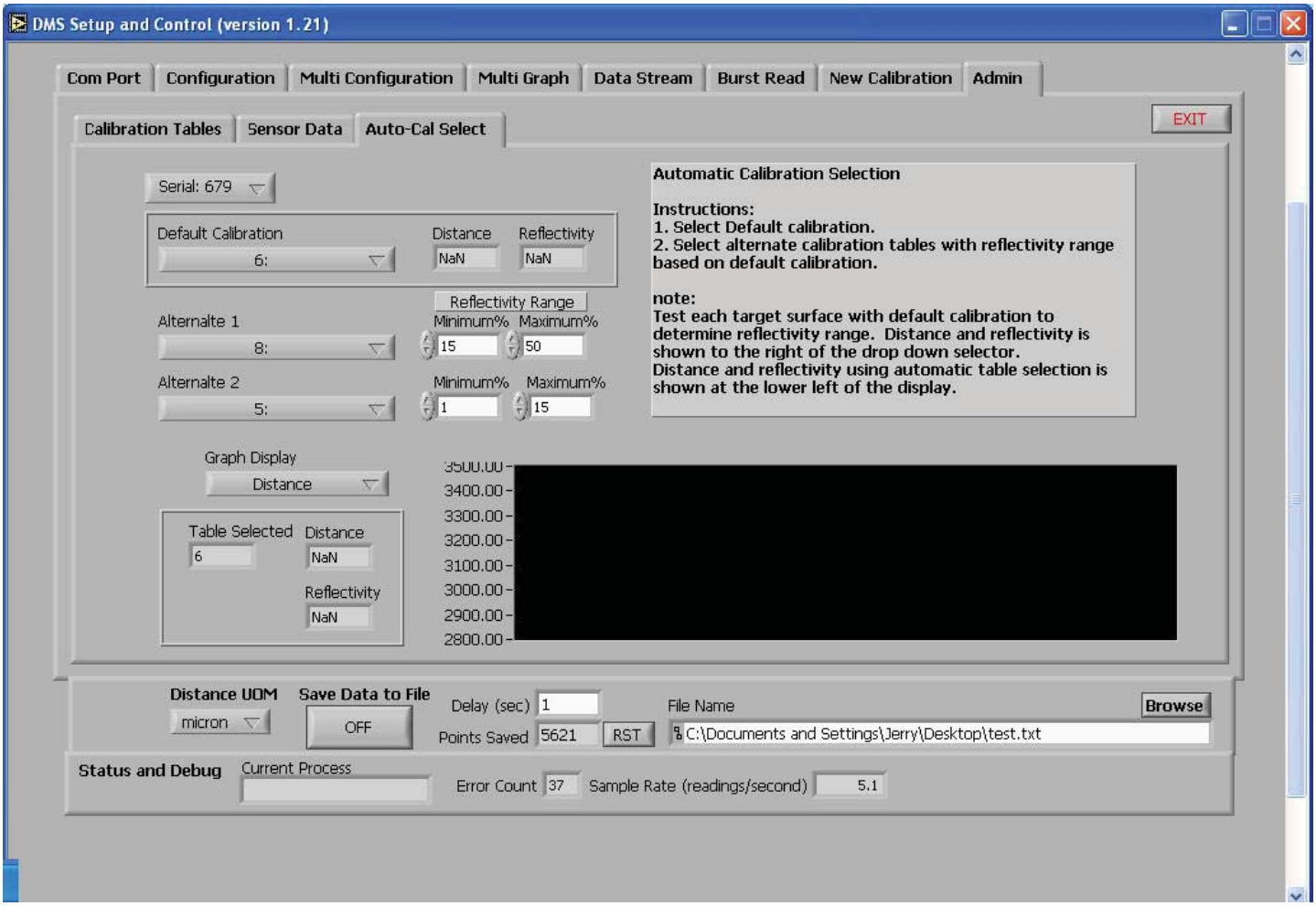


ADMIN - AUTO-CAL SELECT

The ***Admin-Auto-Cal Select*** tab is intended for use in applications where 2 or 3 distinctly different targets are to pass by the sensor, and the distance measure to each of those targets is required.

When the ***Admin-Auto-Cal Select*** tab is in view, the sensor will lookup distance information from the stored calibration tables based upon the reflectivity of the target surfaces. For example, targets with a mirror-like finish (specular reflectors) have a different response than dull or diffuse reflectors, and therefore the two calibration tables are stored on board the sensor. The controls at this tab allow the user to select ranges of reflectivities of the targets that will be measured. The sensor will generate accurate distance information based upon the appropriate calibration table, as defined by the reflectance values. This function has no impact on the sensor sample rate.

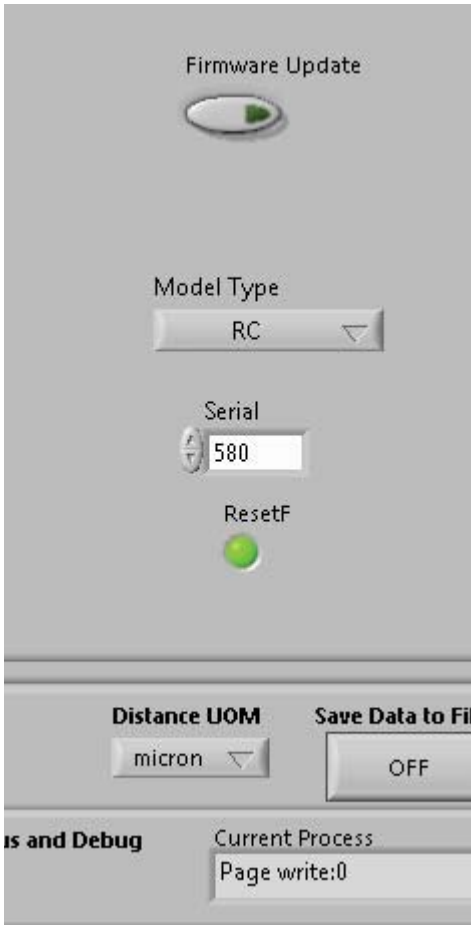
Auto-Cal Select turns off when this tab is deselected.



ADMIN - Firmware Update

The ***Admin-Firmware Update*** tab is used to update the sensors internal firmware coding.

- Click the Firmware Update button. The Reset button will light and then turn off when Page writing commences. When page writing is finished (254 pages), the reset light turns on again as the sensor is refreshed. When the reset light turns off at this point, the update is complete.



SOFTWARE & FIRMWARE UPDATES

DMS sensors can be updated remotely at any PC. The most current edition of software and firmware is posted at http://www.philtec.com/firmware.htm

PROCEDURE
Download the firmware update program to your local hard drive.
Locate the .exe file and execute the program. Follow the on-screen instructions.
The program will instruct you when to reboot the sensor (turn power off, and turn power on).

WARRANTY

Displacement Measurement Systems are warranted by Philtec, Inc. against defects and workmanship for 12 months from the date of shipment from the factory. Damage to the fiberoptic cable or sensor tip are not covered under this warranty.