Honeywell

GelView Sensor Calibration

Manual

6510020177 Rev 01

GelView Sensor Calibration

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Introduction

This manual describes the calibration procedure for the Honeywell GelView Sensor.

Audience

This manual is intended for use by Honeywell field and factory personnel and assumes that the reader has some knowledge of the operation of a paper machine and a basic understanding of mechanical, electrical and computer software concepts.

Related Reading

The following documents contain related reading material.

Honeywell P/N	Document Title / Description
6510020176	*GelView Sensor Overview*
6510020178	*GelView Sensor Installation*
6510020179	*GelView Sensor Troubleshooting and Preventative Maintenance*
6510020180	*GelView Sensor Calibration Constants and Technical Specification*

Conventions

The following conventions are used in this manual:

NOTE: Unless otherwise specified, you may type all text in uppercase or lowercase.

Boldface	Boldface characters in this special type indicate your input.
`Special Type`	Characters in this special type that are not boldfaced indicate system prompts, responses, messages, or characters that appear on displays, keypads, or as menu selections.
Italics	In a command line or error message, words and numbers shown in italics represent filenames, words, or numbers that can vary; for example, filename represents any filename. In text, words shown in italics are manual titles, key terms, notes, cautions, or warnings.
Boldface	Boldface characters in this special type indicate button names, button menus, fields on a display, parameters, or commands that must be entered exactly as they appear.
lowercase	In an error message, words in lowercase are filenames or words that can vary. In a command line, words in lowercase indicate variable input.
Type	Type means to type the text on a keypad or keyboard.
Press	Press means to press a key or a button.
[ENTER] or **[RETURN]**	**[ENTER]** is the key you press to enter characters or commands into the system, or to accept a default option. In a command line, square brackets are included; for example: **SXDEF 1 [ENTER]**
[CTRL]	**[CTRL]** is the key you press simultaneously with another key. This key is called different names on different systems; for example, **[CONTROL]**, or **[CTL]**.
[KEY-1]-KEY-2	Connected keys indicate that you must press the keys simultaneously; for example, **[CTRL]-C**.
Click	Click means to position the mouse pointer on an item, then quickly depress and release the mouse button. This action highlights or "selects," the item clicked.
Double-click	Double-click means to position the mouse pointer on an item, then click the item twice in rapid succession. This action selects the item "double-clicked."

Drag X — Drag X means to move the mouse pointer to X, then press the mouse button and hold it down, while keeping the button down, move the mouse pointer.

Press X — Press X means to move the mouse pointer to the X button, then press the mouse button and hold it down.

The information icon appears beside a note box containing information that is important.

The caution icon appears beside a note box containing information that cautions you about potential equipment or material damage.

The warning icon appears beside a note box containing information that warns you about potential bodily harm or catastrophic equipment damage.

Honeywell, Vancouver Operations Part Numbers

Honeywell, Vancouver Operations assigns a part number to every manual. Sample part numbers are as follows:

6510020004

6510020048 Rev 02

The first two digits of the part number are the same for all Honeywell, Vancouver Operations products. The next four digits identify part type. Technical publications are designated by type numbers 1002. The next four digits identify the manual. These digits remain the same for all rewrites and revision packages of the manual for a particular product. Revision numbers are indicated after the Rev.

1. Calibration

The “Gels” measurement from the GelView sensor is derived from the voltages of the Specular and Diffuse channels. These net voltages are in the range of 0 to 10 volts DC.

This chapter reviews the calibration procedure that must be performed for each installed sensor before an accurate Gels measurement can be provided.

Typically we calibrate our gauges (for example, color) to some laboratory standard. For the GelView gauge there is no equivalent laboratory measurement and so for normal application we are not interested in using a laboratory standard to determine a calibration slope and intercept for each gauge. We calibrate the sensor to the Honeywell Gels Scale (See section 1.4).

In this procedure we sample a material that is a nearly perfect diffuse reflector (Spectralon®). Ideally, measurements of this material should give identical readings on both the Diffuse and Spectral channels. In reality, we will always have differences in the performance of the lenses, optical fibers and amplifier gains and therefore there will be differences in the voltage outputs for the two channels. To correct for these differences requires only the calculation of an Epsilon Ratio for each sensor.

If there is a need to correlate the GelView gauge to a laboratory standard, then the gauge calibration allows you to sample laboratory standards and calculate a slope and intercept for each gauge.

NOTE: It is a requirement that the door to the Electronics Interface Cabinet (EIC) be completely closed and latched for one hour before calibration and at all times during calibration and repeatability testing. This will prevent stray electromagnetic fields from inducing noise in the sensitive, high impedance electronics, which would adversely affect calibration.

1.1. Equipment - required

The only item required to perform the calibration is a piece of 100 percent diffuse reflecting material (Spectralon®).

NOTE:	Spectralon® is a perfect diffuse reflector and must be kept clean and free of any oil contamination. This material is expensive and so only a small amount is supplied with the system. It looks very similar to paper and therefore we suggest that it is stored in a well-marked bag.

1.2. Equipment - optional

There may be a requirement in some applications to calibrate the gauge to some laboratory standard. To do this, a calibration fixture [1] may be used. See Figure 1-1. A special spring loaded bracket [3] holds the standard [2] tight inside the unit. The mirror [4] directs source light beam to the tile and reflected and scattered radiation from the tile back to the receiving optical collimators.

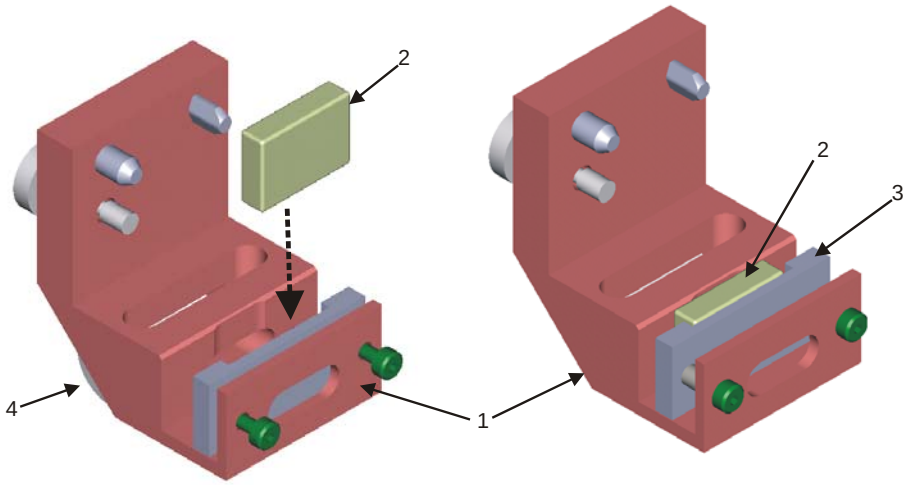

Figure 1-1 Calibration Fixture, with and without a laboratory standard

NOTE: The calibration fixture is not standard equipment and must be purchased separately.

It is very important to keep mirror clean and unscratched.

The calibration fixture with the standard is attached to the sensor mechanical housing by sliding the two “keyed” pins into the sockets in the side of the mechanical housing and tighten the “thumb-wheel” screw [1] as shown in Figure 1-2.

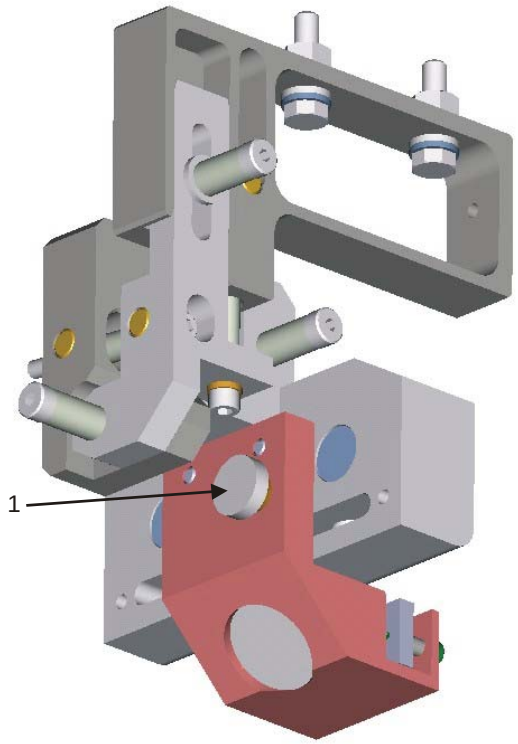

Figure 1-2 GelView Sensor with Calibration Fixture Attached.

NOTE: The calibration fixture must be tightly secured to the module to provide consistent results. Make sure there is no foreign material between the two surfaces.

Ensure that the sensor glass shield assembly is installed and clean before performing any tests.

1.3. Channel amplifier gain setup

1. Align the sensor.
2. Sample the diffuse reflecting material (Spectralon®) and set the gain on the Diffuse channel to maximize the amplifier voltage output.
3. To produce a sample near 100 Gels, stretch a piece of plastic film (cling-film/cling-wrap/Saran wrap) over the diffuse reflecting material (Spectralon®).
4. Sample the 100-Gels reflecting material and set the gain on the Spectral channel to maximize the amplifier voltage output without saturating the amplifier. An amplifier output voltage of 10V indicates that the amplifier is saturated. It is desirable to have a nominal amplifier output of 5 to 8V at from the spectral channel with a 100-Gels sample.

1.4. Calibration to Honeywell Gels Scale

NOTE: Before a sensor calibration is performed, the sensor must be aligned to the sheet support surface (either a paper roll or roller sheet support). Ensure that the glass shield assembly is installed and that the glass is clean.

The calibration equation used for the Honeywell Gels Scale is:

$$Gels = m \times \left(1 - Epsilon_{time\,0} \times \left(\frac{Voltage_{Diffuse} - Voltage_{DiffuseBackground}}{Voltage_{Specular} - Voltage_{SpecularBackground}} \right) \right) + c$$

$$where\ m = 100;\ c = 0.$$

NOTE: The "Honeywell Gels Scale" is an arbitrary scale for measuring coating consolidation. It was developed through laboratory tests of coating consolidation.

To perform the calibration procedure:

1. Place a piece of Spectralon® flat to the measurement surface and in the path of the light.

2. Select the **Sensor Maintenance** display.

3. Select **Modes & Recipes** and place the GelView PMP that contains the sensor to be calibrated in Maintenance Mode.

4. Select the Advanced GelView Calibration dialog, shown in Figure 1-3.

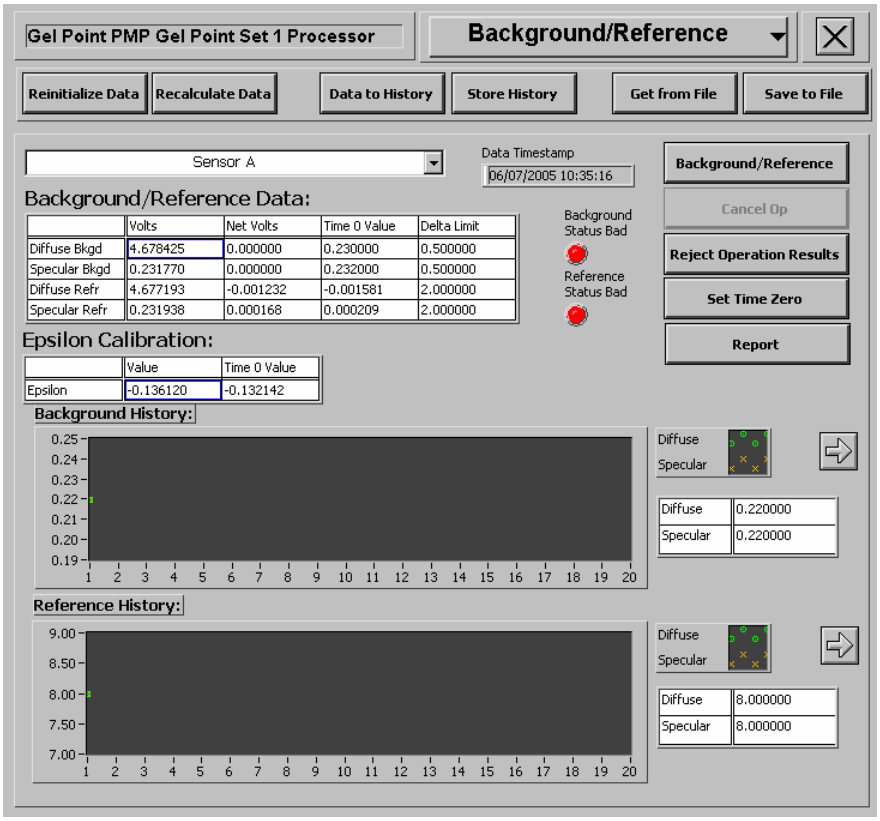

Figure 1-3 Calibration Dialog – Honeywell Scale

5. Press **Background/Reference**.

6. Select the GelView Sensor to be calibrated. The calibration display refreshes and shows the last calibration for the selected sensor.

7. With the Spectralon® standard in place, press **Background/Reference** to sample the standard. Once activated,

this procedure shuts off the light emitting diodes (LEDS) of all the sensors, then it samples and records the background voltages for both the Spectral and Diffuse channels. Finally, the LEDS for all the sensors are activated and the procedure samples and records the reference voltages for the Spectral and Diffuse channels.

The Reference voltage for each channel depends on the amplifier gain, sensor alignment and light transmission losses between components.

8. Perform the **Background/Reference** operation three times. Note and record the value of both the background and reference voltages for the Diffuse and Specular channels as well as the Epsilon ratio.

9. To accept the **Epsilon** calibration value press **Set Time Zero** to set the **Epsilon$_{TimeZero}$** value.

10.. To save a history of the calibration, press **Data to History** to update the history buffer with the latest value. Press **Store History** to permanently save the historical data for all sensors

11.. Repeat steps 1 through 12 for all sensors.

1.5. Calibration to Laboratory Standard Scale

NOTE: This method of calibration is not typically performed and is used only for troubleshooting.

Before a sensor calibration is performed, the sensor must be aligned to the sheet support surface (either a paper roll or roller sheet support). Ensure that the glass shield assembly is installed and that the glass is clean.

Prior to calibrating to a laboratory standard, a value for Epsilon$_{TimeZero}$ must be determined by calibration to the Honeywell Scale (See Section 1.4).

To perform the laboratory calibration procedure:

1. Install a calibration fixture with the ‘laboratory standard’ as explained in Section 1.2 and illustrated in Figure 1-1.

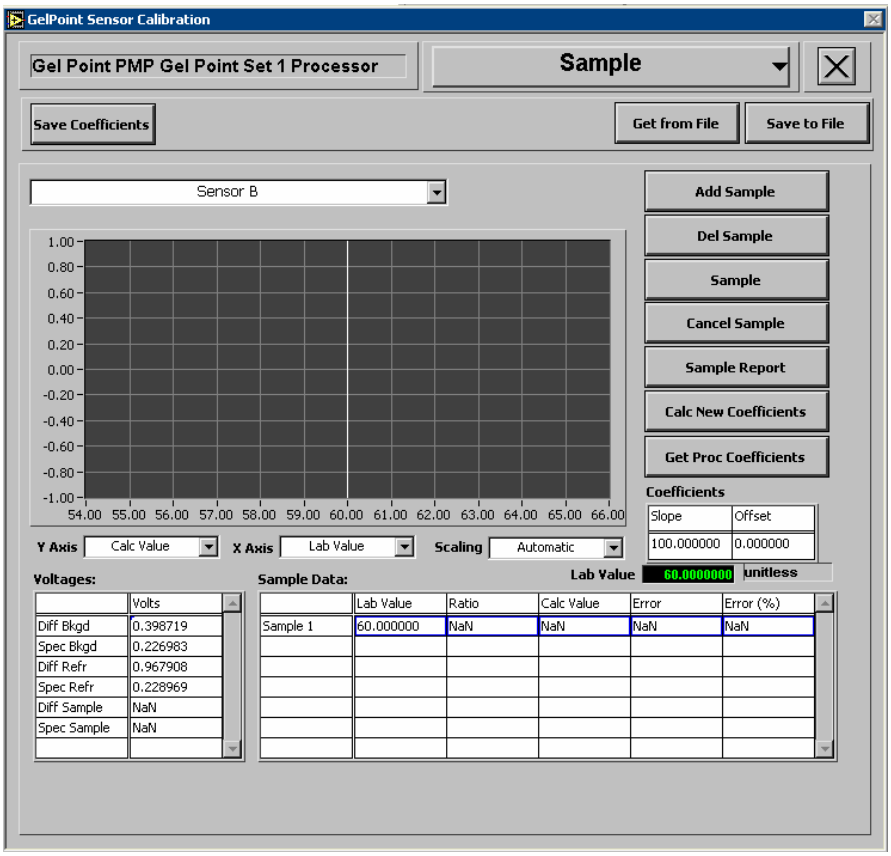

Figure 1-4 Calibration Dialog – Laboratory Standard Scale

2. Press **Sample**.

3. Select the GelView Sensor to be calibrated.

4. With the laboratory standard in place, press **Add Sample** and enter the “laboratory Gels value” for the sample.

5. Perform a **Sample** operation three times. Note and record the value of both the background and actual voltage for the Diffuse and Specular channels as well as the calculated Gels value.

The calibration equation used for the “Laboratory Standard Scale” is:

$$Gels = m \times \left(1 - Epsilon_{time\,0} \times \left(\frac{Voltage_{Diffuse} - Voltage_{DiffuseBackground}}{Voltage_{Specular} - Voltage_{SpecularBackground}} \right) \right) + c$$

$$where\ m = Calculated\ \ Slope;\ c = Calculated\ \ Intercept.$$

6. Repeat steps 1 to 5 for all the other ‘standard’ samples.

7. Once the values for all the standards have been determined, press **Calc New Coefficients** to calculate a calibration slope and intercept for the sensor.

8. The graph in this display shows the correlation of the measured Gels to the laboratory sample Gels. If the linear fit is acceptable, press **Save Coefficients** to save the slope and intercept values to the grade calibration.

9. Repeat steps 1 to 8 for each sensor.