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SpectraProbe® XE Hardware User's Manual

A60-1008-554

Manual Version 2.1

An ISO 9001 Certified Company

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Safety Notes

For your safety when using the SpectraProbe XE, you should pay particular attention to the following types of statements in this User's Manual. Each description is shown in its representative typeface.

Notice: General safety instruction that should be observed at all times while operating the instrument.

CAUTION
Specific safety instruction critical to the type of instrument operation being explained in the area of the manual where the caution appears.

Note: Additional clarification of instructions, not safety-related.

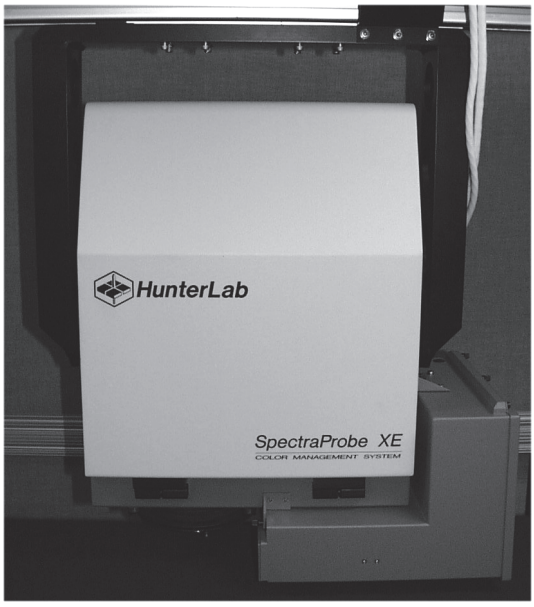
The following symbol indicates that there may be a danger of electric shock from high voltage if the given instructions are not followed carefully.



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SpectraProbe XE Hardware User's Manual



November 2002

Hunter Associates Laboratory
11491 Sunset Hills Road
Reston, Virginia 20190

A60-1008-554
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Chapter One

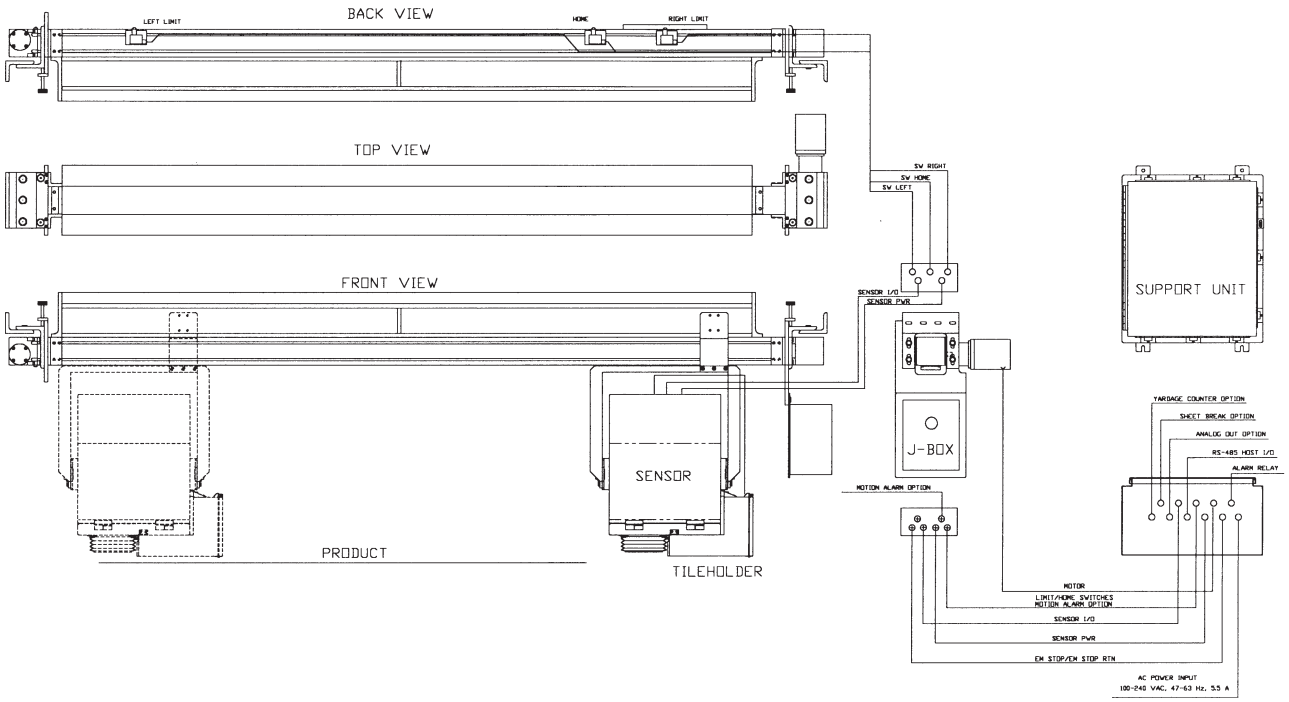
Introduction

Notice: Use of this equipment in a manner not specified by the manufacturer may impair the protection afforded by the equipment.

HunterLab's SpectraProbe XE is a flexible system designed for the on-line measurement of the color of a wide variety of products, including textiles, plastics, paper, and coatings. The basic system consists of the spectrophotometer sensor, support unit, and computer. Either an automatic or a manual tile holder will also be included. There are also various configurations and optional components. All available system components are discussed in greater detail in the rest of this chapter.

System Overview

The drawing below shows overall system configuration.



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The table below indicates the various configuration options for fixed and traversing systems.

System Component	Traversing System	Fixed System
Sensor	All systems will contain a sensor that may be: Large Area View (LAV) with UV Control (L01-1009-316) LAV without UV Control (L01-1009-317) Small Area View (SAV) with UV Control (L01-1009-318) SAV without UV Control (L01-1009-319)	All systems will contain a sensor that may be: Large Area View (LAV) with UV Control (L01-1009-316) LAV without UV Control (L01-1009-317) Small Area View (SAV) with UV Control (L01-1009-318) SAV without UV Control (L01-1009-319)
Support Unit	All systems will contain a support unit with motor control capabilities (L02-1009-469)	All systems will contain a support unit without motor control capabilities (L02-1009-824)
Host Computer	All systems will contain a computer that will operate the MultiSensor Software or SheLyn software	All systems will contain a computer that will operate the MultiSensor Software or SheLyn software
Tile Holder	All systems will contain a tile holder that may be: On the sensor (Automatic) (D01-1009-461) Manual Sample Holder (D02-1010-216)	All systems will contain an On-sensor (Automatic) tile holder (D01-1009-461) or Manual Sample Holder (D02-1010-216)
Rail Assembly	All systems will contain a traversing rail assembly of 59.0-250.9 inches (1500-6375 mm). A dual-position rail with on-line and off-line positioning only is also available (FUTURE).	All systems will contain a fixed mounting assembly (D02-1009-812).
Specific Options	The system may contain one or more of the following options: Positive-pressure air purge for sensor window and automatic tile holder (D02-1011-473) Sensor vortex cooler (D02-1011-474 with heat shield, D02-1011-504 without heat shield) Product backing strip (D02-1010-781) Motion alarm (L01-1010-274) Sheet Break/Seam Detector (L01-1009-748) Standard Edge Detectors (L02-1009-533) Diagonal Edge Detectors (L02-1009-534)	The system may contain one or more of the following options: Positive-pressure air purge for sensor window and automatic tile holder (D02-1011-473) Sensor vortex cooler (D02-1011-474 with heat shield, D02-1011-504 without heat shield) Product backing strip (D02-1010-781) Standard Edge Detectors (L02-1009-533) Diagonal Edge Detectors (L02-1009-534) Four Movable Edge Detectors (D02-1011-475) Sheet Break/Seam Detector (L01-

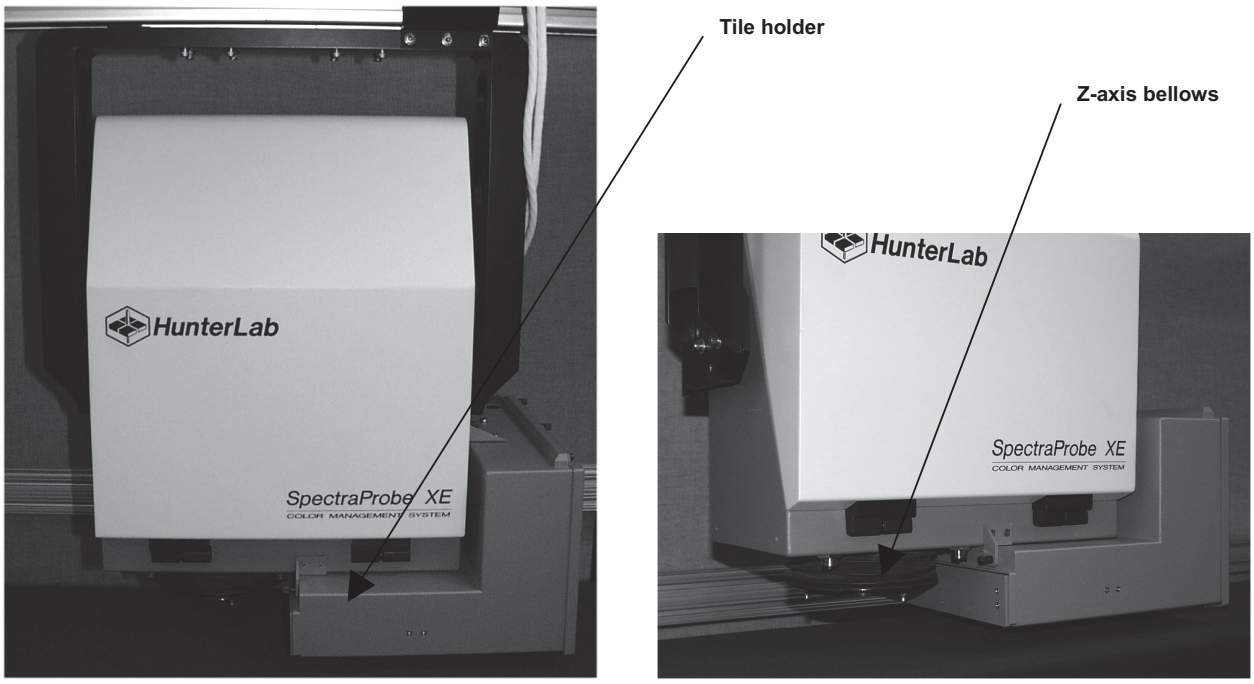
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System Component	Traversing System	Fixed System
	Four Movable Edge Detectors (D02-1011-475) Upper/Lower Guide Bar Assembly (FUTURE) Upper Guide Bar Assembly (L01-1010-044) Blue denim check tile (A11-1011-296)	1009-748) Upper/Lower Guide Bar Assembly (FUTURE) Upper Guide Bar Assembly (L01-1010-044) Blue denim check tile (A11-1011-296)
Support Unit Options	The system may contain one or more of the following options: Length (lineal) Counter (L01-1009-749) 4-Channel Alarm Relay (L01-1010-191) Analog Output (L01-1009-747)	The system may contain one or more of the following options: Length (lineal) Counter (L01-1009-749) 4-Channel Alarm Relay (L01-1010-191) Analog Output (L01-1009-747)
Peripheral Options	The system may contain one or more of the following options: 100-264V, 47-63 Hz Computer (A02-1005-711) 100-264V, 47/63 Hz Printer (A13-1005-721)	The system may contain one or more of the following options: 100-264V, 47/63 Hz Computer (A02-1005-711) 100-264V, 47/63 Hz Printer (A13-1005-721)
Miscellaneous Components	All systems will include software (either MultiSensor Software or SheLyn software), a Standards box and standards, User's Manuals, a Service Manual, and QA and Shipping checklists	All systems will include software (either MultiSensor Software or SheLyn software), a Standards box and standards, User's Manuals, a Service Manual, and QA and Shipping checklists

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The Sensor

The SpectraProbe XE sensor is rugged and designed for use in industrial applications. It is mounted with the sensor window facing the product. The sensor monitors the product's reflected light and sends color information to the computer. The sensor is insensitive to ambient light and so does not need to make direct contact with the product.

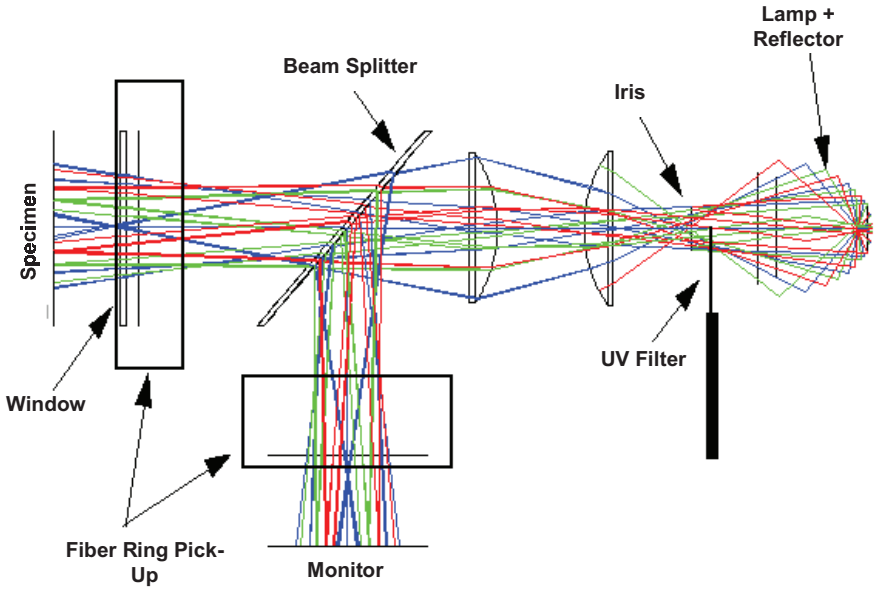


How the Sensor Works

Color measurements are taken at a rate of twenty readings per second using a xenon pulse lamp. Depending upon the instrument configuration, the transmitted light illuminates an area of either 30 mm (1.25" small area view) or 65 mm (2.5" large area view) in diameter on the moving product at a 0° (normal) angle. Reflected light from the product is viewed circumferentially at 45° through a ring of nine symmetrically-spaced optical fibers. The reflected light is then directed into the polychromator assembly where a holographic diffraction grating disperses the light into its spectral component wavelengths. A 128-channel silicon detector array captures the diffracted light and converts the light energy into electrical signals representing the reflectance of the product at 10 nm intervals from 400 to 700 nm wavelengths. The signals are amplified and processed by a digital signal processor (DSP) to generate color values based on a user-selected illuminant, observer angle, and color scale.

The optics of the sensor are illustrated below.

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Mounting the Sensor

The choice of mount for the sensor depends on the product being measured, the type of sensor purchased, and the on-line environment. The guidelines in Chapter Two, "Installation," and the supplied installation drawing will help you determine an appropriate location for the sensor. Important factors to consider when mounting the sensor are:

- **The maximum allowable ambient temperature** is 50° C (122° F).
- **The maximum allowable temperature change** is 2° F per hour.
- **The operating humidity** should be between 5% and 95% relative non-condensing humidity.

The sensor can be positioned with the port facing up, down, or in any other direction.

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The Support Unit

The support unit contains two 24V, 4A power supplies that provide DC power to the sensor. If the system is a traversing system, a motor controller will also be installed in the support unit to control the traversing rail motor. The Power OK light on the front of the support unit indicates that the 24V power is on and in an acceptable range. The support unit also relays messages and commands between the sensor and the computer. An isolated RS-232 module is supplied for the PC interface. Various peripheral devices, such as I/O options and the length counter, are wired through the support unit. An embedded PC may control the computer.



The choice of mount for the support unit depends on the product being measured and the on-line environment. The guidelines in Chapter Two, “Installation” and the supplied installation drawing will help you determine an appropriate location for the support unit. Important factors to consider when mounting the support unit are:

- **The allowable ambient temperature range** is 10°C (50° F) to 50° C (122° F).
- **The exterior dimensions of the support unit** are 24” H x 20” W x 10” D (610 mm x 508 mm x 254 mm).
- **The mounting pattern** is 25.25” H x 14.0” W (641 mm x 356 mm).
- **The mounting hardware** should be 3/8”, Grade 3 or better.

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The Host Computer

The host computer runs HunterLab MultiSensor XE Software or SheLyn software, both of which provide a wide range of colorimetric data, or OEM DSP software, which provides calibrated reflectance data and XYZ values. The computer interfaces to the PC board inside the support unit via a full-duplex serial port.

The host computer and MultiSensor XE Software or SheLyn software allow the display of data from the sensor in any color scale or index using any illuminant and observer combination. They also allow for archiving and retrieval of run data and performance of system diagnostics.

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Options

There are many options which may be installed as part of your SpectraProbe XE system. These options are listed and then briefly described below. HunterLab part numbers are also listed for your convenience.

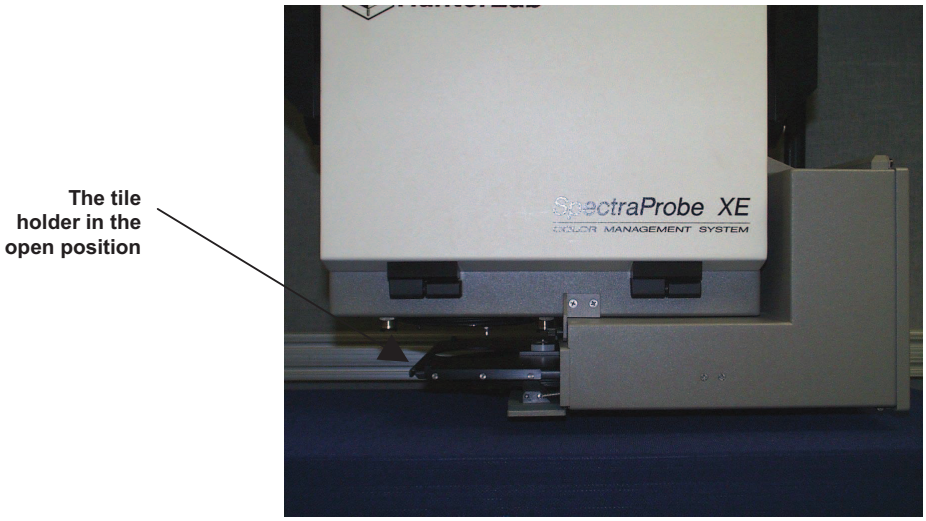
- Automatic tile holder (D01-1009-461)
- Manual sample holder (D02-1010-216)
- Positive-pressure air purge for sensor window and automatic tile holder (D02-1011-473)
- Sensor vortex cooler (D02-1011-474 with heat shield, D02-1011-504 without heat shield)
- Source UV control (UV Option-SPXE)
- 100-264V, 47/63 Hz computer (A02-1005-711)
- 100-264V, 47/63 Hz printer (A13-1005-721)
- Computer-controlled traversing system (Various part numbers)
- Fixed mounting assembly (D02-1009-812)
- Product backing strip (D02-1010-781)
- Upper/lower guide bar assembly (FUTURE)
- Upper guide bar assembly (L01-1010-044)
- Length (lineal) counter (L01-1009-749)
- Standard edge detectors (L02-1009-533)
- Diagonal edge detectors (L02-1009-534)
- Four movable edge detectors (D02-1011-475)
- Motion alarm [Traversing systems only] (L01-1010-274)
- Sheet break/seam detector (L01-1009-748)
- 4-channel alarm relay (L01-1010-191)
- Analog output board (L01-1009-747)
- Blue denim check tile (A11-1011-296).

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Automatic Tile Holder

The internal tile holder automatically positions calibration and check tiles at the measurement port at a distance equal to that of the product being measured. This holder is attached to the sensor housing. Along with the black and white standardization tiles, it also holds a green ceramic check tile and the fluorescent tile in systems with the optional source ultraviolet (UV) control. The presence of a tile holder is automatically detected at power-up or instrument reset.

The tile holder contains two motors, one for opening and closing the tile drawer, and one for rotating the platter on which the tiles are held. Up to four tiles may be stored in the holder at any given time. Tiles to be read and/or used in standardization may be placed wherever desired in the tile holder, although default positions are indicated in the software.

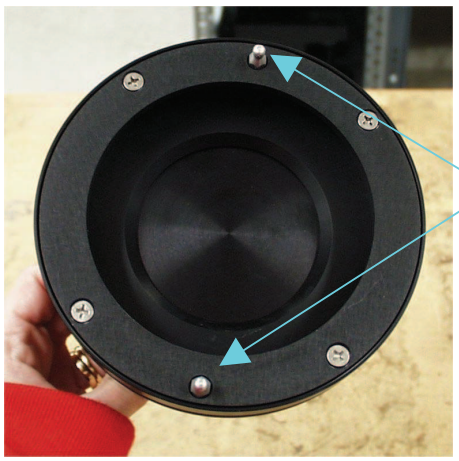


Manual Sample Holder

The manual sample holder snaps onto the sensor using ball studs and ball detents and has a spring-loaded sample clamp to hold small samples and standardization tiles in the proper position under the viewing window. The sample clamp is adjustable toward and away from the viewing window with its spring action and the clamp arm rotates away from the viewing window for measurement of large samples.

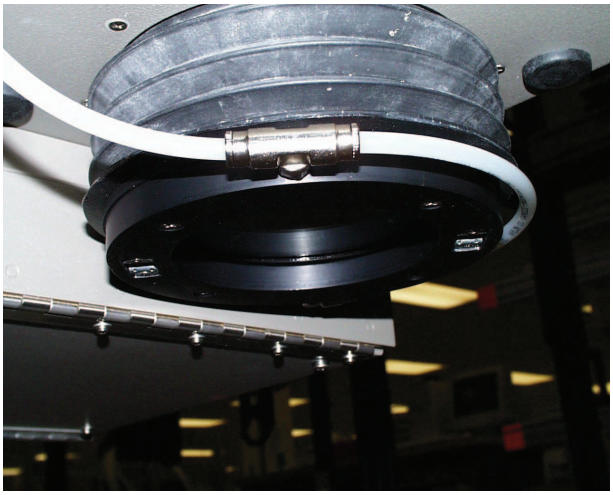


Side view

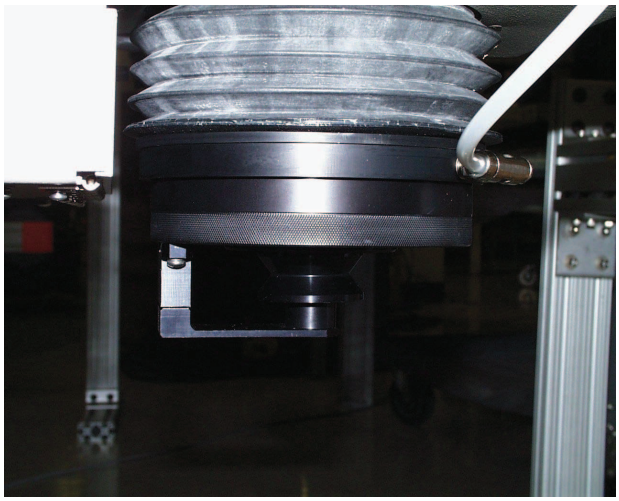


Installation area with two ball studs

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Installation area of sensor window with ball detents



Sample holder installed

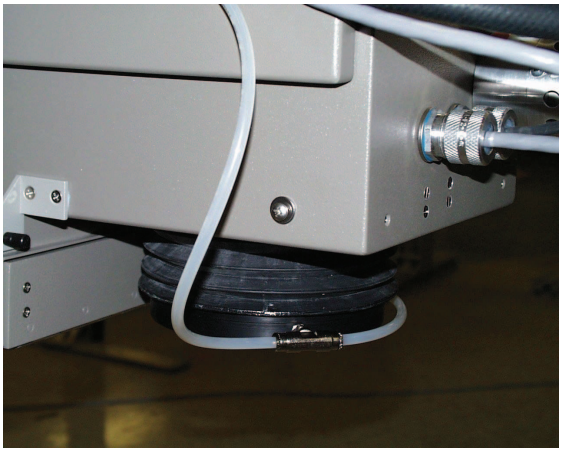
Positive-pressure Air Purge for Sensor Window and Automatic Tile Holder

The air purge assemblies provide positive pressure to blow airborne particulates away from the viewing port and the moving parts of the tile holder. This option consists of the following components:

- Air fitting in the wall of the sensor enclosure
- Air fitting in the wall of the tile holder enclosure
- Required modifications to the sensor enclosure
- Required modifications to the tile holder enclosure
- Pressure regulator mounted on the sensor for localized air pressure adjustment
- 180° - 220° air purge ring that snaps onto the sensor window
- 40 feet of air line to connect from the sensor window to the air filtration panel near the support unit
- 25 feet of air line to connect from the tile holder to the air filtration panel near the support unit
- Air filtration system.

The required modifications are made to the system when it is built.

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Air purge ring installed



The pressure regulator

When desired, snap the air purge ring into position over the sensor window by placing the ball detents on the ring over the ball studs near the sensor window and pressing upward gently. Provide plant air at a pressure of 30-45 psig. To operate the air purges, turn on the air supply to the filtration system to approximately 30-40 psi. Adjust the regulator on the sensor to a minimum pressure of 10 psi as required to keep the sensor window and tile holder free of contaminants.

CAUTION
Check and clean the air filter frequently to avoid contaminants in the air supply. FAILURE TO CLEAN THE AIR FILTER MAY DAMAGE THE SENSOR AND WILL VOID THE WARRANTY.

Sensor Vortex Cooler

The vortex cooler, which mounts to the sensor enclosure, provides a cold air supply to the sensor when the ambient temperature exceeds 49°C (120°F). The system automatically cycles on when a temperature of 43°C (110°F) is detected inside the sensor, and it remains on until a drop of approximately 5°F is achieved. These parameters are pre-set at the factory. A heat shield is also available that reflects the heat radiated from nearby sources. These two items, when used together, allow the sensor to operate at temperatures above the normal limit of 50°C (122°F), to a maximum of 57°C (135°F). The entire package consists of the following components:

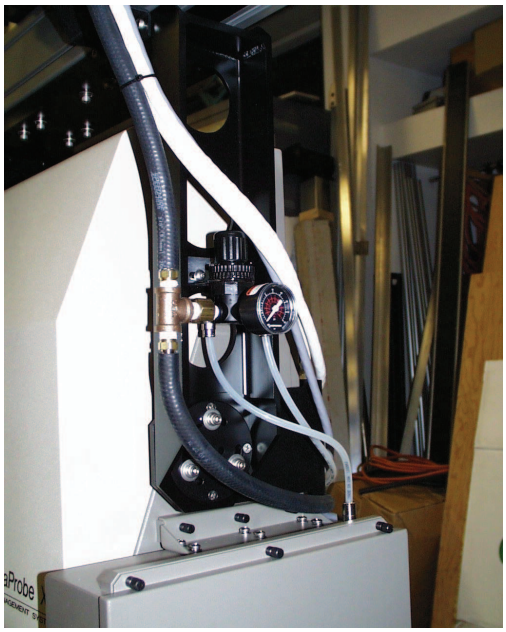
- Thermostat
- Solenoid valve
- Tubing and coupling
- Aluminum radiation heat shield
- Air filtration system.

The required modifications are made to the system when it is built.

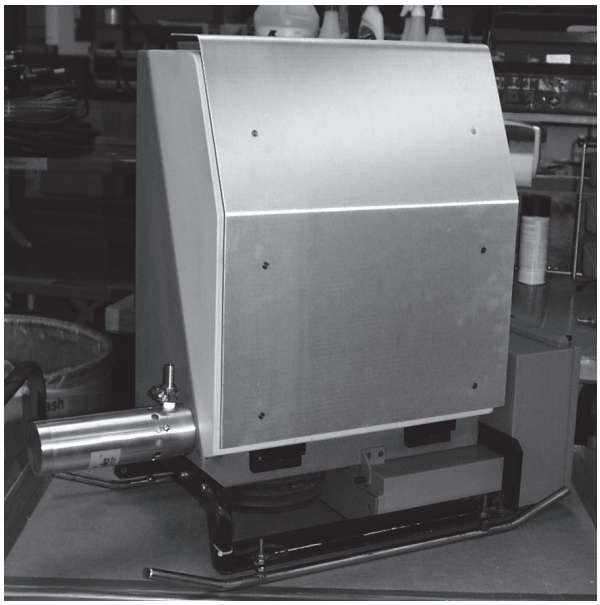
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The vortex cooler



The pressure regulator



The heat shield

A dual-filter air filtration system is included with this option. A minimum of 25 SCFM at 80-100 psi is required. To operate this system, connect it to a 100 VAC power supply and an air supply that can meet the requirements indicated above. Adjust the pressure regulator until a pressure of 80-100 psi is achieved. If the SpectraProbe XE system is also supplied with a sensor air purge and tile holder air purge, all the required air lines may be connected to the same supply panel.

CAUTION

The filter in this assembly uses replaceable filter elements which should be replaced if they become blocked or contaminated. This assembly should be inspected regularly (once per week initially). The filter must be checked and cleaned or replaced if necessary to assure that they do not become blocked by airborne

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contaminants. FAILURE TO CLEAN THE AIR FILTER MAY DAMAGE THE SENSOR AND WILL VOID THE WARRANTY.

Source UV Control

For the measurement of optical brighteners or UV-induced fluorescence, the calibration and control of the source UV energy is important. UV-induced fluorescence can vary based on the geometry of the instrument used, the spectral properties of the simulated source (usually D65), the condition of the instrument's lamp, and the fluorescent characteristics of the sample. Using the variable UV filter available on the SpectraProbe XE, the proper ratio of the energy in the UV region of the electromagnetic spectrum to that in the visible region of the spectrum can be achieved and maintained. This improves the agreement of the illumination between different instruments.

Transfer standards marked with known values are used to set the correct illumination conditions. These standards are stable, white fluorescent plastic samples that have been calibrated at the factory. Special algorithms in the SpectraProbe XE system adjust the UV content by adjusting the position of the UV filter until the whiteness value read by the sensor agrees with the calibrated value for the tile. This process should be carried out periodically since the UV output of the lamp will change as the lamp ages. Instructions for using UV control are given in the software manual, since control of the UV filter is maintained through the software.

Note: It is important to know what type of fluorescence is involved for the samples being measured. Some materials fluoresce due to excitation by visible rather than ultraviolet wavelengths. The UV-absorbing filter does not eliminate this type of fluorescence.

100-264V, 47/63 Hz Computer

A computer that autodetects the available voltage (between 100 and 264 volts) and operates properly using that voltage is available.

100-264V, 47/63 Hz Printer

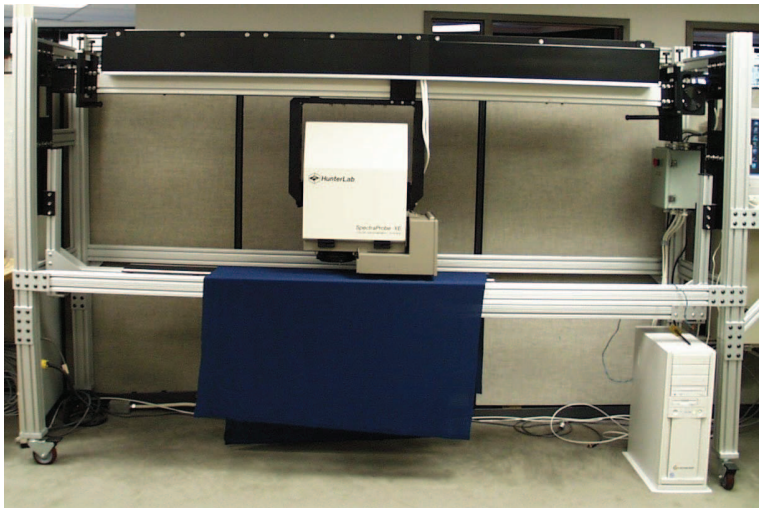
A printer that autodetects the available voltage (between 100 and 264 volts) and operates properly using that voltage is available.

Computer-Controlled Traversing System

The traversing system provides a sensor mount on a rail mechanism that is driven side to side across the production line. Traversing systems are valuable in the event that the conveying system exhibits a cyclical side-to-side motion or belt wander. Rail assemblies are available in lengths between 60.00 inches (1825 mm) and 250.9 inches (6375 mm), in 12.75-inch (325 mm) increments.

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An example of a short traversing system.



The traversing system consists of the linear positioner (“rail”), high-power stepper motor, motor control system, computer interface, and position feedback system. The system is capable of traversing at speeds of up to five feet (1524 mm) per second with a positioning repeatability better than 0.05 inches (1.27 mm). There are two limit switches and one home switch. All other positions can be achieved using “steps” from the home switch, in inches, of measurements by designating the distance points along the rail. The system also contains an emergency stop button. Communications are maintained with the support unit over an RS-485 bus line. The support unit must be equipped with motor control capabilities in order for the traversing system to operate.

A dual-position rail which allows only on-line and off-line positioning is also available.

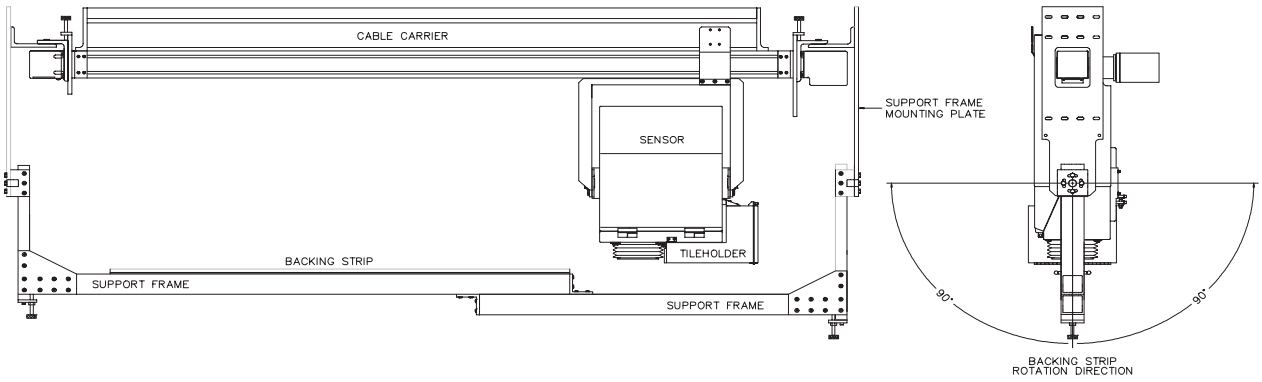
Fixed Mounting Assembly

The fixed system provides a stationary mount for the sensor. This standard mount allows the sensor to pivot around one axis. This allows you to align the sensing port perpendicular to the product.

Product Backing Strip

The product-backing strip provides a constant black background for product measurements. The length of the backing strip will depend on the length of the system’s rail. The system modifications required add 1 inch (25.4 mm) to the overall length and 12 inches (294 mm) to the overall height of the system. The backing strip rotates 180 degrees. When the backing strip is in place, the system J-box must be installed off-line from the standard system position.

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Upper/Lower Guide Bar Assembly

This assembly is an optional system that allows a highly flexible product such as paper or textiles to be captured by the sensor and held at the correct distance from the measurement window. The system prevents motion of the product in the vertical direction that would affect the color readings. The guide bars are "C"-shaped and thus cannot be used for traversing across the full width of the product. This may, however, be allowed using the upper guide bar assembly. The guide bars are made from round, stainless steel bar.

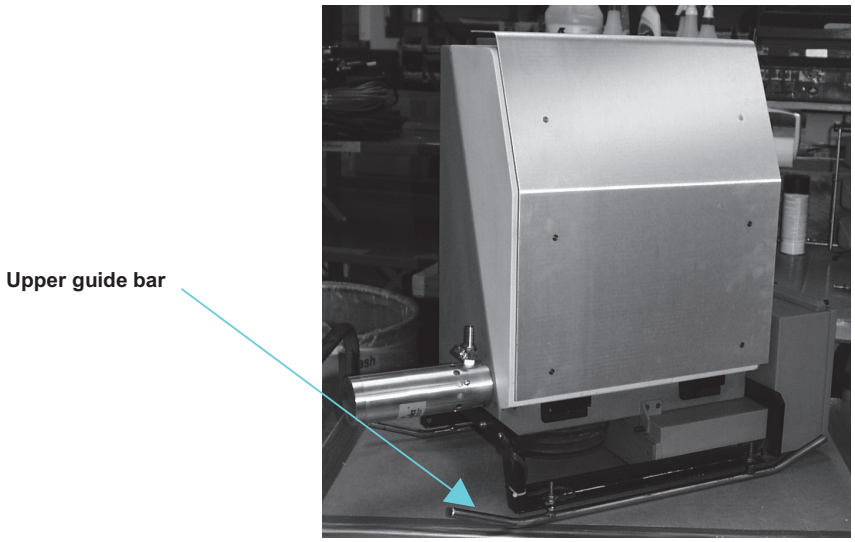
Upper Guide Bar Assembly

This assembly is similar in function to the upper/lower guide bar assembly in that it is used to prevent motion of highly flexible product relative to the measurement port of the sensor. The major difference is that this assembly contacts the top of the product only and, as such, allows the sensor to traverse along the full width of the product.

Because this assembly only prevents the product from moving up, downward movement is not restrained. A light tension should be kept on the product to keep it from drooping and moving away from the sensor.

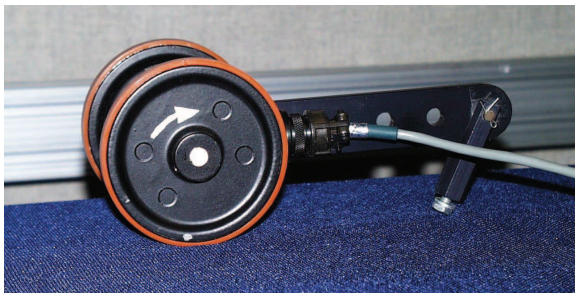
As with the upper/lower guide bar assembly, the upper guide bars are made from round, stainless steel bar.

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Length (Lineal) Counter

The length counter consists of a precision wheel with a rubber tire which rests on the product (or on a roll which revolves with a circumferential velocity equal to the speed of the product), which is connected to an impulse generator that transmits an impulse to the support unit for every one-sixth of an inch (4 mm) traveled. This information may be used to provide length information, which may appear in either yards or meters on the screen of the system computer when length-based trend plots are selected.

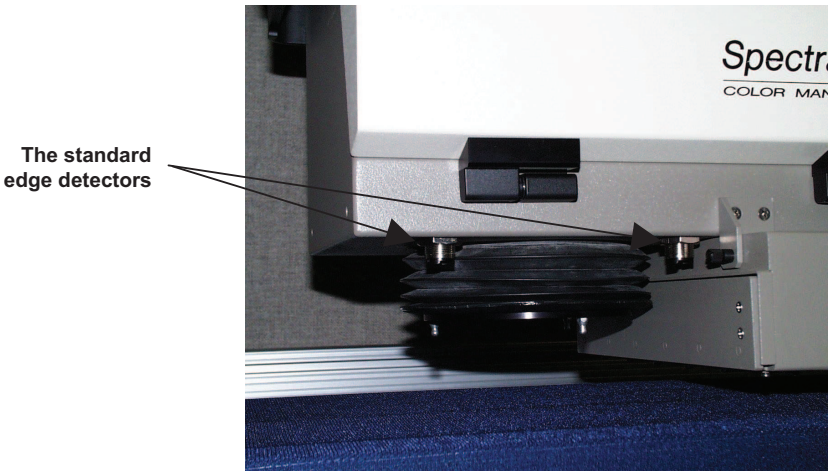


The length counter interfaces directly to the SPPC card on the PC104 bus of the support unit. The presence of a length counter is automatically detected at power-up or instrument reset.

Standard Edge Detectors

Standard edge detectors detect the presence of the measured surface relative to the measurement port. Infrared sensors mounted on the front of the sensor in two configurations detect when the leading edge of the sample moves under the sensor and then when the sample moves away from the sensor. The sensitivity of the detectors is adjustable using a small pot on the side of the housing. Adjust this pot so that the indicator light on the sensor goes on only in the presence of product.

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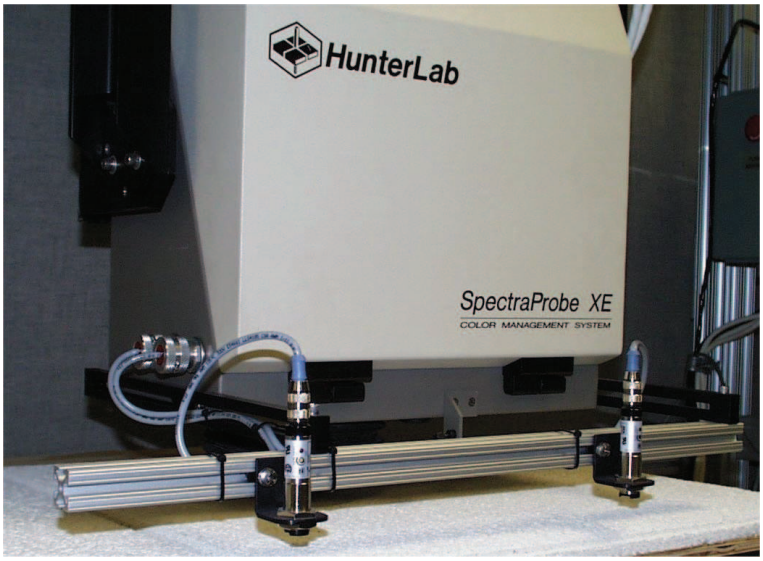


Diagonal Edge Detectors

This option places the edge detectors at opposite corners relative to the sensing port. In this configuration, the sensor can detect fore-and-aft, as well as side-to-side product placement.

Four Movable Edge Detectors

This option provides four external product detectors, two on the front and two on the back of the sensor. The detectors are movable and may be adjusted to the desired position by sliding them along a slotted rail.



Motion Alarm (Traversing systems only)

The motion alarm on the traversing system provides a visual and audible indication that the sensor is either moving or is about to move. The audible alarm, if selected, will sound for a period of time before the sensor starts to move. The visual alarm, if selected, flashes while the sensor is under automated control, if the computer is set to move the sensor either continuously or at predetermined intervals. This provides a safety benefit for operators. The alarm box should be placed in an area that is visible to the operators and anyone else who might be in the way of the moving sensor.

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Sheet Break/Seam Detector

The sheet break/seam detector option allows the system to end a run and/or move the sensor off-line upon detection of a sheet break/seam.

4-Channel Alarm Relay

The 4-channel relay board installed in the support unit activates user-supplied systems such as alarm systems that signal when one of the four measurement parameters (the three components of the color scale and the fourth trace) is out of tolerance.

Analog Output Board

The optional SpectraProbe XE analog output board supplies four channels of 4-to-20 mA output based on numerical values reported by the sensor. Depending on selections made in the software, the analog output can represent either color difference or whole scale values. This output can generate a continuous signal that may be fed into closed-loop control (CLC) or statistical process control (SPC) systems.

The normal analog output is color difference. In this mode, the analog outputs represent the difference between the measured value and the standard value for each parameter of the selected color scale, automatically scaled by the tolerance, T, in use for each parameter such that the analog range always represents -2T to +2T. Thus, a device such as a chart recorder which is looking at the analog output, does not have to be re-scaled when tolerances are changed.

If whole scale analog output is selected in the software, the analog outputs represent the measured whole scale values in the selected color scale. The scaling is then determined by top and bottom of scale values entered in the software.

Blue Denim Check Tile

This 3.5-inch round blue tile may be placed in the automatic tile holder and used as the check tile in place of the standard green tile. See your software manual for a description of the color check.

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Chapter Two

Installation

Sensor

A mounting yoke is included with both fixed and traversing systems. This yoke, along with its captive mounting hardware, can be used to mount the sensor a variety of ways. It may be positioned port up, port down, or at any other angle. The sensor must be installed in accordance with the applicable HunterLab installation drawing, which is included at the end of this chapter for reference. The following factors, as well as the details shown in the installation drawing, should be considered in making this installation.

- **Presentation of the product to the sensor.** The sensor must be located where it can view the product in a stable condition representative of the product color. The distance from the bezel of the sensor window to the product must be 1.5 inch (38.5 mm).

  Note: In order to set the sensor-product distance properly, refer to the subsection on the next page.

- **Access to the sensor.** It will be necessary to have physical access to the sensor for primary calibration and maintenance at regular intervals, so convenient access should be available.

- **Sensor environment.** While the sensor is rugged and sealed, accumulated contamination on the sensor window will eventually degrade performance. The more contaminants to which the sensor is subjected (dust, oil, crumbs, etc.), the more frequently it will need to be cleaned to maintain performance. The ambient air temperature must remain below 50° C (122° F), with a relative non-condensing humidity between 5 and 95%.

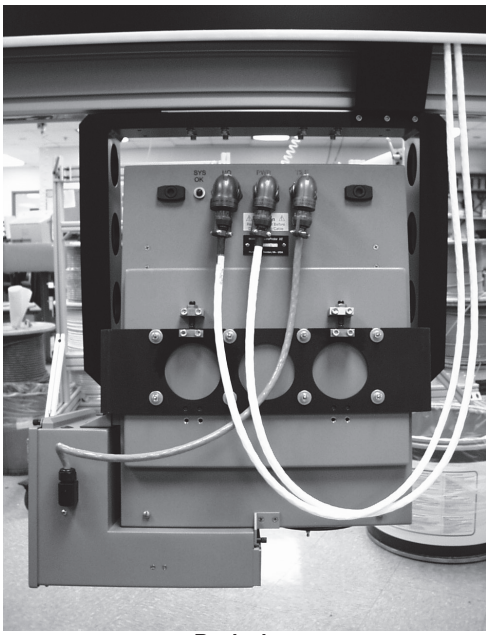
- **Clearance for plant maintenance.** The sensor and mount should be sited so that they are neither in the way nor vulnerable during plant maintenance.

Notice: Welding near the SpectraProbe XE system can cause damage to the sensor and will void your warranty.

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Front view



Back view

Proper Positioning of the Sensor Over the Product

Note: The instructions below are written for users of MultiSensor XE Software. If you are using a different software product, refer to the software user's manual for instructions on setup of the software positioning parameters.

Complete the following steps in order to position the sensor the proper distance over the product:

1. Position the sensor with the bottom of the tile holder about 0.9 inch (22.9 mm) from the product.

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2. On the Measurements and Warning screen in the Run Group Configuration, set the “To Product” value to 0.5 inch. This is an arbitrary beginning value and will be changed to the actual value later.

   Note: Do not change the “To Cal Tiles” value.

3. Press the Control button on the toolbar to access the Sensor Control Dialog.

4. Press the Z Read button to move the z-axis to the Read position (fully-extended).

5. Manually measure the distance between the edge of the z-axis window bezel and the product. The bezel is the lowest point on the z-axis assembly. You will need to either measure this distance in inches or convert the measurement to inches (1 inch = 25.4 mm).

6. Subtract 1 inch (25.4 mm) from the value measured in #5.

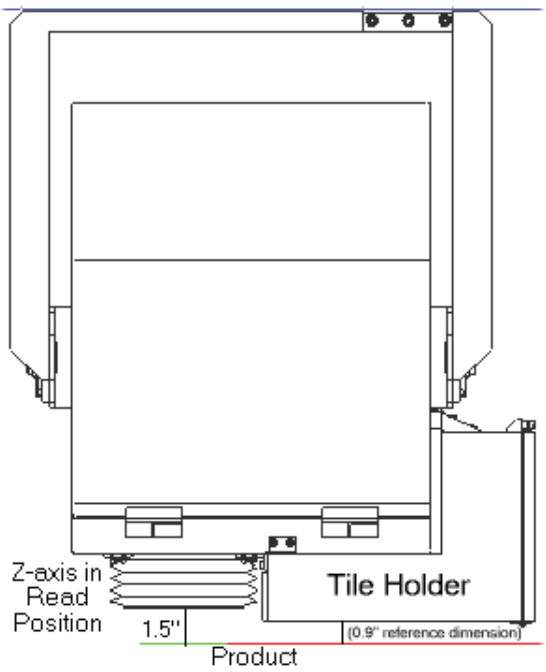
7. On the Measurements and Warning screen in the Run Group Configuration, set the “To Product” value to the number calculated in #6.

   Note: Do not change the “To Cal Tiles” value.

8. Press the Control button on the toolbar to access the Sensor Control Dialog.

9. Press the Z Read button to move the z-axis to the Read position (fully-extended).

10. Repeat Steps 2-9 whenever product height changes. The physical position of the sensor will not need to be changed unless the proper position cannot be achieved only through software modifications (i.e., the z-axis is fully extended and is still too far from the product).



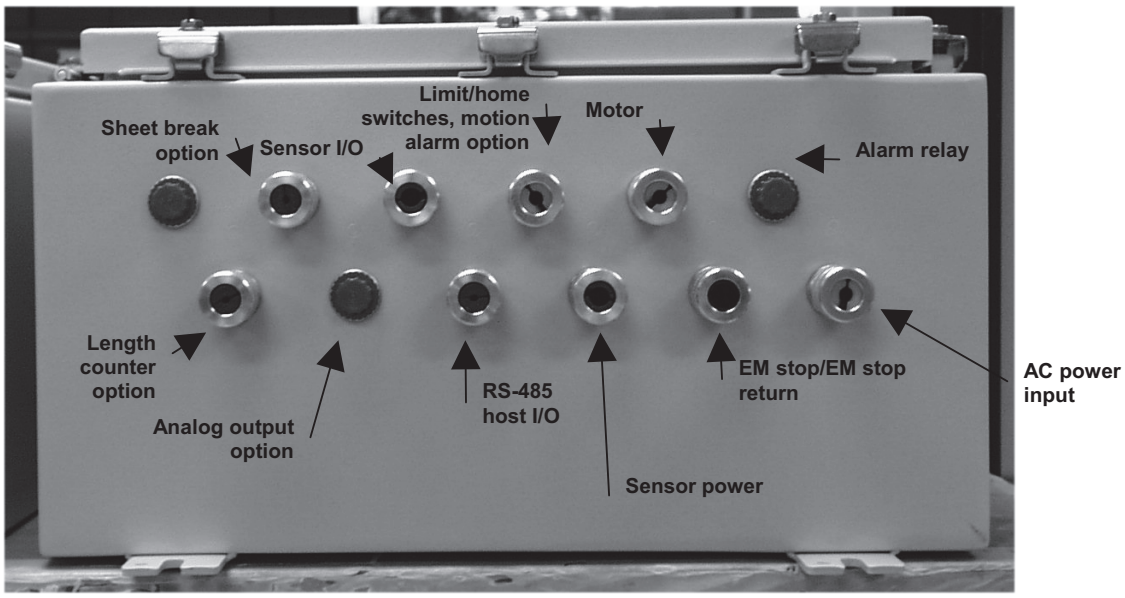
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Support Unit

The support unit must be installed in accordance with the applicable HunterLab installation drawing, which is included at the end of this chapter for reference. The following environmental limitation, as well as the details shown in the installation drawing, should be considered in making this installation.

- **Support unit environment.** The ambient air temperature must remain within the range 10° C (50° F) to 50° C (122° F). The support unit is sealed and can withstand normal factory floor environments.

The connections to be made on the bottom of the support unit are shown below.



After the support unit and sensor are installed, supply power and allow the system to warm up for one hour prior to operation.

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Supervisory Computer

The supervisory computer must be installed in accordance with the applicable HunterLab installation drawing, which is included at the end of this chapter for reference. The following factors, as well as the details shown in the installation drawing, should be considered in making this installation.

- **Access to the computer, monitor, keyboard, and mouse.** Routine operation requires observation of displays on the monitor, use of the keyboard and mouse, and access to the floppy disk drive for routine file backups. Thus, the location and height of the computer, monitor, keyboard, and mouse should be convenient.

- **Environment.** The supervisory computer is a standard, non-hardened system, and requires a normal computer environment. The ambient temperature around the computer and monitor must be between 15° C (59° F) and 30° C (86° F).

- **The communications settings** for the computer serial port should be set as 9600 baud, no parity, 8 data bits, and 1 stop bit.

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The Software

Install MultiSensor XE Software or your SheLyn software as described in the appropriate user's manual for the software.

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External Devices (Optional)

Installation of external devices, such as tile holders, the traversing system, and edge detectors, should be performed as shown on the appropriate installation drawing.

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Cable Requirements

The cables between SpectraProbe XE system components are described in the system installation drawing provided at the end of this chapter.

The following cables are provided with the standard system:

- RS-485 from the tile holder to the sensor, 3 feet
- RS-485 from the support unit to the sensor, 50 feet
- Power cable from the support unit to the sensor, 50 feet
- Isolated RS-232 from the support unit to the PC, 100 feet.

Additional cable lengths may be purchased from HunterLab.

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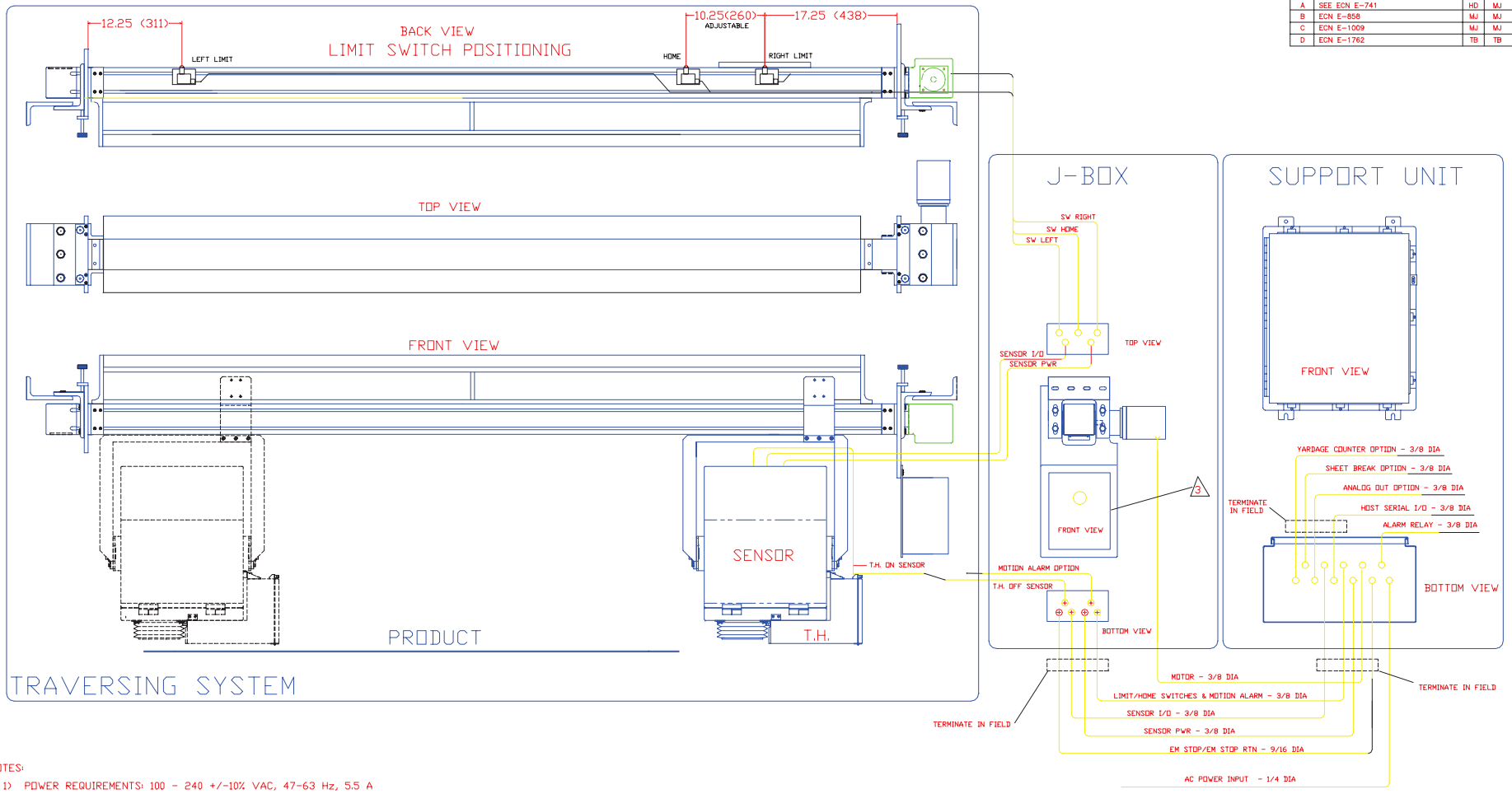
SpectraProbe XE Installation Drawings

The following installation drawings are included for your reference:

- ✓ D09-1009-482 Installation Drawing, SPXE Traversing
- ✓ D03-1008-693 System Interconnect Diagram, SPXE

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REVISIONS				
REV	DESCRIPTION	BY	APPR	DATE
4	ECN661 PRERELEASE	MJ	MJ	6-11-97
A	SEE ECN E-741	HD	MJ	8/6/97
B	ECN E-858	MJ	MJ	11/3/97
C	ECN E-1009	MJ	MJ	2/12/98
D	ECN E-1762	TB	TB	3/02/00

NOTES:

1) POWER REQUIREMENTS: 100 - 240 +/-10% VAC, 47-63 Hz, 5.5 A
2) TEMPERATURE RATING: 0 - 50 C
3) WEIGHT: SENSOR 70 LBS
   RAIL <250 LBS
   SUPPORT UNIT 45 LBS
4) MAXIMUM TRAVEL SPEED = 50"/SEC
5) CABLE LENGTHS BETWEEN THE SUPPORT UNIT AND THE J-BOX NOT TO EXCEED 100 FEET. CONDUIT IS NOT REQUIRED. CABLE DIAMETERS ARE REFERENCED ON SHEET 1.
6) REF SYSTEM INTERCONNECT DIAGRAM #D03-1008-693
7) J-BOX MAY BE MOUNTED OFF THE RAIL. SEE SHEET 3 FOR MOUNTING REQUIRMENTS.

XX.XX = INCHES (XX.XX) MILIMETERS

SHEET 1 SHOWS TRAVERSING SYSTEM - OVERALL VIEW
SHEET 2 SHOWS TRAVERSING SYSTEM DIMENSIONAL DATA
SHEET 3 SHOWS SENSOR ROTATION, SUPPORT UNIT AND J-BOX DIMENSIONAL DATA SHOWS OPTION INPUT SPECIFICATIONS
SHEET 4 SHOWS FIXED POINT SYSTEM OVERALL AND DIMENSIONAL DATA
SHEET 5 SHOWS OEM SENSOR

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SPXE	--
USED ON	NEXT ASSY
APPLICATION	

MATERIAL:
FINISH:
UNLESS OTHERWISE SPECIFIED:
TOLERANCES : 2 PLACE (.XX) = ±.01
3 PLACE (.XXX) = ±.005
ANGLES = ±.5°
125 SURFACE TEXTURE
DO NOT SCALE DRAWING
ALL DIMENSIONS ARE IN INCHES
DIMENSIONS APPLY AFTER FINISHING
REMOVE BURRS AND BREAK SHARP EDGES .005 MAXIMUM
INTERPRET DWG PER ANSI Y-14.5 1982

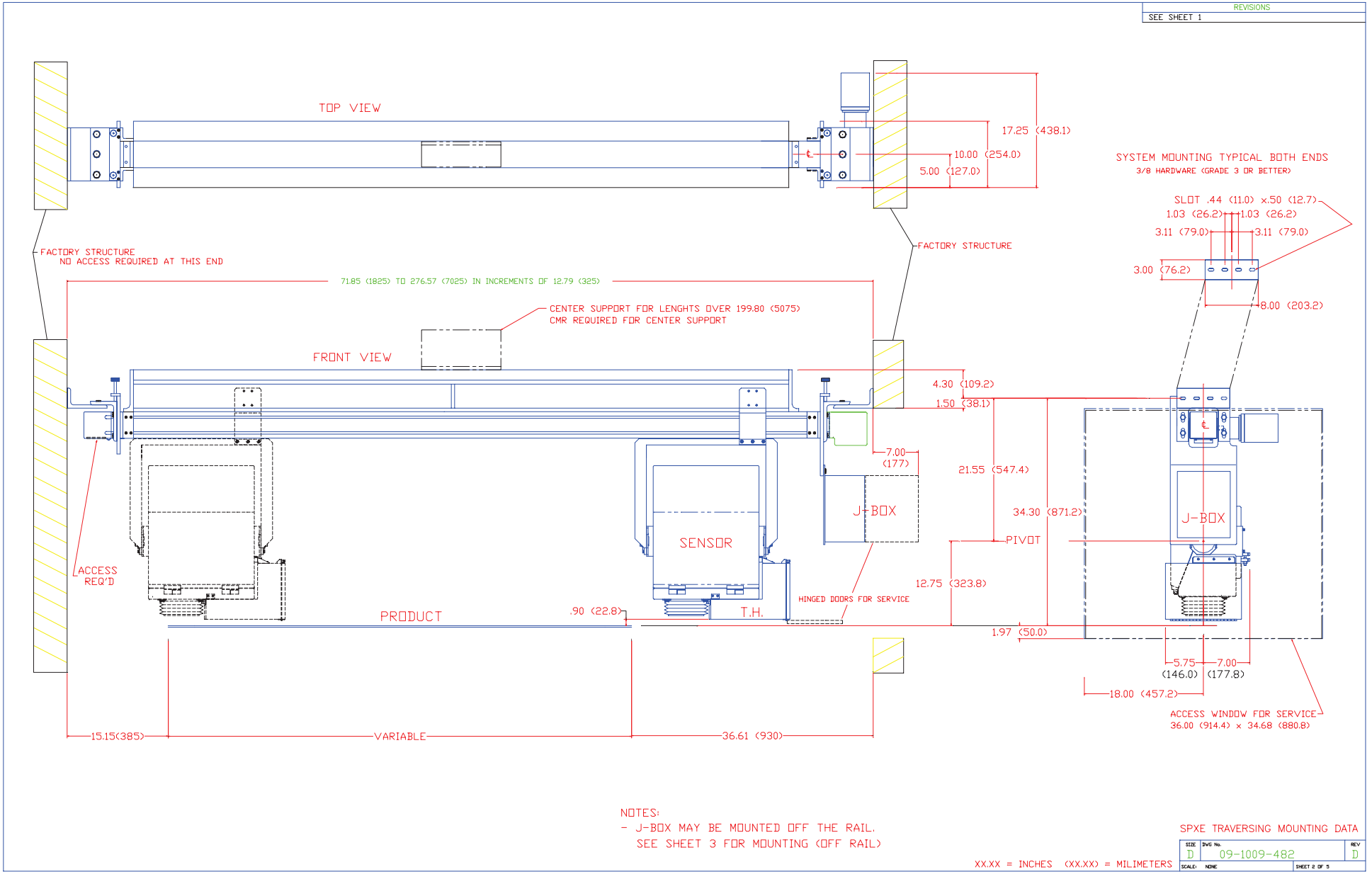
APPROVALS	DATE
DRAWN M JAMES	3-17-97
CHECKED	
COG ENG MJ	6-11-97
PROJ ENG JBF	6/11/97
APPR MG	9/15/97

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INSTALLATION DRAWING
SPXE TRAVERSING

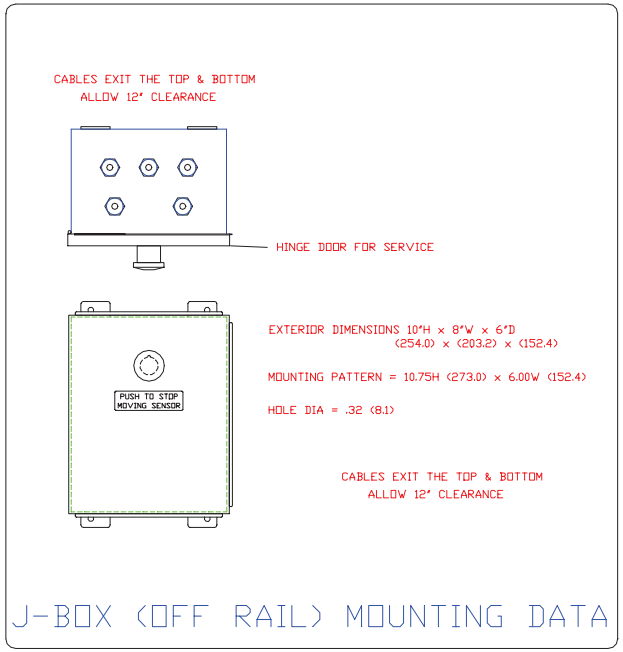
SIZE	DWG No.	REV
D	09-1009-482	D
SCALE: NONE	SHEET 1 OF 5	

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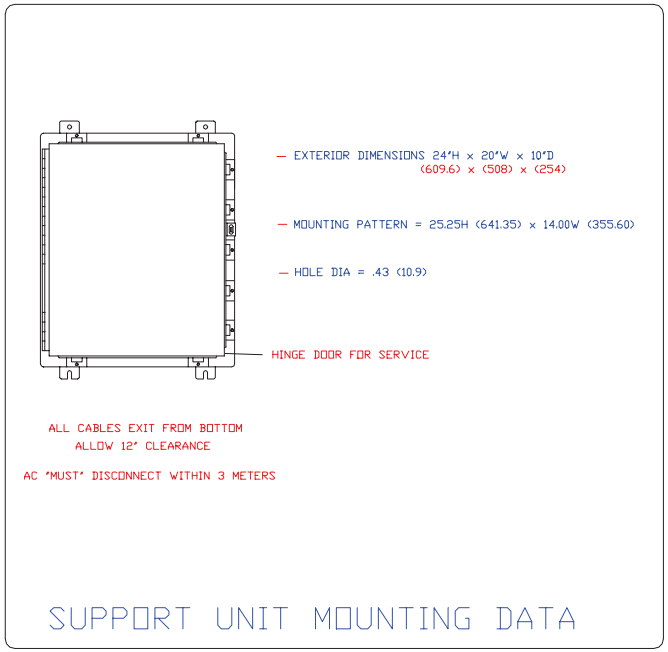


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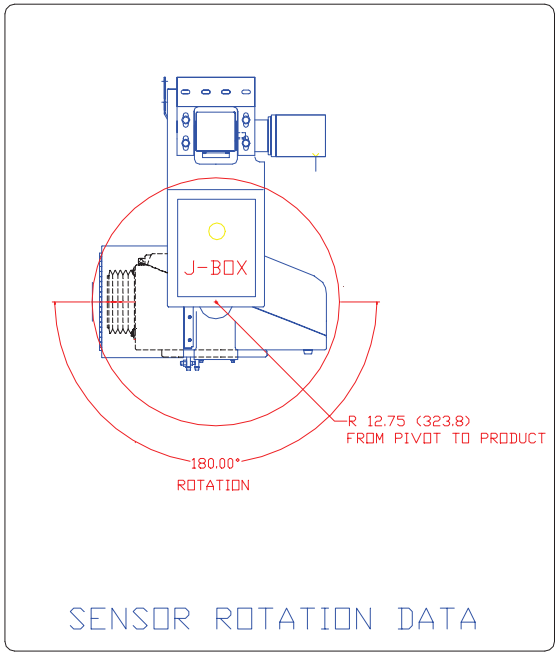
REVISIONS
SEE SHEET 1



J-BOX (OFF RAIL) MOUNTING DATA



SUPPORT UNIT MOUNTING DATA



SENSOR ROTATION DATA

INPUT SPECIFICATIONS FOR OPTIONS

SEAM DETECTOR/SHEET BREAK

- DETECTORS MUST BE OF SWITCH CLOSURE DRY CONTACT TYPE
  CAPABLE OF SINKING 100mA
  CABABLE OF PROVIDING A PULSE OF 10ms MINIMUM
  NORMALLY CLOSED TO OPEN SEAM DETECTION
- DEVICE TO CONNECT TO SUPPLIED CABLE VIA SUPPORT UNIT. REFER TO SYSTEM INTERCONNECT DRAWING #D03-1008-693 TO ID CABLE AND CONNECTIONS.
- STANDARD CABLE LENGTH IS 100 FEET.

ALARM RELAY

- CONTACT FORM: FORM A SPST MECH RELAY
  NORMAL POSITION: OPEN
  CONTACT RATING 10VA
  SWITCHING VOLTAGE DC 100 MAX AC 130 MAX
  SWITCHING CURRENT 0.5 A
  CARRY CURRENT 1.5A
- DEVICE TO CONNECT TO SUPPLIED CABLE VIA SUPPORT UNIT. REFER TO SYSTEM INTERCONNECT DRAWING #D03-1008-693 TO ID CABLE AND CONNECTIONS.
- STANDARD CABLE LENGTH IS 100 FEET.

ANALOG OUTPUT

- OUTPUT VOLTAGE RANGE: 0.0 V TO +11.0V, MIN
  OPEN CIRCUIT VOLTAGE: +13.8V
  LINEARITY OVER RANGE: +/-1 LSB
  DIFFERENTIAL LINEARITY ERROR: +/- 4 LSB
  TEMPERATURE COEFFICIENT, GAIN DRIFT: +/- 30ppm, TYPICAL
- DEVICE TO CONNECT TO SUPPLIED CABLE VIA SUPPORT UNIT. REFER TO SYSTEM INTERCONNECT DRAWING #D03-1008-693 TO ID CABLE AND CONNECTIONS.
- STANDARD CABLE LENGTH IS 100 FEET.

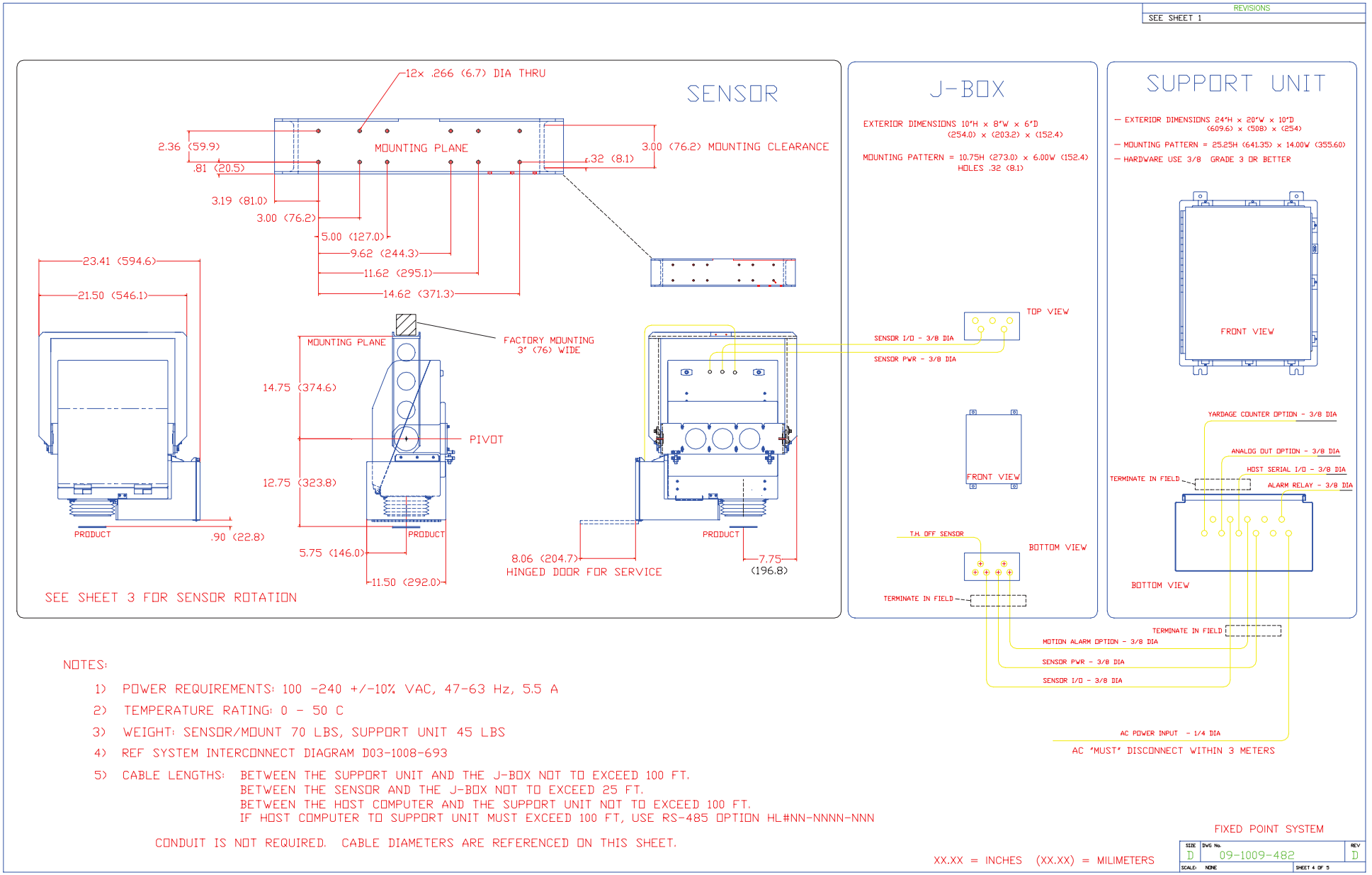
LINEAR COUNTER

- MAX SPEED 3000 METERS/MIN.
- CABLE COMES WITH COUNTER. 100 FT. MAX
  REFER TO SYSTEM INTERCONNECT DRAWING #D03-1008-693
  FOR CONNECTIONS.

XX.XX = INCHES (XX.XX) = MILIMETERS

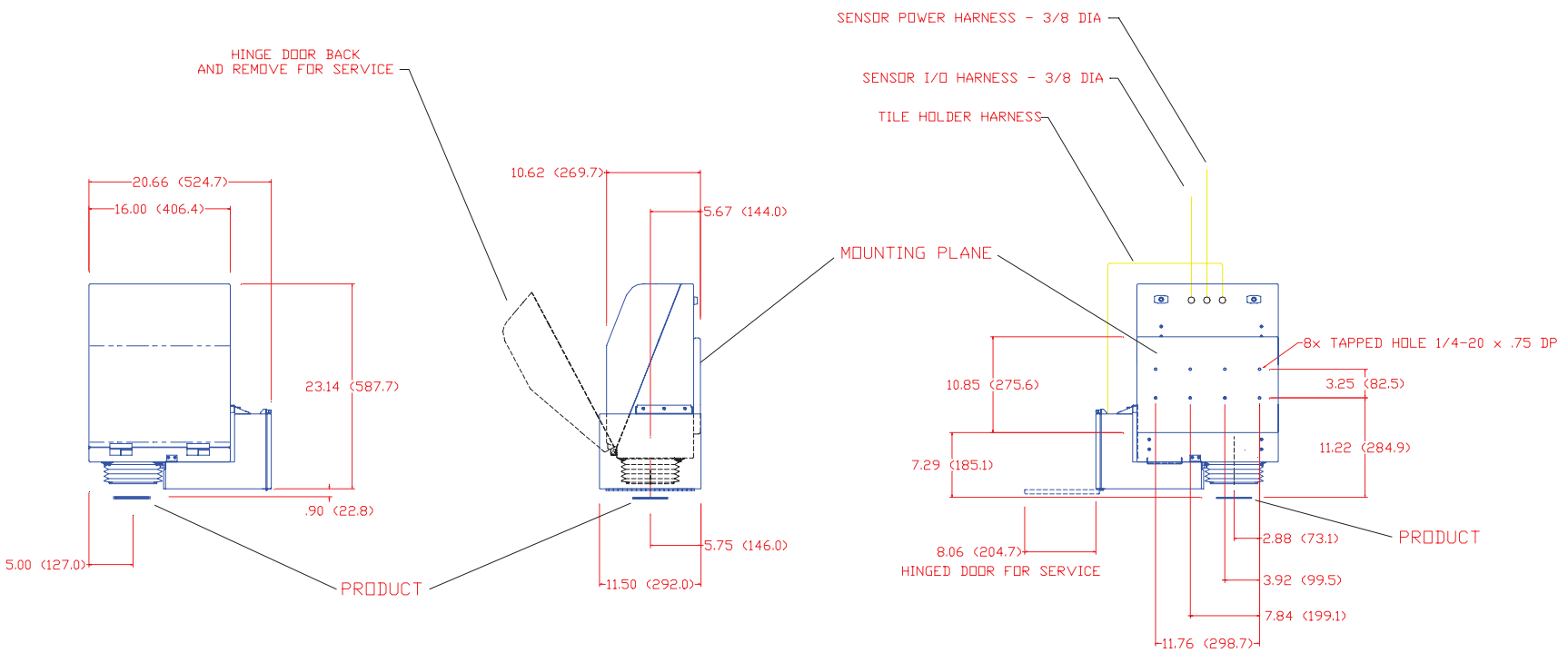
SIZE	DWG No.	REV
D	09-1009-482	D
SCALE: NONE		SHEET 3 OF 5

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REVISIONS
SEE SHEET 1



NOTES:

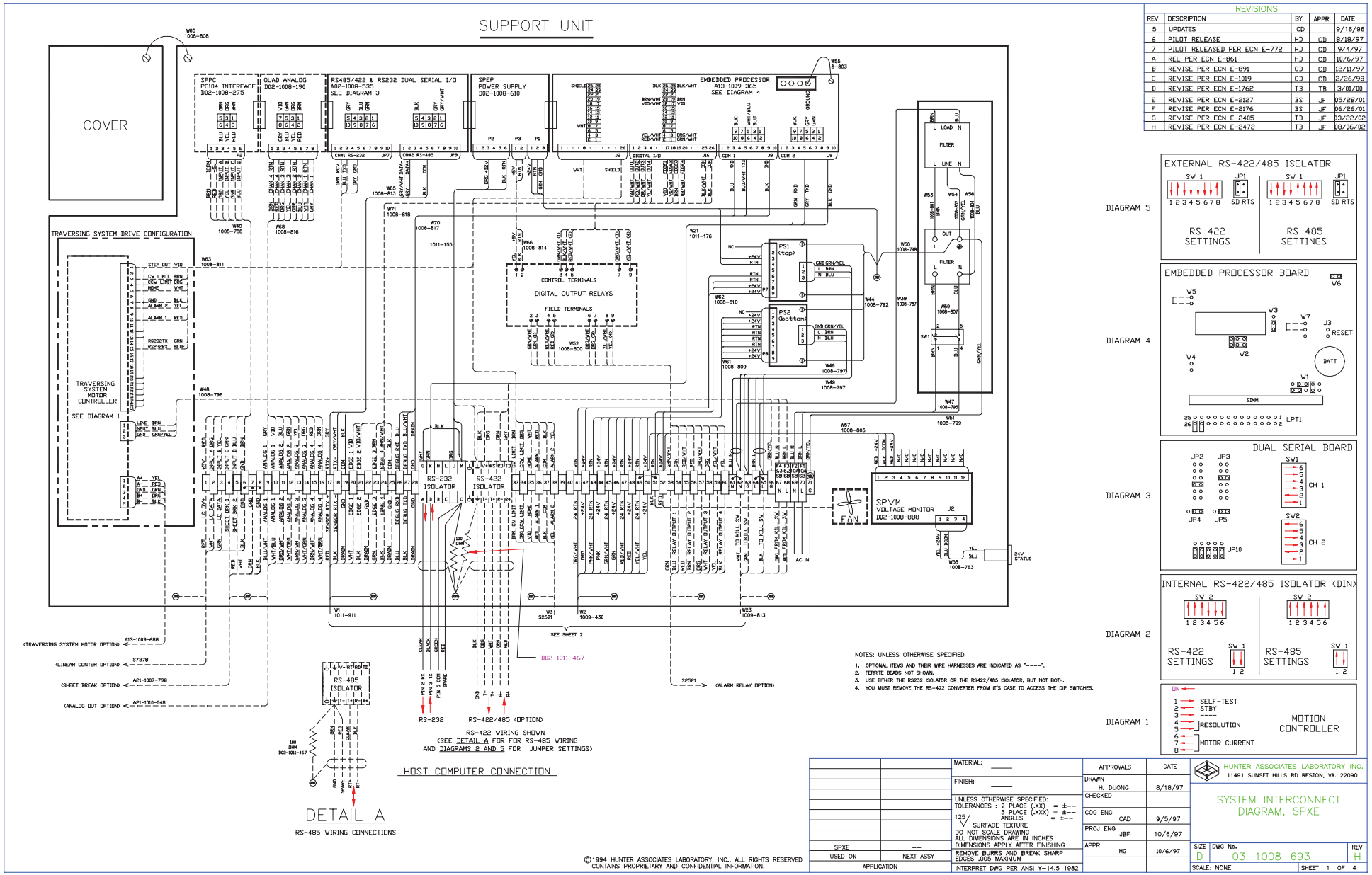
1) POWER REQUIREMENTS: 24 VDC 5 AMPS
2) TEMPERATURE RATING: 0 - 50 C
3) WEIGHT: 70 LBS
4) CONDUIT IS NOT REQUIRED. CABLE DIAMETERS ARE REFERENCED ON THIS SHEET.

SENSOR "ONLY" INSTALLATION

XX.XX = INCHES (XX.XX) = MILIMETERS

SIZE	DWG No.	REV
D	09-1009-482	D
SCALE: NONE		SHEET 5 OF 5

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NOTES: UNLESS OTHERWISE SPECIFIED

1. OPTIONAL ITEMS AND THEIR WIRE HARNESSES ARE INDICATED AS "- - - -".
2. FERRITE BEADS NOT SHOWN.
3. USE EITHER THE RS232 ISOLATOR OR THE RS422/485 ISOLATOR, BUT NOT BOTH.
4. YOU MUST REMOVE THE RS-422 CONVERTER FROM IT'S CASE TO ACCESS THE DIP SWITCHES.

REVISIONS

REV	DESCRIPTION	BY	APPR	DATE
5	UPDATES	CD		9/16/96
6	PILOT RELEASE	HD	CD	8/18/97
7	PILOT RELEASED PER ECN E-772	HD	CD	9/4/97
A	REL PER ECN E-861	HD	CD	10/6/97
B	REVISE PER ECN E-891	CD	CD	12/11/97
C	REVISE PER ECN E-1019	CD	CD	2/26/98
D	REVISE PER ECN E-1762	TB	TB	3/01/00
E	REVISE PER ECN E-2127	BS	JF	05/28/01
F	REVISE PER ECN E-2176	BS	JF	06/26/01
G	REVISE PER ECN E-2405	TB	JF	03/22/02
H	REVISE PER ECN E-2472	TB	JF	08/06/02

DIAGRAM 5

DIAGRAM 4

DIAGRAM 3

DIAGRAM 2

DIAGRAM 1

SPXE	--	MATERIAL: ———	
USED ON	NEXT ASSY	FINISH: ———	
APPLICATION		UNLESS OTHERWISE SPECIFIED: TOLERANCES : 2 PLACE (XX) = ±--- 3 PLACE (XXX) = ±--- ANGLES = ±--- 125/ SURFACE TEXTURE DO NOT SCALE DRAWING ALL DIMENSIONS ARE IN INCHES DIMENSIONS APPLY AFTER FINISHING REMOVE BURRS AND BREAK SHARP EDGES .005 MAXIMUM INTERPRET DWG PER ANSI Y-14.5 1982	

APPROVALS	DATE
DRAWN H. DUONG	8/18/97
CHECKED	
COG ENG CAD	9/5/97
PROJ ENG JBF	10/6/97
APPR MG	10/6/97

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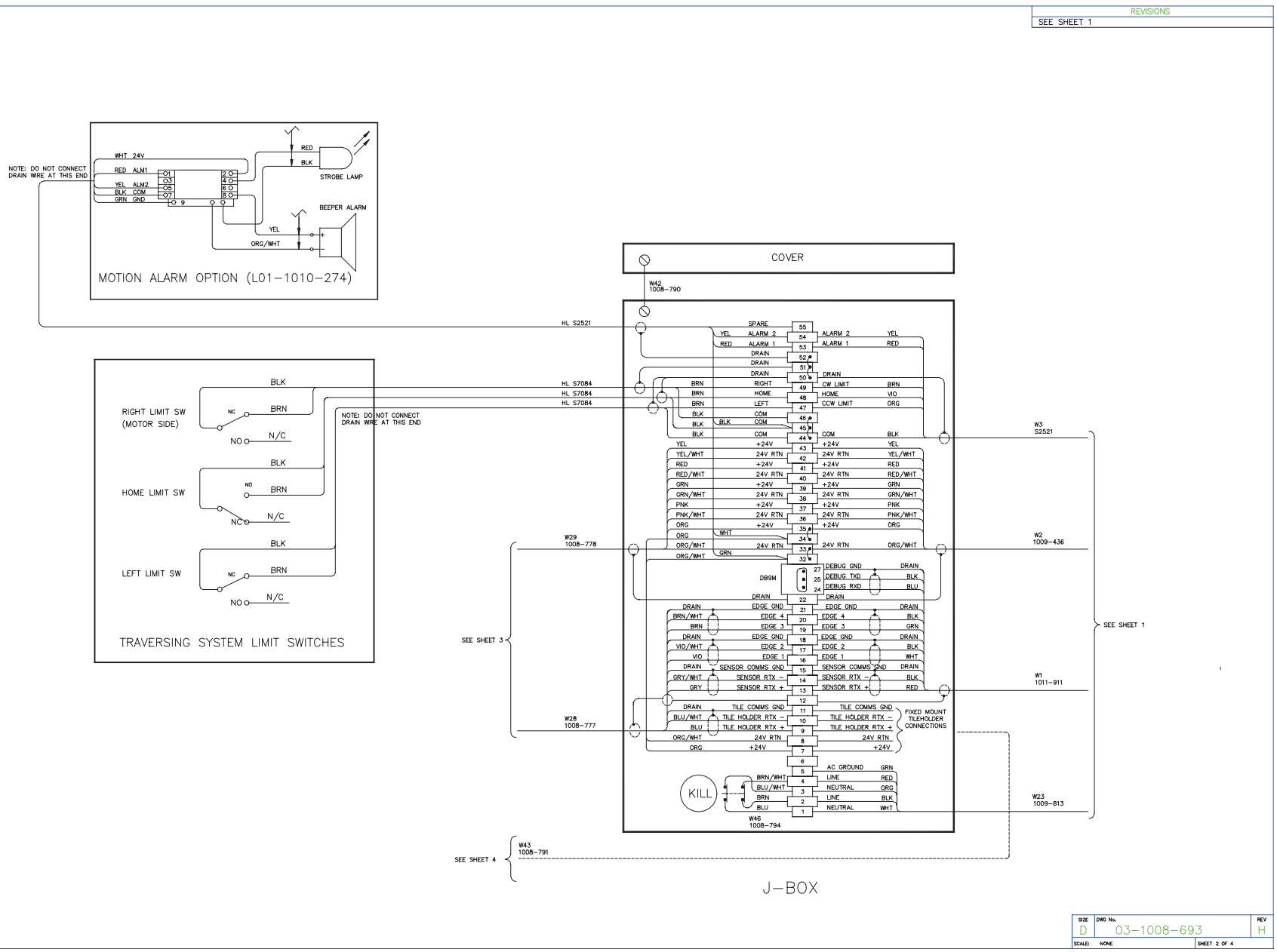
SYSTEM INTERCONNECT DIAGRAM, SPXE

SIZE	DWG No.	REV
D	03-1008-693	H

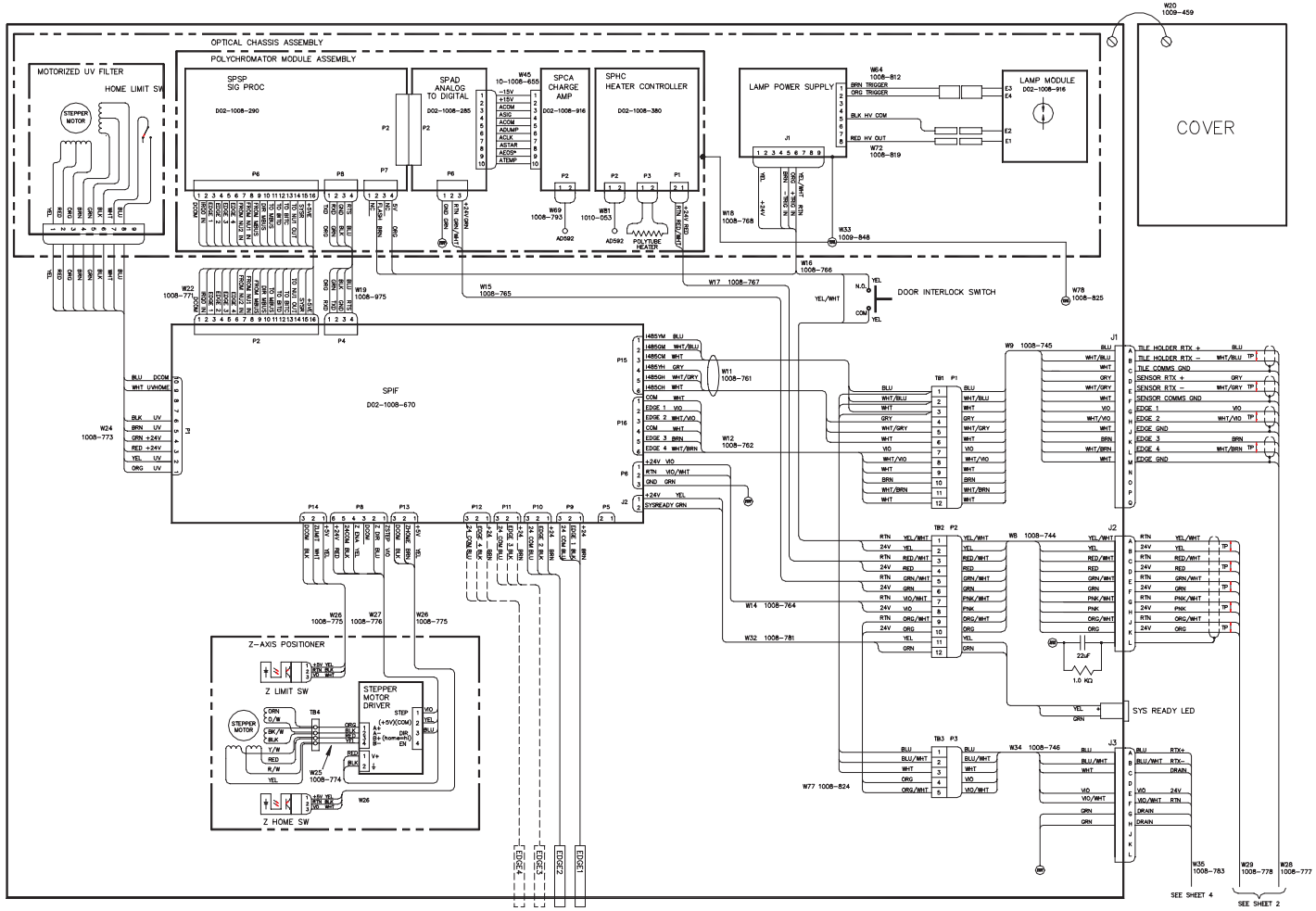
SCALE: NONE SHEET 1 OF 4

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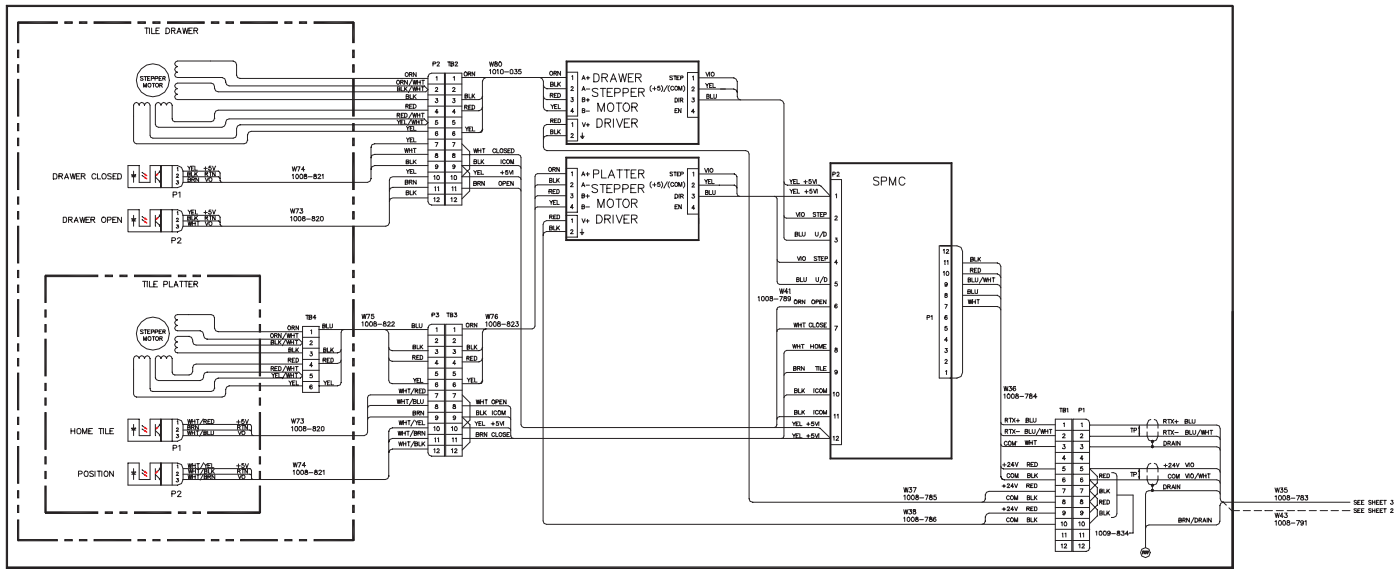
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SENSOR UNIT

SIZE	DWG No.	REV
D	03-1008-693	H
SCALE: NONE		SHEET 3 OF 4

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TILEHOLDER

Chapter Three

Operation

Product Setup

A product setup is a set of operating parameters that define the operation of the system for a specific product. The most obvious parameters that need to be defined are the color scale and standard color values for the product and the acceptable tolerances applied to those values. In addition, other operating parameters must be defined.

Product setups are saved in the computer along with a setup name. A record of setup names to be used with each product should be kept.

Refer to the MultiSensor Software User's Manual or the appropriate SheLyn software manual for setup instructions.

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Standardization

Standardization must be performed periodically to maintain color measurement accuracy. It is the means of correcting the system for any changes that occur to the system over time, such as lamp aging. Thus, system performance depends on good calibration procedures, consistently followed.

It is extremely important that the standards used for standardization be treated with care. They must be clean and in good condition if standardization is to be successful. If there is any doubt about the standards being clean, please clean them as described in the Maintenance chapter.

Two levels of standardization are provided: primary and secondary calibrations. **Primary calibration** on MultiSensor Software systems is performed in the off-line mode by manually presenting the black and white instrument standards to the sensor while the sensor is off-line. On SheLyn software systems, the primary white and black tiles are placed in the automatic tile holder for automatic presentation to the sensor. This may be done infrequently (every week), but it must be done regularly. **Secondary calibration** is performed automatically during on-line operations. The system automatically moves the sensor to the sealed tile holder and presents the secondary white tile to the sensor at a time interval selected in the software.

UV filter calibration may also be performed if the UV control option was purchased. This type of calibration may be performed automatically if the automatic tile holder is installed on the system. This procedure should be performed every time a primary calibration is done.

The frequency with which standardization must be done depends on the operating conditions, including temperature conditions at the sensor and the rate at which dirt and contaminants build up on the sensor. Standardization must be performed at intervals that are short compared to the time required for significant color measurement changes to occur. These changes may be evaluated by simply reading one or more of the instrument standards and observing the changes in these readings over time.

Immediately after standardization, the white standard tile should read within ±0.03 units of its factory-read values in XYZ. Generally, when the white tile readings differ from the factory-read values by more than ±0.05 units XYZ, standardization should be performed.

Typically, secondary calibration every four hours and primary calibration every week is appropriate.

CAUTION

When using an automatic tile holder, keep hands, samples, and equipment out of the way of the tile holder drawer and the z-axis. Both of these parts must be allowed to move freely or damage may result.

Note: The terms "calibration" and "standardization" are used interchangeably in this manual.

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Taking Readings

Refer to the MultiSensor Software User's Manual or the appropriate SheLyn software manual for instructions on taking readings.

If samples are to be presented to the sensor manually, they may be placed directly on the track/conveyer, placed in the optional manual sample holder, or cut to disks of 3 1/2" diameter and 1/4" thick and placed in the tile holder.

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Chapter Four

Maintenance

This chapter describes routine maintenance functions to be performed regularly on the SpectraProbe XE system. Consistent performance is enhanced by a consistent maintenance program.

If it becomes necessary to disconnect the sensor or support unit cables for maintenance, always turn power to the support unit off before disconnecting cables and turn it back on only after reconnecting all cables.

System Warm-up

If power to any of the system components has been turned off, it must be restored to all components before operation can resume.

When restoring power to system components,

1. Restore power to the support unit and computer.
2. Allow one hour for the system to warm up.
3. Initialize the software.
4. Standardize.
5. Begin operation.

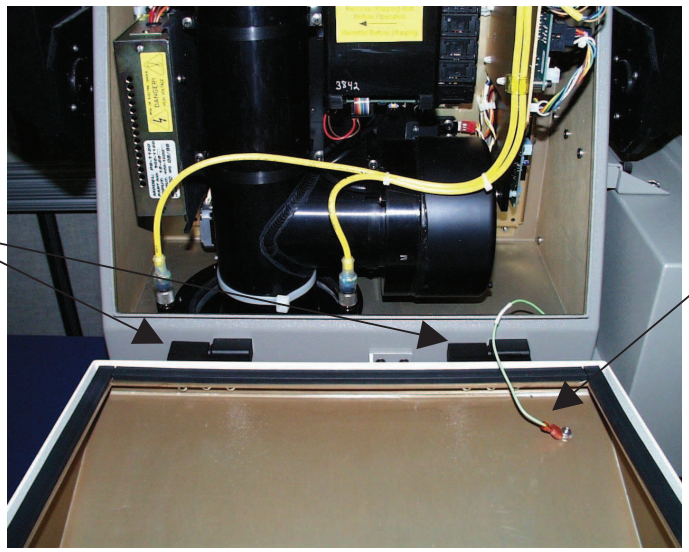
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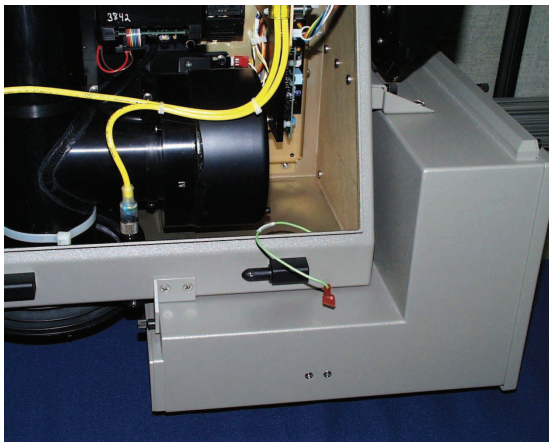
Lamp Changes

The source lamp used in the sensor has an operating life of at least 1.5 billion flashes. The lamp has reached the end of its useful life when the instrument becomes unstable or no longer flashes. The following procedure should be used when changing the source lamp.

1. Turn off the power to the support unit.

2. Open the sensor enclosure by releasing the 1/4 turn latches from the rear of the enclosure. Use a 5/16" allen wrench to turn the two latches 1/4 turn each. The enclosure front cover should now be open. Note the cover grounding strap at the bottom right of the enclosure. The cover may be removed from the enclosure by first disconnecting the ground strap and then sliding the cover off its hinges.





3. Ground yourself before touching anything inside the sensor to avoid static discharges directly to the sensor innards.

CAUTION

An interlock switch disconnects power to the high voltage lamp power supply when the sensor cover is open. However, the lamp should always be treated as if high

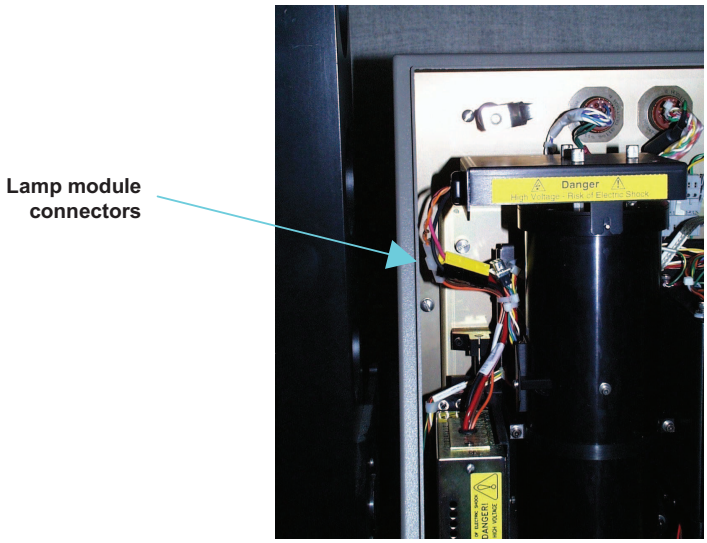
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voltage is present. Also, the interlock switch can be defeated by pulling the switch pin up. This should only be done by trained HunterLab service personnel, and should never be done if the lamp circuit is to be touched in any way.

4. Remove the three screws on the top of the optics tube on the left side of the sensor. Lift off the top section, which houses the lamp assembly.



5. Disconnect the two sets of connectors to the lamp module.



6. Replace the entire lamp module.

   Note: Do not touch the lamp with your bare hands. If necessary, use white cotton gloves to handle the lamp.

7. Reassemble the sensor by reversing the steps described here. Reattach the cover ground strap if it was removed.

8. Allow the system to warm up for one hour.

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9. Standardize the instrument prior to making measurements.

CAUTION
Do not touch any areas inside the sensor box other than the optics tube and lamp assembly.

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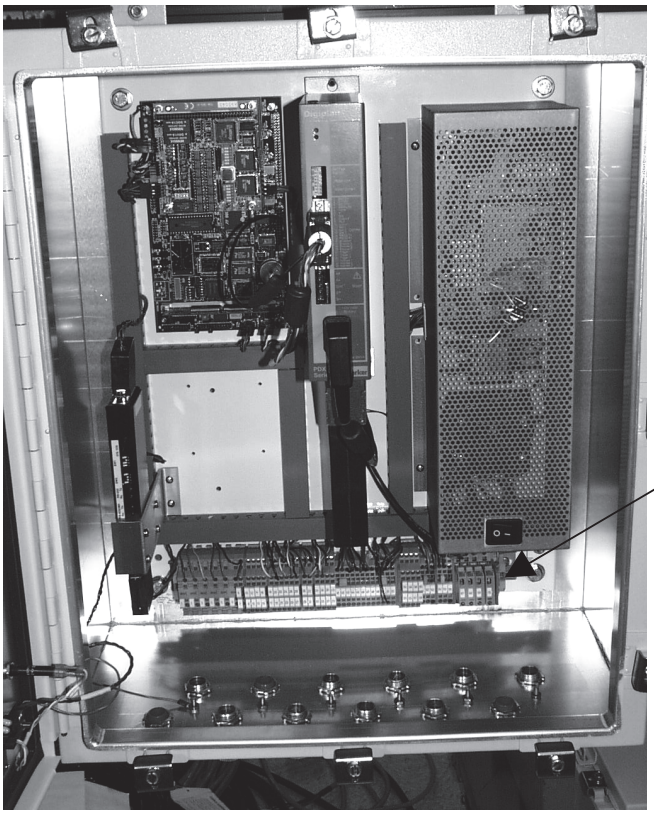
Fuse Changes

Refer to Chapter 5 for the proper fuse values.

To change the fuses in the support unit, perform the following steps.

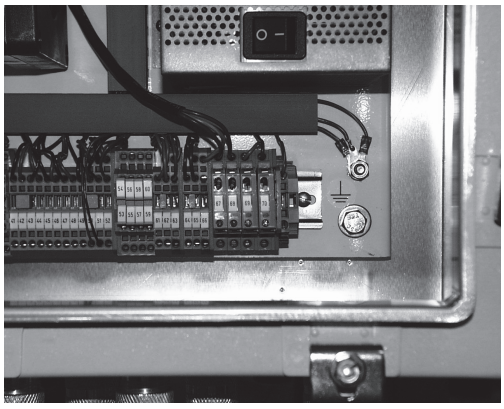
1. Turn off the power to the support unit and unplug it.

2. Remove the slotted screws holding the support unit cover in place and open the cover.



3. Open the fuse disconnect terminal blocks by pulling the pivotable fuse holder open into the locked position with one finger.

The motor controller fuses are in positions 67 and 68 and the power main fuses are in positions 69 and 70.



4. Open the side cover of the fuse holder to eject the fuse.

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5. Replace the fuse, snap the cover closed, and pivot the fuse holder back to the closed position.

6. Apply power and allow the system to warm up for one hour prior to operation.

CAUTION
Do not open the metal cage inside the support unit. All power components are sealed in this cage for safety.

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Care of Instrument Standards

White and Black Tiles

It is important that the standards be treated with great care. They should be kept in the standards box or tile holder when not in use, and should be protected from physical damage and dirt when in use.

Be sure the standards are clean before using them for standardization. Use a soft nylon brush and Sparkleen (Fisher Scientific Catalog Number 4-320) in water solution (1 tablespoon per gallon), followed by a running hot water rinse to clean them. Wipe dry with a clean, lint-free paper towel with no fluorescent whitening agents (FWAs) to remove water marks.

Note: Do not use the anti-static lens cleaning solution on the standards.

Spectralon Fluorescent Standards (optional)

Spectralon is an optical standard and should be handled in much the same way as other optical standards. Although the material is quite durable, care should always be taken to prevent contaminants such as finger oils from contacting the material's surface. Always wear clean gloves when handling the material.

If the material should become soiled, it may be air brushed with a jet of filtered, compressed air or an air puffer. Do not use freon. If air cleaning is insufficient, the piece should be sanded under running deionized water with 220-240 grit waterproof emery cloth until the surface is totally hydrophobic (water beads run off immediately). Blow dry with clean air or nitrogen or allow the material to air dry.

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Calibration Check Using Instrument Standards

The Check Tile

The check tile (green for MultiSensor Software systems and blue denim for SheLyn software systems) is used to detect if the sensor drifts during operation. Drift can result in erroneous readings for product. The check tile is located in the automatic tile holder.

Follow the instructions in your software user's manual to configure your system to automatically perform the check tile test.

The Fluorescent Standard

The fluorescent standard is used as a check to assure that the light source contains the proper ratio of UV to visible light energy. The proper ratio is that which is equal to D65 illumination per the Ganz-Greisser method.

The operating software allows you to initiate an automatic calibration of the UV content. The sensor system reads the fluorescent standard and adjusts the UV content via a motor-driven filter. Correct UV-visible balance is achieved when the whiteness reading of the fluorescent tile equals the factory-assigned value, which is written on the back of tile.

The UV calibration procedure should be performed along with every primary standardization.

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Sensor Cleaning

To ensure proper operation of the sensor it is recommended that the glass viewing window be wiped clean with glass cleaner at the start of each shift. The exterior of the sensor and mount should be cleaned weekly. Pay particular attention to the bellows on the z-axis. They must be kept clean.

If the plastic sensing surfaces of the edge detectors need cleaning, you may wipe them with soapy water or isopropyl alcohol. The edge detectors are small, black cylindrical housings about 3/4 inches in diameter mounted inside the light shade. Be sure to keep liquid out of the sensitivity adjustment ports.

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Replacing the Sensor Port Cover Glass

If the sensor port cover glass becomes scratched or damaged, you may replace it by simply removing the four screws holding it in place, placing the new cover glass, and replacing the screws. Tighten the screws in a "star" pattern.

CAUTION
Do not tighten the screws to more than 8 in-lbs.

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Routine Maintenance Schedule

The following schedule outlines the routine maintenance procedures for the SpectraProbe XE.

Every four hours	Perform secondary standardization.
Daily	Wipe the sensor viewing window clean.
Weekly	Clean the standards using a laboratory-grade detergent and a nylon brush. Wipe dry with a lint-free paper towel that is free of FWAs.
	Clean the exterior of the sensor and mounting. Pay particular attention to the Z-axis bellows.
	Perform primary calibration.
	Perform UV calibration if UV filter installed.
	Read the green tile.
Monthly	Check the operation of the Z-axis system and automatic tile holder.
As needed	Replace lamp.
	Replace fuses.

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Chapter Five

Specifications

Physical Characteristics

NEMA 4/IP66 level of protection for sensor and support unit.

Operating temperature:		0° C (32° F) to 50° C (122° F) for sensor 10° C (50° F) to 50° C (122° F) for support unit 15° C (59° F) to 30° C (86° F) for computer.
Storage temperature:		-15°C to +60°C.
Maximum temperature change:		2° F per hour.
Operating humidity:		5% to 95% relative, non-condensing.
Dimensions:		
	Support unit:	24” H (610 mm) x 20” W (508 mm) x 10” D (254 mm).
	Sensor:	23” H (584 mm) x 20.7” W (526 mm) x 11.50” D (292 mm).
Weight:	Support unit:	30 lb.
	Sensor:	75 lb.
Overall traversing system dims:		Length: 59.0” (1500 mm) to 250.9 (6375 mm) in 12.75” (325 mm) increments Width: 17.25” (438 mm) Height: 40.23” (102 mm).
Overall fixed rail dimensions:		Length: 23.41” (595 mm) Width: 12.75” (324 mm) Height: 27.60” (701 mm).

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Input/Output (I/O)

Analog outputs:	Four isolated 4-20 mA user-definable for tristimulus color scales (RGB, XYZ, Lab, or L*a*b*) and height.
Alarm relays:	Four contact closures.
Digital outputs:	RS-422/RS-232 serial link for bi-directional communications to computer.

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Power Required

Support unit power input:	100-240 VAC, 47-63 Hz, 5.5A
Sensor power input:	24 VSC, 5A.
Installation category:	II.
Required warm-up period:	1 hour after power applied.

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Fuse Specifications

Main power input:	Terminal block positions 69 and 70 10A, 250 VAC, SB, 5 x 20 mm.
Traversing motor controller:	Terminal block positions 67 and 68 6.3 A, 250 VAC, SB, 5 x 20 mm.

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Conditions of Illumination and Viewing

Geometry:	0°/45° circumferential viewing.
Viewed area:	2.5” (65 mm) diameter (LAV), 1.25” (30 mm) diameter (SAV).
Light source:	Xenon flash
Source UV content:	Excess UV vs. D65 with UV control option
Monochromator:	Diffraction grating/detector array
Port orientation:	
Standard:	Horizontal sample plane, port down
Optional:	Horizontal sample plane, port up Vertical sample plane, port sideways
Source lifetime:	>1.5 billion flashes (>6 months of continuous operation at the fastest measurement speed, 100 Hz).
Standoff distance:	1 inch
Standoff tolerance (for maximum allowable change in L* of 0.5):	±1/4 inch
Measurement speed:	100 Hz.

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Instrument Performance

Note: All colorimetric specifications are in 10° standard observer, illuminant D65.

Spectral resolution:

Range:	400-700 nm
Interval:	10 nm
Bandwidth at 1/2 height:	<12 nm

Wavelength accuracy: 0.75 nm

Short-term repeatability (p-p of 20 consecutive measurements):

L*a*b*, white tile: 0.02
L*a*b*, selected high chroma BCRA II: 0.04
L*a*b*, selected neutral or low chroma BCRA II tiles: 0.02
Spectral, 420-680 nm, white tile, % full scale: 0.10
Spectral, 400-420 nm and 680-700 nm, white tile, % full scale: 0.15

Stability (p-p in L*a*b*, white tile, over operating temperature range, maximum temperature change of 2° F/hour without standardizing):

30 minutes:	0.05
4 hours:	0.15

Photometric range: 0-150%

Photometric resolution (reported): 0.01%

Measurement speed:

Command to data output:	≤0.05 sec
Read to read:	≤0.05 sec
Report rate (to PC):	1 per sec

Warm-up time (hours from off at room temperature to specification performance): 1 hour.

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Chapter Six

Instrument Replacement, Repair, Problems, and Questions

The following HunterLab policies are described in this section:

- Warranty
- Claims
- Returns
- Service
- Technical Assistance.

Warranty

HunterLab warrants that all instruments it manufactures will be free from defects in material and workmanship under normal use and service for one year from date of shipment of new instruments and two months from the date of shipment of repaired instruments. HunterLab's obligation under this warranty is limited to repairing or replacing any defective parts which our examination discloses to have been factory defective when returned to us by prepaid transportation. The printer and computer are covered under original manufacturer's warranty. HunterLab does not cover expendable items such as lamps, fuses, batteries, diskettes, etc. The warranty is void if the user has made unauthorized repairs, performed improper installation, or has improperly used the instrument. On-site warranty repair is available at prevailing rates, if requested, with travel and living expenses billed at cost.

An instrument registration card is shipped with major pieces of HunterLab equipment. It is important that you return this card promptly upon receipt of equipment. The registration card is kept on file with the HunterLab Service Department with complete information on the exact equipment purchased. Questions concerning operation, maintenance, or repair of your equipment directed to the Service Department can then be knowledgeably handled.

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Shipping Claims

All materials are sold F.O.B. from Reston, Virginia (unless otherwise specified) and HunterLab responsibility ends upon delivery to the first carrier. All claims for loss or damage must be rendered by the consignee against the carrier within fifteen days of receipt of goods. A copy of this notice must also be forwarded to HunterLab within five days of its receipt.

Breakage or Damage

According to the contract terms and conditions of the carrier, the responsibility of HunterLab ends at the time and place of shipment. The carrier then assumes full responsibility. Perform the following procedures in the case that your instrument arrives broken or damaged.

Freight or Express

1. Notify your local carrier.

2. Hold the damaged goods with their container and packaging for inspection by the examining agent. Do not return any goods to HunterLab prior to inspection and authorization of the carrier.

3. File a claim against the carrier. Substantiate this claim with the examining agent's report. A certified copy of our invoice is available upon request. The original B/L is attached to our original invoice. If the shipment is prepaid, write for a receipted transportation bill.

4. Advise HunterLab regarding replacement.

Parcel Post Shipment

1. Notify HunterLab at once in writing, giving details of the loss or damage. This information is required for filing a claim.

2. Hold the damaged goods with their container and packaging for possible inspection by postal authorities.

3. Advise HunterLab regarding replacement.

United Parcel Service

1. Contact your local UPS office regarding damage and insurance claim. Each UPS office has a different method of handling these occurrences and yours will advise you of its procedures.

2. Retain the container and packaging.

3. Notify HunterLab at once for replacement.

Shortage

Perform the following procedure if your order appears to be missing items.

1. Check the packing list notations. The apparent shortage may be a back ordered item and may be marked as an intentional short-ship.

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2. Re-inspect the container and packing material, particularly to locate smaller items.

3. Ascertain that the item was not removed by unauthorized personnel prior to complete unpacking and checking.

4. Notify HunterLab immediately of the shortage in writing.

Incorrect Shipment

Perform the following procedure if material received does not correspond with your order.

1. Notify HunterLab immediately, referencing order number and item.

2. Hold incorrect items until return shipping instructions are received.

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Returns

A return materials authorization (RMA) number is required before any items can be returned to HunterLab. Contact HunterLab Technical Support to obtain an RMA.

Do not return any damaged or incorrect items to HunterLab until all shipping instructions are received.

> *Note: HunterLab must be notified within fifteen days or we cannot accept responsibility for damaged or incorrect items.*

HunterLab offers complete repair service for all instruments it manufactures. Call HunterLab for the service facility nearest your location. If your equipment is not functioning properly, contact HunterLab Technical Support for maintenance or repair instructions. Many times, this on-the-spot diagnosis is all that is required.

If repair is required, HunterLab offers two means of servicing. Instruments may be returned to a HunterLab service facility for repair or a HunterLab Service Department technician can come to your location to perform on-site repair. For schedule and terms for on-site repairs by trained service technicians, call HunterLab Technical Support. Please read "When You Need Assistance" prior to contacting HunterLab.

The customer is responsible for incoming and outgoing freight charges for all instrument being returned to HunterLab for repair, including warranty repairs.

CAUTION
Remove the sample holder from the sample port before return shipment. Failure to do so may cause damage to the instrument.

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When You Need Assistance

When you have a problem with an instrument or software or need technical advice concerning a specific application, you may contact HunterLab for assistance. In order to help us help you, please have the following information available prior to telephoning HunterLab:

1. The type of sensor for which you need assistance (SpectraProbe XE).

2. The serial number of the instrument (found on a plaque on the side or back of the sensor).

3. The type of processor or software you use to access the sensor output (i.e., MultiSensor XE Software or SheLyn software), the version of the software, and the brand and type of computer, if applicable.

4. The specific nature of the problem, including the exact error message received or the results of the appropriate diagnostic test.

5. The steps performed prior to the start of the problem.

6. Steps already performed to reconcile the problem and/or results of any diagnostics.

7. The type of product being measured.

8. Operating environmental conditions under which the instrument is normally used, such as temperature, humidity, dust, fumes, etc.

9. Whether the instrument has recently been moved or the computer reconfigured.

10. The name(s) of any HunterLab personnel with whom you have previously discussed the problem.

The general telephone number for HunterLab is (703) 471-6870. To place an order or for prices on instruments, software, or replacement parts, ask for the ORDER PROCESSING DEPARTMENT. For applications advice, for help in correcting instrument or software problems, to return instruments to HunterLab for service, or to ask questions about the servicing or recalibration instruments, ask for TECHNICAL SUPPORT.

HunterLab may also be contacted through its website, www.hunterlab.com.

The mailing address for HunterLab Headquarters is given below. Customers outside the United States should contact their HunterLab Distributor for initial assistance.

Hunter Associates Laboratory, Inc.
11491 Sunset Hills Road
Reston, Virginia 20190 U.S.A.

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