Honeywell

GelView Sensor

Installation Manual

6510020178

GelView Sensor Installation Manual

October, 2003

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Introduction

The purpose of this manual is to describe the installation and alignment of GelView Sensors.

Audience

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

About This Manual

This manual contains seven chapters.

Chapter 1, **GelView System Installation Overview**, describes a high-level overview of the system installation and the documents required to support the installation and commissioning of the system.

Chapter 2, **Pre-Installation Requirements Overview,** describes preparatory measures and tools required for the installation of a GelView sensor system.

Chapter 3, **Electronic Interface Cabinet,** describes the EIC component of the GelView system and how to install.

Chapter 4, **Precision Measurement Processor Cabinet,** describes the PMP component of the system and how to install.

Chapter 5, **Standard Communication Cable,** describes the non-fiber optic communication required by the system.

Chapter 6, **Fiber Optic Communication Cable,** describes fiber optic cable, its care and handling, pre-installation checks and how to install.

Chapter 7, **Individual GelView Sensors,** describes mounting and alignment of sensors at installation and different types of sensor installation.

Related Reading

The following documents contain related reading material.

Honeywell P/N	Document Title / Description
6510020177	*GelView Sensor Calibration*
6510020178	*GelView Sensor Installation*
6510020179	*GelView Sensor Troubleshooting and Preventative Maintenance*
6510020180	*GelView Sensor Calibration Constants and Technical Specification*

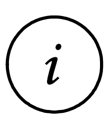
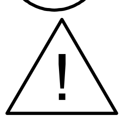
Conventions

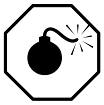
The following conventions are used in this manual:

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. GelView System Installation Overview

The GelView system is a scalable system that contains a combination of mechanical, electrical and computer based equipment. This manual covers the installation of the mechanical and electrical based components of a GelView system. This manual does not cover the principle of operation of the sensor, nor the application setup required in the Da Vinci Server .

This chapter covers a top-level overview of the system installation and the documents required to support the installation and commissioning of the system. Subsequent sections of this manual cover the installation of the specific components as identified in "GelView System Hardware Components Overview".

1.1. GelView System Hardware Components Overview

A basic GelView sensor system consists of:

- a set of independent GelView sensors
- a set of fiber optic cables
- an Electronics Interface Cabinet (EIC)
- a Precision Measurement Processor (PMP) cabinet
- an EIC-PMP serial communication cable
- a Da Vinci Application Server with LAN connections

For more complex GelView systems, the same basic components are used as building blocks to support the number of sensors required for the specific installation.

The basic six sensor GelView system configuration, with and the interconnectivity of these core components, is shown in Figure 1-1 Basic GelView Sensor System Configuration.

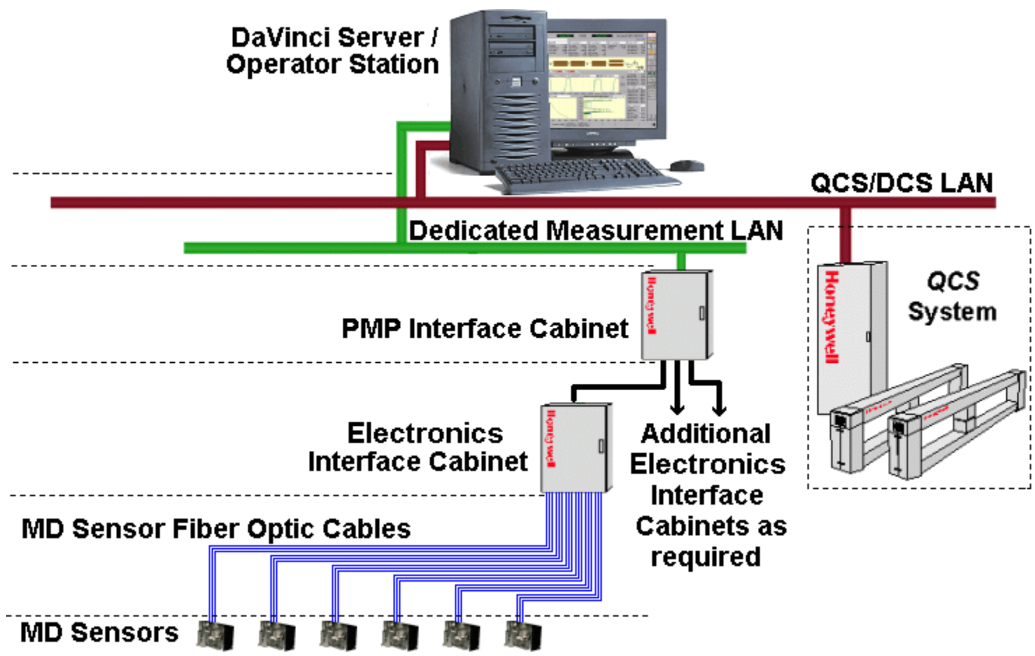


Figure 1-1 Basic GelView Sensor System Configuration

A more complex GelView sensor system configuration for two coating stations with twelve sensors per station is shown in Figure 1-2 Two Coater Station GelView Sensor System Configuration.

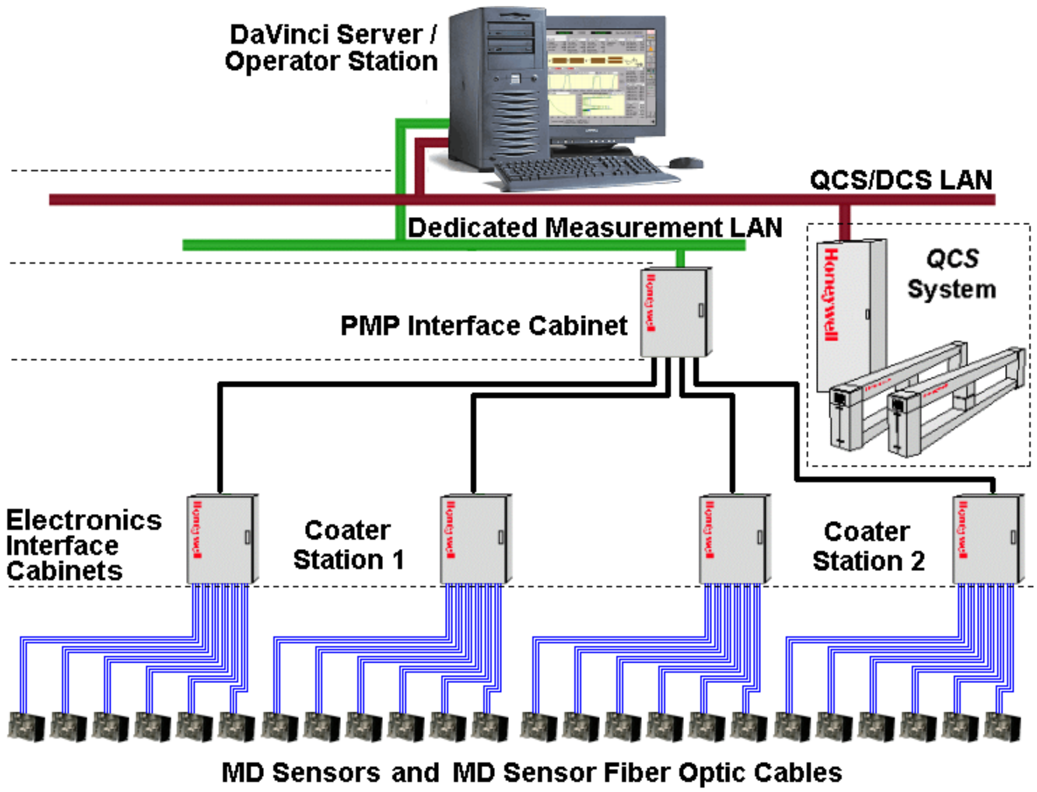


Figure 1-2 Two Coater Station GelView Sensor System Configuration

The remaining sections of this manual are focused on:

- Pre-Installation Requirements Overview
- Electronic Interface Cabinet
- Precision Measurement Processor Cabinet
- Standard Communication Cable
- Fiber Optic Communication Cable
- Individual GelView Sensors

This manual deals with all aspects of the installation. It does not deal with long-term maintenance or troubleshooting aspects of the system.

CAUTION:	Be aware that if the user installs and/or uses the GelView equipment in a manner not specified by Honeywell, the safety protection provided by the equipment may be impaired.

2. Pre-Installation Requirements Overview

Installation of a GelView system does require some process and machine operation knowledge as well as a good appreciation for mechanical installation requirements. This manual refers to a paper coating production machine as the target machine for the installation, but the same core questions and issues are applicable regardless of the actual machine product.

Some of the key aspects of the project outline should already have been covered prior to the sale of a GelView system, but these key aspects of the process and the machine should be reconfirmed. Key information includes:

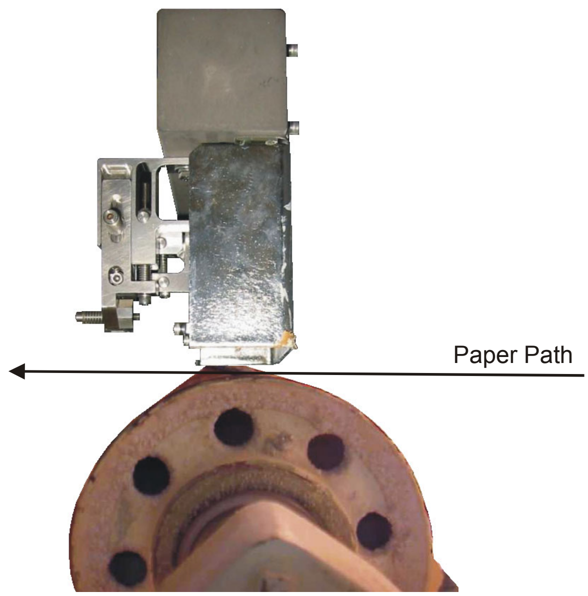
- Target machine configuration
- Current Process drying strategies
- Front-side or Back-side of the machine for the location for the GelView sensors
- Mechanical Mounting Options and Issues
- Installation time frame and resource availability
- Access to Process Variable information for Monitoring and Control

From a sensor mounting point of view, knowledge of the different types of mechanical mounting methods available for the GelView sensors (see "Typical GelView Sensor Mounting Options") will greatly reduce the time that it takes to determine what locations are acceptable for the sensors.

2.1. Typical GelView Sensor Mounting Options

For a successful GelView sensor measurement, the sensor must be correctly aligned and the sheet to be measured must be stable. If the sheet is stabile and always in the same Z-direction position with regards to the sensor, than a reliable, repeatable measurement will be obtained. To obtain these conditions, there are three common mounting options for the sensor. The pros and cons of each mounting method are noted below:

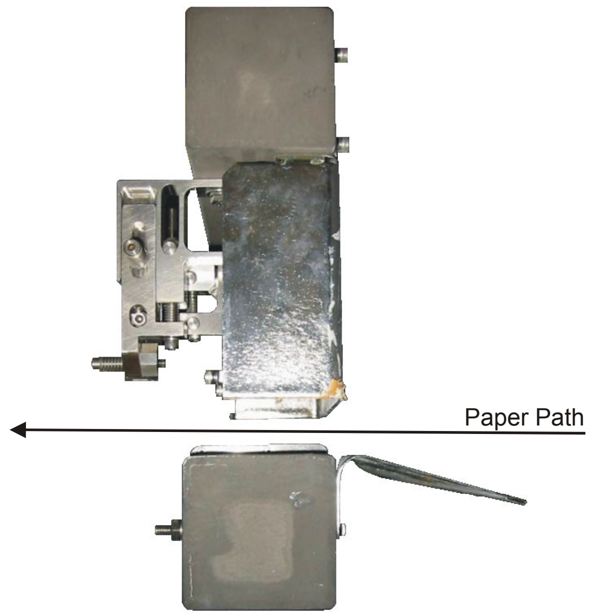
1. Sensor mounted opposite a turning roll.



This mounting arrangement is one of the most common and is very simple to setup. The roll provides the sheet stability required and the only issues for installation are:

- Correct sensor alignment to the sheet.
- Ensuring the measurement is on the tangent of the roll where the paper is fully supported by the roll, but have the sensor mounted towards the leading edge of the roll to reduce the angle for coating splatter to potentially come in contact with the sensor optics
- Large enough diameter roll to provide a measurement area that can be assumed to be approximately “flat”. A roll diameter of at least 200 mm (7.87 inches) is required.

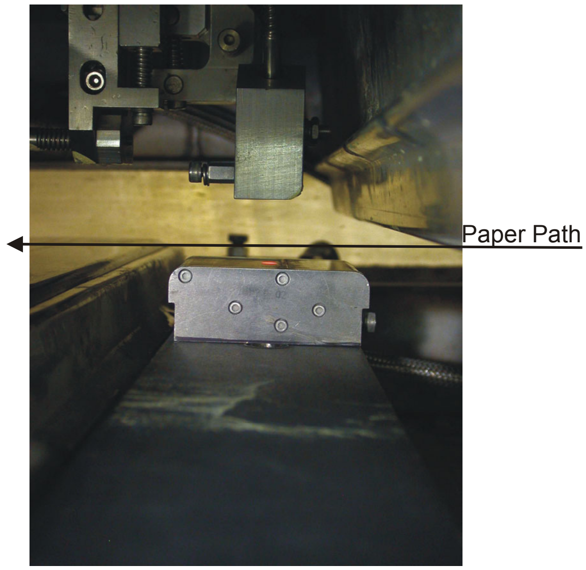
2. Sensor mounted on a C-Frame with integrated precision web controller (Air Sheet Stabilizer).



This mounting arrangement is used in open draw areas. Alignment of the sensor to the measurement spot is relatively simple, but setup of the C-Frame so that the sheet is reliably held stable by the integrated Air Sheet Stabilizer is difficult and requires additional time to setup. The issues for installation are:

- Suitable mounting location for the C-Frame
- Known location of the sheet for alignment of the integrated Air Sheet Stabilizer (Z-direction, MD angle).

3. Sensor mounted opposite an independently mounted sheet stabilizer unit.



This mounting arrangement is used in open draw areas or in Air Dryers (either single sided or double sided). Alignment of the sensor to the measurement spot is again relatively simple, but setup of the air sheet stabilizer or other sheet stabilization unit is very difficult and requires additional time to setup. The issues for installation are:

- Suitable mounting location for the independently mounted sheet stabilization unit
- Known location of the sheet for alignment of the independent sheet stabilizer (Z-direction, MD angle). This is aspect of the alignment is complicated by the fact that the paper path is usually affected by the air pressure supplied by the Air Dryer and therefore the straight-line paper path can not be assumed.

Sensors mounted in an open draw or mounted in an Air Dryer with no paper backing support where the position of the paper is not repeatable and stabile are not recommended. This mounting arrangement is not recommended because establishing the correct sensor alignment to the sheet is almost impossible since there is no reference point and the sheet position can not be guaranteed from grade to grade.

All these mounting options are discussed in more detail in "Individual GelView Sensors".

2.2. Preliminary Site Inspection

The main reason for the preliminary site visits is to confirm the mechanical configuration of the machine and to determine whether the correct number of GelView sensors are available for monitoring and control, and whether machine drying element control is feasible. The number of coat stations on the machine, the coat stations that will be instrumented, and the number of drying elements for each coating station are key pieces of information that are required. Most of this information can be retrieved or identified from a coating machine elevation AutoCAD drawing. The machine elevation in AutoCAD format does not need to be overly detailed but the information that we are looking for, for each coating station that is being instrumented, includes:

- Number of Infrared (IR) drying units installed per coating station and the number of banks per drying unit and whether they are independently controlled or not.
- Number and type of Air Floatation drying units installed per coating station and the number of banks per unit and whether they're temperature and pressure controllers are independently controlled or not.
- Location and diameter of the turning rolls between the coating head and any dryer cans installed per coating station.
- The physical size of the installed drying units and the distance between each of the mechanical components installed.
- The location of columns and structural beams that can be used to mount the sensor support brackets.

The next piece of information is a little more difficult to get. In discussion with the process engineers and coating experts at the mill, try and determine:

- Where in the MD is the coating surface losing the majority of its moisture content? This is characterized by a dulling of the coating surface reflectivity. This may not be easy to identify, but even narrowing the location down to a specific drying element will help.
- What is the known range in the MD of this drying location? Many production personnel will indicate that there is very little

movement of this location, but the key is to determine the range for the range of coat weights applied on that coating station.

Additionally, determine whether the sensors will be mounted on the front-side or back-side of the machine. Typically, the sensors are mounted on the machine such that the actual sensor and measurement spot is located 0.5 meters (19.7 inches) from one of the sheet edges. When determining the location of the sensors, you must take into account the following issues:

- Will the sensors interfere with the threading of the machine, in particular the paper-feed ropes?
- Will the sensors interfere with access to the machine, including operator walkways, visual inspection points, and machine cleaning areas?
- Will the sensors interfere with the retraction system of any of the equipment installed on the machine?
- How much paper movement in the Z-direction is there? Is the location of the paper the same in the Z-direction for different grades?

Finally, the preliminary visit also provides an indication of any other issues with regard to the installation or measurement. In terms of the installation of the sensors, physically look at the machine and determine the issues that might exist if a sensor was located in a particular location. For example:

- A sensor located next to a retractable Air Floatation dryer may interfere with either the dryer during advancement or retraction.
- A sensor located next to a dryer element may interfere with the access panels to that dryer element.
- A sensor located in a tight location opposite a turning roll may eliminate the possibility of replacing the roll without completely removing the sensor mount bracket from the machine.

In terms of the sensor measurement, the measurement is sensitive to Z-direction alignment and CD and MD paper tilt. With the measurement in mind, review the machine and determine if there are any specific alignment issues.

For example:

- If a sensor is mounted in a drying element, does that drying element vibrate to a degree that would compromise the measurement (more than 0.2 mm Z-direction movement)?

- If a sensor is mounted in a retractable drying element with no paper support on the other side of the sensor, will the paper be in the same Z-direction position and angle every time the dryer element is lowered into position? If not, then a sheet stabilizer unit of some description will be required. In this case, are there any space constraints for mounting an independent sheet stabilizer unit?

- If a sensor is mounted with a double-sided Air Dryer, will the change in air pressure affect the Z-direction position and angle of the paper at the measurement point? In this case, a sheet stabilization unit will of some description be required.

- If a sensor is mounted opposite a turning roll, will that roll always be in the exact same position since tension rolls or bowed rolls can change their absolute position?

- Is the coater always threaded the same way, or are there alternate paper paths depending on the grade manufactured and the number of coatings applied to the base sheet?

All this information will aid in the successful installation of the GelView system.

Other aspects of the machine that will affect the measurement (vibration, retraction system variability, etc) should also be noted and relayed back to the installation team.

2.3. Determination of Individual Sensor Positions

The determination of where the sensors should be placed is highly dependent on the mechanical configuration of the machine and the number of drying elements available.

Based on the information provided by the mill process engineer and coating experts, the location of the first and second critical solids point and the central drying region are the critical areas that need to be instrumented. If the central drying region is not satisfactorily instrumented, then determination and control of the evaporation rate in this region will not be possible. Similarly, if the region around the first and second critical solids point is not satisfactorily instrumented, then determination and control of the MD location of the critical drying region will not be possible during steady state, blade change or grade change conditions.

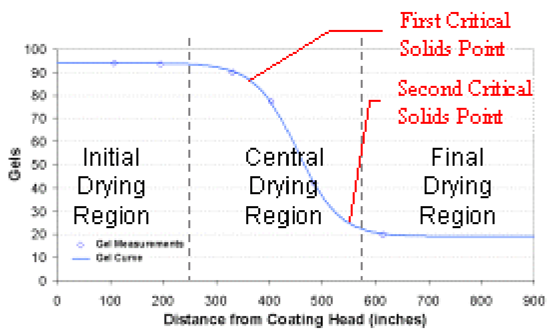


Figure 2-1 Example Reflectivity Decay Curve

Once these regions have been identified, the placement of the sensors then comes down to simple mechanics; what is the configuration of the machine and where can the sensors be physically located. This is ultimately the biggest determining factor as to how many sensors are installed on a particular coating station, along with how broad the grade mix is on the machine.

2.4. System Installation Planning

Sensor installation takes time. If the sensors are not setup correctly, then the system will not work as planned and the system commissioning will be delayed.

The sensor installation also requires that the fiber optic cable and the EIC are installed and operational, so it is key that these two components are the first to be installed.

Total installation time depends on the number of sensors to be installed, and the number of qualified installers. Any technician can install mechanical equipment, but sensor alignment needs to be performed by someone who knows how to adjust the sensor mechanics to get the optimal sensor reading. This is the key factor that determines the required installation time. For 95% of the installations, an eight-hour shut will not be enough. A rough installation time can be calculated using the following guidelines, and this information needs to be relayed to the mill at the earliest opportunity.

2.4.1. Necessary Equipment for System Installation

The following equipment is required for the GelView sensor installation process:

- Optical Power meter (one supplied with system)
- Alignment Block (one supplied with system)
- Set of three calibration fixtures (one set supplied with system)
- Allen Key
- Paper sample
- Reflective aluminum sample
- Lightweight nylon twine and two weights. These are used for determining paper path.
- Calibration verification sample

If the time allocated for equipment installation is short and more than one qualified installer will be used, additional installation equipment will be required.

2.4.2. Shutdown Duration and Resource Requirements

Total installation time depends on the number of sensors to be installed on the required number of coating stations, and the number of qualified installers. Mechanical mounting equipment and the basic sensor can be installed by anyone, but sensor alignment needs to be performed by someone who knows how to adjust the sensor mechanics to get the optimal sensor reading. This is the key factor that determines the required installation time. The following times can be used as a rough calculation of the total installation time required.

These times assume that all mechanical mounting equipment used fits onto the machine correctly and places the sensor within 25 mm ±8 mm from the sheet.

	Installation time	Alignment Time	Calibration Time
Sensor opposite turning roll	1.0	0.5	0.25
Sensor with C-Frame	1.5	0.75	0.25
Sensor mounted opposite an independently mounted sheet stabilization unit	2.0	0.75	0.25

The installation times include mounting of the basic mounting arm to support the GelView sensor and the mounting of the sensor on this arm. Alignment time includes alignment time for the sensor (MD, CD, Z-Direction) and alignment time for the sheet stabilization unit if applicable. Calibration time assumes that the Da Vinci Server, PMP and EIC are all installed and have been commissioned.

Installation times are assuming completion by any mechanically-minded individual. Alignment and calibration times assume completion by someone experienced in sensor setup and Da Vinci Server operation.

2.5. Components that can be installed prior to System Installation

Many of the GelView system components can be installed prior to the installation. Pre-installing these components will significantly speed up the commissioning time of the installation. The components that can be pre-installed are:

- GelView Electronic Interface Cabinet (EIC) (Section 3).
- PMP Cabinet (Section 4).
- Da Vinci Server
- Fiber optic cables between the individual sensor locations and the EIC (Section 6).
- Communication cable between the EIC and PMP (Section 5).

- Network cable between the PMP and the Da Vinci Server (Section 5).
- Network cable between the Da Vinci Server and the QCS/DCS system (Section 5).

Each of these sections details the approximate installation time. **This means that if these components are not installed prior to the GelView sensor installation, then this time needs to be added to the total installation time**.

In addition, it is critical that the fiber optic cables and the EIC be installed and operational as early as possible since these two components must be installed prior to any work being done on the sensor alignment.

3. Electronic Interface Cabinet

The Electronic Interface Cabinet (EIC) is the main signal-processing component of the GelView system. It not only provides the light source for the measurement, but also takes all the diffuse and specular signals from the sensors and converts them from a “light measurement” to a digitized voltage. A more detailed description of the EIC is provided in the *GelView Sensor Overview* document (p/n 6510020176).

One EIC supports up to six GelView sensors. If more than six sensors are included in the GelView system, multiple EIC’s will have to be installed. The following cabling is required for each EIC:

- Power Supply (110VAC / 230VAC)
- RS-485 Serial Communication Cable
- Fiber Optic Cables (3 per sensor)

The EIC is designed to be either wall or panel mounted. Since the regular fiber optic cable is 30 meters in length, the EIC should be located within 20-25 meters of any of the sensors that it is responsible for. The EIC is NEMA 4 rated, but it is recommended that the cabinet be mounted in a relatively dry area, free from excessive vibration.

Figure 3-1 GelView EIC shows an example of a panel mounted EIC. All fiber optic cables are connected on the flange plate at the base of the EIC. It is recommended that the power supply and communication also be brought into the cabinet through the base side of the cabinet. The approximate size of the cabinet is:

- Depth: 200 mm

- Height: 760 mm
- Width: 600 mm

These dimensions are approximate and should be confirmed in the installation drawings, but they are provided to give the installer an idea of the required space for mounting the EIC. In addition, at least 400 mm should be available beneath the EIC for connection of the fiber optic cables and storage of the excess cable if applicable.

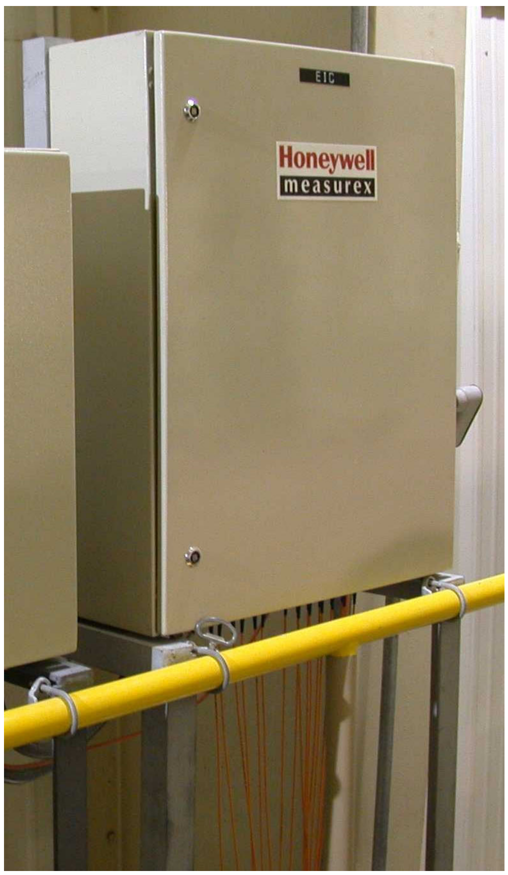
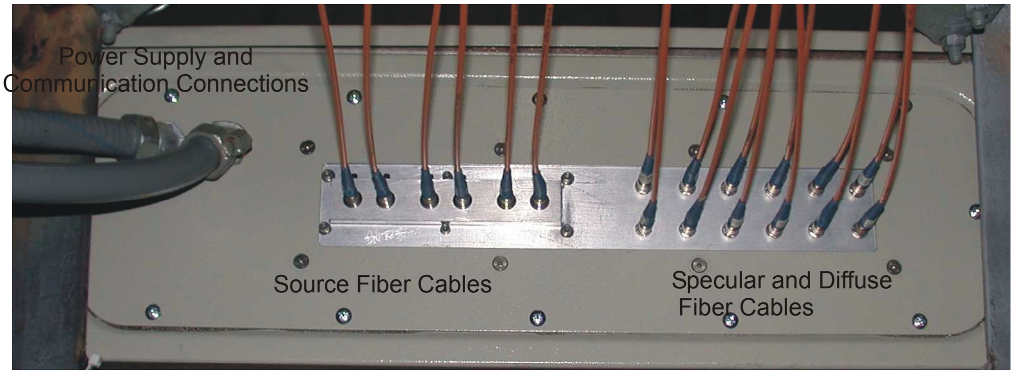


Figure 3-1 GelView EIC

Figure 3-2 GelView EIC Base Connection Configuration shows the layout of the base of the EIC. The power supply and communication cable is brought in through conduit on the left-hand side of the base. The main connection plate is for the fiber optical cables. The source LED channels are located on the left-hand side of the flange plate, while the spectral and diffuse channels are located on the right-hand side. The specular channels are usually located towards the back of the EIC, while the diffuse connections are located towards the EIC door.

Door Side of EIC Cabinet



Back Panel of EIC Cabinet

Figure 3-2 GelView EIC Base Connection Configuration

Prior to installation, the base of the EIC should never be set down on a flat surface since the fiber optic connectors protrude from the base.

For detailed information regarding the connection of the input AC power and RS-485 serial communication lines, please refer to the installation drawings. The terminal strip for connecting the input AC power supply is located in the lower left hand side of the EIC under a shielding cover, while the 485 serial communication terminal strip is located on the interconnect board in the upper left corner of the cabinet.

4. Precision Measurement Processor Cabinet

The Precision Measurement Processor (PMP) is the gauge-processing component of the GelView system. It takes the digital absolute voltage measurements sampled at a 2 KHz rate and produces a set of time averaged voltages to the QCS server at a user configured rate (usually ten 100ms samples updated every second). The PMP also adjusts the sample periods as required for sensor calibration and background. A more detailed description of the PMP is provided in the *GelView Sensor Overview* document (*p/n 6510020176*).

One PMP (also known as an MSS (Measurement Sub-System)) supports up to four GelView EICs. If more than four EICs are included in the GelView system, multiple PMPs will have to be installed. The following cabling is required for each PMP:

- Power Supply (110VAC / 230VAC)
- RS-485 Serial Communication Cable
- LAN Connection to the Da Vinci Server

The PMP (see Figure 4-1 GelView PMP) is designed to be either wall or panel mounted and should be located within 350 meters of any of the EIC's that it is responsible for. The PMP is also NEMA 4 rated, but it is recommended that the cabinet be mounted in a relatively dry area, free from excessive vibration. It is recommended that the power supply and all LAN and communication cables be brought into the cabinet through the base side of the cabinet. The approximate size of the cabinet is:

- Depth: 200 mm

- Height: 600 mm
- Width: 600 mm

These dimensions are approximate and should be confirmed in the installation drawings, but they are provided to give the installer an idea of the required space for mounting the PMP. The back panel of the PMP can also be removed from the cabinet and mounted in a temperature and humidity controlled computer room.

Figure 4-1 GelView PMP

Figure 4-2 GelView PMP Back Panel Layout shows the layout of the PMP back panel. The top section of the back-plane contains the precision power supplies for the PMP. The middle right hand side is the terminal strip for the input AC power. The middle section is the industrial PC card cage with 6 card slots. The top slot (slot 1) always contains the CPU board. Slot 2 contains the LAN card used for the communications to the QCS server. Slots 3 and 4 are typically empty for a single point MD GelView system. Slot 5 contains the PC-DAQ card, which deals with all RS-485 communications to all the configured EIC’s. The frame controller card occupies slot 6.

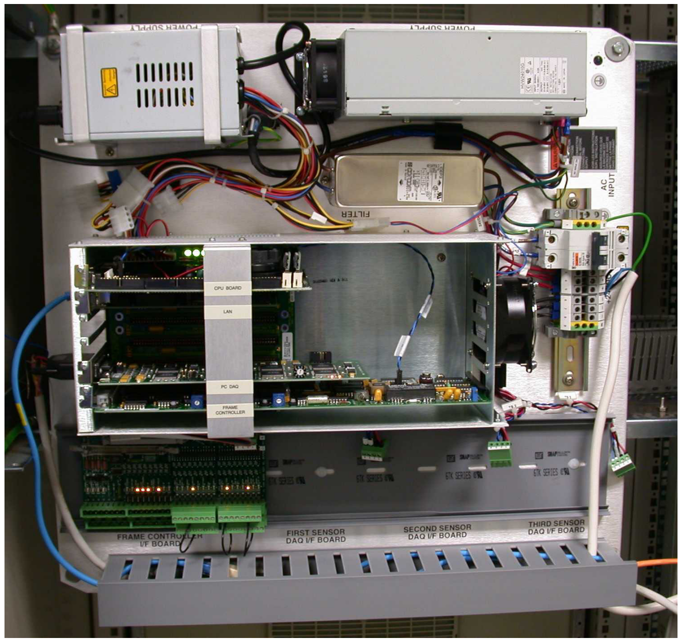


Figure 4-2 GelView PMP Back Panel Layout

The lower section of the back panel contains the Frame Controller Interface Board and the cable conduit.

The actual termination points for the AC input power supply are defined in the system installation drawings.

The RS 485 communication link between the EIC and the PMP is a simplex link with unsolicited communications coming from the EIC to the PMP.

The RS 485 communication cable (typically a Belden-M 8723 CM 2PR22 Polypropylene Insulated cable or equivalent – see installation drawings for specific detail) must be at least a 22 gauge shielded twisted pair configuration and is terminated in the 25 pin D-Shell on the end of the PC-DAQ card. The PC-DAQ supports up to four EICs and the typical D-Shell connector termination configuration is as shown in Figure 4-3 PMP PC-DAQ RS 485 Termination Configuration. Again refer to the installation drawings for specific detail.

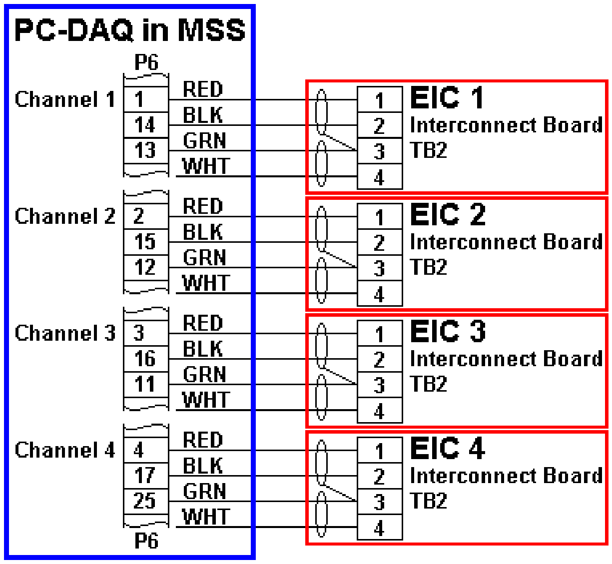


Figure 4-3 PMP PC-DAQ RS 485 Termination Configuration

Although no other external cable terminations are required in the PMP, the Frame Controller Interface Board, which is connected to the Frame Controller Card, requires some digital contacts to be closed before the sensors are identified ready for operation.

Figure 4-4 PMP Frame Controller Interface Board Digital shows the digital contact configuration that is required for the sensors to be declared ready for measurement operation. The three inputs that are required are:

- Computer Ready
- Emergency Stop
- Scan Enabled

No measurement data will be available until these contacts are satisfied.

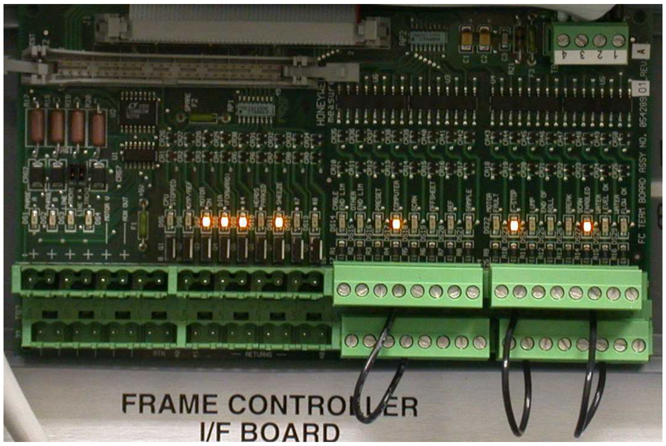


Figure 4-4 PMP Frame Controller Interface Board Digital

These digital contacts are terminated on terminal block TB2 of the Frame Controller Interface Board. The connections are shown in Figure 4-5 PMP Frame Controller Interface Board Digital Contact Configuration but again, these should be confirmed in the specific installation drawings.

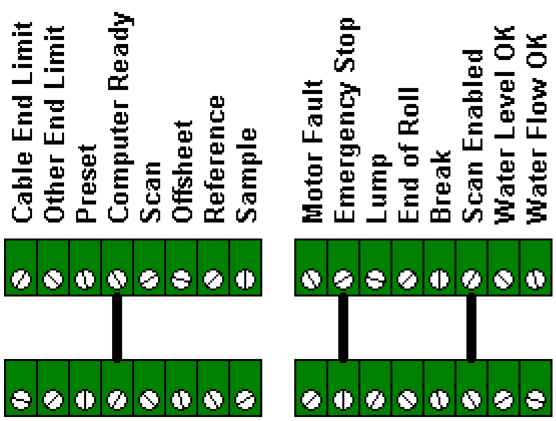


Figure 4-5 PMP Frame Controller Interface Board Digital Contact Configuration

The final configuration information required from the PMP is the network interface card (NIC) absolute hardware address (a twelve digit hexadecimal number).

Nothing is required from the user, but this information is required by the QCS server to correctly configure the QCS Server to PMP network connection The NIC address is provided on a label on the end plate of the LAN card as shown in Figure 4-6 PMP NIC Address Location.

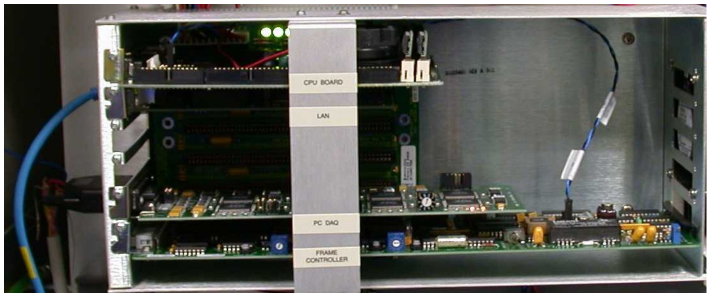


Figure 4-6 PMP NIC Address Location

5. Standard Communication Cable

This section provides a brief description of the non-fiber optic communication required by the system. These cabling requirements cover the following connections:

- RS-485 communication between the EIC and the PMP.
  The RS 485 communication cable (typically a Belden-M 8723 CM 2PR22 Polypropylene Insulated cable or equivalent – see installation drawings for specific detail) must be at least a 22 gauge shielded twisted pair configuration and is terminated in the 25 pin D-Shell on the end of the PC-DAQ card.

- LAN communication between the PMP and the QCS Da Vinci Server.
  Typically this cable is a Category 5 "Crossover" cable used for peer to peer network communication. If a network "Hub" is used, the network must be a dedicated "measurement" LAN utilizing standard Category 5 "Straight-through" cable.

- LAN communication between the QCS Da Vinci Server and the mill-wide DCS.
  Typically this cable is a Category 5 "Straight-through" cable connected to the mill-wide network through a network "Hub". The target DCS system required for process data must also be located on this network.

Please refer to the system installation drawings for further details.

6. Fiber Optic Communication Cable

CAUTION: Fiber optic cable installation is not like installing electrical cable. Fiber optic cable must be handled with extreme care.

Fiber optic cable is relatively fragile and great care must be taken when installing. The fiber optic cable used in the GelView system is not exactly like regular communication fiber optic cable.

Its construction is based on the same construction format with a silica core surrounded by a silica cladding. A silica based buffer surrounds the cladding to provide a layer of optical buffering for the outside world. This assembly then has a nylon based jacket, like electrical cable, to provide a sealed environment for the optical cable itself. The major difference between the GelView cable and regular communication cable is that the cable used in the GelView system is designed to collect light from the measurement sample and the level of light captured on the two channels defines the characteristics of the paper. This is an analog signal, not a digital signal. To make the sensor measurement sensitive to small process changes, the cable needs to be large enough to collect enough light to get the desired signal sensitivity. The silica core of the GelView cable is typically 0.4mm diameter. Regular communication cable is typically only 0.05mm in diameter since the cable is only interested in binary signals and therefore the same “volume” of light is not required.

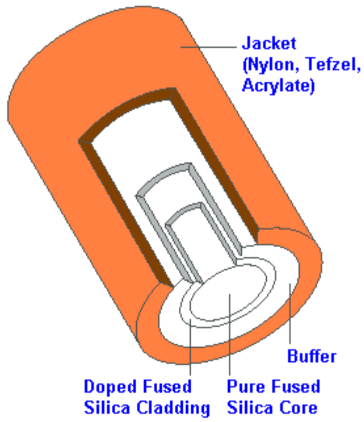


Figure 6-1 Cross Section of a Fiber Optic Cable

Based on these physical characteristics, the GelView cable has the following physical limitations:

- Short term bend radius can not be less than 4 cm
- Long term bend radius can not be less than 8 cm

When installing any fiber optic cable, it is critical that the handling instructions in "Handling Instructions" be followed. The installation can be broken down into four components:

1. Fiber optic cable pre-installation check
2. Fiber optic cable installation
3. Fiber optic cable post-installation check
4. Coupling to the sensor temperature resistant fiber.

6.1. Fiber Optic Cable Pre-Installation Check

Prior to installing the fiber optic cable, check the integrity of the cable. To do this, the EIC must be installed. With the EIC installed and powered up, and all the cables available, complete the following steps:

1. The LEDs used by the GelView system are located at the bottom of the EIC. Select one of these LED channels for use in testing the integrity of all the cables.

2. Remove the SMA connector cover and visually check that light is emitted from the LED in the EIC. It is recommended that you do not look directly into the light path. There are no real health issues from short exposures, but it is easy enough to see if light is coming out from the LED from an alternate angle to normal.

3. For each fiber optic cable (make sure they are labeled or numbered), connect one end of the cable to the selected LED channel and the other end of cable to the optical power meter.

4. Turn the optical power meter "ON" and ensure that the wavelength selector switch is set to "665".

5. Record the light intensity in "dBm". A normal intensity LED with a 30 meter cable should provide a "dBm" level of -10 to -14. Any cable with an intensity level between -14 and -15 should be used only if absolutely necessary. An intensity level lower than -15 should not be used. If a "dBm" level of -10 to –14 is not obtained with any of the cables, try a different LED. If a "dBm" level of -10 to –14 is still not obtained, check the integrity of the LEDs and the LED driver board inside the EIC. In addition, check the integrity of the connection to the optical power meter.

Keep the recorded values from all cables. These values will be used in the sensor alignment section of the manual. These values are also useful for determining when the LED board may need to be replaced.

6.2. Fiber Optic Cable Installation

The standard fiber length for each sensor in the GelView system is 30 meters. All cables are run from the EIC to the individual sensor locations and should be run within cable conduit for protection. Obey all handling instructions as detailed in "Handling Instructions" while running the fiber optic cable.

If the conduit is continuous (no breaks in the conduit), then great care must be taken to ensure that the cable is not bent tighter than the absolute bend radius.

If the conduit is not continuous (the cables are run through sections of conduit), then make sure that the bend radius is never exceeded and that the cables are not overly tensioned around the entry and exit points of the conduit sections. In addition make sure that there is enough tension relief on large vertical height runs so that the fiber optic cables do not become overly tensioned around turning points.

At the sensor end of the cable, the minimal amount of cable should be left so that there is not an excessive amount of cable that can be damaged. At the same time make sure that enough cable is available to be connected to the temperature resistant fiber.

Once the regular fiber optic cable has been run, the excess cable should be coiled up at the EIC complying with the bend radius limitations. Using the coil drums that the regular fiber optic cable was shipped in may be a way of storing the excess cable if storage space is not an issue.

The temperature resistant fibers do not need to be included in conduit but should be controlled with stainless steel cable ties only between the sensor and the coupling junction boxes. Plastic cable ties cannot be used because of the temperature limitations.

6.2.1. Handling Instructions

As stated earlier, the fiber optic cables need to be handled with extreme care. The following characteristics or advisories should be considered during any part of the fiber optic cable installation:

- Remember these cables are manufactured from a type of glass. Handle them with care.
- Remove the fiber optic cable protective end cap when connecting a fiber optic cable to a connector or another cable. Leave the protective end caps on the fibers at all other times.
- Do not touch or scratch the fiber connector tips. The fiber tips should be clean and free of debris before connection.
- Do not exceed the bend radius of 4 cm at any time.
- Do not exceed the bend radius of 8 cm for any prolonged period of time.
- Do not stand on the cables.
- Do not let the cable become overly twisted.

- Do not stress the cables by pulling too hard on them.
- Do not push cables through cable conduit. Always pull the fiber to route through conduit or cable trays.
- Do not overcrowd cables in the cable conduit.
- Place cable in protective conduit if possible. If conduit is installed, make sure that the bend radius is not compromised. Also provide strain relief for long height runs.
- When cable is coming out of conduit, make sure that the cables are not stressed at the exit or entry point of the protective conduit.
- Do not use plastic twist ties for fastening the cables to piping or similar. With plastic cable ties there is too much possibility for someone to over-tighten the cable ties and crush the fiber optic cable.
- Cable checkout with optical power meter prior and after installation.
- Anything that can potentially crack or break a glass rod can crack or break fiber optic cable.
- Do not use cable pulling machines to pull fiber optics.
- Even though the cable is not physically broken, the fiber optic cable inside the sheathing may be cracked, fractured or completely broken. Any of these conditions renders the cable useless.

6.3. Fiber Optic Post-Installation Check

This is a repeat of the procedure detailed in "Fiber Optic Cable Pre-Installation Check". This post installation check is to ensure that the cables incurred no damage during the installation. The “dBm” levels obtained should be approximately the same as the pre-installation check. A value up to 1.5 “dBm” less than the pre-installation value is acceptable. Keep the recorded values from all cables.

6.4. Coupling to the Sensor Temperature Resistant Fiber

If a junction box is used for the coupling between the regular fiber and the temperature resistant fiber, make sure that the junction box is large enough for the cable entry points used.

- If the regular fibers are brought in on one side of the junction box and the temperature resistant fibers are brought in the opposite side of the junction box, then the junction box size does not have to be that large.
- If the regular fibers are brought in on one side of the junction box and the temperature resistant fibers are brought in the same side of the junction box, then the junction box has to be large enough for the fiber to be looped inside the junction box without compromising any bend radius of the cable.

When the fibers are brought inside the junction box, ensure that there is enough slack in the regular cable run to not compromise the bend radius limitations. Figure 6-2 View of a Fiber Optic Cable Junction Box shows an example of a correctly run cable (A) and an incorrectly run cable (B). The result of the incorrectly run cable was that the cable became fractured at the entry point (C) and the cable had to be replaced.

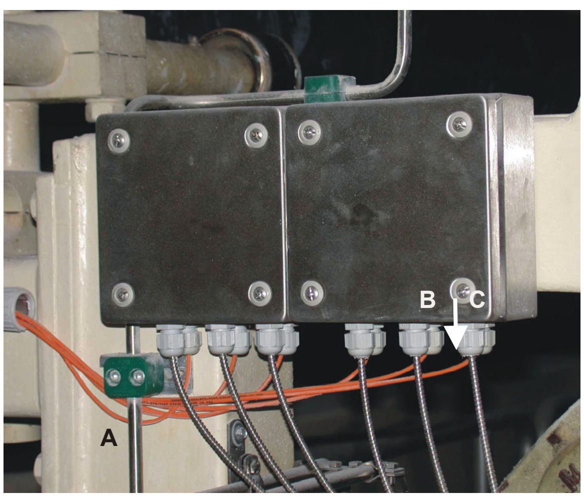


Figure 6-2 View of a Fiber Optic Cable Junction Box

If no junction box is used to contain the coupling between the regular fibers and the temperature resistant fibers, then secure the coupling with heat-shrink. This will ensure that the coupling does not come undone during normal operation.

Once the regular fiber optic cable has been run, the excess cable should be coiled up at the EIC complying with the bend radius limitations.

6.5. Fiber Optic Cable Connection Cleaning Procedure

In general, there should be no need to clean the ends of the fiber optic cables. However if a cover of a cable is removed during the installation process and the end of a cable becomes dirty, the end of the cable can be cleaned using the following procedure:

- Saturate the cotton ball end of a cotton-based swab with rubbing alcohol and gently clean the end of the fiber.
- Once the end of the fiber is clean, dry the end of the fiber with a dry cotton-based swab

Do not use any other solvent other than rubbing alcohol.

7. Individual GelView Sensors

Success of the GelView system is dependent on the alignment of the sensors. If any sensor is not properly aligned, a biased measurement will be returned, which will ultimately reduce the effectiveness of that sensor and the system as a whole. Proper sensor installation and alignment is therefore critical and extra time should be taken to ensure that the alignment is optimal. All the sensors should also be located in the same CD location on the machine. This should be taken into account when determining the mounting bracket arrangements for the sensor installation. The types of sensor installations that are covered in this section are:

- Sensor mounted opposite a turning roll
- Sensor mounted on a C-Frame with an integrated Air Sheet Stabilizer
- Sensor mounted opposite an independently mounted sheet stabilizer (inside an air-dryer or air-hood)

Individual sensor alignment should begin only after the particular sensor has been securely mounted and its associated temperature resistant and communication fibers are properly connected to the EIC. The following equipment is essential for aligning a GelView sensor:

- GelView Sensor Alignment Block (25.4mm square with a small 0.4mm notch on one corner)
- Optical Power Meter
- 5/32 inch Allen Key

- Mirrored silver reflective tape
- Recorded “dBm” levels for each cable for all the sensors.

7.1. Install Sensor Mounted Opposite a Turning Roll

This type of sensor installation is the most common since there are many turning rolls on a coater line that provide a stabile sheet measurement for the GelView sensor. The sensor is installed opposite the turning roll approximately 1 meter from the edge of the roll in the cross direction (CD) as shown in the Figure 7-1 Sensor Mounted Against a Turning Roll.

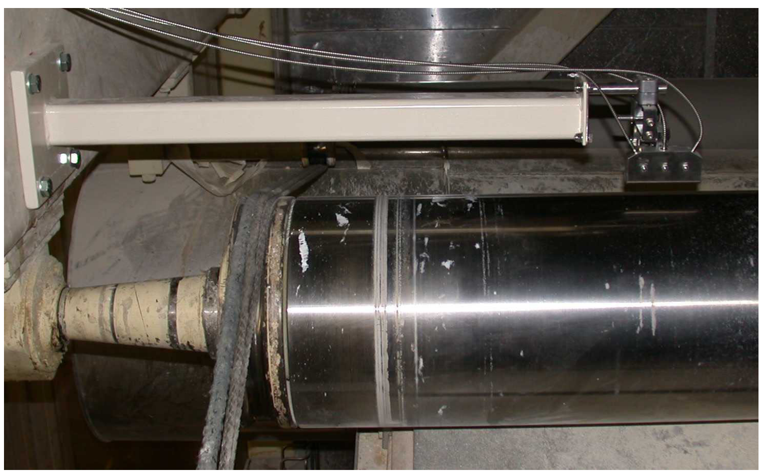


Figure 7-1 Sensor Mounted Against a Turning Roll

It is essential that the sensor to be aligned relative to the paper’s surface. At the turning roll, the paper path changes and for some distance bends around the roll. This is where the sensor must be aligned to the roll. It is best to be closer to the leading edge of paper contact with the roll to reduce the angle of coating splatter, making the protective shield more effective in keeping the optics clean. This is not a consideration for sensors mounted closer to the dry end, but more for the sensors that are mounted close to the coating station.

Usually sensors are installed in the absence of paper. The sensor’s position during installation must be very carefully chosen. The sensor must be installed normally (perpendicular) to that part of a roll where the paper is still bending around the roll during normal running conditions (see Figure

7-2 Correct and Incorrect Method of Mounting GelView Sensor, A). It must not be in a position where the paper is departing from the roll (see Figure 7-2 Correct and Incorrect Method of Mounting GelView Sensor, B), because it will have a tilt relatively to the paper and will provide an invalid measurement.

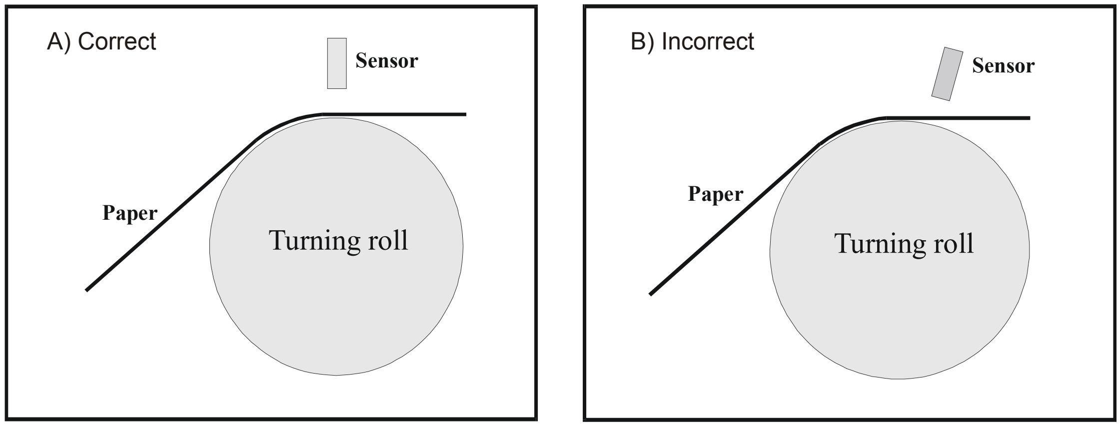


Figure 7-2 Correct and Incorrect Method of Mounting GelView Sensor

To proceed mounting a GelView sensor opposite a turning roll:

1. Run a piece of twine along the paper path and tension the twine with a weight at either end. This will provide not only the paper path, but also the portion of the roll that will be in contact with the paper (see Figure 7-3 Sensor Alignment - Paper Path Determination for a Turning Roll). Mount the sensor on the machine such that the sensor is perpendicular to a portion of the roll that the paper will be in contact with.

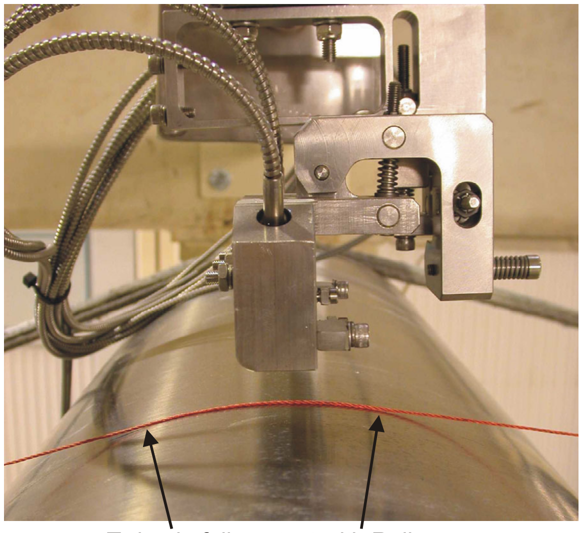

Twine in full contact with Roll between these two points

Figure 7-3 Sensor Alignment - Paper Path Determination for a Turning Roll

2. Make sure that the closest point of the sensor is 25 mm from the roll ±10 mm when the vertical adjustment of the sensor is mid-ranged. If the face of the sensor is outside of this range, there will not be enough movement in the vertical adjustment to align the sensor. Use the alignment block provided to confirm that the initial sensor position is within range. If the sensor is too far away or too close to the roll (see Figure 7-4 Sensor Alignment - Sensor Mounted Too Close to a Turning Roll) then the sensor must be remounted so that the sensor is located the correct distance from the roll.

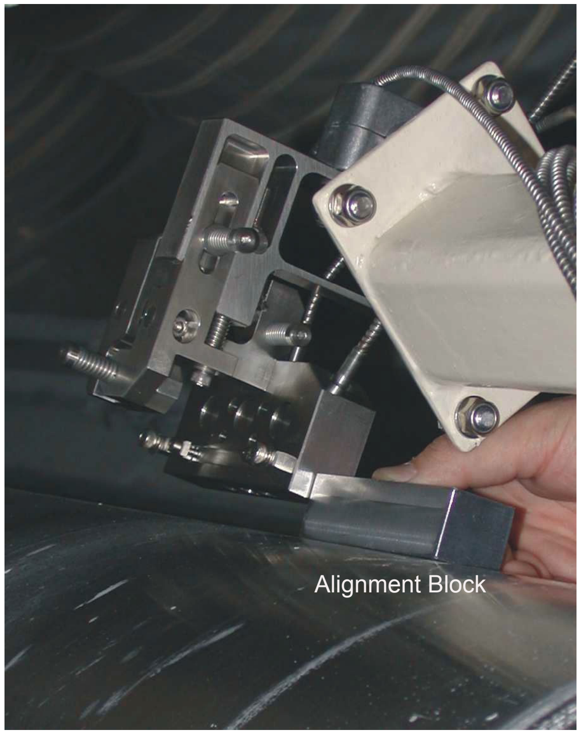


Figure 7-4 Sensor Alignment - Sensor Mounted Too Close to a Turning Roll

3. With the sensor securely mounted to the mounting bracket, use the vertical adjustment on the sensor to raise the face of the sensor so that the alignment block can be placed between the sensor and the roll. Then using the CD and MD adjustments (in that order), ensure that the sensor is parallel to the roll. Then re-adjust the vertical position of the sensor such that the alignment block fits snuggly between the sensor and the roll. Use the edges of the alignment block to confirm that the sensor is parallel to the roll. This provides a preliminary alignment only and should place the sensor in the correct region for attaining proper alignment.

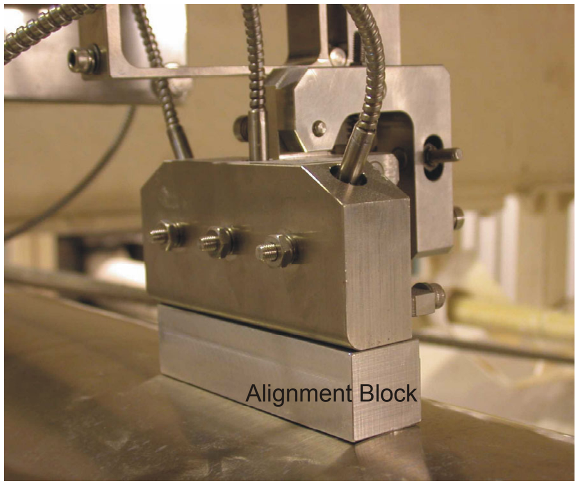


Figure 7-5 Sensor Alignment - Sensor Roughly Aligned Using the Alignment Block as a Reference

4. After reaching this preliminary level of alignment, remove the alignment block. Connect all three temperature resistant fibers to their respective standard communication fibers and ensure that the EIC is turned on. Once all the fibers are connected, a red light spot should be visible on the roll surface. At this point, place a reflective label onto the surface of the roll at the point that the sensor will be taking its measurement.

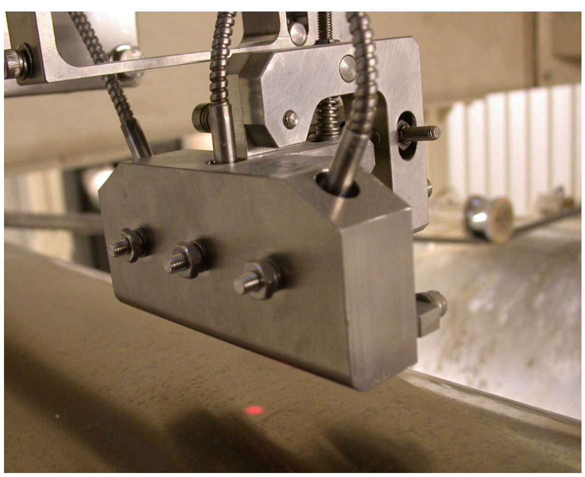


Figure 7-6 Sensor Alignment - Measurement Spot on Roll Prior to Sensor Alignment

5. The rest of the alignment procedure is focused on optimizing the sensor alignment by monitoring the reflected light received by the specular fiber channel. To start this precise alignment procedure, disconnect the specular temperature resistant fiber

from the specular communication fiber and connect the specular temperature resistant fiber to the mini optical power meter as shown in Figure 7-7 Sensor Alignment - Fiber Configuration for Precise Sensor Alignment.

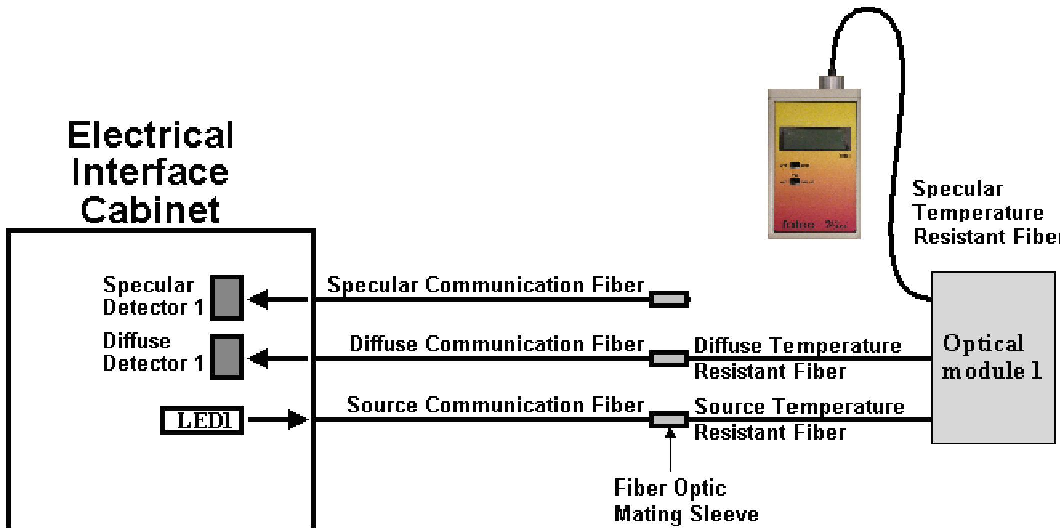


Figure 7-7 Sensor Alignment - Fiber Configuration for Precise Sensor Alignment

6. Two examples of an Optical power meter are shown in Figure 7-8 Optical Power Meters. Turn the power meter on (by moving an upper switch from the "OFF" position to the "dBm" position or pressing the "On-Off" button) and ensure that the wavelength switch is in the "665" position or that the displayed wavelength is "630" respectively. Different power meters may have different wavelength settings, but pick the setting closest to 650 nm. In addition, always ensure that "dBm" units are used since these are already normalized for a standard light intensity.

Figure 7-8 Optical Power Meters

7. Making small movements on all three sensor adjustments, align the sensor's optical module so that the light received through the specular channel is at its maximum possible level. The highest optical signal level correlates to a small negative number on a display of the optical power meter (Figure 7-9 Sensor Alignment – Optical Power Meter and Reflective Surface Used to Align Sensor Accurately). **This process takes a lot of time as you repeatedly make small changes to all three sets of sensor adjustments**. Try and get the CD and MD levels optimized before making major changes to the vertical adjustment. Bear in mind that one full turn in the vertical adjustment correlates to a 1.5875 mm (0.0625 inches) change in the vertical height of the sensor.

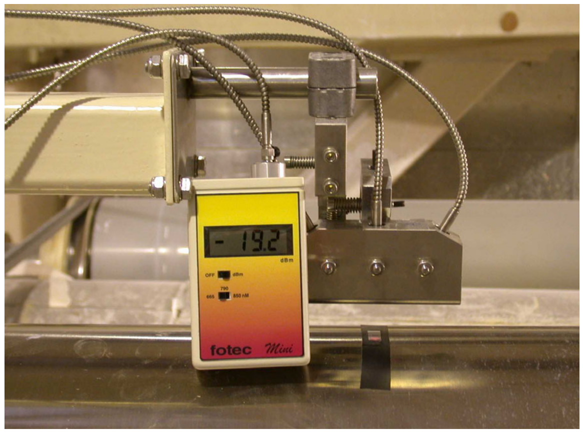


Figure 7-9 Sensor Alignment – Optical Power Meter and Reflective Surface Used to Align Sensor Accurately

8. After maximizing the specular signal, verify that the reflected beam of light is entering the drilled hole in the face of the sensor where the collimator is located. To perform this quick sanity check, take a small piece of stiff card, and cover the dilled hole used by the specular channel. The reflected beam should appear on the card sample in the middle of the drilled hole. The reason for this check is that it is possible to align the sensor to a minimum “dBm” level but not have the reflected beam in the center of the drilled hole, but offset to one side.

9. If all the sensor fiber optic cables have a maximum “dBm” level from the source LED of around –10 to –14, then the maximized level received from the specular channel should be in the region of –18 to –24 “dBm”. Anything with a “dBm” level of –28 or less means that something in the optical setup has not been optimized or is damaged, and a more detailed audit of the sensor optics should be performed.

10. Once this basic check has been performed and the installer is satisfied that the reflected beam is centrally located in the specular channel collimator, disconnect the specular temperature resistant fiber from the optical power meter and connect it back to the specular communication fiber.

11. **Do not forget to remove reflective label from the turning roll** after alignment is finished.

7.2. Install Sensor Mounted on a C-Frame with an Integrated Air Sheet Stabilizer

C-frame GelView sensor installation and alignment can be divided into two independent procedures: Sensor alignment and C-frame installation. It is very convenient to align the sensor to the Air Sheet Stabilizer installed in the C-frame before the C-frame is actually installed.

7.2.1. C-Frame Sensor Alignment

A C-frame with a GelView sensor optical module and Air Sheet Stabilizer is shown in Figure 7-11 GelView Sensor Mounted on a C-Frame with an Air Sheet Stabilizer Installed. The Air Sheet Stabilizer (2) is 6.25 mm (0.25 inches) proud of the lower C-frame arm in order to avoid paper contact with the C-frame lower arm if there is curl at the edge.

The alignment procedure for the sensor is very similar to the sensor installation against a turning roll.

When starting to align the sensor already securely mounted to the C-frame, use the vertical adjustment on the sensor to raise the face of the sensor so that the alignment block can be placed between the sensor and the Air Sheet Stabilizer.

The alignment block is a 26.18 by 25.4 mm block (1.031 by 1.0 inches) where the 25.4 mm (1.0 inch) height is used for alignment to a turning roll and the 26.18 mm (1.031 inch) height is used with alignment to an Air Sheet Stabilizer unit. The alignment block also has a small 0.56 mm by 6 mm (0.022 by 0.236 inches) notch in one corner. Use the alignment block placed on the Air Sheet Stabilizer unit, such that the 0.56 mm (0.022 inch) notch is used to step over the Air Sheet Stabilizer back step (0.45 mm), to perform the initial sensor alignment (see Figure 7-10 Alignment Block Arrangement for a Sensor Mounted Opposite an Air Stabilizer Unit).

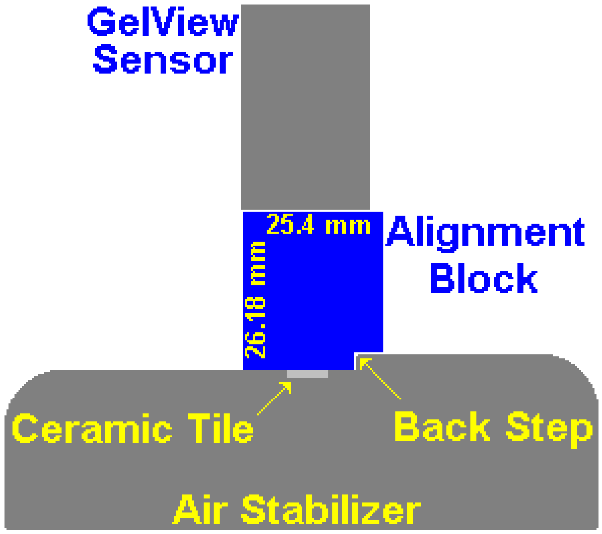


Figure 7-10 Alignment Block Arrangement for a Sensor Mounted Opposite an Air Stabilizer Unit

Using the CD and MD adjustments (in that order), ensure that the sensor is parallel to the roll. Then re-adjust the vertical position of the sensor such that the alignment block fits snuggly between the sensor and the roll. Use the edges of the alignment block to confirm that the sensor is parallel to the roll. This provides a preliminary alignment only and should place the sensor in the correct region for attaining proper alignment.

For final alignment of the sensor, a shiny surface is required. In this case use either the shiny label supplied with the system or the embedded shiny ceramic tile (3) in the Air Sheet Stabilizer (see Figure 7-11 GelView Sensor Mounted on a C-Frame with an Air Sheet Stabilizer Installed).

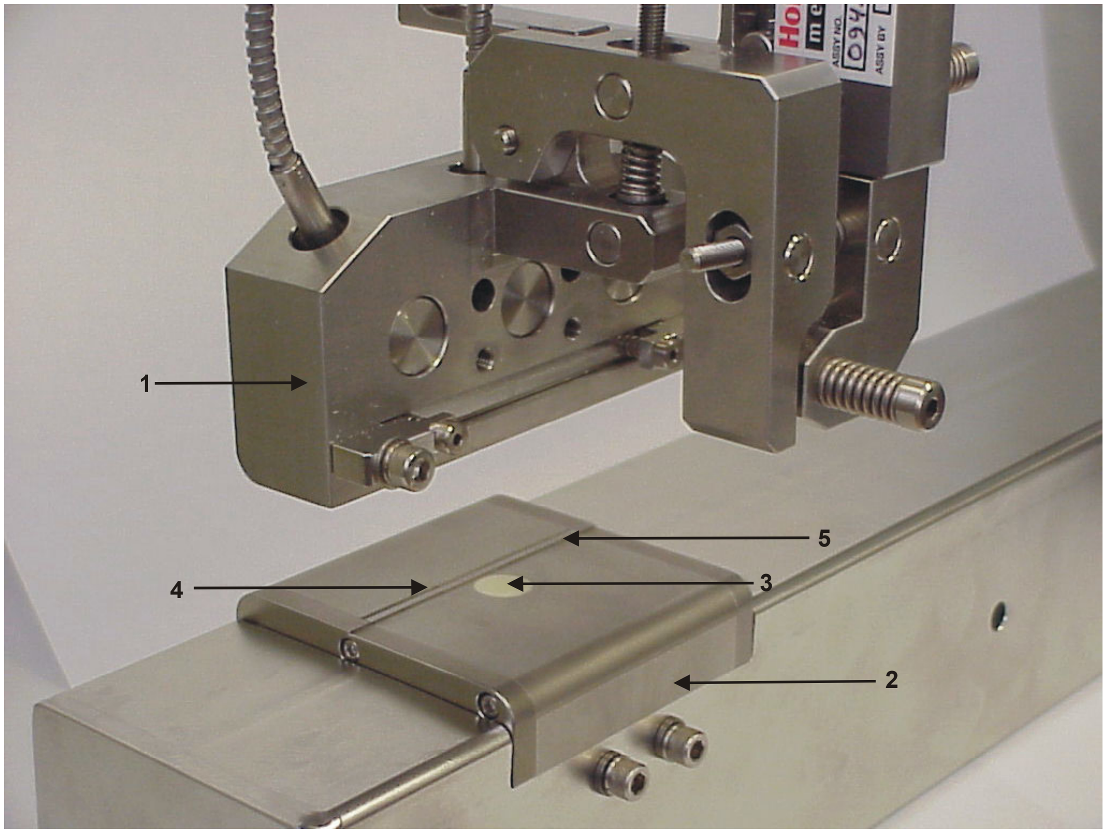


Figure 7-11 GelView Sensor Mounted on a C-Frame with an Air Sheet Stabilizer Installed

The advantage of the shiny label is that the alignment results can be compared to the alignment for all the other sensors and so a level of confidence can be obtained. However, great care must be taken to ensure that the shiny label is completely flat on the ceramic tile and that the measurement spot is directly in the center of the ceramic tile. The advantage of using the embedded shiny ceramic tile is that the user does not have to worry about getting the shiny label completely flat. However the “dBm” levels obtained with this alignment are NOT comparable to results using the shiny label.

To complete the alignment of the GelView sensor to the to the Air Sheet Stabilizer unit, please refer to "Install Sensor Mounted Opposite a Turning Roll" and continue with the alignment procedure as described in procedure item 4 and beyond.

7.2.2. C-Frame Alignment

The next step in C-frame sensor installation is the mounting of the C-frame to the coating machine frame and the alignment of the C-frame itself to the paper path. There are three major recommendations, which should be followed during C-frame installation:

1. The installation of the C-frame should ensure that the measurement point of the Air Sheet Stabilizer unit is at least 600 mm in from the edge of the paper so that the edge flutter of the paper does not affect the stability of the paper over the Air Sheet Stabilizer.

2. Once the C-Frame has been mounted to the coating machine frame, adjust the angle of the C-frame such that the Air Sheet Stabilizer top surface is parallel to the paper pass-line. Use a piece of twine along the paper path and tension the twine with a weight at either end. This will provide the paper path to which the Air Sheet Stabilizer top surface should be aligned to (see Figure 7-12 Alignment of C-frame and GelView Sensor to the Machine Paper Path).

3. The distance between Air Sheet Stabilizer and the paper should not exceed 2 mm (0.2 inch). On heavier weight paper, this distance should be no more than 0.5 mm (0.05 inches).

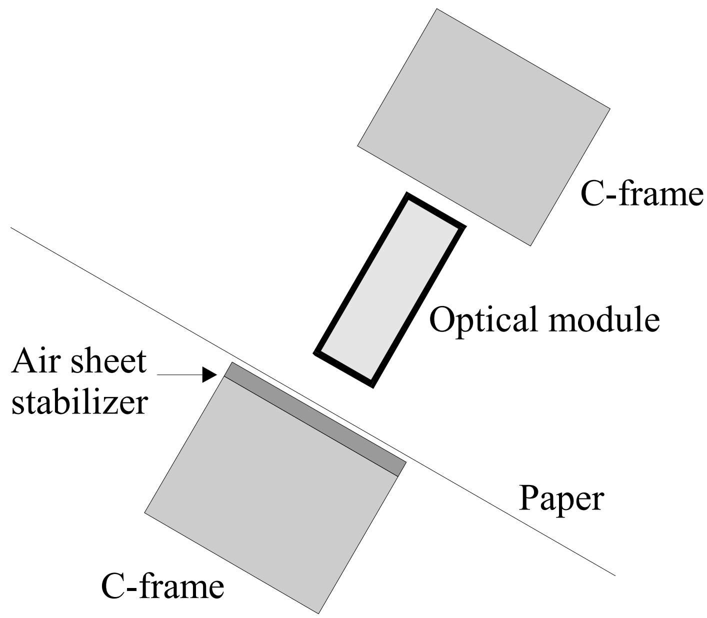


Figure 7-12 Alignment of C-frame and GelView Sensor to the Machine Paper Path

Once the C-Frame has been mounted to the coating machine frame and properly aligned, the air supply for the Air Sheet Stabilizer needs to be installed and setup correctly. The recommended air supply to the Air Sheet Stabilizer is 1.5 liters/sec (200 Standard Cubic Feet per Hour (SCFH)) at 2.8 kg/cm^2 (40 Pounds per Square Inch (PSI)) supply pressure. Considerable lower and also higher settings (+/-20%) will result in poorer paper stability. **The supplied air should be filtered and free from water and oil.**

Although the Air Sheet Stabilizer stabilizes the sheet without contacting it, dust built-up has been observed on its surface. In order to ensure undisturbed flow, and proper functioning, the slot and surface need to be kept clean. Wiping off the surface with a soft cloth is recommended. Any scratches, especially in the slot opening, will compromise the effectiveness of the Air Sheet Stabilizer.

7.3. Install Sensor Mounted Opposite an Independently Mounted Sheet Stabilizer

This type of installation is the most custom and most complicated of all the installation types and requires a lot of customer involvement. Because the GelView sensor is very sensitive to sheet positioning, it is critical to install the sensor inside an air dryer together with some sort of sheet stabilizer. Currently, two types of sheet stabilization exists:

- An Air Sheet Stabilizer mounted independently with or without guide rolls. An example of a sensor installation inside an air-floatation dryer with an Air Sheet Stabilizer unit is presented in Figure 7-13 Example GelView Sensor Installation Inside an Air-Floatation Dryer with an Air Sheet Stabilizer.

- A small backing roll. An example of a sensor installation inside an air-floatation dryer with a sheet stabilizer roll is presented in Figure 7-14 Example GelView Sensor Installation Inside an Air-Floatation Dryer with a Sheet Stabilizer Roll.

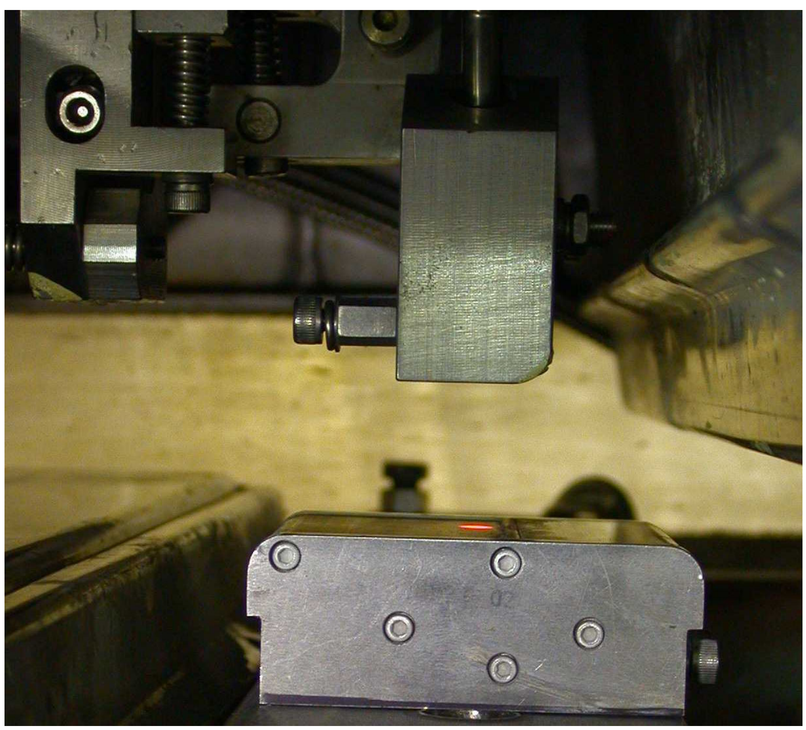


Figure 7-13 Example GelView Sensor Installation Inside an Air-Floatation Dryer with an Air Sheet Stabilizer

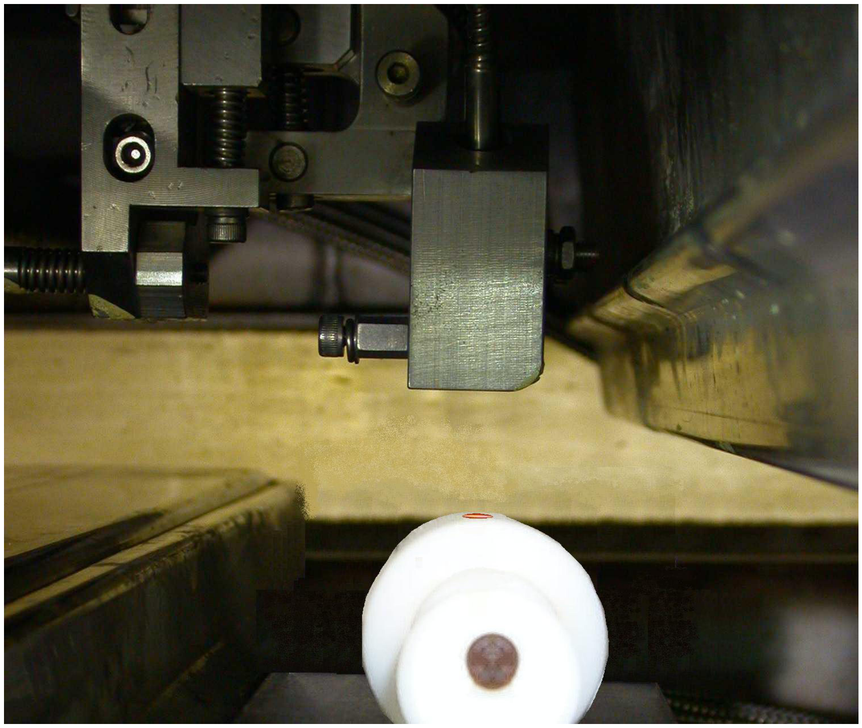


Figure 7-14 Example GelView Sensor Installation Inside an Air-Floatation Dryer with a Sheet Stabilizer Roll

The following procedure will refer to some of the information that has already been provided and so only covers actions that are specific to this type of mounting arrangement. The installation of the sheet stabilizer and the GelView sensor is a two-part operation. To install the sheet stabilizer:

1. Prior to the GelView installation shutdown, determine the proposed location of the GelView sensor. Then determine the type of sheet stabilization unit that would be required. For light-weight paper or a double-sided air floatation dryer where space is limited, a Air Sheet Stabilizer would be recommended. On medium to heavy weight paper or on a single sided dryer where space is not really an issue, a sheet stabilizing roll would be recommended.

2. For the intended measurement location, determine the location of the paper path in terms of distance to a fixed point on the dryer, or surrounding equipment, and the angle at which the paper will pass this measurement point. These are very hard measurements to obtain. One method is to take a stainless steel ruler with a curved end (with no sharp edges) and using a reference point on the machine frame, measure the distance

from the reference point to the paper path position for each of the intended sensor locations. The reason this needs to be done for each sensor location is that the air pressure from the air dryers will push the sheet down from its straight-line path between rolls. An example is shown in Figure 7-15 Example for Measuring Location of Paper Path Using the Machine Frame as a Reference.

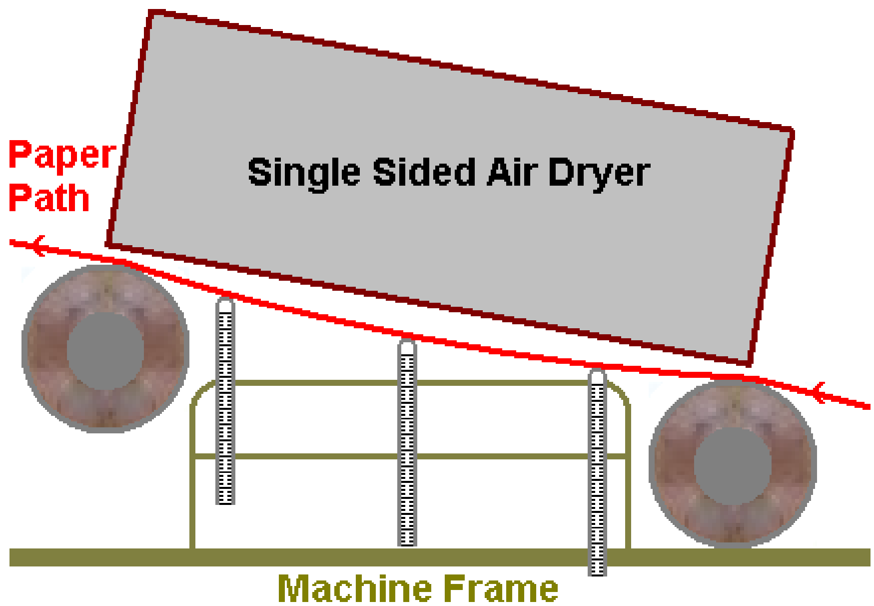


Figure 7-15 Example for Measuring Location of Paper Path Using the Machine Frame as a Reference

3. Once the desired heights have been determined for the proposed sensor locations, attempt to determine the pass angle of the paper. This measurement is even harder than measuring the paper location, but having a rough indication is better than no indication at all. In addition, for this type of mounting, there is an appreciation that the sensor alignment will not be exact the first time, but the closer you can get, the more likely you are to get the alignment right on the second attempt. Remember to obtain both the paper path and paper pass angle for several grades to evaluate the level of movement of the paper.

4. During the installation of the sensor and the independent sheet stabilizer, mount the sensor first and then roughly set up the sensor so that the face of the sensor is 25.4 mm (1.0 inches) above the average paper path. Then setup the mounting bracket for the sheet stabilizer. The mounting bracket needs to be level

in the CD for proper alignment to the paper path. Attach the sheet stabilizer to the mounting bracket and align the top most point of contact with the paper path. If the sheet stabilizer will be a roll stabilizer unit, then the roll should be pressed 1-3 mm (0.04 to 0.12 inches) into the paper path to ensure good contact and sheet tension. If the sheet stabilizer will be an Air Sheet Stabilizer, then the unit should be mounted to 0.5 mm (0.02 inches) below the paper path. Align the sheet stabilizer and the GelView sensor so that the measurement spot is at the peak of the roll, or on the ceramic tile on the Air Sheet Stabilizer. This will not be easy to do, but once complete measure the current position of the paper tangent of the roll or the face of the Air Sheet Stabilizer to a reference point. This needs to be recorded so that if the unit is lowered because of machine problems, then the sheet stabilizer can be repositioned at the next shutdown to approximately the same position but with the necessary adjustments to avoid the same paper problems.

5. While maintaining the position of the sheet stabilizer unit, perform the fine alignment of the GelView sensor as described in "Install Sensor Mounted Opposite a Turning Roll", procedure item 4 and beyond.

6. The whole alignment of a GelView sensor and an independent sheet stabilizer is prone to errors in terms of the absolute position of the sheet stabilizer to the paper path. Using a roll based sheet stabilizer is less problematic than the Air Sheet Stabilizer. The key during this alignment process is to get the alignment close enough so that if a second alignment is required at the next shutdown, the installer knows what adjustments are required to get the alignment right so that a valid measurement is obtained. Multiple adjustments may be required, but it will be much better to limit the number of adjustments to two.