Sensorik
Messtechnik
A-8010 Graz, Riesstraße 146
Tel.: +43 316 40 28 05, Fax: 40 25 06
nbn ELEKTRONIK
Handelsgesellschaft m.b.H.

OPERATING INSTRUCTIONS FOR

FIBEROPTIC

DISPLACEMENT MEASUREMENT SYSTEM

DMS

Type D - Reflectance Dependent

Model DMS-D Serial Nos.

PHILTEC, INC. www.philtec.com
Precision Dynamic Measurements

Description

Displacement Measurement Systems (DMS) with Type RC fiberoptics are microprocessor-based systems for providing direct outputs of distance using RS-232 protocol. They are comprised of:

- Reflectance Compensated Fiberoptic Light Guides To Develop Analog Input Signals
- Digital Processing Units with storage capacity for 31 calibrations per channel
- Keypad/front panel display for local operation
- RS232 output for remote operation

Power Requirements
DMS Single Channel: 12 VDC @ 350mA
DMS Dual Channel: 12VDC @ 450mA

OPERATING PRINCIPLE. Light is transmitted to the target thru glass fiberoptic bundles. The intensity of reflected light returns thru the reflectance dependent fiberoptics to the DMS where it is precisely measured and compared with 24 bit resolution to stored calibration data. The return signal intensity varies with target motion and will also vary proportionately with target reflectivity 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.

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.

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 31) can be stored per channel.

Communication

Communication with sensors is conducted thru one RS232 port. Multiple 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)

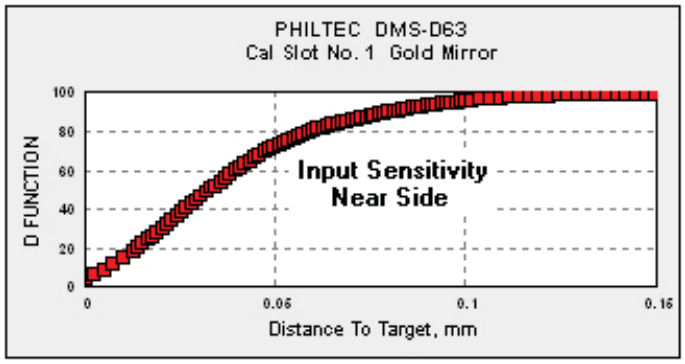
Temperature Stabilization

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.

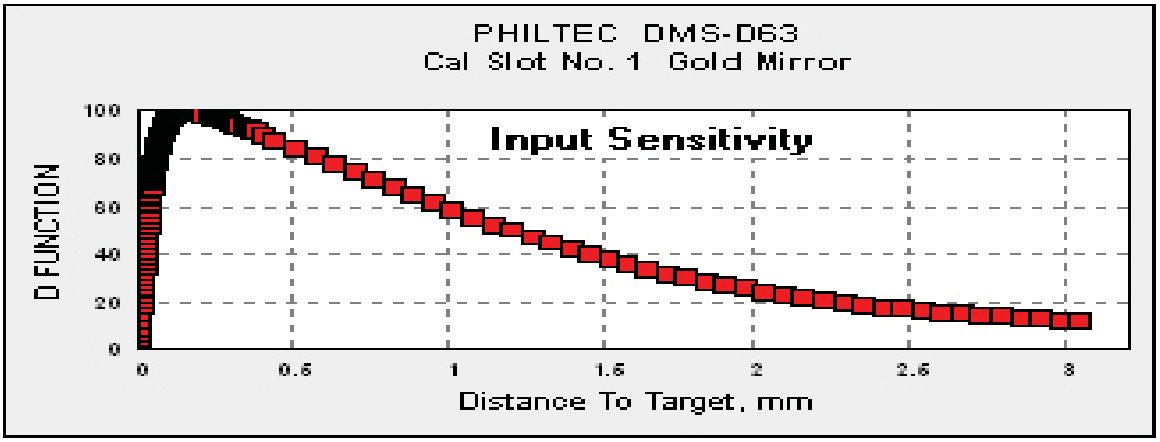
Notes:
1. If the amplifier temperature creeps above the set temperature by more than 0.1 degree, further increase the set temperature to reach a stable and controllable temperature set point.
2. This heater circuit has limited heat flow capacity. If the active temperature drops below the set temperature, 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.

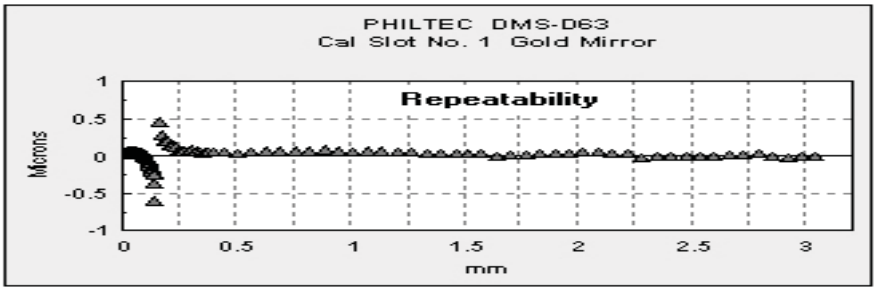


FACTORY CALIBRATIONS AND ACCURACY

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

Procedure

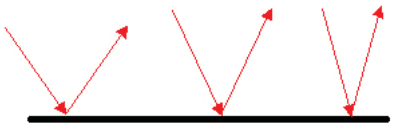
1. Mount the target on the stage table.
2. Mount the sensor off the stage table. The target moves during calibration. The sensor is stationary.
3. Begin with the sensor making light contact with the target.
4. Move the stage with target away from the sensor in small steps covering the total operating 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.*

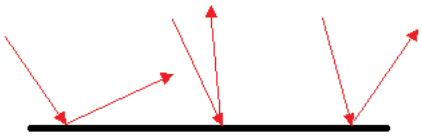
A factory supplied calibration to a specular target is stored in cal slot #1, where the target is a front surface mirror.This calibration should be used if the target surface is any highly polished, mirrored, glossy or very shiny (specular) target. Thin transparent materials require their own calibration,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

Remote Operation via PC

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.

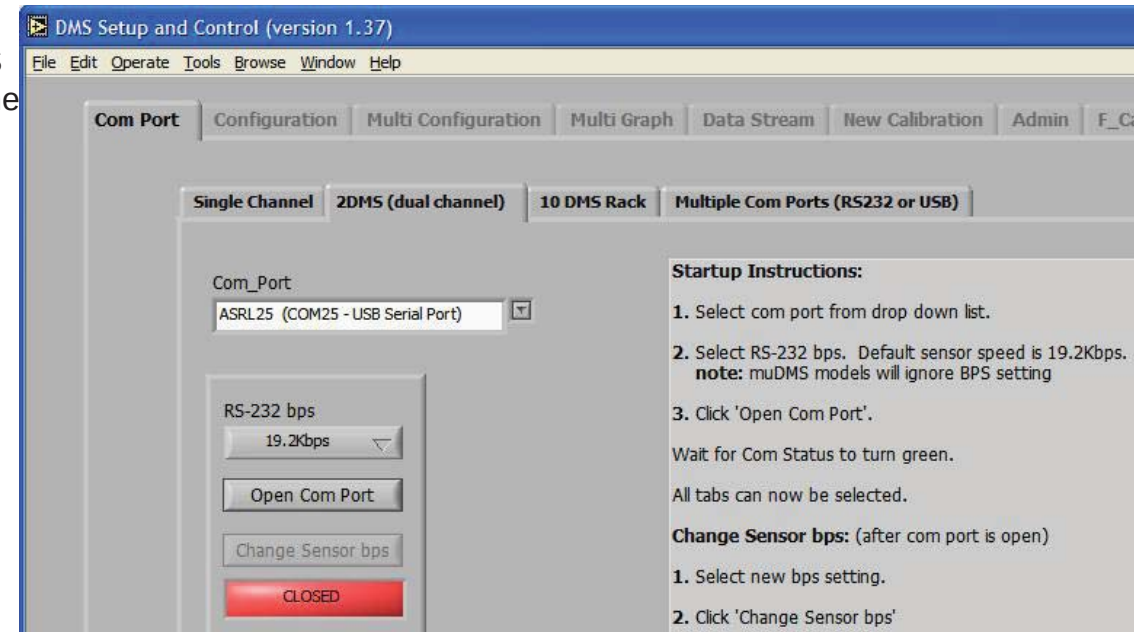
DMS Control Software

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

Opening One Sensor

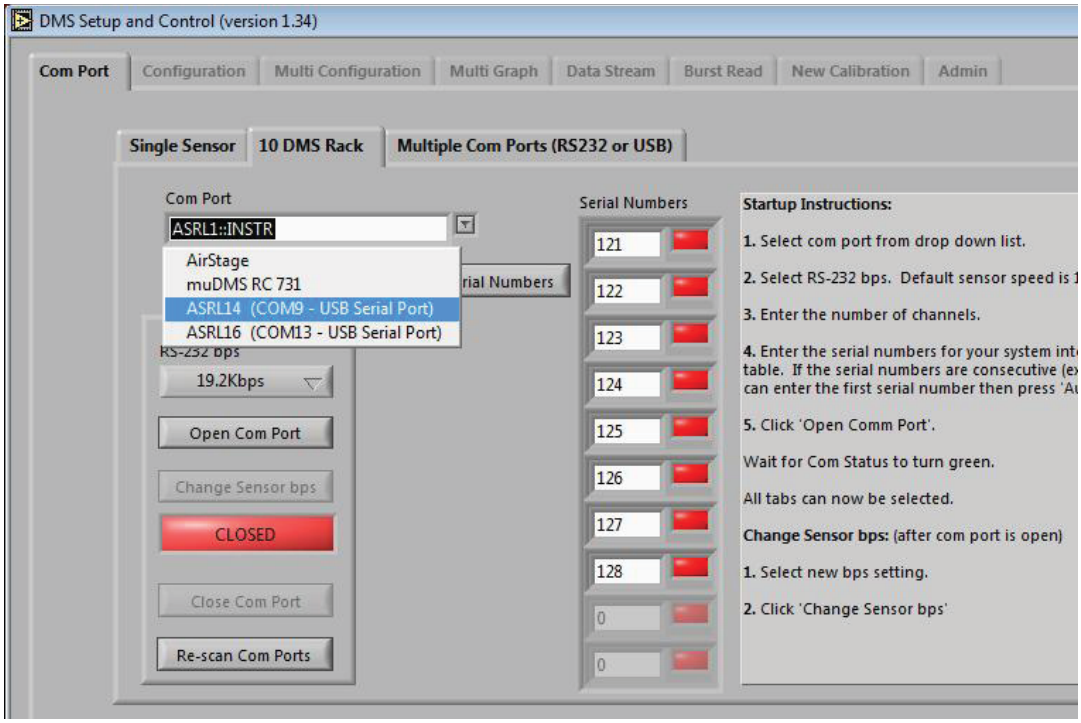
1. To open a single sensor, go to "**Single Channel**" tab and select the com port from the drop down list.
2. Click Open Com Port

3. Dual Channel DMS units are opened at the "**2DMS....**" tab.



Opening Multiple Sensors on One Com Port

1. At the **"10DMS"** 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

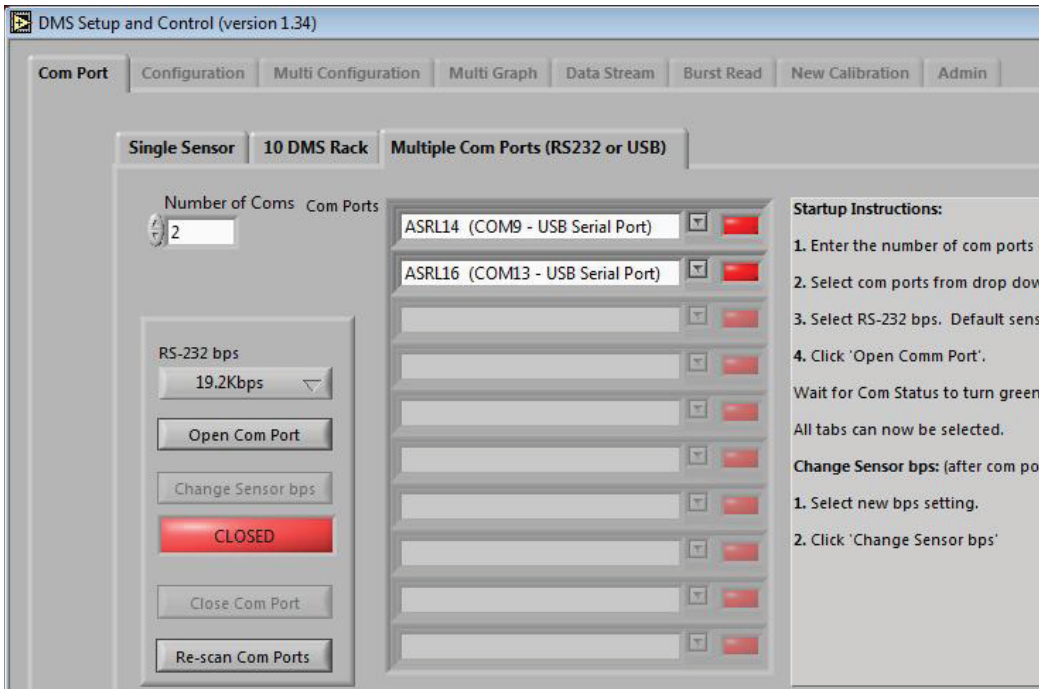


Opening Multiple Sensors on Multiple Com Ports

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

<u>NOTE</u>

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



SETUP & CONFIGURATION

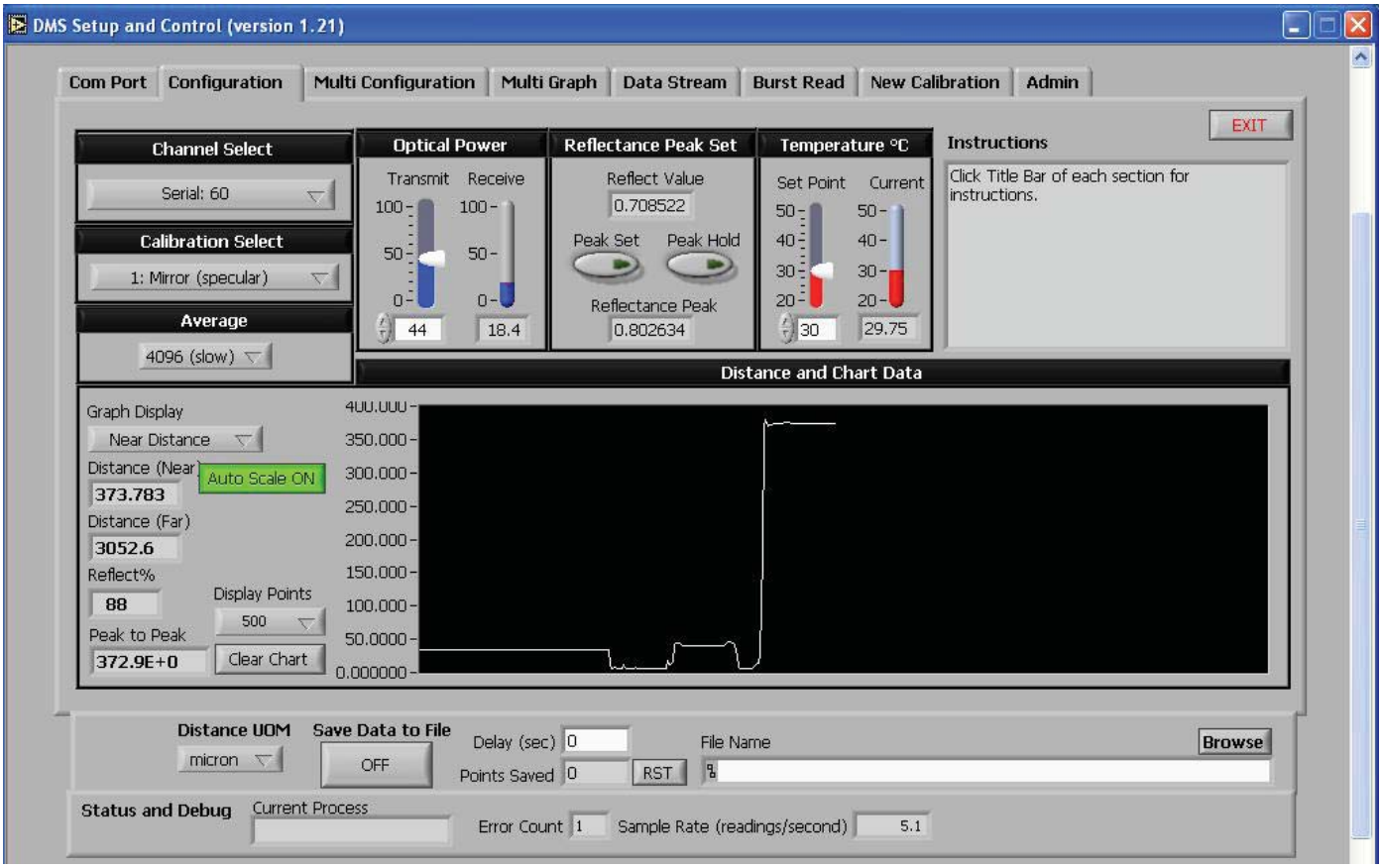
Use the Configuration Tab to setup the sensor for measurements. The sensor should be fixtured in place perpendicular to the target to be measured. Click Title Bar of each section for instructions.

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

2. ***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.

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

4. ***Optical Power***: Move the sensor close to the target and find the peak optical power, stopping at the highest Receive Power**.** At that gap**,** maximize the ***Receive Power*** by **u**sing the Transmit Power slide controls.



5. ***Reflectance Peak Set:*** <u>With the optical peak power maximized at step 3,</u> 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.

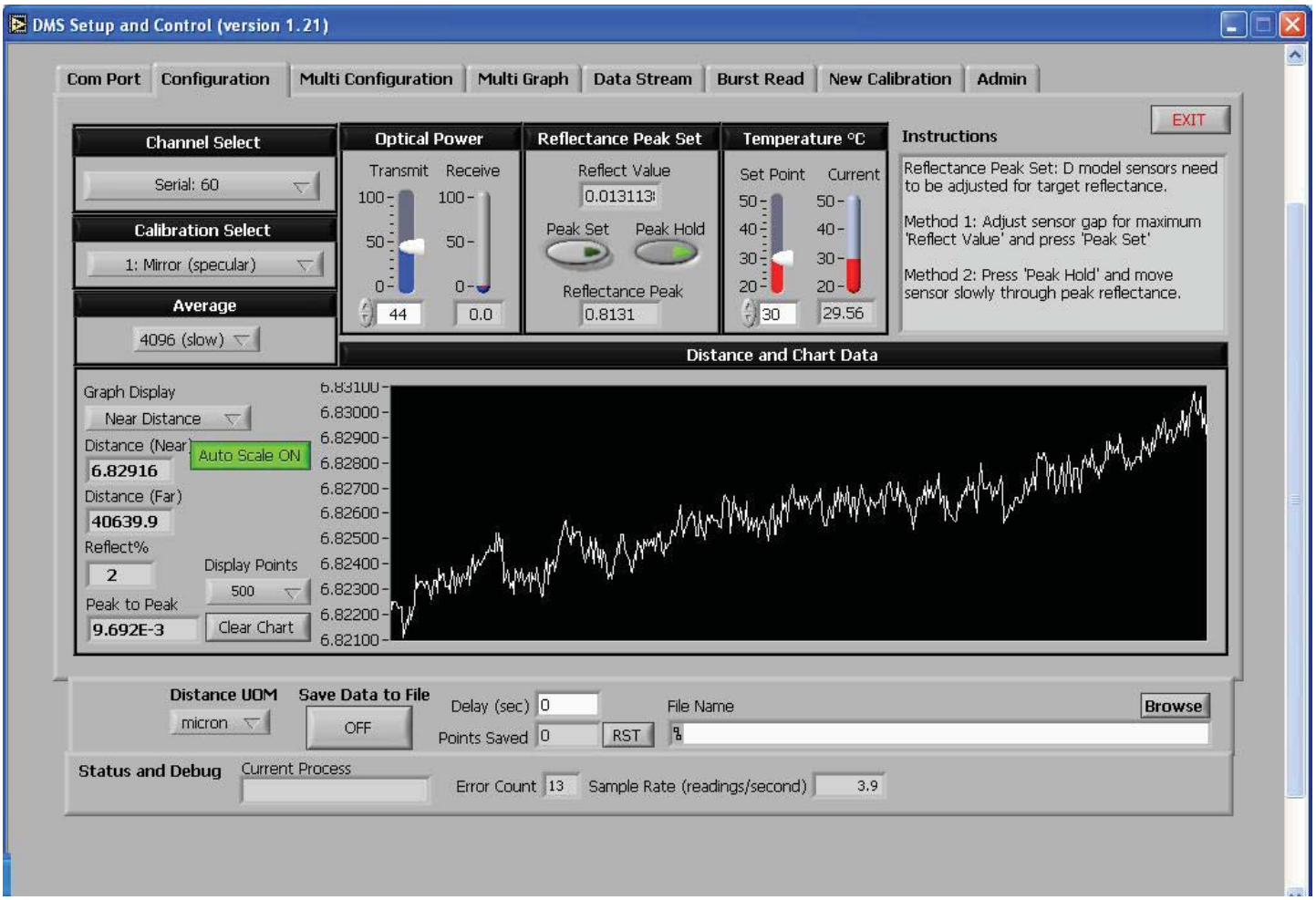
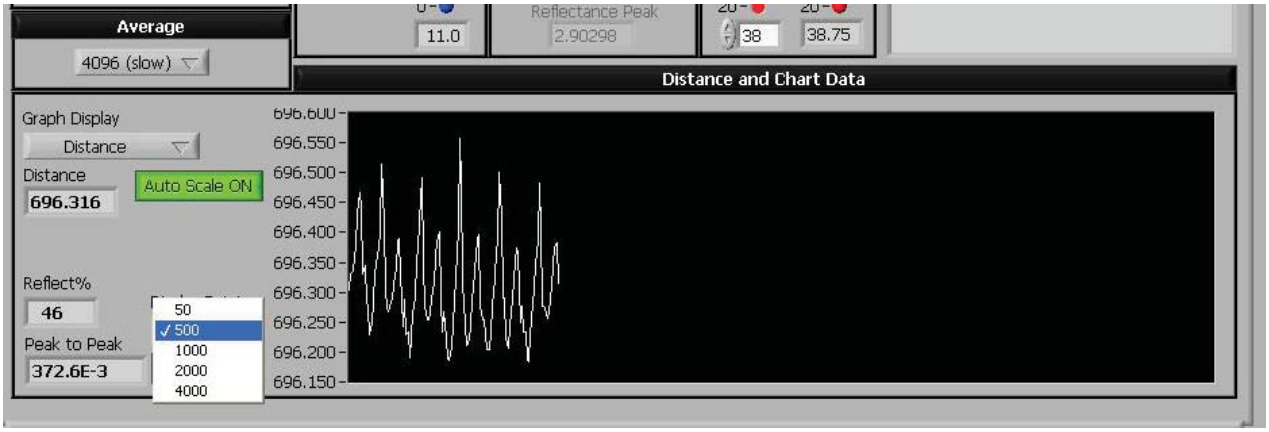


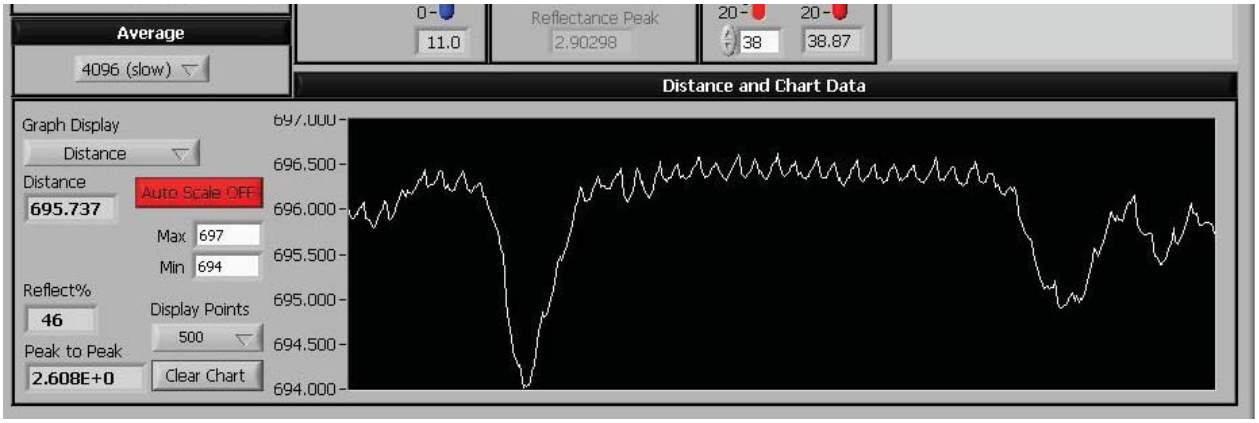
Chart Data



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

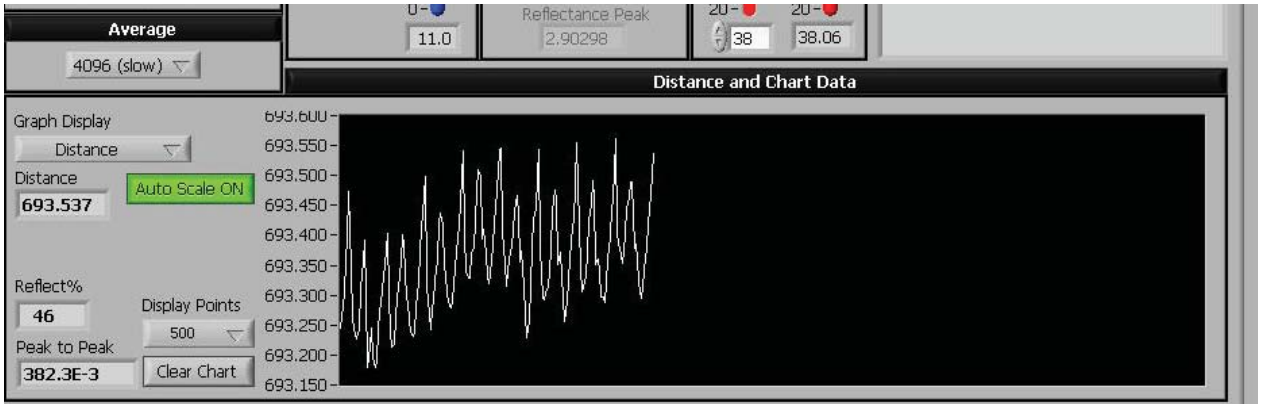
AUTOSCALING

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.



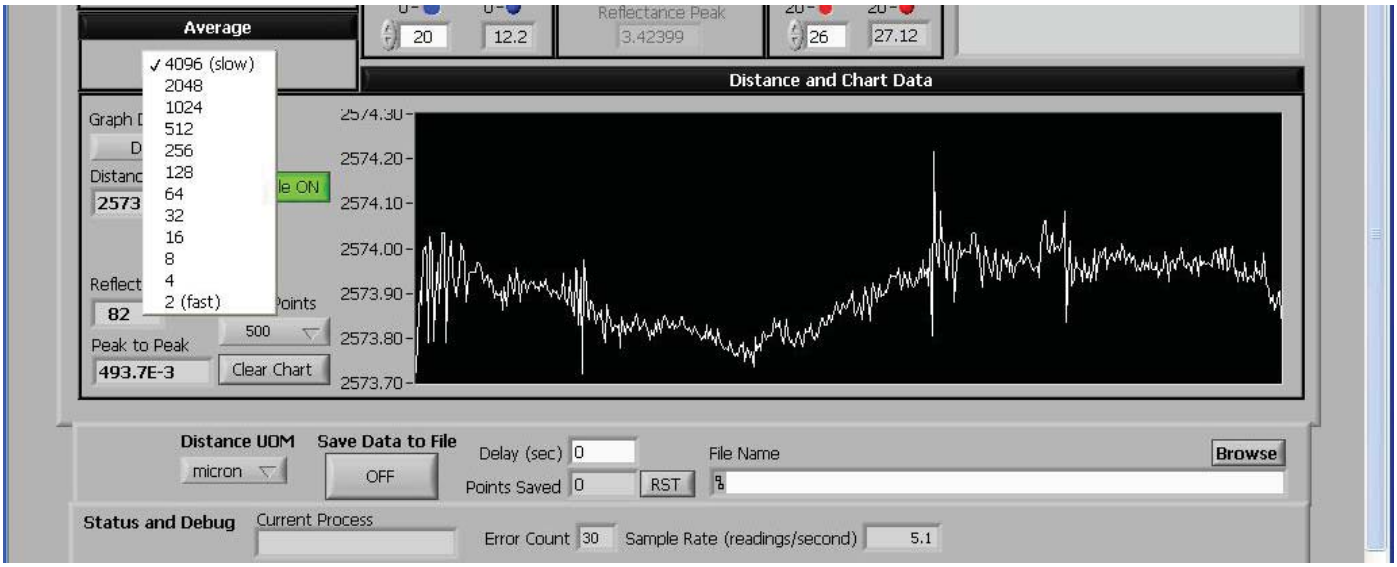
PEAK-TO-PEAK

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.



AVERAGE

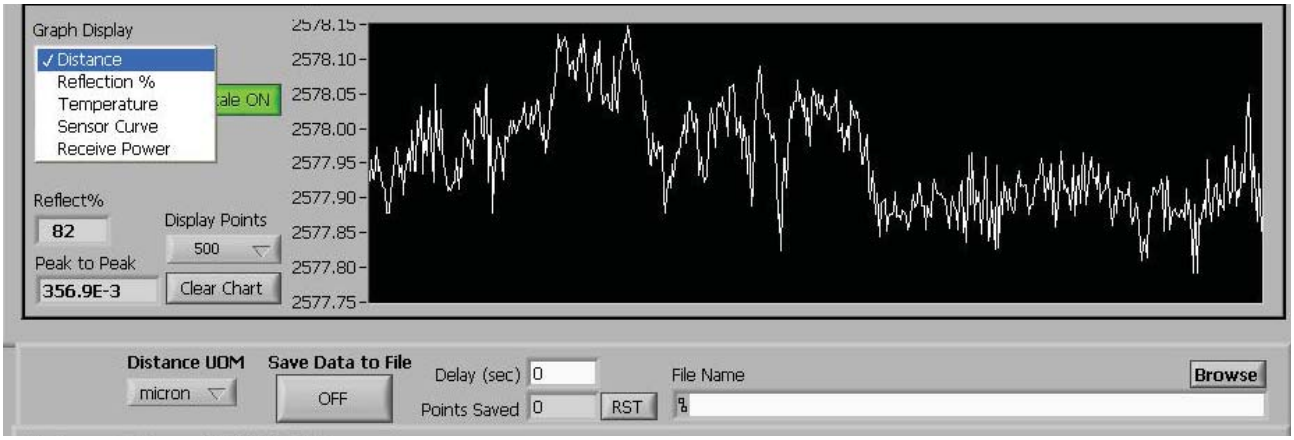
DMS sensors have an internal sampling rate of 20 KHz; miniDMS sensors have a 40 KHz clock rate. The average filter controls how many readings the sensor will average together before sending the results to the serial port. Higher averages will slow down sensor response and increase resolution. The actual 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 10 readings per second for mini-DMS sensors and 5 r/s for DMS sensors. For the highest speed, use the Data Stream tab.



GRAPH DISPLAY

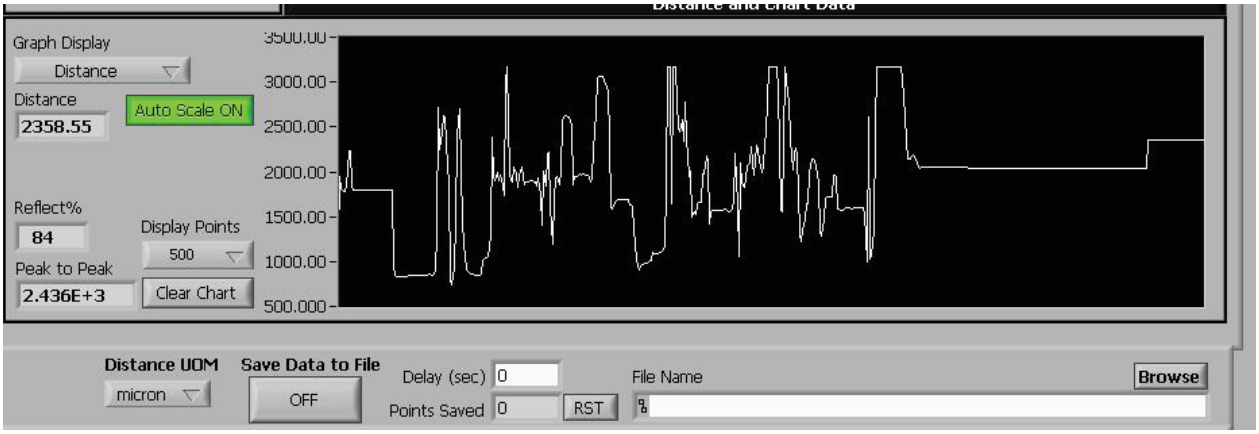
At Graph Display, select one parameter to chart from the drop-down list:

- 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

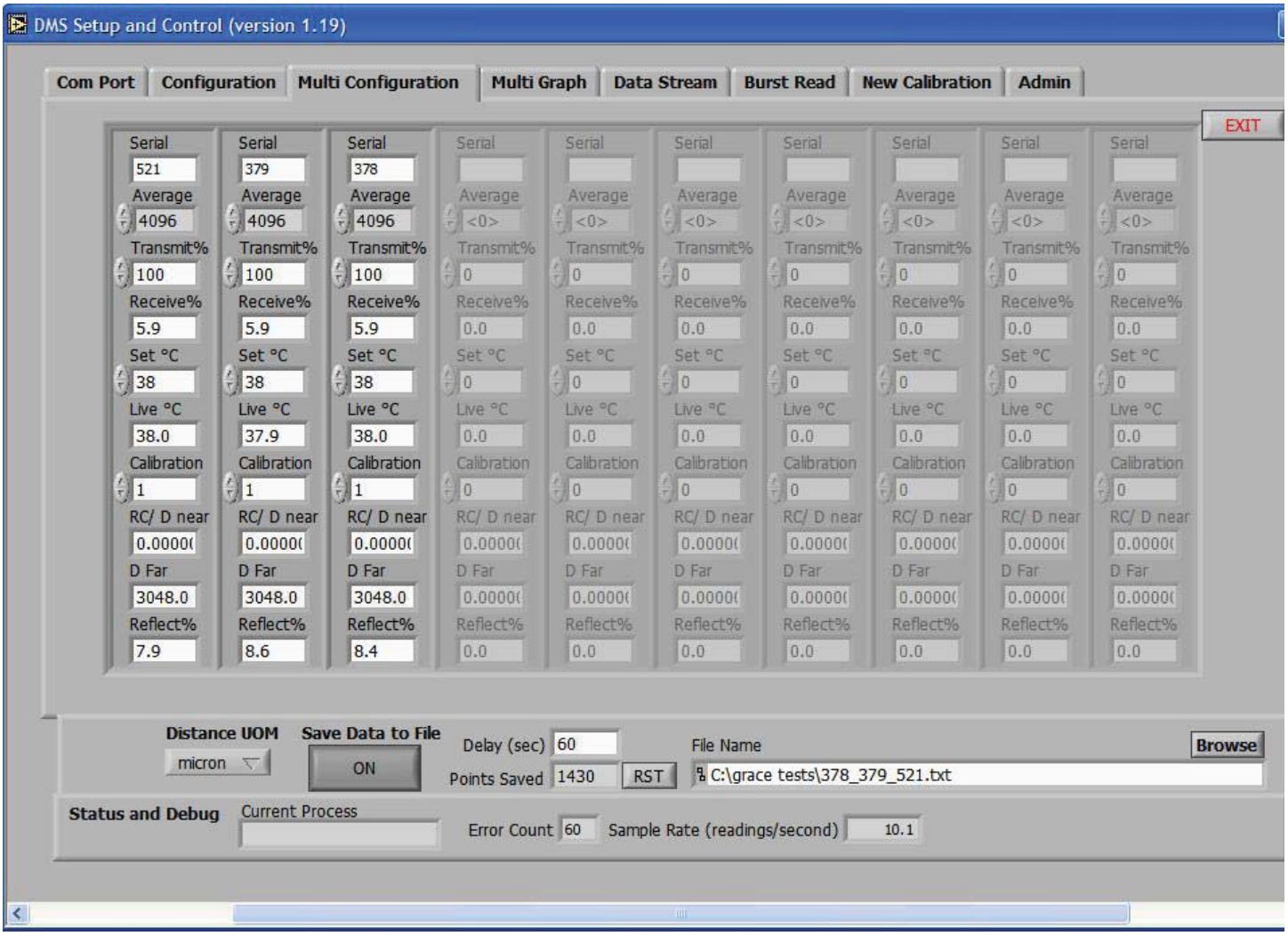
Note: Time stamping data points enables post processing applications such as fft analysis.

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 sigle 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



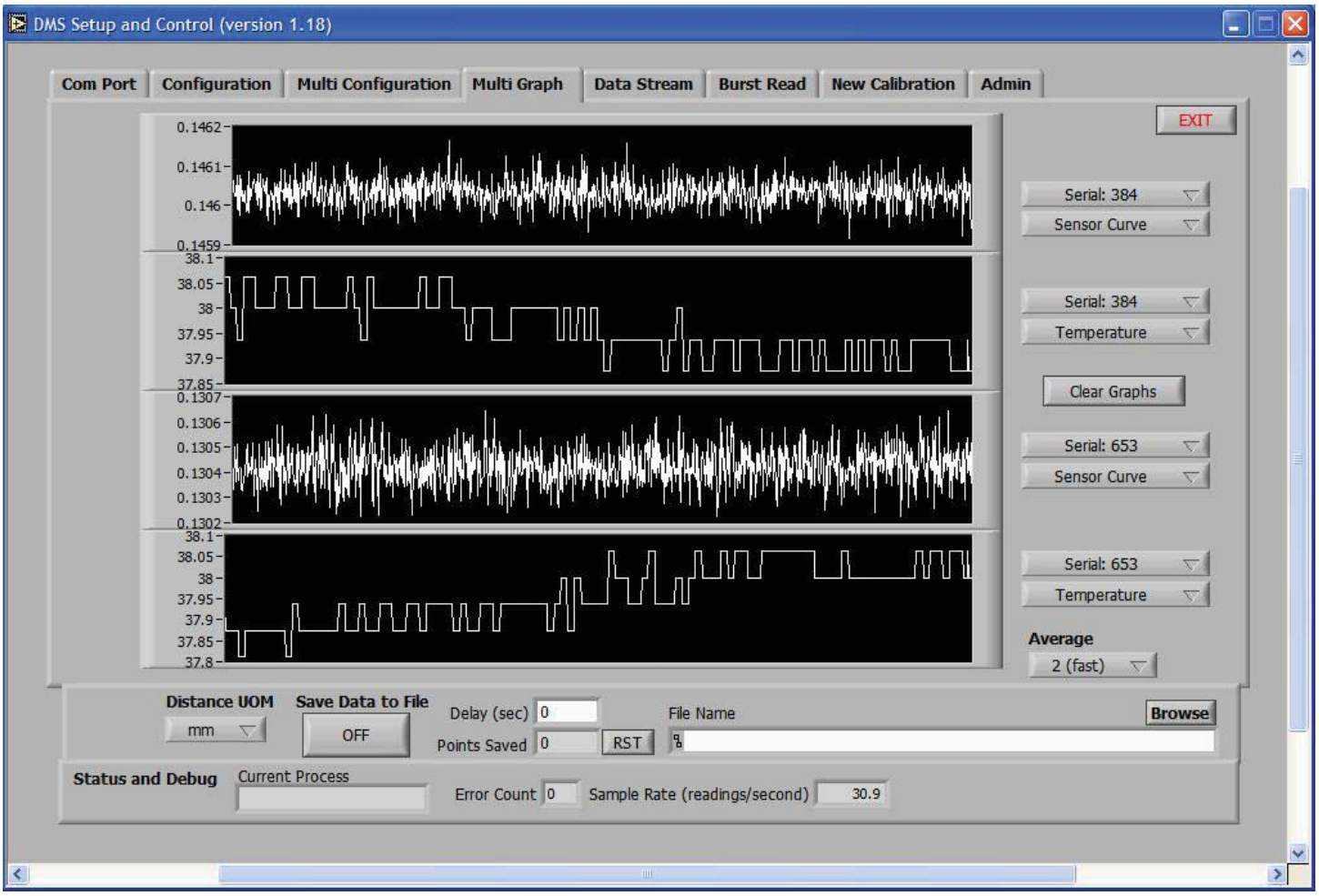
MULTI-CHANNEL GRAPH

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



DATA STREAM

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

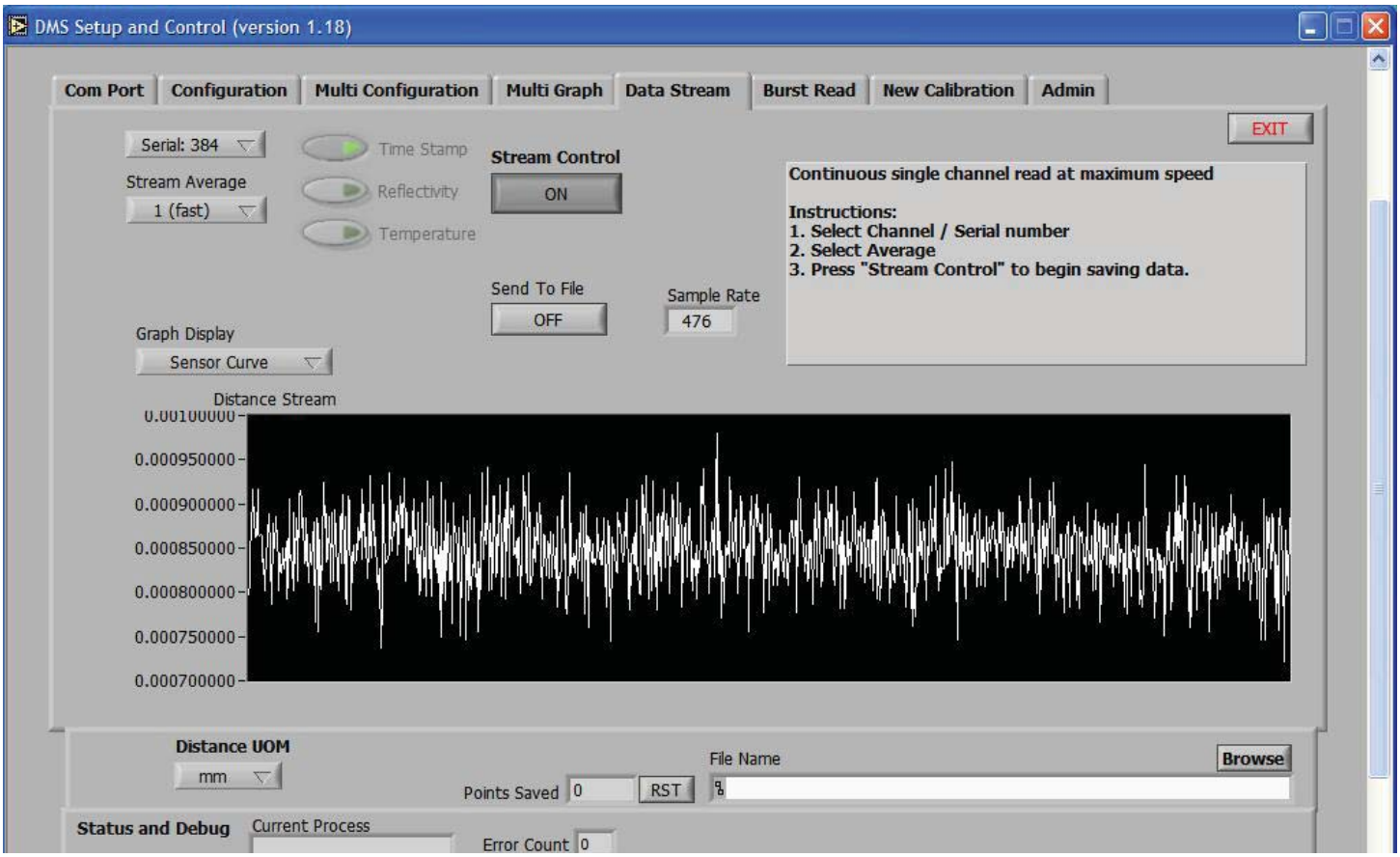
- Time Stamp
- Reflectivity
- Temperature

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

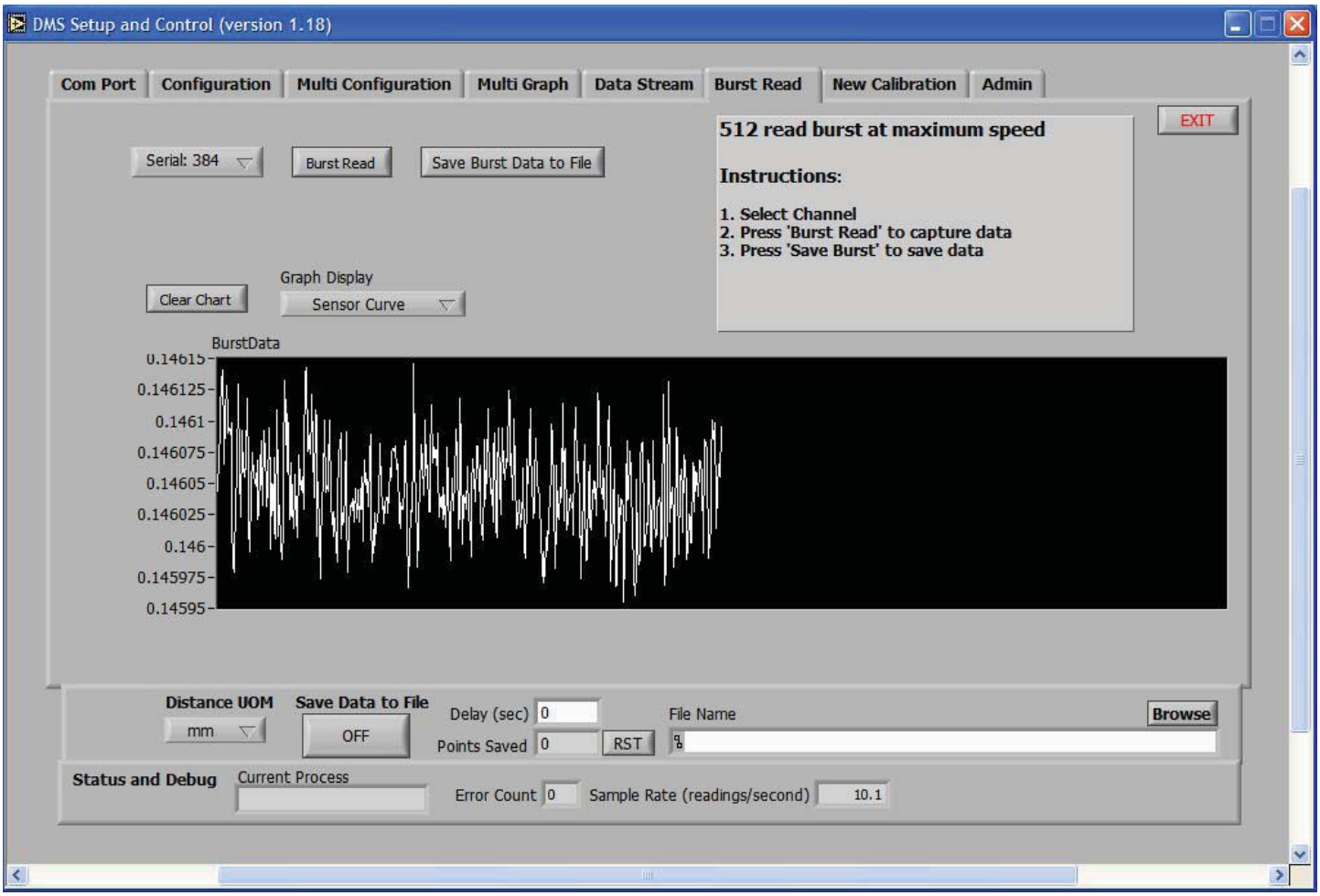


BURST READ

In ***Burst Read*** mode, 512 readings - equally time-spaced - are recorded at the clock rate of the sensor, which is the highest speed achievable from the sensor:

- DMS = 20.85 KHz
- miniDMS = 41.7 KHz

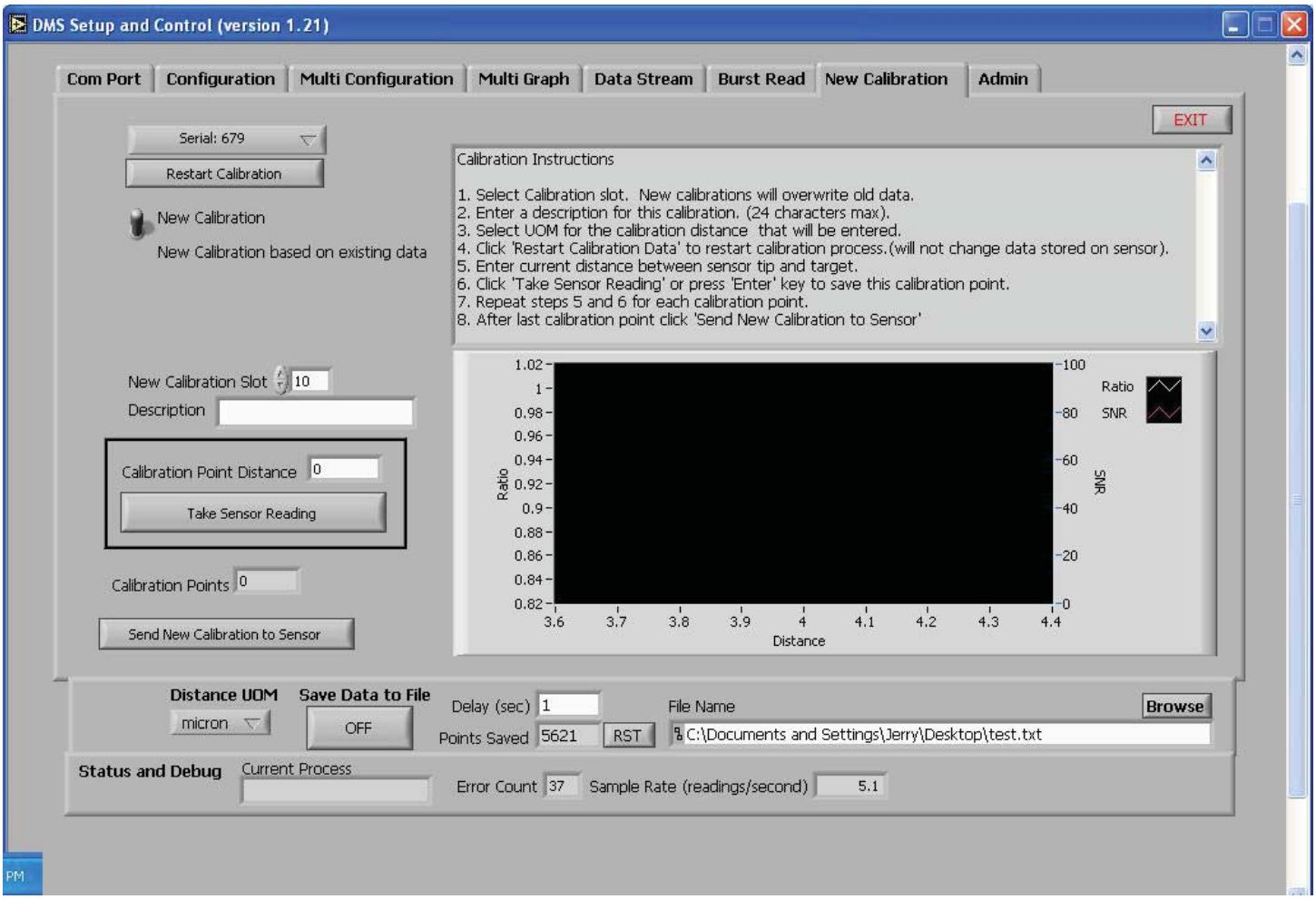
The data can be saved to a file.



NEW CALIBRATION

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

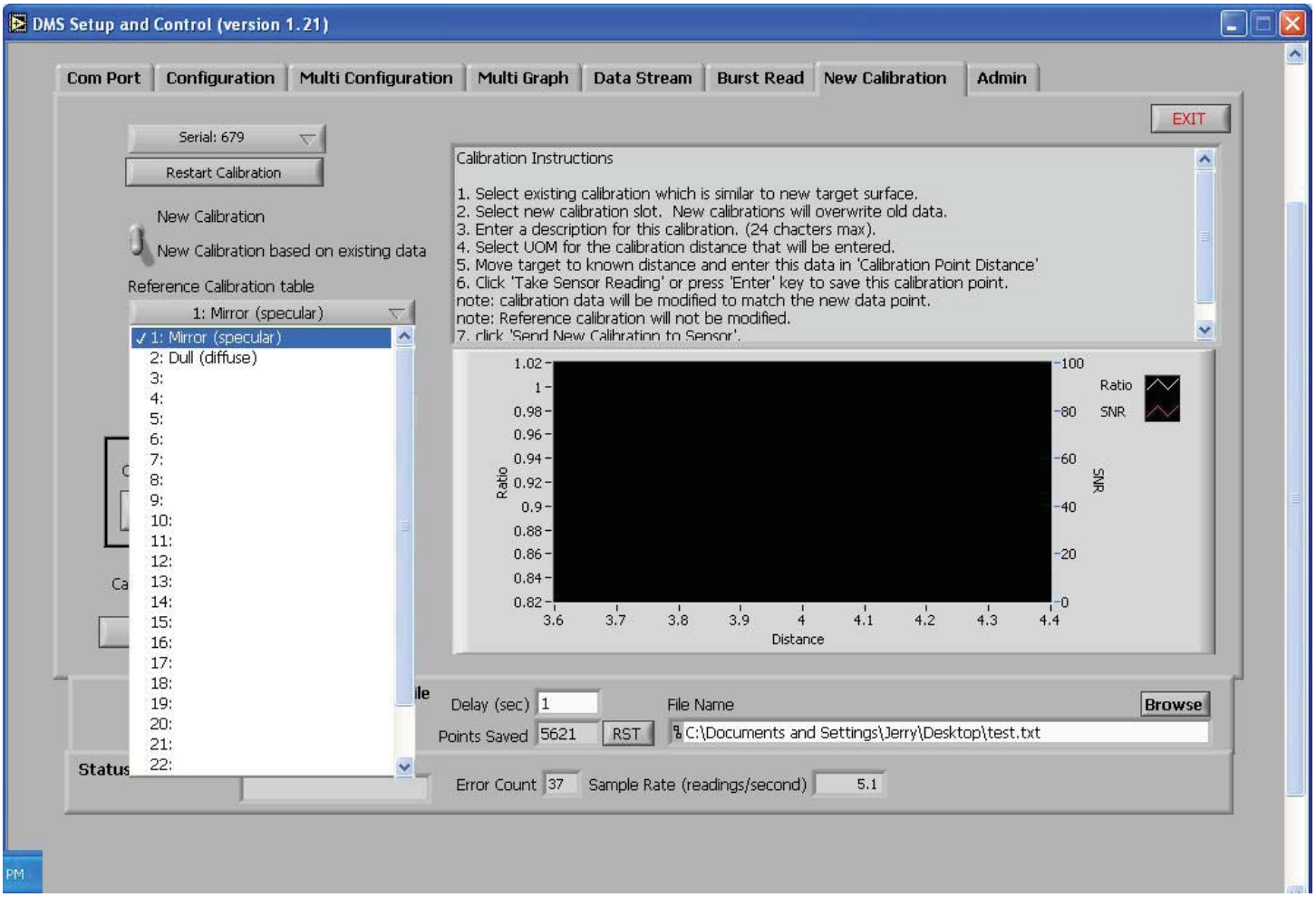
- At ***New Calibration Slot***, select the calibration slot to be used
- At ***Description***, enter a description of the calibration
- At ***Distance UOM***, select the units of measure that will be used for the calibration distance
- Click Restart Calibration
- At ***Calibration Point Distance***, 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.

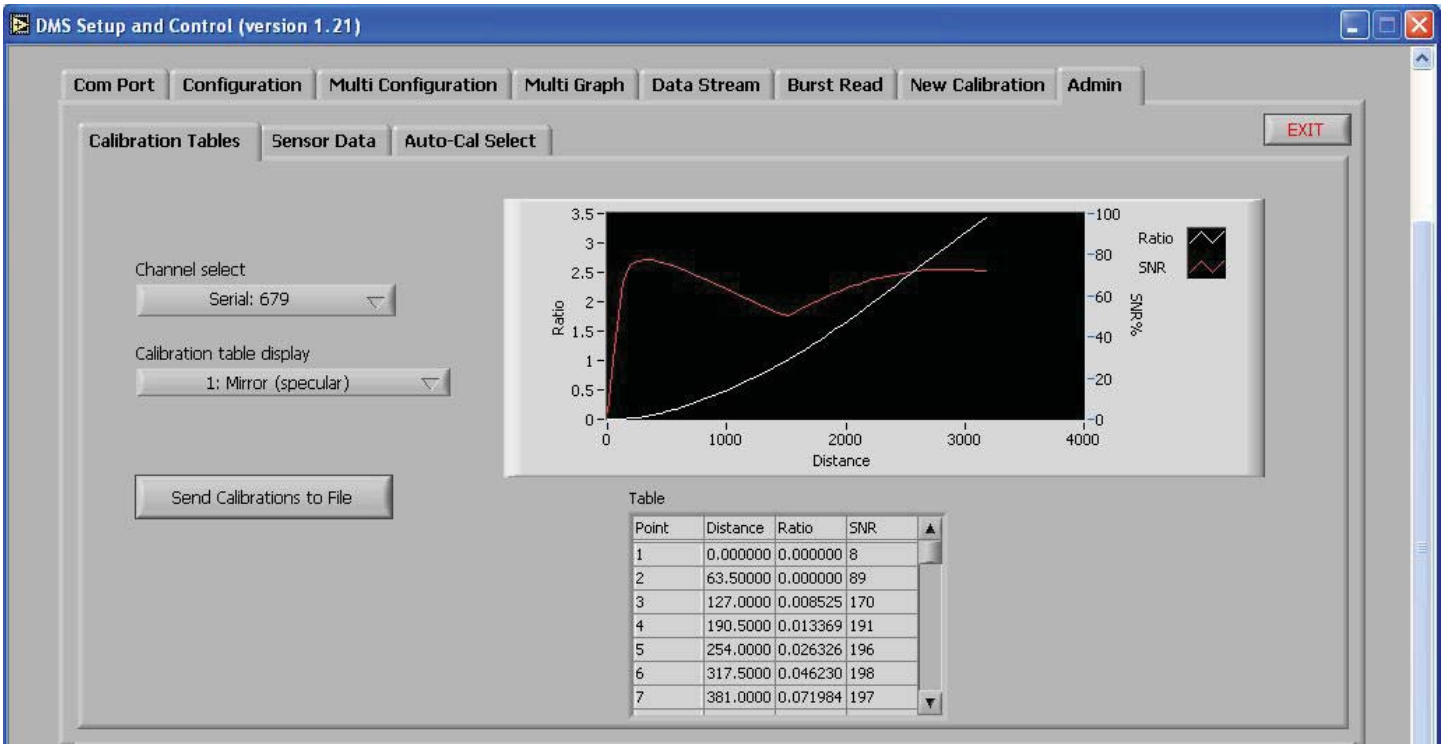
- At ***Reference Calibration Table***, select the reference table
- At ***New Calibration Slot***, select the calibration slot to be used
- At ***Description***, enter a description for the calibration
- At ***Distance UOM***, select the units of measure that will be used for the calibration distance
- 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

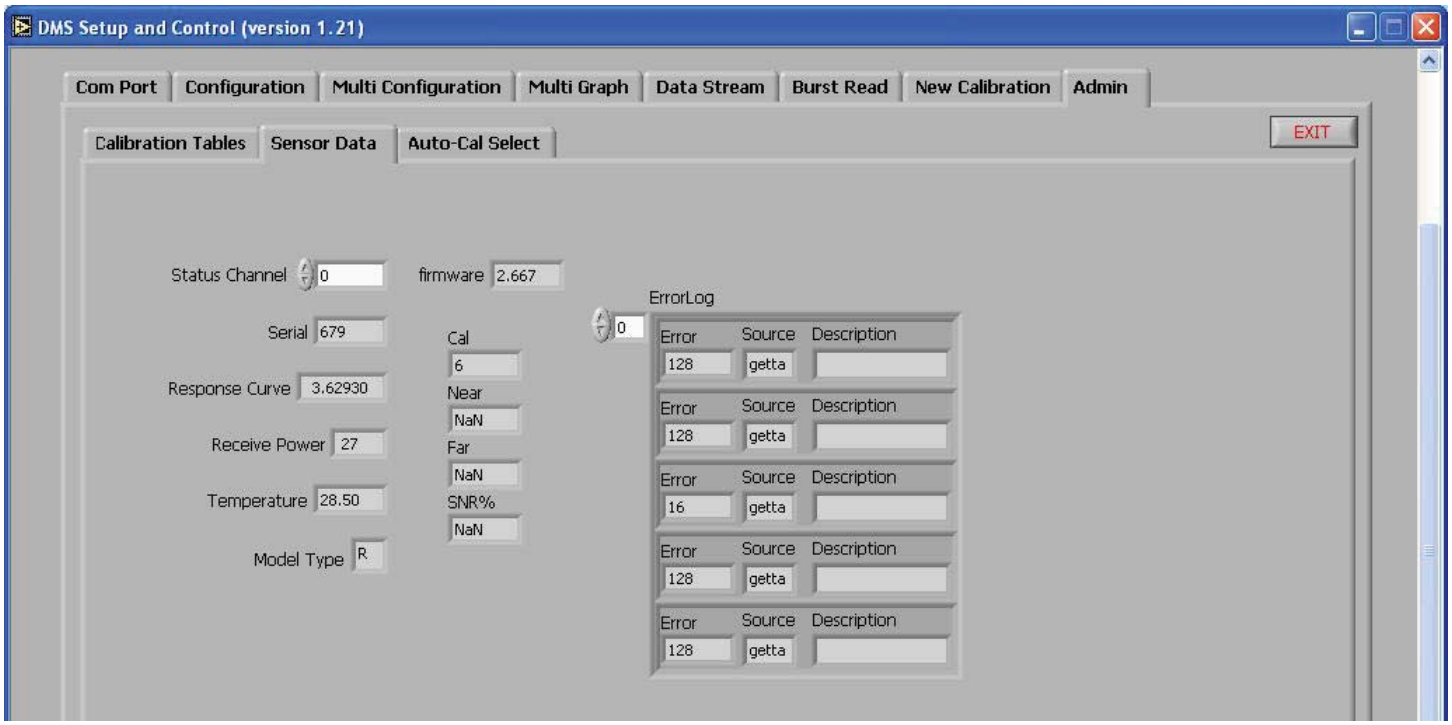
The ***Admin-Calibration Tables*** tab is used to view the data stored in the sensor's calibration tables.

Click on "***Send Calibrations To File"*** to create a text file of all the sensor's calibration tables.



ADMIN - SENSOR DATA

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

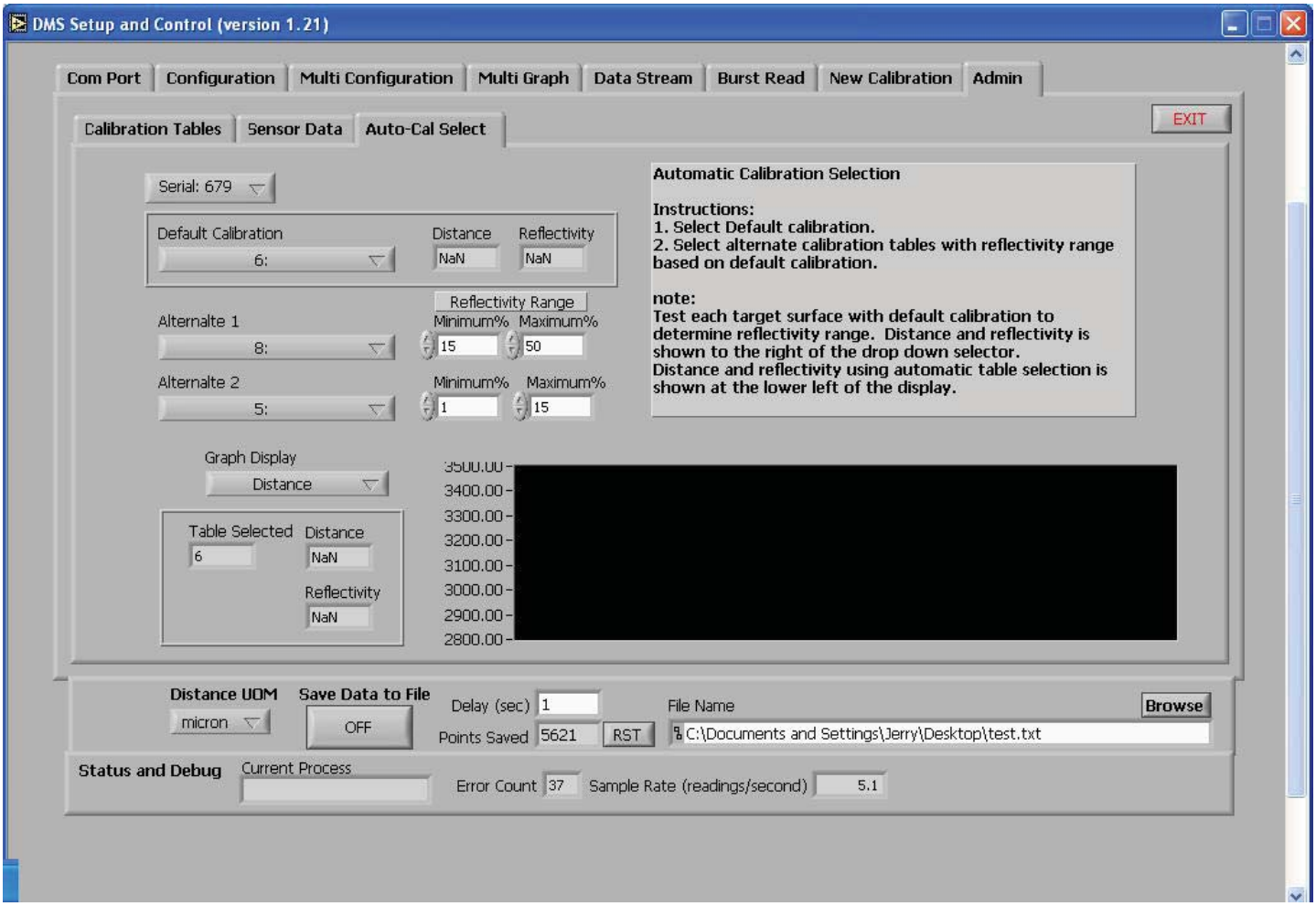


ADMIN - AUTO-CAL SELECT

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.



KEYPAD/LCD OPERATION

When the **DMS** is first powered up, it displays the bar graph screen that was last displayed before the power down. For local operation, **DMS** systems have a two-tier display system:

1. A menu program for setup and selection of parameters and features

2. Active bar graphs for displaying measured results

MENU STRUCTURE

To move from the bar graph display to the menu, press and hold the MENU button for 1 second (This is the only keystroke requiring a press and hold). The **DMS** has a horizontally arranged menu structure. The top line of the display shows the present selection choice in brackets. The keypad buttons will do the following:

MENU ... Returns to the active bargraph display
< ... Scrolls left
> ... Scrolls right
SELECT ... Opens the bracketed selection choice

The menu is arranged in the following order:

- Bar Graph Display
- Display Channel (for dual channel units)
- Distance Tare
- Reflectance Tare
- Calibration Slot
- Calibration Scale
- Gain Setting
- Temperature Set
- Units of Measure
- RS-232 BPS

DMS SETTINGS

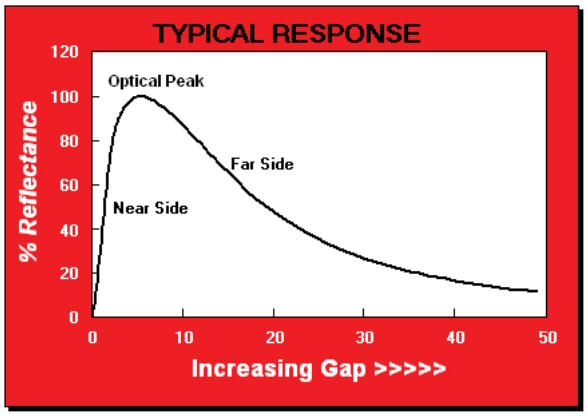
The following parameters can be set or selected:

- Calibration Data Slot
- System Gain/Optical Signal Power
- Amplifier Temperature
- RS-232 Baud Rate
- Units of Measure

The following section gives detailed operating instructions for use of the keypad/LCD.

NOTE: For dual channel units, the LCD can be set (from the Display Channel Menu) to display channel 1 only, channel 2 only, or both channels 1 & 2.

OPERATING PROCEDURES



Reflectance Dependent Fiberoptics

With reflectance dependent fiberoptics, the optical signal power reflected from a target is proportional to the gap and to the reflectance of the target. The D Type sensor has a double valued output function called the near side and the far side regions. Operation in the near side region gives high sensitivity with limited range. Operation on the far side gives moderate sensitivity with much greater operating range.

The optical peak is where the reflected light signal strength reaches a maximum value. To make accurate distance measurements with these devices, the following procedure must be followed:

1 - Check Gain/ Signal Power
2 - Set Optical Peak
3 - Select Near Side or Far Side

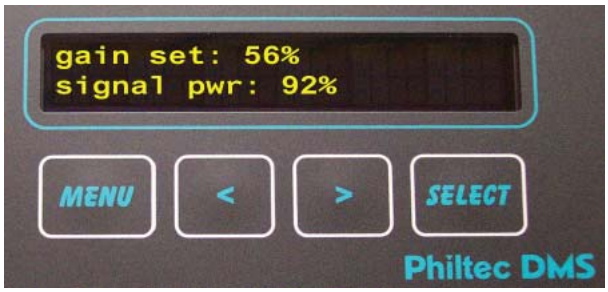
Before any measurements are made, the sensor should be fixtured perpendicular to the target surface, the signal power checked, and the optical peak established. This procedure optimizes the signal strength and calibrates the sensor to the target surface to be measured. This is easily accomplished using the keypad/LCD on the DMS unit.

Keypad Procedure

1. Check Gain/ Signal Power Level

Scroll to the "Gain Setting" screen and
press SELECT

- The top line shows the current Gain Setting
- The bottom line shows the Signal Power Level

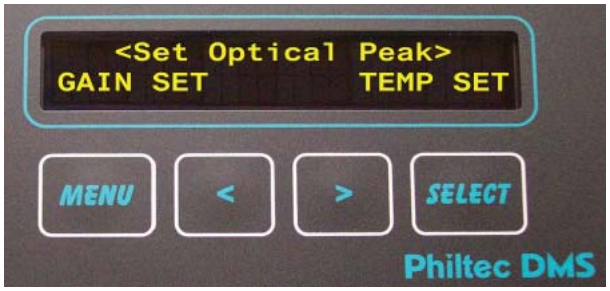


PROCEDURE. At very close range to the target, vary the sensor gap and move to the highest Signal Power reading. At that gap position, use the cursor keys to increase or decrease the signal strength as needed. Adjust the gain to achieve the highest signal power safely without exceeding *100% signal power*
press SELECT

The best performance is attained with the highest SPL.

Important! The Gain and Optical Peak Power are linked together. The optical peak MUST be reset any time the gain is changed to a new value.

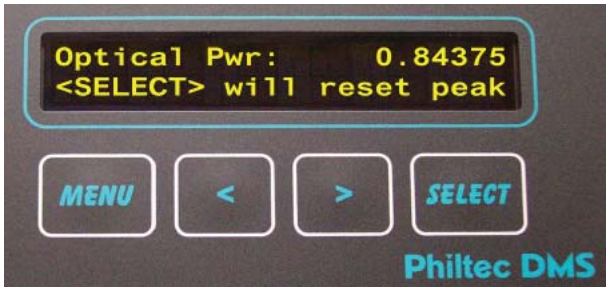
2. Set Optical Peak



1. Scroll to the “Set Optical Peak” screen and
press SELECT

The optical power is displayed on the top line.

2. Adjust the sensor gap to maximize the Optical Power reading. When the optical power is maximized, hold the sensor at that gap and
press SELECT



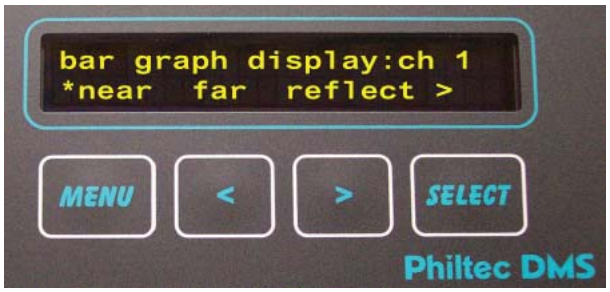
Important! The Gain and Optical Peak Power are linked together. The optical peak MUST be reset any time the gain is changed to a new value.

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.

3. Select Near Side or Far Side

The DMS does not automatically know which side it is on. The user must set the DMS to measure on the near side or set it to measure on the far side.



Scroll to the Bar Graph Display.
Move the cursor to *near* or *far*
Press SELECT

Keypad/LCD Details

BAR GRAPH DISPLAY

The choices for *dual channel* bar graph displays are:
1. Distance only both channels
2. Reflectance only both channels

The choices for *single channel* bar graph displays are:
1. Distance Only
2. Reflectance Only
3. Distance & Reflectance
4. Total Runout, T.I.R.
5. Peak-to-Peak Distance Amplitude, 40 Hz to 5 Khz
6. Peak-to-Peak Distance Amplitude, 4 Hz to 5 Khz

In this display an asterisk highlights the selection choice.
MENU ... Returns to the main menu
< ... Moves asterisk left
> ... Moves asterisk right
SELECT ... Sets the bar graph display to the asterisked item
Note: The select key must be pressed to activate a new selection. Pressing the menu key returns to the main menu without saving the new selection.

BAR GRAPH DISPLAYS

1 Channel DISTANCE ONLY

The upper line displays 3 values:
- the start of the measurement range, 0.00
- the active sensor-to-target distance
- the upper limit of the DMS measurement range

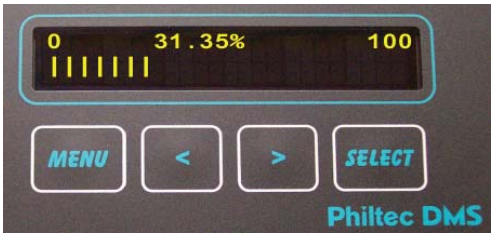
The lower line is an active distance bar graph.

2 Channel DISTANCE ONLY

Channel 1 on Top Line, Channel 2 on Bottom Line

Note: mils = mINCH = 0.001”

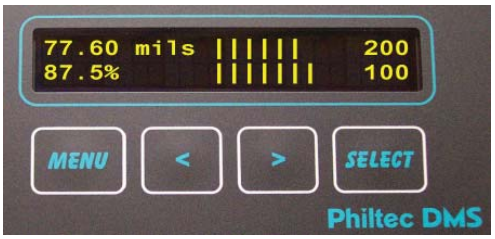
REFLECTANCE ONLY



The upper line displays three values:
- zero
- the active percent reflectance relative to the loaded calibration target material
- 100%

The lower line is an active reflectance bar graph

DISTANCE & REFLECTANCE



The upper line displays:
- The active distance measurement with active bargraph

The lower line displays:
- The active reflectance measurement with active bargraph

BAR GRAPH DISPLAYS CONTINUED

TOTAL INDICATED RUNOUT, T.I.R.

When T.I.R. is selected from the Bargraph Display menu, a two-line display is presented that gives 5 numbers:

Top Line		
Minimum Value	Tared Distance	Maximum Value
Bottom Line		
Absolute Distance		T.I.R.

where T.I.R. = Maximum Value - Minimum Value.
The left or right cursor keys, when depressed, will reset the T.I.R. Values to zero.

NOTES:
1. The T.I.R. function is intended for slowly moving parts such as the manual rotation of a shaft. It is limited to movements at 10 Hz and slower.
2. T.I.R. can be used with or without the distance tared, however it makes more sense to use this function when the distance reading is tared to zero before motion starts.

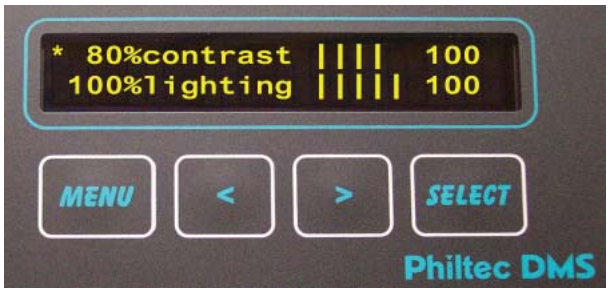
PEAK-to-PEAK VIBRATION AMPLITUDE

Peak-to-Peak amplitude of vibrations can be measured with one of two high pass filters:
40 Hz - 5 Khz and 4 Hz - 5 KHz.
These two displays will appear exactly like the distance only displays. The LCD is refreshed 4 times per second, displaying the pk-pk amplitude of 4092 readings taken every 1/4 second.

DISPLAY BRIGHTNESS AND CONTRAST

The display brightness and contrast levels can be adjusted while viewing any bar graph display.

While viewing any bar graph display, press the select button to bring up the contrast and lighting screen shown here.



Press the select button again to switch between contrast and lighting.

Use the arrow buttons to increase or decrease the levels.

Press the menu button to return to the bar graph display. The new settings will be saved.

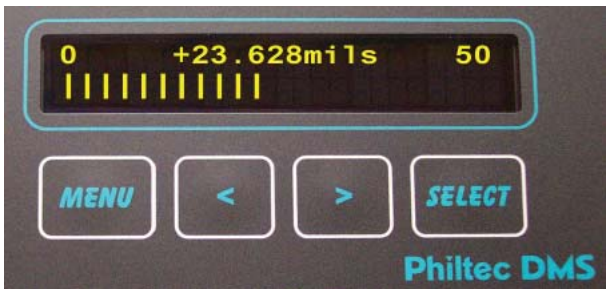
Note: The display brightness can be totally turned off to reduce power consumption as in a “Sleep Mode”.

DISTANCE TARE

The distance tare feature sets the current measured value to zero. The active bar graph remains in the untared mode. To Tare to the current measured value:

move the asterisk to “reset-on”
Press SELECT

Off is used to turn off the tare function
On is used to turn on the tare to the previously selected tare value.



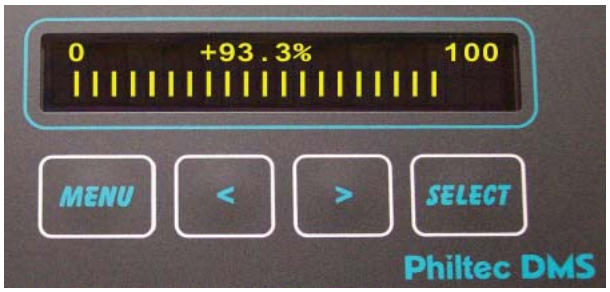
NOTE: When the tare function is on, a plus or minus sign is placed in front of the active tared value, and, the tared value is displayed on the distance tare setup screen.

REFLECTANCE TARE

The reflectance tare feature sets the current measured value to 100%. The active bar graph remains in the untared mode. To Tare to the current measured value:

move the asterisk to “reset-on”
Press SELECT

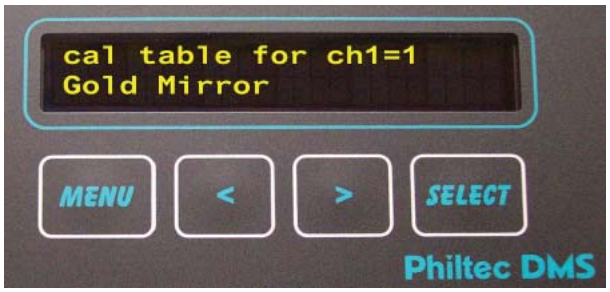
Off is used to turn off the tare function
On is used to turn on the tare to the previously selected tare value.



NOTE: When the tare function is on, a plus or minus sign is placed in front of the active tared value.

SELECT CALIBRATION TABLE

This screen is used to select which calibration table the system will use for distance lookup. Twenty four (24) characters are available to describe the calibration data. The factory supplied calibrations are stored in slots 1 & 2. Thirty one (31) slots are available for storage. Each slot can store up to 256 data points.

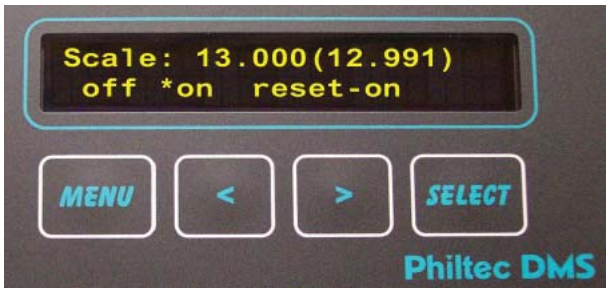


Scroll < or scroll > to the desired cal table
Press SELECT The cal table will be loaded for use.

CALIBRATION SCALING

Scaling of the sensor calibration data is useful for two purposes:

1. It can be used to reset the sensor calibration accuracy if the DMS system sensitivity has drifted over time or temperature.
2. It can be used in place of an actual distance calibration, to rescale the DMS calibration data to a different target material for which a calibration does nor exist.



USING KEYPAD

Using the keypad only, the Scaling Gap MUST be equal to the sensor's maximum operating distance. To rescale the selected calibration that has been loaded:

a. Gap the sensor to the maximum distance from the target
b. From the main menu, scroll to Calibration Scale and press SELECT
c. The display will show the master distance and the (active <u>unscaled</u> distance measurement). Note the active reading. If it is not correct, scaling is needed.

USING PC

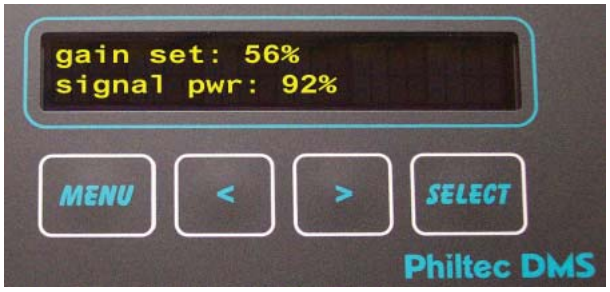
Using a PC keyboard, any gap can be used for Calibration Scaling. To rescale the selected calibration that has been loaded:

a. Set the master distance via a serial port command (see RS232 command instruction set)
b. Gap the sensor to the master distance from the target
c. From the main menu, scroll to Calibration Scale and press SELECT
d. If the unit is a 2-channel DMS, select ch. 1 or ch. 2
e. The display will show the master distance and the (active <u>unscaled</u> distance measurement). Note the active reading. If it is not correct, scaling is needed.
f. Move the asterisk to "reset-on"
g. Press SELECT
h. Return to your bar graph display and note the active reading is now correct.

Off is used to turn off the scaling function
On is used to turn on the scaling to the previously selected value.

*GAIN SETTING**

- The top line shows DMS internal gain.
- The bottom line shows the strength of the signal returned from the target under measurement.



PROCEDURE. Move the sensor thru its operating range and note the highest reading. Use the cursor keys to increase or decrease the signal strength as needed. Adjust the gain to achieve the highest signal power safely without exceeding 100% signal power.

*Note: If the target is very dark, SPL below 5%, a higher gain setting will increase the signal strength and will improve resolution

TEMPERATURE READ and SETTING

This display gives the temperature set point on the upper line and the active temperature measurement on the lower line. The units are always °C.

PROCEDURE FOR TEMPERATURE STABILIZATION

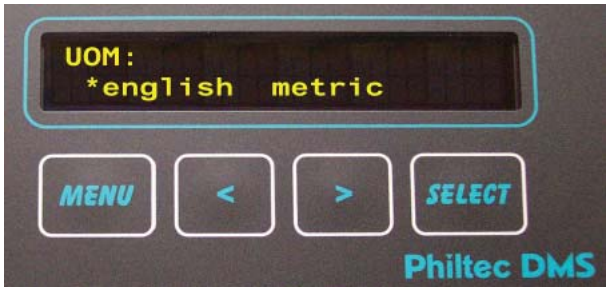
- Power up the DMS and allow it to reach an equilibrium temperature.
- Use the cursor keys to set the temperature 2-3 de grees above the equilibrium temperature
- Press SELECT
- The DMS temperature will maintained at the set tem perature ± 0.1°C in normal ambient room temperature conditions

Occassionally check the active temperature. If ambient conditions change and the active temperature exceeds or falls below the Set Temperature, the Set Temperature must be reset to regain temperature control.

UNITS OF MEASUREMENT

Scroll < or scroll > to the desired units

Press SELECT

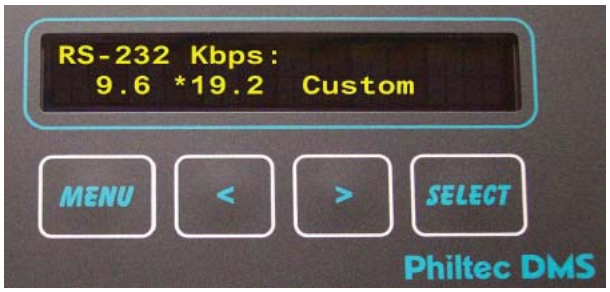


SELECT RS232 BAUD

Scroll < or scroll > to the desired baud rate

Press SELECT

Note: A custom baud rate can be selected by the keypad, but the value of the custom baud must have been preset by using a PC terminal.



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.