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MultiSensor Software for SpectraProbe® XE
Versions 1.5 and Above

Manual Version 2.2
November, 2002

A60-1009-857

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.

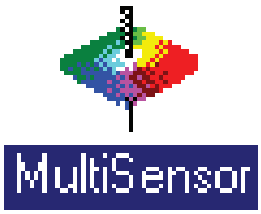
The following symbol indicates that there may be a danger of electric shock from high voltage if the given instructions are not followed carefully.



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MultiSensor Software for SpectraProbe XE
Versions 1.5 and Above



Manual Version 2.2

November, 2002

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

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Appendix A

System Messages

The following table lists all the error, alarm, and system status messages that may appear on the computer display. Also given are explanations of what the messages mean and what actions should be taken, if any.

Note: When MultiSensor Software displays a message in the archive viewer event log, it may also display a detail code after the message text, such as "Fail Do Secondary Standardize 200," where 200 is the detail code. The detail code gives more information about the exact cause of the event. The detail code is not displayed in the online Event Log screen.

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MULTISENSOR XE SYSTEM MESSAGES					
1. On-line messages					
Event Log	**Short Message**	**Source**	**Explanation**	**Possible Causes**	**Action**
Automatically Standardized	AUTO STDZ	Support Unit	The sensor has performed an automatic standardization.	The sensor has performed an automatic standardization.	None; this is normal operation.
Fail Do Secondary Standardize	FAIL STDZ	Support Unit	The sensor has failed an automatic standardization.	1. Z-axis failure 2. Tile holder failure	Check the operation of the Z-axis and tile holder. If the problem persists, contact HunterLab.
New Roll	NEW ROLL	Support Unit	A seam input has triggered a new roll.	A seam input has triggered a new roll.	None; this is normal operation.
Run Aborted	RUN ABORT	Support Unit	The current run has been aborted by the support unit.	The sensor is unable to move.	Check the position of the emergency stop button. Check that the sensor is clear of any obstructions. If the problem persists, contact HunterLab.
Run Terminated	RUN TERM	Support Unit	The current run has been stopped by a remote computer.	The current run has been stopped by a remote computer.	None.
Missed Reading	MISSED RD	Support Unit	The support unit failed to take a reading from the sensor during a run.	1. Hardware problem. 2. Serial communications error between the support unit and the sensor.	If the problem persists, contact HunterLab.

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MULTISENSOR XE SYSTEM MESSAGES					
1. On-line messages					
Event Log	**Short Message**	**Source**	**Explanation**	**Possible Causes**	**Action**
Waiting for Seam Input to Start Reading	WAIT SEAM	Support Unit	The support unit is waiting for a seam input to begin readings.	The support unit is waiting for a seam input to begin readings.	None; this is normal operation.
Reading Started on Seam Input	START SEAM	Support Unit	The support unit has detected a seam input and has started reading.	The support unit has detected a seam input and has started reading.	None; this is normal operation.
Wait Start Run on Tag	WAIT TAG	Support Unit	The support unit is waiting for a predetermined linear distance to begin reading.	The support unit is waiting for a predetermined linear distance to begin reading.	None; this is normal operation.
Run Started on Tag	START TAG	Support Unit	The support unit has started reading after passing a predetermined linear distance.	The support unit has started reading after passing a predetermined linear distance.	None; this is normal operation.
Product Break	BREAK	Support Unit	A product break has occurred.	A product break has occurred.	None; this is normal operation.
End of Break	END BREAK	Support Unit	The product break has ended.	The product break has ended.	None; this is normal operation.
Lost Calibration	NO CALIB	Support Unit	The support unit has lost its calibration factors.	Hardware or software error	If problem persists, contact HunterLab.

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MULTISENSOR XE SYSTEM MESSAGES					
1. On-line messages					
Event Log	**Short Message**	**Source**	**Explanation**	**Possible Causes**	**Action**
Update Interval Too Short	INT SHORT	Support Unit	The update (reporting) interval is too short.	During a traversing run, the sensor does not complete a traverse within the update interval.	1. Increase the update (data collection) interval in the product setup. 2. Increase the traversing speed of the sensor.
Lamp Failed	LAMP FAIL	Support Unit	The lamp has failed.	The lamp has failed.	Contact HunterLab.
Did Not Move	NO MOTION	Support Unit	The sensor did not move.	1. Emergency stop button is active. 2. Hardware problem with motion controller or support unit.	Check the emergency stop button. If the problem persists, contact HunterLab.
[From-To] Color Out of Tolerance	OFF COLOR	Support Unit	The product color has gone out of tolerance. The message is preceded by an indication of which color value has gone out of tolerance (i.e., CTR-STD is Center to Standard). CTR = Center, RGT = Right, LFT = Left, STD = Product Standard.	The product color has gone out of tolerance.	None; this is normal operation when product color is off-spec.

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MULTISENSOR XE SYSTEM MESSAGES					
1. On-line messages					
Event Log	**Short Message**	**Source**	**Explanation**	**Possible Causes**	**Action**
[Position] Missed	*[Position]* MISSED	Support Unit	The sensor has timed out waiting for an expected position. The message "Missed" is preceded by the actual position (i.e., "Left Center Missed.") For the short message, the word MISSED is preceded by a code indicating the position missed (i.e., LC MISSED). LT = Left Tile, LL = Left Limit, LE = Left Edge, LC = Left Center, CC = Center, RC = Right Center, RE = Right Edge, RL = Right Limit, RT = Right Tile.	1. Hardware problem. 2. Step out output of the motion controller has failed.	If the problem persists, contact HunterLab.
Sensor Does Not Respond	SEN NO RESP	Support Unit	The support unit is not able to communicate with the sensor via the serial communications line.	1. Hardware problem with the support unit or sensor. 2. Broken serial communications cable between the support unit and the sensor.	If the problem persists, contact HunterLab.
Sensor Responds	SEN RESP	Support Unit	The support unit has resumed communications with the sensor.	The support unit has resumed communications with the sensor.	None; this is normal operation.

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MULTISENSOR XE SYSTEM MESSAGES					
1. On-line messages					
Event Log	**Short Message**	**Source**	**Explanation**	**Possible Causes**	**Action**
Motion Controller Does Not Respond	MC NO RESP	Support Unit	The support unit is not able to communicate with the motion controller via the serial communications line.	1. Hardware problem with the support unit or the motion controller. 2. Emergency stop button is active.	If the problem persists, contact HunterLab.
Motion Controller Responds	MC RESP	Support Unit	The support unit has resumed communications with the motion controller.	The support unit has resumed communications with the motion controller.	None; this is normal operation.
Hard Disk Space Low (Archives Deleted)	DISK LOW	Supervisory Computer	The supervisory computer has deleted the oldest archive files to free hard disk space.	The hard disk free space is getting low.	1. Increase free space on the hard disk. 2. Do nothing and allow the program to free space by deleting old archive files.
Hard Disk Space Low (Could Not Delete Archives)	DISK LOW	Supervisory Computer	Free space on the hard disk of the supervisory computer is getting low, but the program cannot delete archives to increase it.	The hard disk space is getting low and no old archives are available for deletion.	Increase the free space on the hard disk by deleting other files or applications.

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MULTISENSOR XE SYSTEM MESSAGES					
1. On-line messages					
Event Log	**Short Message**	**Source**	**Explanation**	**Possible Causes**	**Action**
Disk Read/Write Error	DISK ERR	Supervisory Computer	The supervisory computer has encountered a problem reading from or writing to the hard disk.	Hard disk error or disk full.	Check the amount of hard disk free space. If the problem persists, contact HunterLab.
Could Not Clear Linear Counter	CLR COUNTER	Supervisory Computer	The supervisory computer is not able to clear the lineal counter.	The lineal counter is not enabled in the run group configuration.	Enable the lineal counter in the run group configuration. Contact HunterLab if the problem persists.
Fail Read Linear Counter	FAIL COUNTER	Supervisory Computer	The supervisory computer is not able to read the lineal counter.	The lineal counter is not enabled in the run group configuration.	Enable the lineal counter in the run group configuration. Contact HunterLab if the problem persists.
Run Started	RUN PROG	Supervisory Computer	The run has been started.	The run has been started.	None; this is normal operation.
Run Ended	RUN ENDED	Supervisory Computer	The run has ended.	The run has ended.	None; this is normal operation.

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MULTISENSOR XE SYSTEM MESSAGES					
1. On-line messages					
Event Log	**Short Message**	**Source**	**Explanation**	**Possible Causes**	**Action**
Serial Communications Error	COM ERR	Supervisory Computer	A serial communications error has occurred between the supervisory computer and the support unit.	1. Hardware. 2. Random noise glitch on the serial communications line.	If the problem persists, contact HunterLab.
Fails to Respond	NO RESPND	Supervisory Computer	The supervisory computer is not able to communicate with the support unit.	1. Hardware failure. 2. The power to the support unit is off. 3. The serial communications cable between the supervisory computer and support unit is disconnected. 4. The power to the RS-232-to-RS-485 converter is lost.	Check the hardware. If the problem persists, contact HunterLab.
Fail Start Run	FAIL START	Supervisory Computer	The supervisory computer could not start a run.	1. Hardware. 2. No serial communications with the support unit.	Redo the operation. If the problem persists, contact HunterLab.

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MULTISENSOR XE SYSTEM MESSAGES					
1. On-line messages					
Event Log	**Short Message**	**Source**	**Explanation**	**Possible Causes**	**Action**
Fail Stop Run	FAIL STOP	Supervisory Computer	The supervisory computer could not stop a run.	1. Hardware. 2. No serial communications with the support unit.	Redo the operation. If the problem persists, contact HunterLab.
Fail Resume Run	FAIL RESUME	Supervisory Computer	The supervisory computer could not resume a run.	1. Hardware. 2. No serial communications with the support unit.	Redo the operation. If the problem persists, contact HunterLab.

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MULTISENSOR XE SYSTEM MESSAGES				
2. Off-line messages				
A. SERIAL COMMUNICATIONS				
Message	**Source**	**Explanation**	**Possible Causes**	**Action**
Host Message Framing Error	Support Unit	The support unit received a distorted message from the supervisory computer.	1. Random glitch on the serial communications line. 2. Hardware problem.	Redo the operation. If the problem persists, contact HunterLab.
Host Message Overrun Error	Support Unit	The support unit received a distorted message from the supervisory computer.	1. Random glitch on the serial communications line. 2. Hardware problem.	Redo the operation. If the problem persists, contact HunterLab.
Host Message Parity Error	Support Unit	The support unit received a distorted message from the supervisory computer.	1. Random glitch on the serial communications line. 2. Hardware problem.	Redo the operation. If the problem persists, contact HunterLab.
Host Message Checksum Error	Support Unit	The support unit received a distorted message from the supervisory computer.	1. Random glitch on the serial communications line. 2. Hardware problem.	Redo the operation. If the problem persists, contact HunterLab.
Host Message Format Error	Support Unit	The support unit received a distorted message from the supervisory computer.	1. Random glitch on the serial communications line. 2. Hardware problem.	Redo the operation. If the problem persists, contact HunterLab.
Support Unit Message Framing Error	Supervisory Computer	The supervisory computer received a distorted message from the support unit.	1. Random glitch on the serial communications line. 2. Hardware problem.	Redo the operation. If the problem persists, contact HunterLab.
Support Unit Message Overrun Error	Supervisory Computer	The supervisory computer received a distorted message from the support unit.	1. Random glitch on the serial communications line. 2. Hardware problem.	Redo the operation. If the problem persists, contact HunterLab.

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MULTISENSOR XE SYSTEM MESSAGES				
2. Off-line messages				
A. SERIAL COMMUNICATIONS				
Message	**Source**	**Explanation**	**Possible Causes**	**Action**
Support Unit Message Parity Error	Supervisory Computer	The supervisory computer received a distorted message from the support unit.	1. Random glitch on the serial communications line. 2. Hardware problem.	Redo the operation. If the problem persists, contact HunterLab.
Support Unit Message Checksum Error	Supervisory Computer	The supervisory computer received a distorted message from the support unit.	1. Random glitch on the serial communications line. 2. Hardware problem.	Redo the operation. If the problem persists, contact HunterLab.
Support Unit Message Format Error	Supervisory Computer	The supervisory computer received a distorted message from the support unit.	1. Random glitch on the serial communications line. 2. Hardware problem.	Redo the operation. If the problem persists, contact HunterLab.
Support Unit Received Un-Recognized Command	Support Unit	The support unit received a command it does not recognize.	Software error.	Redo the operation. If the problem persists, contact HunterLab.
Support Unit Received Improper Command	Support Unit	The support unit received a command it did not expect.	Software error.	Redo the operation. If the problem persists, contact HunterLab.
Host Received Un-Recognized Message	Supervisory Computer	The supervisory computer received a message from the support unit it does not recognize.	Software error	Redo the operation. If the problem persists, contact HunterLab.

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MULTISENSOR XE SYSTEM MESSAGES				
2. Off-line messages				
A. SERIAL COMMUNICATIONS				
Message	**Source**	**Explanation**	**Possible Causes**	**Action**
Host Received Improper Response	Supervisory Computer	The supervisory computer received a response to a command to the support unit that it did not expect.	Software error	Redo the operation. If the problem persists, contact HunterLab.
Support Unit Not Responding	Supervisory Computer	The supervisory computer does not receive a response from the support unit.	1. Serial communications problem between the supervisory computer and the support unit. 2. The support unit is not working or is turned off.	Redo the operation. If the problem persists, contact HunterLab.
Sensor Does Not Respond	Support Unit	The support unit is not able to communicate with the sensor.	1. Hardware problem with the sensor or the support unit. 2. Problem with the serial communications cable between the support unit and the sensor.	Redo the operation. If the problem persists, contact HunterLab.
Motion Controller Does Not Respond	Support Unit	The support unit is not able to communicate with the motion controller.	1. The motion controller inside the support unit is not working. 2. The emergency stop button is pressed. 3. A hardware problem in the support unit.	Redo the operation. If the problem persists, contact HunterLab.

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MULTISENSOR XE SYSTEM MESSAGES				
2. Off-line messages				
A. SERIAL COMMUNICATIONS				
Message	**Source**	**Explanation**	**Possible Causes**	**Action**
Cannot Resend Message	Support Unit	The support unit cannot resend a serial message requested by the supervisory computer.	The requested message has been overwritten.	None; this is normal operation.
Fail Send Message	Supervisory Computer	The supervisory computer could not send a serial message to the support unit.	Software error	If the problem persists, contact HunterLab.
Fail Open Serial Port	Supervisory Computer	Could not open the serial port.	1. Wrong serial port chosen in the run group configuration. 2. Problem with the serial port hardware.	Check that the correct serial port is selected and retry the operation. If the problem persists, contact HunterLab.
Fail Close Serial Port	Supervisory Computer	Couldn't close the serial port.	Software error	Retry the operation. If the problem persists, contact HunterLab.
Support Unit is Busy	Supervisory Computer	The supervisory computer could not send a message to the support unit.	The support unit is currently executing a command.	Wait for the current operation to finish.
Could Not Synchronize	Supervisory Computer	The supervisory computer can't synchronize with the support unit.	Support unit hardware problem.	Retry the operation. If the problem persists, contact HunterLab.

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MULTISENSOR XE SYSTEM MESSAGES				
2. Off-line messages				
B. SETUP PARAMETERS				
Message	**Source**	**Explanation**	**Possible Causes**	**Action**
Error in Setup Parameters	Support Unit	The supervisory computer could not change the setup parameters on the support unit and the sensor.	Hardware problems with either the support unit or the sensor.	Redo the operation. If the problem persists, contact HunterLab.
Error Reading Setup File	Supervisory Computer	The supervisory computer can't read a setup file.	The setup file does not exist or has been renamed.	Check that the setup exists. Recreate the setup if necessary.

MULTISENSOR XE SYSTEM MESSAGES				
2. Off-line messages				
C. CALIBRATION				
Message	**Source**	**Explanation**	**Possible Causes**	**Action**
Fail Sensor Calibration	Support Unit or Sensor	The sensor could not perform a calibration operation.	1. The tile holder cannot open. 2. The z-axis mechanism inside the sensor does not work. 3. Error in the sensor parameters (i.e., calibration tile position).	Check the tile holder and Z-axis, then redo the operation. If the problem persists, contact HunterLab.

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MULTISENSOR XE SYSTEM MESSAGES				
2. Off-line messages				
C. CALIBRATION				
Message	**Source**	**Explanation**	**Possible Causes**	**Action**
Fail To Do UV Filter Calibration	Sensor	The UV filter calibration could not be completed.	1. The tile holder cannot open. 2. The UV filter mechanism is not working.	Check the tile holder, then redo the operation. If the problem persists, contact HunterLab.
Failure to Open Sealed Tile Holder	Support Unit or Sensor	The tile holder did not open or close.	A problem with the mechanical or electrical operation of the tile holder.	Redo the operation. If the problem persists, contact HunterLab.
Sealed Tile Holder Open	Support Unit	Could not close the tile holder and/or lower the Z-axis to the read position at the end of a secondary standardization. If a run was in progress, then the run is suspended. The support unit will retry the tile holder every five minutes.	Tile holder or Z-axis blocked or malfunctioning.	Check for any blockages. If the problem persists, contact HunterLab.
Sealed Tile Holder Closed	Support Unit	The Sealed Tile Holder Open condition has been cleared.	The Sealed Tile Holder Open condition was cleared.	None required.
Check Tile Read	Support Unit	The green calibration check tile has been read and no instrument drift was detected.	The green calibration tile check was performed properly.	None required.
Check Tile Not Saved	Support Unit	The green calibration tile check was not performed because the reference value has not been saved.	Values have not yet been established for the green calibration check tile.	Perform primary calibration or use the Read and Save Check Tile operation in the Calibration menu.

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MULTISENSOR XE SYSTEM MESSAGES				
2. Off-line messages				
C. CALIBRATION				
Message	**Source**	**Explanation**	**Possible Causes**	**Action**
Check Tile Drift 1	Support Unit	The green calibration check tile values have changed more than the allowed delta from the last check.	The green tile is dirty, the delta indicated in the run group configuration is unreasonably tight, or the sensor is drifting.	Clean the green tile, check that the delta indicated in the run group configuration is as intended. If the problem persists, contact HunterLab.
Check Tile Drift 2	Support Unit	The green calibration check tile values have changed more than the allowed delta from the values saved during primary calibration.	The green tile is dirty, the delta indicated in the run group configuration is unreasonably tight, the check tile values in the system are incorrect, or the sensor is drifting.	Clean the green tile, check that the delta indicated in the run group configuration is as intended, check that the values from the last primary calibration are reasonable. If the problem persists, contact HunterLab.
Fail to Read Check Tile	Support Unit	The calibration tile check could not be performed.	Unknown	Check the error code stored in the event log. Make sure that the green tile is located in its proper position in the tile holder. If the problem persists, contact HunterLab.

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MULTISENSOR XE SYSTEM MESSAGES				
2. Off-line messages				
D. SYSTEM OPERATION				
Message	**Source**	**Explanation**	**Possible Causes**	**Action**
Run Still In Progress	Support Unit	An offline operation was attempted while the system is in a run.	The system is currently executing a run.	Stop the current run and try the operation again.
Failure to Clear Yardage Counter	Support Unit	The yardage counter could not be reset.	Hardware problem with the support unit or the lineal counter module.	Redo the operation. If the problem persists, contact HunterLab.
Fail to Take Reading	Support Unit	The support unit could not make a single (offline) reading.	A hardware problem in the support unit	Redo the operation. If the problem persists, contact HunterLab.
Sensor Did Not Move	Support Unit	The sensor could not move.	1. The emergency stop button is pressed. 2. The motion controller in the support unit is not working. 3. The embedded processor in the support unit is not able to communicate with the motion controller. 4. If moving to an edge, the edge detectors are not working. 5. The motion time out value in the product setup is too short.	Check that the sensor motion time out value in the product setup is long enough. Make sure that the sensor is being told to move to a valid edge. If the problem persists, contact HunterLab.

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MULTISENSOR XE SYSTEM MESSAGES				
2. Off-line messages				
D. SYSTEM OPERATION				
Message	**Source**	**Explanation**	**Possible Causes**	**Action**
Start Run	Support Unit	The support unit could not start a run.	1. The sensor is in a seam break. 2. Invalid scan pattern. 3. There is a run already in progress.	Check that the system is not in a seam break. Check that a run is not already in progress. Retry the operation and if the problem persists, contact HunterLab.
Stop Run	Support Unit	The support unit could not stop the current run.	Software error	Redo the operation. If the problem persists, contact HunterLab.
Cannot Send Spectral Data	Support Unit	The support unit can't send spectral data for a prior reading.	1. The spectral data is not enabled in the run group configuration. 2. The requested spectral data does not exist or has been overwritten in the support unit.	Redo the operation.
Fail Execute Command	Support Unit	The support unit could not execute the command (general failure).	Hardware or software errors	Retry the operation. If the problem persists, contact HunterLab.
Run Group Locked	Supervisory Computer	The requested operation can't be performed.	The program is busy performing another operation.	Wait until the current operation is finished.
Run is Currently in Progress on this Run Group	Supervisory Computer	Can't perform an offline operation.	A run is in progress.	Stop the current run before attempting the operation.

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MULTISENSOR XE SYSTEM MESSAGES				
2. Off-line messages				
E. MISCELLANEOUS				
Message	**Source**	**Explanation**	**Possible Causes**	**Action**
System Error	Support Unit	A general software error	Software error	Retry the operation. If the problem persists, contact HunterLab.
Unknown Host Error	Supervisory Computer	An unspecified error has occurred.	Software error	Retry the operation. If the problem persists, contact HunterLab.
Support Unit Diagnostics *[error]*	Support Unit	The support unit diagnostics alarm has been triggered. The associated error code indicates the cause.	Depends on the error code.	Contact HunterLab with the error code number.
Program Loader Error	Support Unit	The support unit can't execute a command.	The support unit is in "loader" mode.	Take the support unit our of "loader" mode. Contact HunterLab for instructions.

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Appendix B

Configuration of the INI File

The Windows initialization file MSS.INI contains various global parameters which are seldom changed. However, this file can be modified using a text editor such as Notepad.

Program Initialization File - MSS.INI

The program initialization file is placed in the same sub-directory as the MultiSensor XE host application. Usually the default values will be satisfactory (i.e., most or all of these parameters are not required). If you wish to make changes to the file to fit your particular system, you must edit the file using a separate text editor such as Notepad. After changes have been made to this file, save it and then restart MultiSensor XE in order for the changes to take effect.

The MSS.INI file contains sections to control the following parameters as defined in the table below:

1. disk directories
2. display size
3. colors
4. fonts
5. toolbar size and location
6. tabular data spreadsheet
7. archive management
8. seam break
9. tile detectors
10. miscellaneous others

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Name	Description	Values	Default
[display]	Display Settings		
width	set width of screen (pixels)	any value up to the current screen resolution (note: not normally used.)	same as the current resolution
height	set height of screen (pixels)	any value up to the current screen resolution (note: not normally used.)	same as the current resolution
[colors]	Screen Colors		
background	background color	see Note 1	black
text	text color	see Note 1	white
bold	bold text color	see Note 1	white
[regular_font]	Normal Text Font		
weight	font weight	see Note 2	600
_height	font height	see Note 2	see Note 2
face	font name	see Note 2	“Arial”
system	use system font	0 = don’t use 1 = use	0
[large-font]	Large Font		
weight	font weight	see Note 2	600
_height	font height	see Note 2	see Note 2
face	font name	see Note 2	“Arial”
[xlarge_font]	Extra-Large Font		
weight	font weight	see Note 2	600
_height	font height	see Note 2	see Note 2
face	font name	see Note 2	“Arial”
[shade]			
font_name	name of font for shade screen	see Note 2	“Arial”
page_size	number of rows that fit on a page	0 to maximum number that will fit on screen	15
font_weight	shade screen font weight	see Note 2	400

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Name	Description	Values	Default
[shade_summary]			
font_name	name of font for shade summary screen	see Note 2	“Arial”
page_size	number of rows that fit on a page	0 to maximum number that will fit on screen	15
font_weight	shade summary screen font weight	see Note 2	400
[prt_font]	Printer Font		
weight	font weight	see Note 2	600
_height	font height	see Note 2	12 point
face	font name	see Note 2	“Arial”
[toolbar]	Control Toolbar		
type	toolbar type and location	0 = none 1 = left 2 = right 3 = bottom 4 = top 5 = floating	3
ideal_columns	ideal number of columns for vertical toolbar	1 or 2	1
ideal_rows	ideal number of rows for horizontal toolbar	1 or 2	1
column_width	width of columns (pixels)	10 - 100	see Note 3
row_height	height of rows (pixels)	10 - 100	see Note 3
font_name	font name	see Note 2	“Arial”
font_height	font height	see Note 2	10
font_weight	font weight	see Note 2	200
font_italic		0 = no italic 1 = italic	0

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Name	Description	Values	Default
[status_bar]	Status Bar		
type	type of status bar	0 = none 1 = bottom 2 = top	1
height	height in absolute pixels	see Note 2	18
font_name	font name	see Note 2	“Arial”
font_height	font height	see Note 2	height minus 2
font_weight	font weight	see Note 2	200
font_italic	selects if font should be italic	0 - not italic 1 - italic	0
[tabular_data]	Archive Tabular Data		
max_rows	maximum number of spreadsheet rows	0 to 500	50
columns	items to be displayed	a = date b = time c = run distance d = roll distance e = sample number f = whole values (standard scale) g = whole values (optional scale) h = delta values (standard scale) i = delta value (optional scale) j = lot name k = roll number “ ” = blank column	all fields on example: columns=“ab fg hl”

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Name	Description	Values	Default
[archives]	Various Archive Settings		
max_files	maximum archive files per run group	any number up to 2500	2500
min_disk_bytes_free	minimum free disk space (bytes)	should be greater than 5000000	2500000
disk_check_minutes	disk check interval (minutes)	between 5 and 60 minutes	30
[end_roll_report]	End Roll Reports		
trend_points	number of points in a trend screen	0 - same as online trend	same as online trend
[settling_time]			
ms	SpectraProbe settling time parameter in ms	0 - 32767	2000
[sample_size]			
count	SpectraProbe sample size	1 - 32767	178
[options]	Miscellaneous Options		
left_tile_allowed	used with traversing systems that have a left tile position	0 = no left tile 1 = has left tile	0
[preferences]	Preferences		
MultiSensor	application directory path	set to path of mss app	mss
Product_Setups	product setup directory path	set to correct product setup directory path	psetups
Archives	archive directory path	set to correct archive file directory path	archives
Debug_Output	enable/disable debugging output	0 = off 1 = on	0
Sensor_Simulator	enable/disable “dummy” sensor	0 = off 1 = on	0

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Name	Description	Values	Default
[run_queue]	Run Queue Control		
group1	enable/disable run queue for Run Group 1	off on	on
group2	enable/disable run queue for Run Group 2	on off	on
group3	enable/disable run queue for Run Group 3	on off	on
group4	enable/disable run queue for Run Group 4	on off	on
[setup]			
Note: After adding or changing parameters in the [setup] section of MSS.INI, you will need to resend the run group configuration to the support unit. When you enter MultiSensor XE Software, enter the Run Group Configuration and scroll through the various screens until the end so that the new parameters will be sent.			
auto_standardize_ minutes	override the normal autostandardize interval in the Product Setup Editor	value in minutes	uses the value in the product setup
read_calibration_ check_tile	read the green calibration check tile at auto standardization	0 = off 1 = on	0
send_log_messages	write support unit log messages to the file SPXE_LOG.TXT	0 = off 1 = on	0
scan_m_speed	the scan speed of Scan Pattern M	floating point value in inches per second	0.40
start_run_code	type of run	0 = normal (with secondary standardization and sensor moving to Read position) 1 = quick start (sensor begins reading without moving)	0
tile_holder_timeout_ seconds	set automatic tile holder open/close timeout	value in seconds	5

Note 1: Colors are selected by specifying the RGB value where R is the red color field value between 00 and FF (hex), G is the green color field value between 00 and FF (hex) and B is the blue color field value between 00 and FF (hex). For example, black is 000000 and white is FFFFFF.

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Note 2: The font parameters may need to be modified if text on any screen is cut off. The large font is used for the digital fields on the trend screens. The extra-large font is not currently used.

Note 3: The default toolbar button width is the width of the screen divided by 14. The default height is the height of the screen divided by 7.5. Therefore, for a 640 x 480 screen, the defaults would be 45 and 64.

The value chosen for _height is the height of the desired font in points.

The weight should be selected from the following table:

Weight	Result
100	thin
200	extra light
300	light
400	normal
500	medium
600	semi-bold
700	bold
800	extra-bold
900	heavy

The face name can be the name of any installed font.

Windows will load the closest font to the one requested.

The following are the default values for _height:

Name/Res	640 x 480	800 x 600	1024 x 768	1280 x 1024
regular_font	12	16	20	24
large_font	16	20	24	28
xlarge_font	20	24	28	32

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Chapter One

Overview of the MultiSensor XE Software User's Manual

This manual is comprehensive in that it provides information concerning your color measurement sensor and computer hardware (including installation, use, maintenance, and troubleshooting), as well as instructions for installation and use of the MultiSensor XE software. Thus, every component of your color measurement system is covered. If more information concerning your specific sensor is required, consult the hardware-specific manual for the sensor.

Hardware information is given in the front of the manual (Chapters 2-4) and software instructions are given in the second part of the manual (Chapters 5-12). Additional reference information on color scales, system messages, etc. is given in Chapter 13 and the appendices.

Please note the following concerning the software sections of the manual:

HunterLab MultiSensor Software is a 16-bit application designed for the Microsoft Windows Version 3.x operating system. It will also run under Windows 95, Windows 98, Windows NT 4.0, and Windows 2000. When screen representations are shown in this manual, you may notice that some windows are shown in Windows 3.x format and some are shown in the format of Windows 95 and higher. There is only a slight difference between the two (the maximize, minimize, close, and restore buttons in the upper right corner of the screen, for instance). The MultiSensor Software content of the screens is identical. If you have questions concerning Windows 3.x, refer to the *Microsoft Windows User's Guide*. If you have questions concerning Windows 95 or higher, refer to the documentation that came with the operating system. Where instructions differ in this manual, it is explicitly stated which operating system is being referred to.

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Chapter Two

Hardware Description and Installation Instructions

Basic system information and installation instructions are provided in this chapter. If more information concerning your specific sensor is required, consult the hardware-specific manual for the sensor.

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

System Description

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 below.

Sensor

The SpectraProbe XE sensor is a spectrophotometer designed for use in industrial applications. It is mounted with the sensor window facing the product. The sensor illuminates the product with light from a xenon source. A ring of nine optical fibers collects the product's reflected light and the processor inside the sensor calculates the color information. The sensor is insensitive to ambient light and so does not need to make direct contact with the product. Further information on the operation of the sensor is given in the SpectraProbe XE Hardware manual.

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 RS-485-to-RS-232C adapter 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.

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Host Computer

The host computer runs HunterLab MultiSensor XE Software, which provides a wide range of colorimetric data and interfaces to the PC board inside the support unit via a full-duplex serial port. The host computer and MultiSensor XE 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. Each host computer can control up to four sensor/support unit systems.

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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. For more information on any of these options, refer to your SpectraProbe XE Hardware manual.

- Automatic tile holder (D01-1009-461)
- Manual tile holder (D01-1009-462)
- 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 source ultraviolet (UV) control option. 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 Tile Holder

The manual tile holder snaps onto the sensor with ball studs to provide accurate positioning for the primary standard and black tile during primary calibration.

Manual Sample Holder

The manual sample holder snaps onto the sensor with ball studs and has a spring-loaded sample clamp to hold small samples 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.

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.

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). 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).

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

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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 portion of this 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 of belt wander. Rail assemblies are available in lengths between 71.85 inches (1825 mm) and 250.9 inches (6375 mm), in 12.75-inch (325 mm) increments.

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 six feet (1829 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. The 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.

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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. This motion 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 accomplished 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.

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 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.

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.

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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 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.

Sheet Break/Seam Detector

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

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. Based 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 Chapter 11 for a description of the color check.

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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 in the SpectraProbe XE hardware-specific manual. 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 Installation chapter of the SpectraProbe XE Hardware User's Manual.

- **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.

Support Unit

The support unit must be installed in accordance with the applicable HunterLab installation drawing, which is included in the SpectraProbe XE hardware-specific manual. 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 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.

Supervisory Computer

The supervisory computer must be installed in accordance with the applicable HunterLab installation drawing, which is included in the SpectraProbe XE hardware-specific manual. The following factors, as well as the details shown in the installation drawing, should be considered in making this installation.

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- **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.

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. MultiSensor XE Software should be installed as described in Chapter Five of this manual.

Cable Requirements

The cables between SpectraProbe XE system components are described in the system installation data drawing in the SpectraProbe XE hardware-specific manual.

Installation Drawings

The SpectraProbe XE installation drawings are included in its hardware-specific manual.

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Chapter Three

Hardware 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 more information concerning your sensor is required, consult the hardware-specific manual for the sensor.

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 at least one hour for the system to warm up. For best results, allow the system to stabilize for four hours.
3. Initialize the software.
4. Standardize.
5. Begin operation.

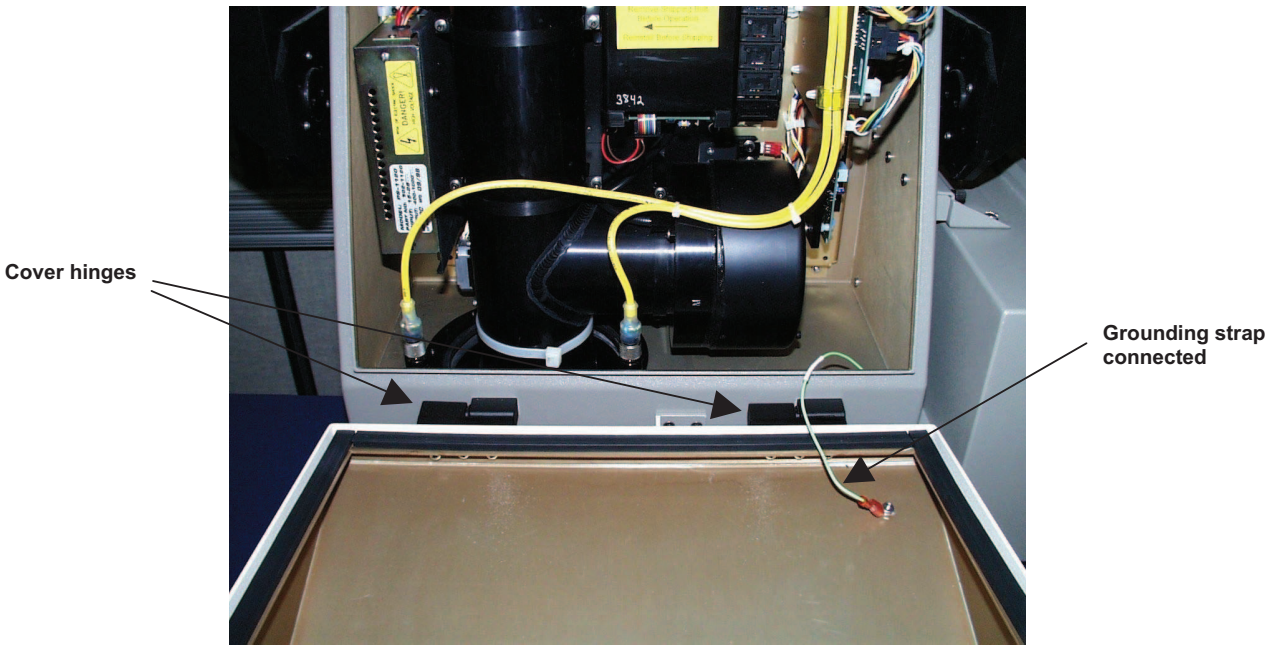
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Lamp Changes

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.

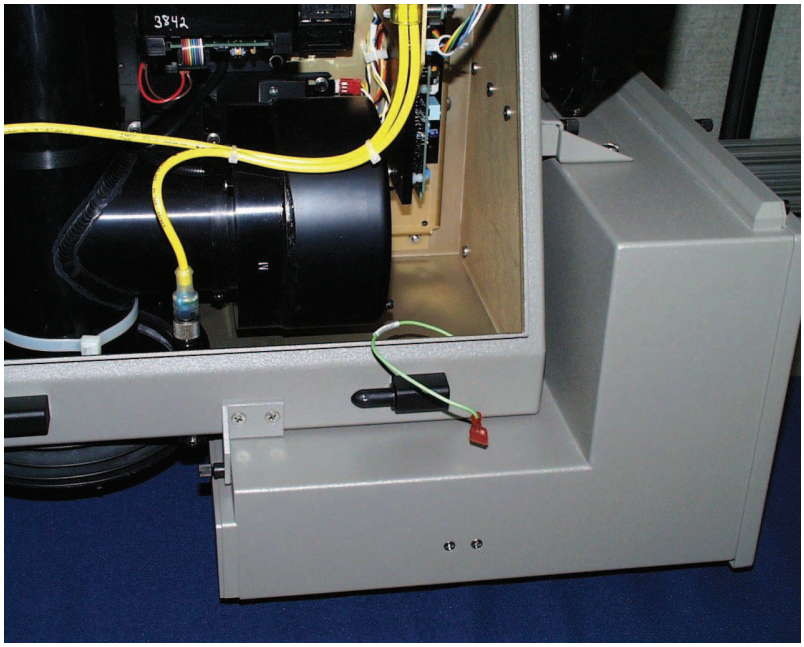
1. Turn off the power to the support unit.

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.



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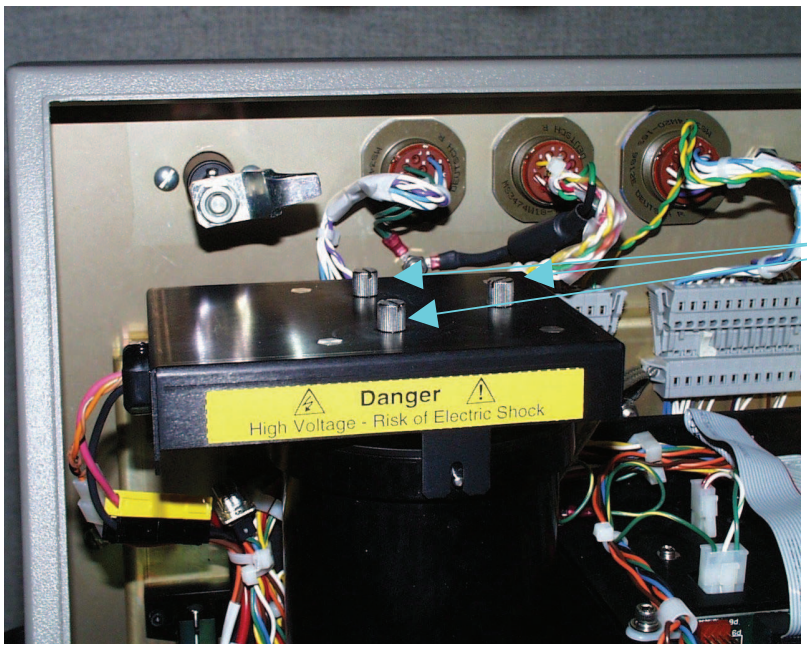
Grounding strap disconnected and cover removed.



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

   Note: 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 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.

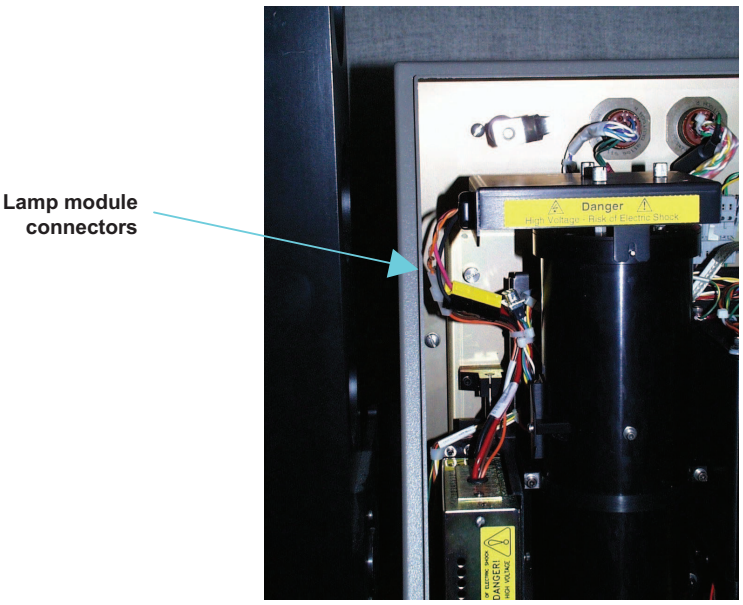
4. Remove the three screws on the top of the optics tube on the left side of the sensor. Lift off the top section, which houses the lamp assembly.



Optic tube screws

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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.

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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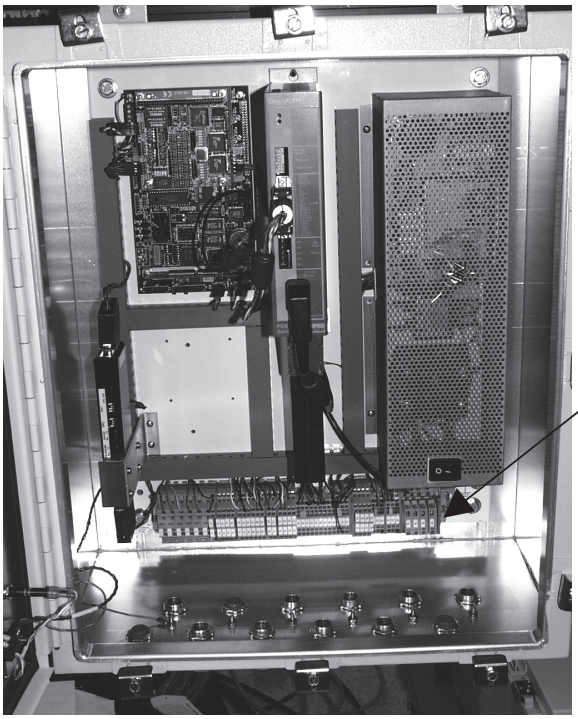
Fuse Changes

Refer to your hardware-specific manual for the proper fuse values.

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

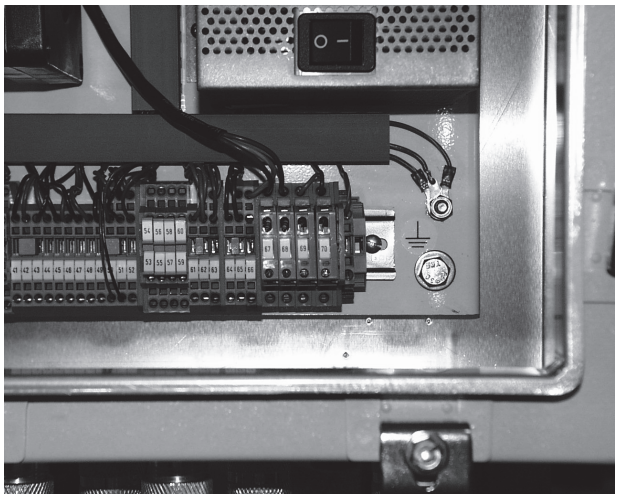
1. Turn off the power to the support unit and unplug it.

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



3. Open the fused 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, Black, and Green 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 Green Tile

The green tile is used to detect if the sensor drifts during operation. Drift can result in erroneous readings for product. The green calibration check tile is located in the automatic tile holder.

If the green calibration tile check operation is enabled in the run group configuration, the check procedure occurs as follows:

1. The green tile is read and its XYZ values saved when a primary calibration is performed.

2. At periodic (configurable) intervals during a run, the green tile is read and its values compared to the values that were saved at primary calibration and to the values obtained during the last green tile check. If either of these differences is outside the range specified in the run group configuration, a message is displayed in the event log.

3. If desired, the green tile readings can be automatically logged into a text file after each check operation using the send_log_messages=1 command in the software's INI file. See page B-6 for more information.

   Note: If a blue denim tile was purchased as an option, it may be used in lieu of the green tile for this color calibration check.

The Fluorescent Standard (for optional UV content control)

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-Griesser method.

MultiSensor XE 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 the 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.

Also wipe any accumulated lint or dust from the small windows on the bottom of the edge detector assemblies on either side of the sensor (if included). The edge detector assemblies are small black plastic windows on the bottom of the sensor.

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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 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 mount. Pay particular attention to the z-axis bellows.
	Perform primary calibration.
	Perform UV calibration if UV filter installed.
Monthly	Check the operation of the z-axis system and automatic tile holder.
As needed	Replace lamp.
	Replace fuses.

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Chapter Four

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

If 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 (usually 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 (MultiSensor XE 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 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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Chapter Five

Introduction to MultiSensor XE Software

Overview

MultiSensor XE Software is designed to run using Microsoft Windows Version 3.x, Windows 95, Windows 98, Windows NT 4.0, or Windows 2000. The software can be run by using a mouse to make selections. Simply use the mouse to place the cursor over the desired button bar selection or menu item and click the left mouse button once. Keyboard operation shortcuts are also available for use as defined on the Keyboard Shortcuts card included in the front pocket of the manual binder.

The button bar (also called the tool bar), shown on one of the borders of your screen, provides you with various options. For example, selection of **Setup** displays the Current Setup screen. The top of the setup screen shows the setup information and the bottom line displays any alarm conditions. If there is no run in progress, then the message at the bottom of the screen appears on a clear background. If there is a run in progress, then the message appears on a green background. If there is an alarm that has not been acknowledged and cleared, then the message appears on a red background.

The buttons on the button bar provide the following options:



Starts a run.



Ends a run.



Displays the Offline Functions Menu. The options available through this menu are described in later chapters in this manual.

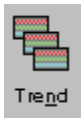


Displays the Current Setup screen.

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Displays the Trend Graph for a sampling section (from 1 to 4 depending upon the system). For instance, TREND 1 displays the first trend screen of the run group.



Displays a combined trend screen.



Displays the Shade Screen.



Displays the Shade Summary Screen.



Displays the Event Log.



Allows you to change the current lot name and/or roll number.



Brings up the Sensor Control Dialog. This dialog is described in the next section.



Opens the Run Queue dialog box. This dialog box is described beginning on page 6-3.

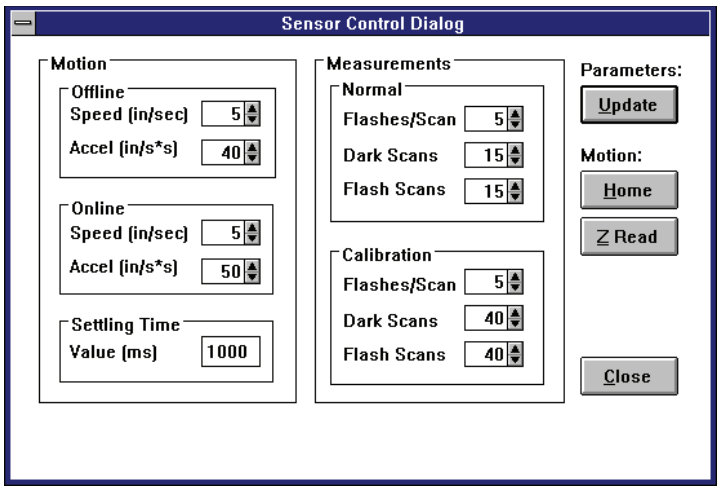


Prints the screen. The printer used is the Windows default printer.

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The Sensor Control Dialog

The Sensor Control Dialog, accessed by pressing the **Control** button on the tool bar, allows you to set off-line and online speed, acceleration, settling time, and number of flashes per scan. You may also move the sensor to its home position or the z-axis to the read position.



When this screen is first entered, the current information is filled in. This information is updated when **Update** is pressed. You may manually adjust any of the values by typing in the new value or pressing the up and down arrows. The **Home** button moves the sensor to the Home position and the **Z Read** button moves the z-axis to the Read position (after an "Are you sure?" message). The **Close** button closes the dialog box. The Motion parameters are applicable only to traversing systems.

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Installation

Normally, MultiSensor XE Software is installed on the system at the factory and initial installation of the hardware is done by HunterLab personnel. However, instructions are provided below for your information in case upgrading or reinstallation is required.

Installation of Computer Hardware

Hardware is installed according to the detailed installation drawings included in your hardware-specific manual in conjunction with documentation from the computer manufacturer.

The minimum column below lists the minimum configuration your computer must meet in order to run MultiSensor XE Software. The Recommended column lists the minimum configuration suggested for optimum operation of the software.

Component	Minimum	Recommended
Processor	486 DX	Pentium
Clock Speed	33 MHz	800 MHz
RAM	8 MB	64 MB
Expansion Slots	1 8-bit, 6 16-bit	3 16-bit ISA, 2PCI
Operating System	Windows 3.x or Windows 95	Windows 95, 98, 2000, or NT 4.0
Hard Disk	200 MB IDE	10 GB EIDE
Installation Medium	3.5” 1.44 MB (combined floppy and IDE hard drive interface)	3.5” 1.44 MB floppy disk
Video Adapter	1 MB SVGA video card	1 MB PCI graphics card, 800 x 600 resolution, 0.28 dot pitch
Monitor	14” color	17” color
Communication Ports	2 serial (16550 UART) if using a serial mouse, 1 serial port if using a bus mouse	2 serial (16550 UART) if using a serial mouse, 1 serial port if using a bus or USB mouse, OR 1 USB port with the purchase of a USB adapter
Parallel Port	1 parallel	1 parallel
Communications Card	4-port multiport card (16550A), RS-485	4-port multiport card (16550A), RS-485
Serial Cable	25-to-9 pin null modem	25-to-9 pin null modem
Pointing Device	Serial or bus mouse	Serial or bus mouse
Keyboard	101-key	101-key
Surge Protection	Surge protector	Line conditioner or surge protector
Backup Medium	Floppy Disks	Tape or ZIP disk system or network

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Note: The system may use regular COM1 or COM2 ports, but may not be as reliable.

The computer's CONFIG.SYS file should contain the following lines:

```
DEVICE=C:\WINDOWS\HIMEM.SYS
DEVICE=C:\WINDOWS\EMM386 NOEMS
FILES=50
BUFFERS=50
STACKS=9,256
FCBS=4,0
DOS=HIGH,UMB
SHELL=C:\WINDOWS\COMMAND.COM /P /E:5000
```

The computer's AUTOEXEC.BAT file should contain the following line:

```
PATH=%PATH%;C:\MSS
```

Installation of Software

Note: Do not install MultiSensor Software for SpectraProbe XE over the generic version of MultiSensor Software. If you wish to retain MultiSensor Software while also installing MultiSensor Software for SpectraProbe XE, install the new software to a directory other than C:\MSS. If you wish to overwrite the MultiSensor Software installation with MultiSensor for SpectraProbe XE, first delete the entire C:\MSS directory and then install MultiSensor Software for SpectraProbe XE as described below. There are no problems associated with upgrading an older version of MultiSensor Software for SpectraProbe XE to a newer version of the same software.

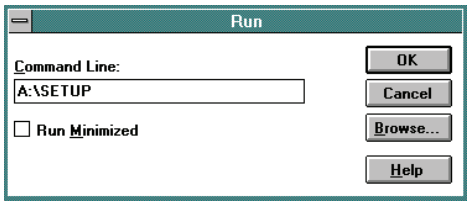
MultiSensor XE Software runs as a Windows application and requires that Microsoft Windows Version 3.x, Windows 95, Windows 98, Windows NT 4.0, or Windows 2000 be installed on the system. To install Windows, refer to the manuals which accompany Windows. You may choose to do an EXPRESS installation of Windows. The printer should also be installed through Windows according to the instructions in the Windows manual before loading the HunterLab software. A printer driver must be installed and a default printer selected before installing MultiSensor XE Software, even if no physical printer is actually attached. MultiSensor XE Software prints to the default printer as set up in the Print Manager. If the default printer is changed, then MultiSensor XE Software must be restarted.

Note: If there is no default printer installed, the message "MSS Cannot Initialize Libraries" will be obtained when the software is opened.

To install MultiSensor XE Host Software on the host computer:

1. Insert the master installation disk #1 into the "A" drive.
2. Go to the Windows Program Manager and select the **File** menu. (In Windows 95 or higher, click the **Start** button.)
3. Choose **Run**.

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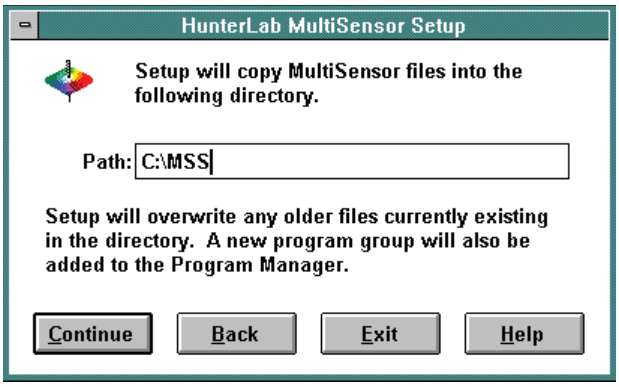


4. In the edit box, type A:\SETUP, and then press the **Enter** key.

5. After a brief wait, a dialog box will appear labeled "HunterLab MultiSensor Setup." Press **Continue** to continue the installation or press **Exit** to stop. The **Help** button reiterates this information.



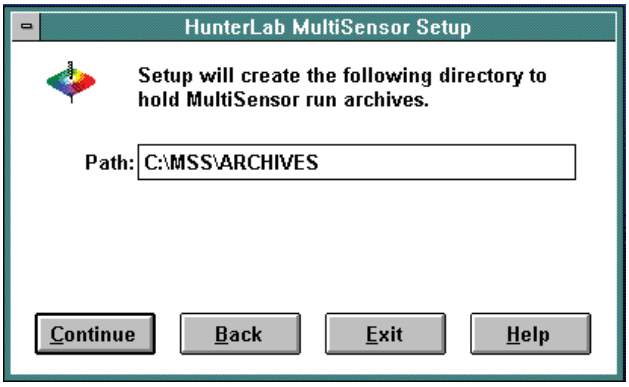
6. The next dialog box prompts for the directory in which to install MultiSensor XE. The default path is C:\MSS.



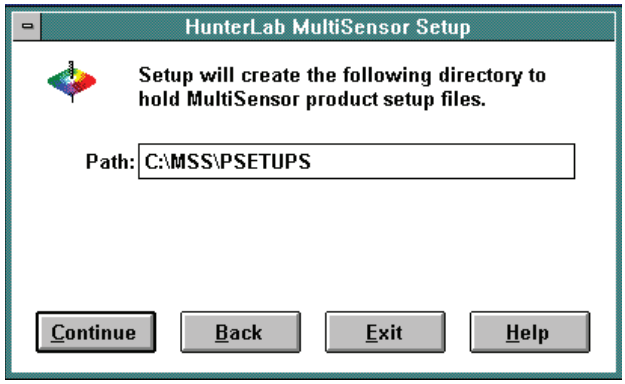
7. You may enter a different path if you wish. Press **Continue** to move forward in the installation. Press **Back** to go to the previous dialog box. Once again, you may elect to exit or view help.

8. The next dialog box asks you where to put the archives. The default directory is C:\MSS\ARCHIVES. Press **Continue** or the **Enter** key to accept this directory and move forward in the installation. Alternatively, you may enter a different directory in which to place the archives. Again, **Back** returns you to the previous dialog box, **Exit** stops the installation process, and **Help** brings up a help screen.

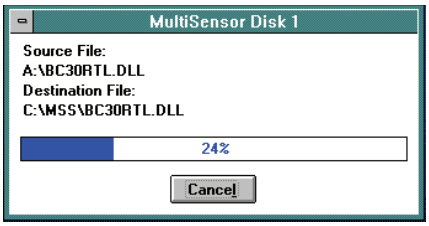
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9. The next dialog box prompts you for the directory in which the Product Setup files will be placed. To accept the default directory of C:\MSS\PSETUPS, press **Continue**. Other options remain as detailed above.



10. The MultiSensor XE setup will proceed to copy all of the files from Disk 1 and prompt you to insert Disk 2. A progress box will display the percentage of the setup completed.



11. To cancel the procedure at any time, press **Cancel**.

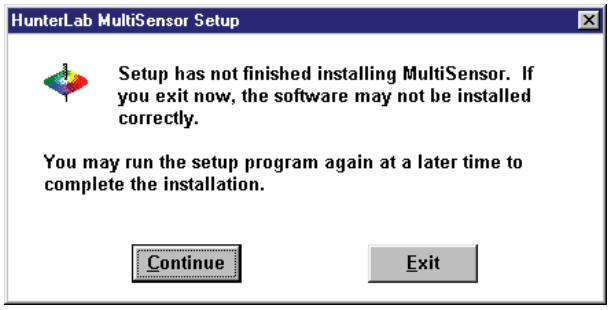
12. When the installation has been successfully completed, you will first receive a message concerning adjusting your CONFIG.SYS file. This message applies only if you are using Windows 3.x. If you are, complete the instructions given there. Click **OK**.

13. Next, a thank you box will be displayed. Press **OK** and the MultiSensor XE application will commence.

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If the installation does not complete successfully or is canceled at some point during the setup, the following box is shown.



Note: In Windows 95 and higher, at the end of the installation procedure a box displaying the following error message will be shown: "This program has performed an illegal operation and will be shut down. If the problem persists, contact the program vendor."

Even though this message is shown, the program has been successfully installed. Close the box and continue with normal operation of the software.

A MultiSensor XE icon like that shown below will be added to a HunterLab program group. Double click that icon to start the software. In Windows 95 and higher, follow instructions given in your Windows User's Guide to add a MultiSensor XE icon to your desktop or to your Start menu for accessing the software.



Note: Immediately after installation, proceed to Run Group Configuration under System Maintenance and configure the system. A "failure to open the serial port" message may be received until the proper COM port is selected in the Run Group Configuration.

Note: There must be a printer driver installed and a default printer selected before starting MultiSensor Software, even if there is no physical printer attached. If the default printer is then changed, the software must be rebooted.

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Automatic Startup of MultiSensor XE Software

To automatically start MultiSensor XE software whenever Windows starts, click on the MultiSensor icon in the HunterLab program group, and then drag and drop it into the Startup program group.

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Color Scales

The following color scales are available in MultiSensor XE Software:

- DWEPY
- FMC2
- L*a*b* (CIE)
- L*C*H*
- L*C*H* (CMC)
- Lab (Hunter)
- Rdab
- XYZ
- Yxy

The following color difference scales and indices are available:

- BT
- C*
- E (Hunter)
- E*
- Ecmc
- Ef
- WI
- WI (Gz)
- YI
- Z%

Descriptions of all measurement scales are given in Chapter Thirteen.

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Illuminants and Observers

The following illuminants and observers are supported on SpectraProbe XE systems:

Illuminants: A, C, D50, D55, D65, D75, F02, F07, and F11.

Observers: 2° and 10°.

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Chapter Six

Software Operation

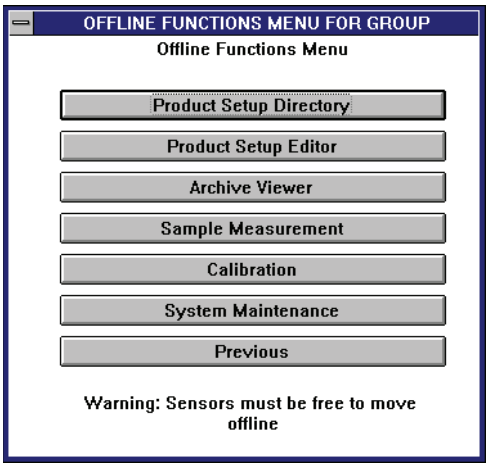
This chapter describes typical operation of the MultiSensor XE Software system from the supervisory computer. Once the system has been installed and product setups have been created you will typically perform the sequence of steps listed below.

- Standardize the sensor
- Select a product setup
- Start a run
- Select the display screen
- End the run.

Subsequent chapters describe each of the off-line functions of the software in greater detail.

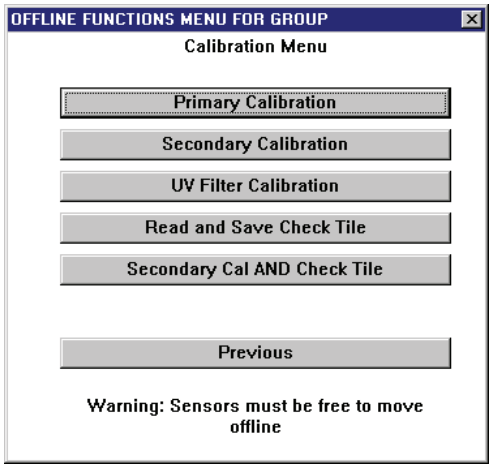
Standardizing the Sensor

1. Press the **Offline** button to display the Offline Functions Menu as shown below.



2. Select **Calibration**.
3. Select **Primary Calibration** from the Calibration Menu.

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4. Follow the on-screen prompts to complete primary standardization.

Further instructions on standardization are provided in Chapter Eleven.

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

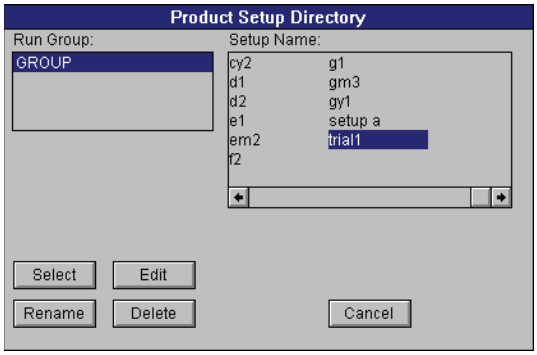
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Selecting a Product Setup

1. Press **Offline** to display the Offline Functions Menu.

2. Select **Product Setup Directory**.

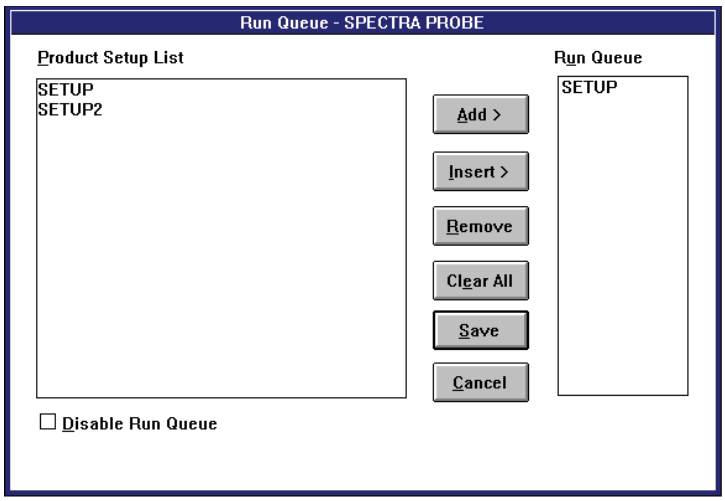
3. All of the run groups and product setups for the selected run group are listed as shown in the picture below.



4. Select the desired run group on the left side of the screen and its product setups are displayed on the right. (You may also rename, edit, or delete a product setup from this screen.)

5. Highlight the product setup you want to use on the right side of the screen and choose **Select**. The product setup information is downloaded to the sensor and you are returned to the current display screen.

Product setups may also be chosen and assigned to the run queue by clicking on the **Queue** button on the tool bar. This opens the Run Queue dialog box as shown in the picture below.



*Note: If the **Queue** button is not shown on the tool bar, click **Offline**, select **System Maintenance**, **Run Group Configuration**, and then check Use Run Queue on the right side of the Run Group Options screen. Toggle through several more screens and then press **Done**.*

The functions available from the Run Queue dialog box are described below.

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Add

To add a product setup to the queue, select one of the setups in the Product Setup List and then press the **Add** button. A dialog box appears prompting for the lot name and roll number for the run.

Insert

To insert a product setup into the run queue, select the name of the setup to be inserted in the Product Setup List (on the left) and the product setup at the insertion point in the Run Queue list (on the right) and then press **Insert**. The name from the Product Setup List is inserted in front of the selected name in the Run Queue list. A dialog box appears prompting for the lot name and roll number for the run.

Remove

To remove a product setup from the run queue, select the setup in the Run Queue list and then click the **Remove** button.

Clear All

Clear All clears all the entries in the run queue.

Save

Save saves the contents of the Run Queue list.

Cancel

Cancel closes the dialog box without saving.

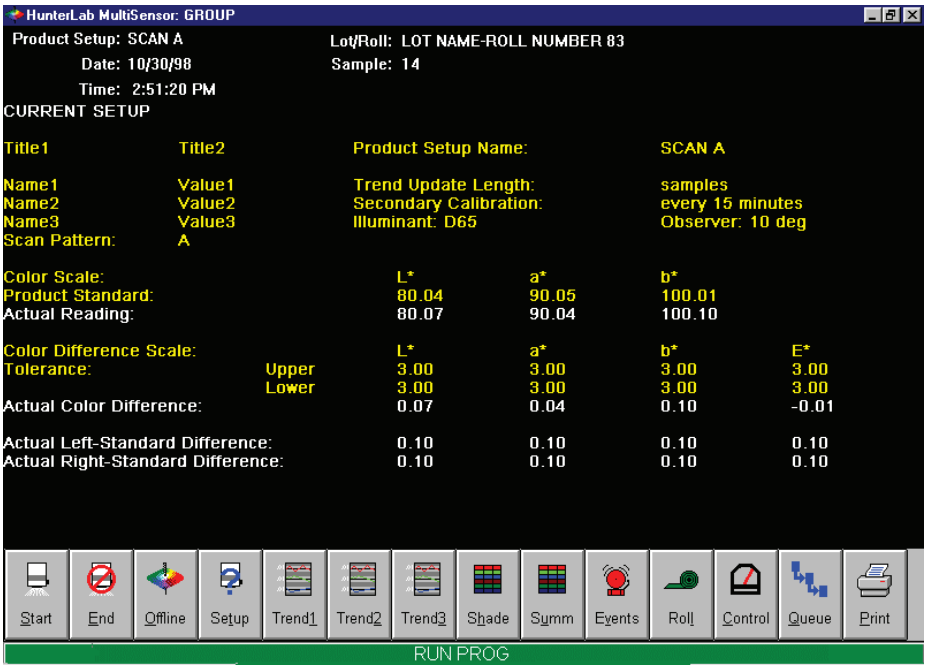
Disable Run Queue

This check box is used to temporarily disable the run queue.

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Starting a Run

Press **Start** to initialize the run. You may be prompted to enter a lot/roll number or product setup name if these options are configured. The sensor begins taking measurements based on the parameters of the current setup. When a new roll is detected, the roll number is incremented, a white vertical line appears on the trend screens, and the data is displayed in a fashion similar to that shown below. The Current Setup screen is shown by default.



Lot Name and Roll Number

Enter a lot name and roll number at the start of a run. When this feature is turned on in the Run Group Configuration, a dialog box pops up when you start a run. Lot names may be up to twenty characters and the roll number may contain up to sixteen alphanumeric characters.

Product Setup Name

Enter a product setup name at the start of a run. When this feature is turned on in the Run Group Configuration, you are prompted for the setup name when you start a run.

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Selecting the Display Screen

The desired display screen can be selected using the button bar.

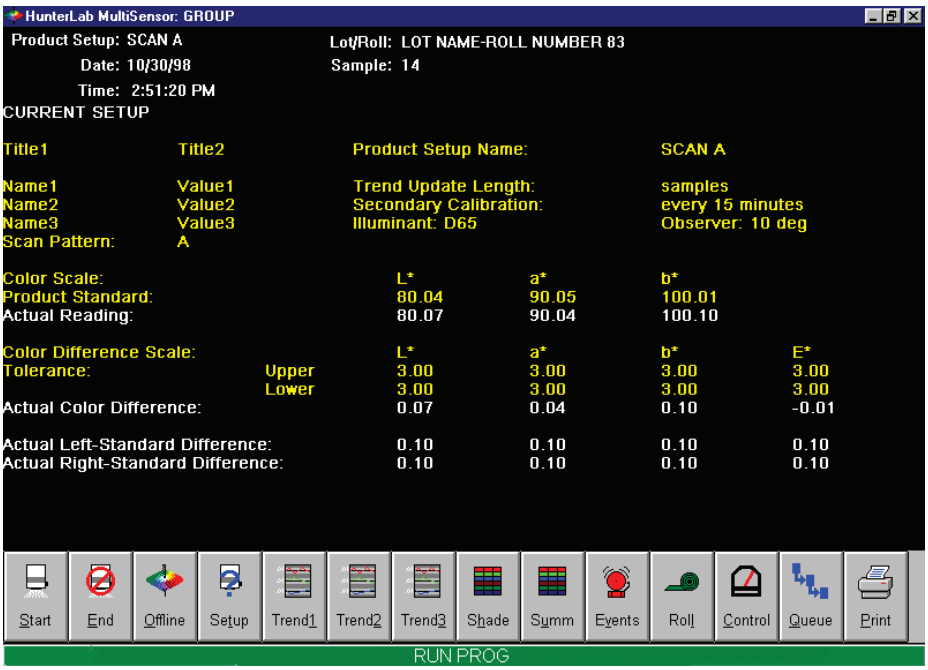
- Setup selects the Current Setup screen.
- Trend 1 selects the first Trend Graph screen.
- Trend 2 selects the second Trend Graph screen.
- Trend 3 selects the third Trend Graph screen.
- Trend 4 selects the fourth Trend Graph screen.

  Note: Not all systems have the option of displaying four trend screens. Some display only one.

- Trend selects the combined Trend Graph screen.
- Shade selects the Shade Screen.
- Summ selects the Shade Summary Screen.
- Events selects the Event Log.

Current Setup

The Current Setup screen displays status information for the setup along with the color scale and index values for both the product standard and the current reading. The color differences are also displayed. A sample Current Setup screen is shown below.

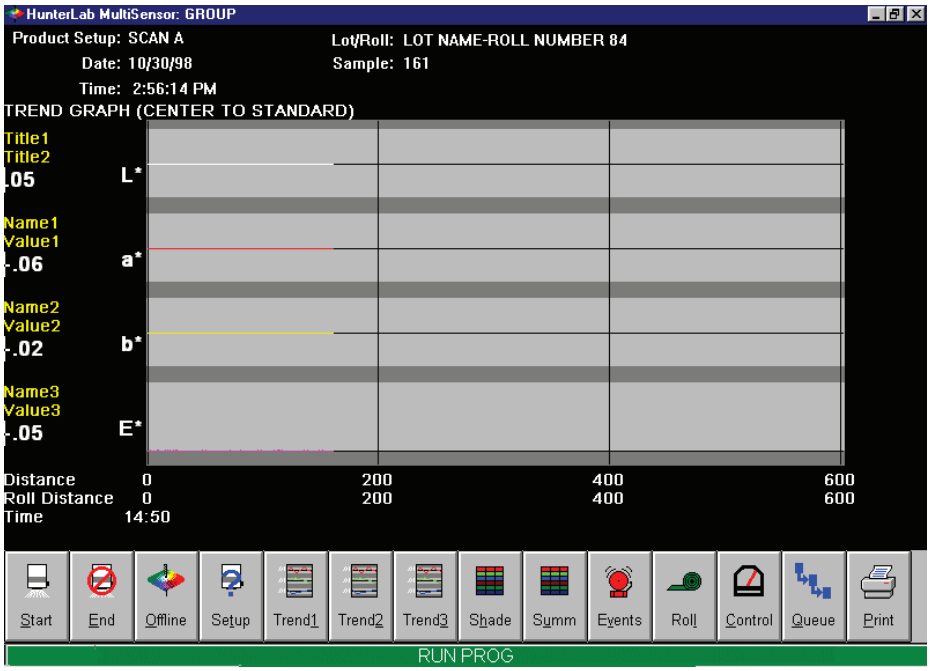


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Trend Graph Screens

The Trend Graph screens display the samples relative to the current standard. The values of the standard are plotted as the center line on each plot (L*, a*, and b* in the example below) and upper and lower tolerances are the top and bottom of scale. Each sample is plotted above or below the standard line on each plot based on whether the value read is higher (above) or lower (below) the standard's value. The color of each sample's trace also indicates whether the sample is lighter (white) or darker (black) than the standard, redder (red) or greener (green) than the standard, yellower (yellow) or bluer (blue) than the standard. The fourth trace (DE* in this example) is always shown in purple. As samples are read, they are added to the plot in the order they are read so that you can view the trend of the color difference. The rate at which the trend plot is updated, which determines the elapsed time or length represented by the full width of the plot, is one of the parameters selected when a setup is created. A white vertical line is placed on the Trend Graph when a new roll is started.

On the left side of the trend plot screen there are eight areas for messages entered as part of the product setup. (In this example they are labeled “Title,” “Name,” and “Value.”) A marked event is shown by a red line. A sample Trend Graph screen is shown below.



The picture above shows the horizontal axis labeled with run time. You may also configure the screen to show roll length.

The five trend graph screens can display color difference data in five different ways for traversing systems.

1. Center-Standard, Left-Center, Right-Left
2. Center-Standard, Left-Center, Right-Center
3. Center-Standard, Left-Standard, Right-Standard
4. Color Difference scale or index for all three areas on one trend screen.

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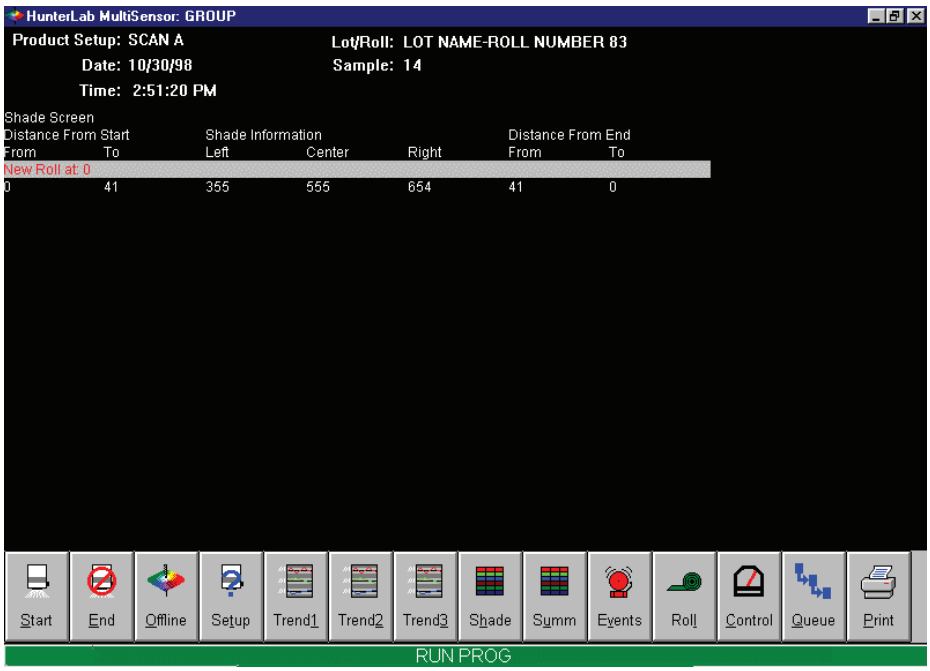
5. Left, Center, and Right trend data on one screen as lines instead of bars.

The choice of how to display trend data is made in the first Run Group configuration dialog box.

Note: The combined screen is only available for traversing systems.

Shade Screen

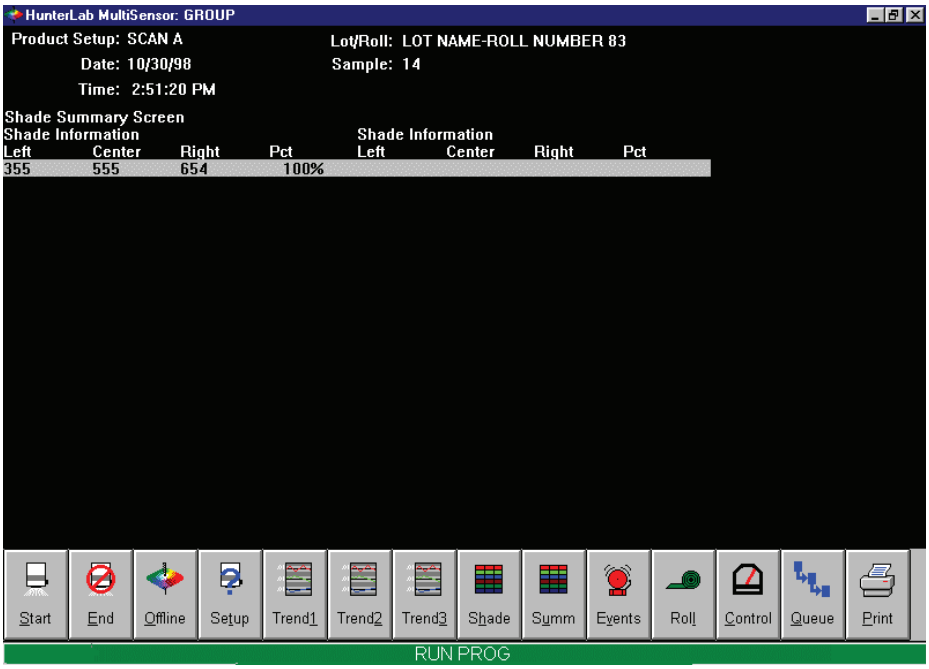
The Shade Screen provides shade numbers for each section of sample measured. A sample Shade Screen is shown below.



Shade Summary Screen

The Shade Summary Screen provides a summary of shade numbers obtained in a fashion similar to that shown below.

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Events

The Event Log is a table of events that have occurred since the last time a run was started. See the figure below. The events recorded are the start of a run, standardization, a new roll, any out of tolerance measurements, any system error conditions, and then end of the run.

For each event, the description of the event is recorded along with the time it occurred. When the event is either acknowledged or cleared, this time is also recorded. An event is acknowledged when the event log is viewed. An event is cleared when the condition is eliminated.



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Ending the Run

Press the button labeled **End** to end the run.

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Exiting MultiSensor XE Software

To exit MultiSensor XE Software, double-click on the box at the upper left corner of the screen or press **Alt** and **F4**.

Note: In Windows 95 and higher, you may also click "X" in the upper right corner of the screen or double-click the HunterLab logo in the upper left corner of the screen to exit.

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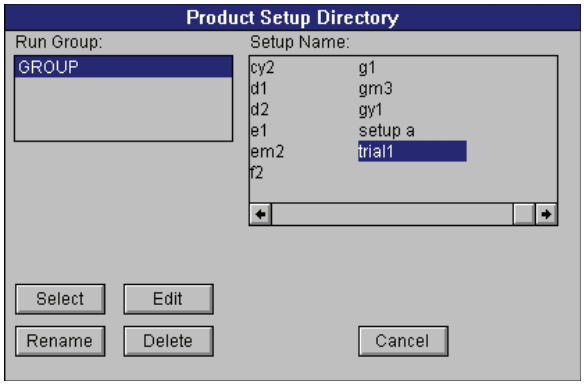
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Chapter Seven

Product Setup Directory

Select **Offline** to display the Offline Functions Menu. When you select **Product Setup Directory** from the Offline Functions Menu, all of the run groups and setup file names are displayed as shown in the picture below. You can select the desired run group and setup and then use one of the following functions:

- **Select**
- **Edit**
- **Rename**
- **Delete**
- **Cancel**.



Select

Select allows you to pick a new setup and load the new setup parameters.

Edit

Edit displays the Product Setup screen and allows you to make changes to the selected setup. Refer to the next chapter for descriptions of the setup parameters.

Rename

Rename allows you to change the name of the selected setup.

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Delete

Delete allows you to remove the selected setup file from the Product Setup Directory.

Cancel

Cancel returns you to the current display screen.

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Chapter Eight

Product Setup Editor

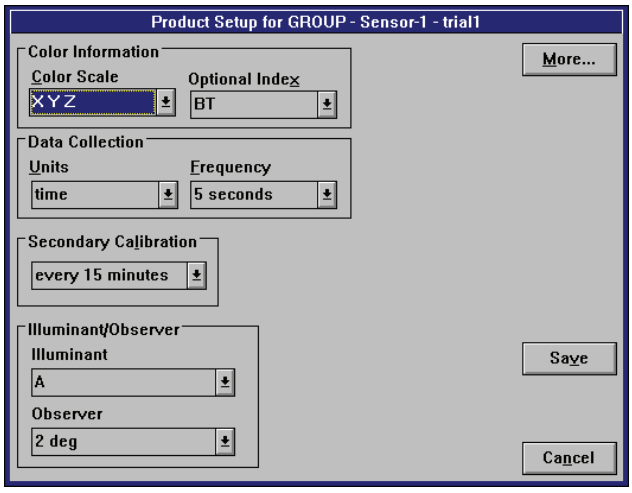
A product setup is a set of operating parameters that defines the operation of the system for a specified product. The most obvious parameters that need to be defined are the color scale and standard color values for the product, and the acceptable tolerances applied to those values. In addition, there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

Product setups may be created and modified only from the supervisory computer. Once stored on disk, product setups may be loaded and used from the optional remote display but cannot be created or modified from there.

Press **Offline** to display the Offline Functions Menu and then choose **Product Setup Editor** to modify the current setup.

Product Setup Screens

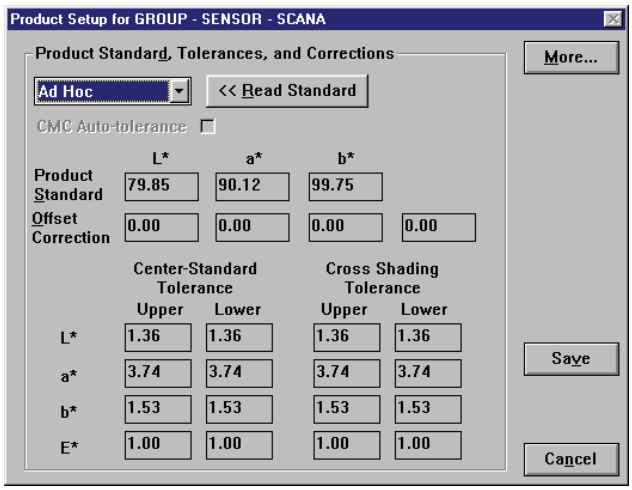
When you select **Product Setup Editor** from the Offline Functions Menu, the first Product Setup screen for the current setup is displayed as shown below. This Product Setup screen can also be displayed for a selected setup by using the Edit function from the Product Setup Directory listing.

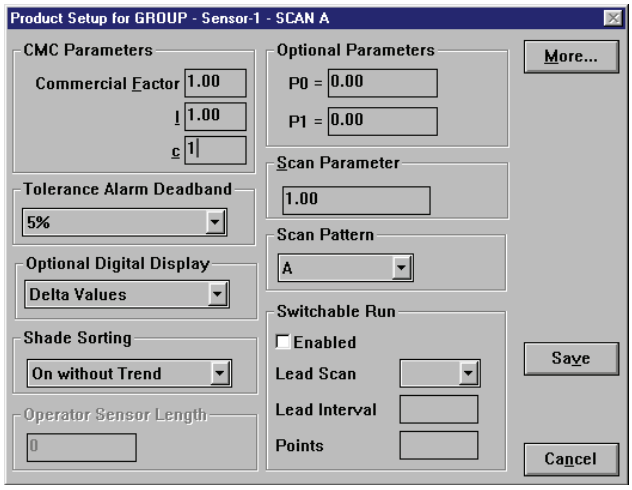


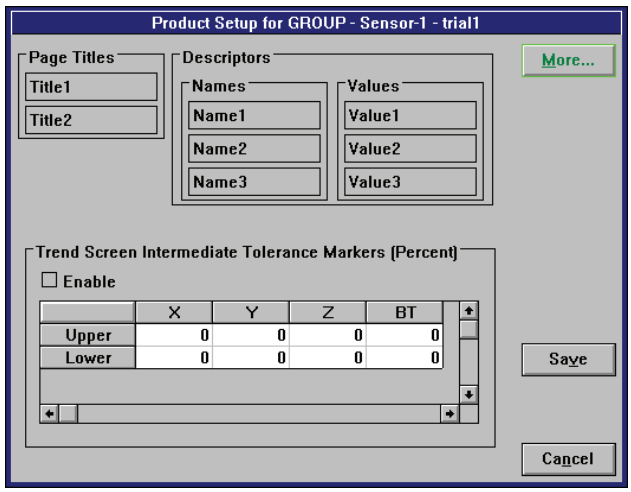
More

Not all of the parameters fit on one screen, so the **More** selection at the top right corner of the screen is available to toggle between all the product setup screens.

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Save

Save prompts for entry of a setup file name that is used for saving the parameters for the active run group in the product setup directory. The product setup name may contain up to eight alphanumeric characters.

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Cancel

Cancel returns you to the current display screen.

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Product Setup Parameters

Following are descriptions of the parameters on the product setup screens.

Color Scale

Choose a color scale for the display of data on the Current Setup and Trend Graph screens. The color scale choices are XYZ, Lab (Hunter), L*a*b* (CIE), Rdab, L*C*H*, L*C*H* (CMC), Yxy, FMC2, and Dominant Wavelength and Excitation Purity (DWEPY).

Optional Index

Choose an index or difference parameter to display on the Current Setup and Trend Graph screens. The choices are None, BT, Z%, E*, Ecmc, C*, E, YI, WI, Ef, and WI (Gz), but not all indices are available with all of the color scales. The table below indicates which indices are available with each color scale.

Color Scale	Available Indices
XYZ	Any
Lab (Hunter)	None, BT, Z%, Hunter E, YI, WI, WI(Gz), Ecmc
L*a*b* (CIE)	None, BT, Z%, E*, C*, YI, WI, WI(Gz), Ecmc
Rdab	None, BT, Z%, YI, WI, WI(Gz)
L*C*H*	None, BT, Z%, E*, C*, YI, WI, WI(Gz), Ecmc
L*C*H* (CMC)	None, BT, Z%, E*, C*, YI, WI, WI(Gz), Ecmc
Yxy	None, BT, Z%, YI, WI, WI(Gz)
FMC2	None, BT, Z%, YI, WI, WI(Gz), Ef
DWEPY	Any

Data Collection

For Units, choose Time or Length (Feet, Yards, or Meters) for the time or length presented across the full width of the trend screen. The Frequency is the interval at which new data points are entered at the right end of all the traces on the trend screen. Each new data point is the average of the color measured throughout the update time interval. For Time, choose either every 5 seconds, 15 seconds, 30 seconds, 1 minute, 2 minutes, or 4 minutes. For Length, choose either 10, 15, 20, 25, 30, 35, 40, 90, 100, 110, or 120 (feet, yards, or meters).

Secondary Calibration

Choose the time interval between automatic secondary calibrations. Choices are None, At Start of Run, Every 15 minutes, Every 30 minutes, and Every 60 minutes. At the interval selected, the sensor automatically moves to the tile holder and secondary calibration is performed. Then the run continues. If the interval is set to a choice other than "None" or "At Start of Run," this parameter can be overridden using the auto_standardize_minutes command in the [setup] section of MSS.INI. See page B-6 for more information.

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Note: None and At Start of Run should only be used when no run lasts more than thirty minutes and the conditions are such that no significant sensor drift occurs in thirty minutes.

Illuminant/Observer

Select the illuminant and observer to be used when making color scale and index calculations. The available choices are listed on page 5-11.

Product Standard, Tolerances, and Corrections

Choose one of four product standard types. The choices are Numeric, Physical, Transfer, and Ad Hoc. For the numeric standard, enter the assigned color values in the Product Standard field. For the physical standard, place the specimen in the tile holder or on the line under the sensor and measure it by pressing Read Standard. For the transfer standard, place the specimen in the tile holder or on the line under the sensor, measure it using the Read Standard button, and then enter the assigned color values obtained from the master instrument. For the ad hoc product standard, the first reading of the run becomes the standard value.

The transfer standard type provides for measuring a physical standard, then entering the values of that standard as read on a master instrument. MultiSensor XE Software then automatically computes and uses correction factors which result in the values agreeing with those assigned by the master for the standard and similar products.

Indicate next to "CMC Auto-tolerance" whether you wish tolerances to be calculated automatically ("X" in the box) or you wish to enter your own tolerances (empty box).

You may also enter an offset correction value for each color scale parameter. The value is then added algebraically to the measured color scale values and the result is displayed. Offset values may be used to force the values read by the system to agree with values read on another instrument. Offsets may be used to compensate for all sources of disagreement, including changes in the product between readings and instrumental differences.

For offset correction to be used most effectively, the measurements used as the basis for deriving offset values must be done carefully, using good procedures and techniques. Attention should be given to consistent sample presentation, calibration, and operating conditions of both instruments, consistent sample conditioning, consistent time delay between observing on-line measurements and measuring a sample of the product in the lab, and any other factors which may affect the measurements.

Note: Offset correction is not imposed on the color scale values on the Sample Measurement screen.

You may enter numerical values for the upper and lower tolerances to be applied to each dimension of the color scale. You must enter numerical values for each dimension of the color scale selected (such as L, a, and b) unless autotolerancing has been selected. The tolerances are the absolute value of the difference between the product standard value and measured value that is required to trigger an alarm condition.

CMC Parameters

Enter a commercial factor (CF) and a lightness-to-chroma ratio (l:c) to be used in computing a single number tolerance.

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Optional Parameters

You may enter two parameters, P0 and P1, to compute an optional single number index. In this case, P0 is the slope and P1 is the offset used in the equation to compute TAPPI brightness, BT.

BT = P1 + P0(Z).

Tolerance Alarm Deadband

Select a percent of tolerance for the tolerance alarm deadband which prevents the tolerance alarm from toggling on and off. Once the tolerance threshold is crossed, subsequent difference values have to change by the amount of the deadband to change the alarm condition. The choices are 5, 10, 15, 20, or 25 percent of tolerance.

Scan Parameter

When using Scan Pattern "M," the value entered in the Scan Parameter field indicates the distance between the edges and the first and last readings in inches. Enter this value as a real number (i.e., 1.23).

Optional Digital Display

Choose no digital display or a digital display of whole values or delta values for the left side of the trend.

Scan Pattern

Select any one of a number of possible scan patterns. In a typical scan pattern, the sensor starts at the LEFT EDGE, taking readings for a defined integration time, t seconds. The sensor then moves to the right and takes readings for five seconds starting when it reaches the LEFT CENTER switch. In a similar manner, readings are taken for t seconds at the RIGHT EDGE. On the way back to the left edge, readings are taken for t seconds starting at the RIGHT CENTER switch.

Note: "Right" is the end of the rail closest to the motor.

Note: The automatic secondary standardization and movement to the initial position of a scan pattern may be skipped using the start_run_code command in the [setup] section of the MSS.INI file. See page B-6 for more information.

General Descriptions of Scan Patterns:

Scan Pattern	General Description
A	Dwell and read at each edge; take center readings on the fly.
B	Dwell and read at each limit; take center readings on the fly.
C	Dwell and read at each edge and each center position.
D	Dwell and read at each limit and center position.
E	Scan continuously; read left, center, and right zones on the fly.
F	Continuous readings from the LEFT CENTER position.

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Scan Pattern	General Description
G	Continuous readings from the RIGHT CENTER position.
H	Continuous readings from the LEFT LIMIT position.
I	Continuous readings from the RIGHT LIMIT position.
J	Fixed read at the LEFT TILE position.
K	Fixed read at the LEFT EDGE position.
L	Fixed read at the RIGHT EDGE position.
M	Measures lanes across the product between the edges.

Detailed Descriptions of Scan Patterns:

A. Dwell and read at each edge; take center readings on the fly.

1. At the end of a run, the sensor parks at the HOME position.
2. At the start of a run, the length counter is reset to zero; the sensor moves to the HOME position.
3. The sensor auto-standardizes using the internal secondary tile.
4. The sensor moves to the LEFT EDGE position.
5. The sensor waits for the settling time value entered in the Sensor Control Dialog to allow vibrations to settle.
6. The update interval count is started.
7. The sensor takes a single reading at the LEFT EDGE.
8. The sensor moves to the right.
9. When the LEFT CENTER position is detected, the sensor starts reading.
10. The sensor takes readings as it moves across the center region until it reaches the RIGHT CENTER position, where readings stop.
11. The sensor continues moving until it reaches the RIGHT EDGE.
12. The sensor waits to allow vibrations to settle.
13. The sensor takes a single reading at the RIGHT EDGE.
14. The sensor moves to the left.
15. When the RIGHT CENTER position is detected, the sensor starts reading.
16. The sensor takes readings as it moves across the center region until it reaches the LEFT CENTER position, where readings stop.

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17. The sensor continues moving until it reaches the LEFT EDGE.

18. Data for the completed update cycle is transmitted to the system computer.

19. The procedure is repeated, starting at Step 5.

20. If the run is ended during a given cycle, the sensor moves to, and parks at, the HOME position. Data for the incomplete update cycle is not transmitted.

B. Dwell and read at each limit; take center readings on the fly.

This pattern is the same as A except that readings are taken at the LEFT LIMIT and the RIGHT LIMIT instead of at the LEFT EDGE and the RIGHT EDGE.

C. Dwell and read at each edge and each center position.

1. At the end of a run, the sensor parks at the HOME position.

2. At the start of a run, the length counter is reset to zero; the sensor moves to the HOME position.

3. The sensor auto-standardizes using the internal secondary tile.

4. The sensor moves to the LEFT EDGE position.

5. The sensor waits for the settling time value entered in the Sensor Control Dialog to allow vibrations to settle.

6. The update interval count is started.

7. The sensor takes a single reading at the LEFT EDGE.

8. The sensor moves to the right.

9. The sensor stops at the LEFT CENTER position and waits for the settling time.

10. The sensor takes a single reading at the LEFT CENTER position.

11. The sensor continues moving until it reaches the RIGHT EDGE.

12. The sensor stops at the RIGHT EDGE and settles.

13. The sensor takes a single reading at the RIGHT EDGE.

14. The sensor moves to the left.

15. The sensor stops at the RIGHT CENTER position and settles.

16. The sensor takes a single reading at the RIGHT CENTER position.

17. The sensor continues moving until it reaches the LEFT EDGE.

18. Data for the completed update cycle is transmitted to the system computer.

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19. The procedure is repeated, starting at Step 5.

20. If the run is ended during a given update cycle, the sensor moves to, and parks at, the HOME position. Data for the incomplete update cycle is not transmitted.

D. Dwell and read at each limit and each center position.

This pattern is the same as C, except that readings are taken at the LEFT LIMIT and the RIGHT LIMIT instead of at the LEFT EDGE and the RIGHT EDGE.

E. Scan continuously; read left, center, and right zones on the fly.

1. At the end of a run, the sensor parks at the HOME position.

2. At the start of a run, the length counter is reset to zero; the sensor moves to the HOME position.

3. The sensor auto-standardizes using the internal secondary tile.

4. The sensor moves to the LEFT EDGE position.

5. The sensor waits for the settling time value entered in the Sensor Control Dialog for vibrations to settle.

6. The sensor starts moving to the right and taking readings continuously.

7. On reaching the RIGHT EDGE the sensor stops.

8. The sensor waits to allow vibrations to settle.

9. The sensor starts moving to the left.

10. On reaching the LEFT EDGE the sensor stops.

11. The pattern repeats, starting at Step 5.

12. During each update cycle, readings are posted to three registers: left, right and center, according to whether the sensor is to the left of the LEFT CENTER position, to the right of the RIGHT CENTER position, or between the two center positions.

13. At the end of each update cycle, the average of all the left data, the average of all the right data, the average of all center data, and the length at which the cycle ended is transmitted to the system computer. Data from any incomplete update cycle is discarded.

14. When the run is ended, data from any incomplete update cycle is discarded.

15. The sensor parks at the HOME position.

F. Continuous readings from the LEFT CENTER position.

1. At the end of a run, the sensor parks at the HOME position.

2. At the start of a run, the length counter is reset to zero; the sensor moves to the HOME position.

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3. The sensor auto-standardizes.
4. The sensor moves to the LEFT CENTER position.
5. The sensor waits for the settling time value entered in the Sensor Control Dialog to allow vibrations to settle.
6. The update interval count is started.
7. The sensor takes readings for the update cycle period (UCP) at the LEFT CENTER position.
8. Data for the completed update cycle is transmitted to the system computer.
9. The procedure is repeated, starting at Step 6.
10. If the run is ended during a given update cycle, the sensor moves to, and parks at, the HOME position. Data for the incomplete update cycle is not transmitted.

G. Continuous readings from the RIGHT CENTER position.

1. At the end of a run, the sensor parks at the HOME position.
2. At the start of a run, the length counter is reset to zero; the sensor moves to the HOME position.
3. The sensor auto-standardizes.
4. The sensor moves to the RIGHT CENTER position.
5. The sensor waits for the settling time value entered in the Sensor Control Dialog to allow vibrations to settle.
6. The update interval count is started.
7. The sensor takes readings for the UCP at the RIGHT CENTER position.
8. Data for the completed update cycle is transmitted to the system computer.
9. The procedure is repeated, starting at Step 6.

If the run is ended during a given update cycle, the sensor moves to, and parks at, the HOME position. Data for the incomplete data cycle is not transmitted.

H. Continuous readings from the LEFT LIMIT position.

1. At the end of a run, the sensor parks at the HOME position.
2. At the start of a run, the length counter is reset to zero; the sensor moves to the HOME position.
3. The sensor auto-standardizes.
4. The sensor moves to the LEFT LIMIT position.

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5. The sensor waits for the settling time value entered in the Sensor Control Dialog to allow vibrations to settle.

6. The update interval count is started.

7. The sensor takes readings for the UCP at the LEFT LIMIT.

8. Data for the completed update cycle is transmitted to the system computer.

9. The procedure is repeated, starting at Step 6.

10. If the run is ended during a given update cycle, the sensor moves to, and parks at, the RIGHT LIMIT position. Data for the incomplete update cycle is not transmitted.

I. Continuous readings from the RIGHT LIMIT position.

1. At the end of a run, the sensor parks at the RIGHT LIMIT position.

2. At the start of a run, the length counter is reset to zero; the sensor moves to the HOME position.

3. The sensor auto-standardizes.

4. The sensor moves to the RIGHT LIMIT position.

5. The sensor waits for the settling time value entered in the Sensor Control Dialog to allow vibrations to settle.

6. The update interval count is started.

7. The sensor takes readings for the UCP at the RIGHT LIMIT.

8. Data for the completed update cycle is transmitted to the system computer.

9. The procedure is repeated, starting at Step 6.

10. If the run is ended during a given update cycle, the sensor remains and parks at the HOME position. Data for the incomplete update cycle is not transmitted.

J. Fixed read at the LEFT TILE position. This is a single reading. The number of flashes is entered in the Sensor Control Dialog.

K. Fixed read at the LEFT EDGE position. This is a single reading. The number of flashes is entered in the Sensor Control Dialog.

L. Fixed read at the RIGHT EDGE position. This is a single reading. The number of flashes is entered in the Sensor Control Dialog.

M. Measures lanes across the product between the EDGES.

1. The sensor moves to the LEFT EDGE.

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2. The sensor moves a specified distance from the LEFT EDGE. This distance is entered in the Scan Parameter field as a real number in inches.

3. The sensor traverses and takes readings at one-inch increments until the specified distance from the RIGHT EDGE is reached (as entered in the Scan Parameter field).

4. The sensor returns to the LEFT EDGE and repeats the pattern.

Note: For Scan Patterns A, B, C, and D, the LEFT data transmitted to the computer is based on the averages of X, Y, and Z read during the t-second integration time at the LEFT EDGE. The RIGHT data is defined similarly. The CENTER data is based on the averages of X, Y, and Z read during the two integration times associated with the center of the cloth. The CENTER reading is the average reading made continuously between the LEFT CENTER and RIGHT CENTER positions.

Shade Sorting

Choosing Shade Sorting turns the option off or on with or without the trend.

Note: To enable shade sorting, Shade Sorting must also be checked in Installation Options and the Data Collection Units must be distance-based.

Operator Sensor Length (optional)

The linear counter is used to calculate the distance from the operator to the sensor so that the information displayed on the system corresponds to the product in front of the operator.

Switchable Run

With this type of run, the sensor starts off reading at a fixed position for a preset distance, saving the data in a buffer. Once the chosen distance has been reached, the product standard for the run is calculated by averaging the readings over the next specified number of intervals. At this point, the run switches to a traversing pattern and the fixed point data which was buffered is displayed.

The switchable run parameters are set as follows:

Enabled: Enables the switchable run type.

Lead Scan: This is the scan pattern of the fixed point portion of the run, where the choices are F (right center), G (left center), H (left limit), I (right limit), and J (left tile).

Lead Interval: This is the fixed point read interval of the run. The units are the same as the data collection units specified on the first page of the Product Setup Editor.

Points: This is the number of data points from the fixed portion of the run to average to obtain the product standard.

In order to select a switchable run, you need two conditions:

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a. The Traversing Trend type (set in the Run Group Configuration) must be Center-Standard, Left-Standard, Right-Standard).

b. The product Standard type must be AD HOC.

Switchable runs are not available in Version 1.4 of the software.

Page Titles

These are the first two messages shown on the Current Setup screen and on the left side of the Trend Graph screen. Each message can be up to thirteen characters long.

Descriptor Names and Values

These are the remaining six messages on the Current Setup screen and Trend Graph screens. Each message can be up to thirteen characters long.

Enable Trend Screen Intermediate Tolerance Markers (Percent)

If this box is checked, then intermediate tolerance lines will appear on the trend screens. These lines do not cause a color out of tolerance condition if exceeded by the current reading.

Upper and Lower Trend Screen Intermediate Tolerances

This field is available to allow you to enter both upper and lower intermediate tolerance values for each trace expressed as a percentage of tolerance for the intermediate tolerance markers. The markers appear as horizontal lines on the trend screens.

Note: It is suggested that your product setup files (all files in the C:\MSS\PSETUPS directory) be backed up weekly.

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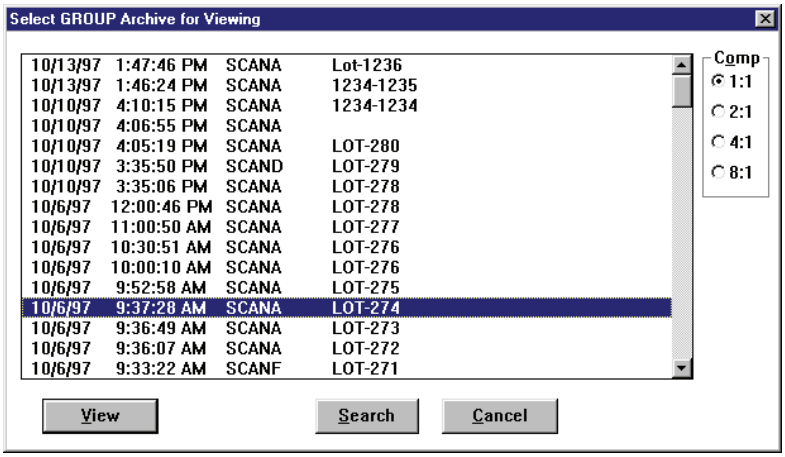
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Chapter Nine

Archive Viewer

Trend data and events are automatically saved to the hard disk during a run and may be replayed later. Tabular data can also be saved if this option is selected in the Run Group Configuration.

Press **Offline** to display the Offline Functions Menu. When you select **Archive Viewer** from the main menu a list of runs is displayed. The current run or most recent run is at the top of the list and the oldest run is at the bottom of the list. See the picture below.



Highlight the archive you wish to view by using either the arrow keys or the mouse. Select the degree of compression for the data. Compression allows you to look at more data than would normally be displayed on the screen. For example, a compression of 8 to 1 averages eight data points and displays it as one point on the screen so that you can view eight times as much data. Click on **View** to view the selected archive.

Once the archive you have selected to view has been displayed, the button bar choices change to correspond with the Archive activities — **Trends**, **Events**, **Tabular**, **Dump**, **Copy**, **Shade**, **Print**, **Rewind**, **Previous**, **Next**, and **Done**. The Archive tool bar buttons are described below.



Shows the center-standard trend screen for the selected run.



Displays the events that took place during the selected run.

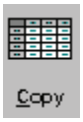
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Lists each individual data point used in the trend (available only if this option was selected in the Run Group Configuration during the run).



Allows you to save tabular and archive data to a floppy disk or another location on your hard drive.



Allows you to copy tabular and archive data to the Windows clipboard.



Displays the Shade Screen for the selected run.



Allows you to print tabular and trend data.



Returns you to data at the top of the run.



Takes you back to the previous data screen.



Allows you to view more data.



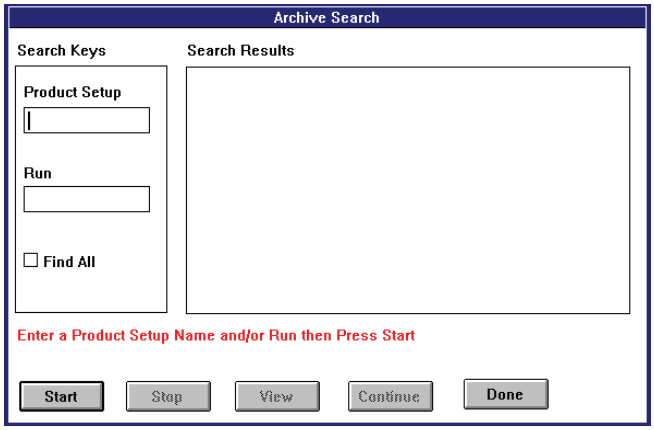
Exits the archive screen.

The box in the lower right corner identifies the percentage of data that is displayed on any archive screen.

Alternatively, you may elect to use the Archive Search feature by depressing the **Search** button from the Select Archive for Viewing screen. See the picture below. You will be presented with the Archive Search window. Enter the product setup name and/or the run number for the archive you wish to find. Either box may be left blank. If you enter information into both edit boxes, then only those archives that match both keys will be found. You may stop the search process after each matching archive has been

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found by leaving the Find All box unchecked. If you want to search the entire archive directory from beginning to end, check the Find All box.



To begin the search, click on the **Start** button. As each archive matching the search criteria is found, its name will be displayed in the Search Results list box. If the Find All box has not been checked then the search will stop after the first archive is located. The search can be resumed by clicking on the **Continue** button. The **Stop** button can also be clicked to stop the search at any time.

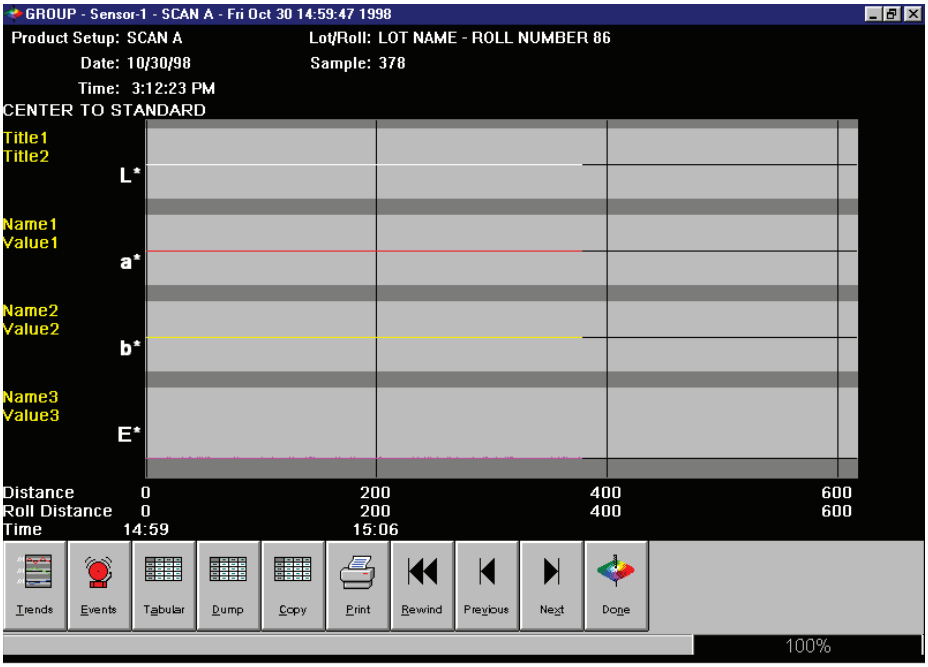
When the Search Results list contains entries, the **View** button can be selected to look at any of the archives in the list.

Select the **Done** button to close the window and return to the archive selection window.

Trends

Selection of **Trends** shows the center-standard Trend Graph screen for the selected run as shown in the picture below. The screen shows upper and lower out-of-tolerance bands as top and bottom of scale, a product standard center line, and dotted lines representing the user-definable intermediate tolerance lines.

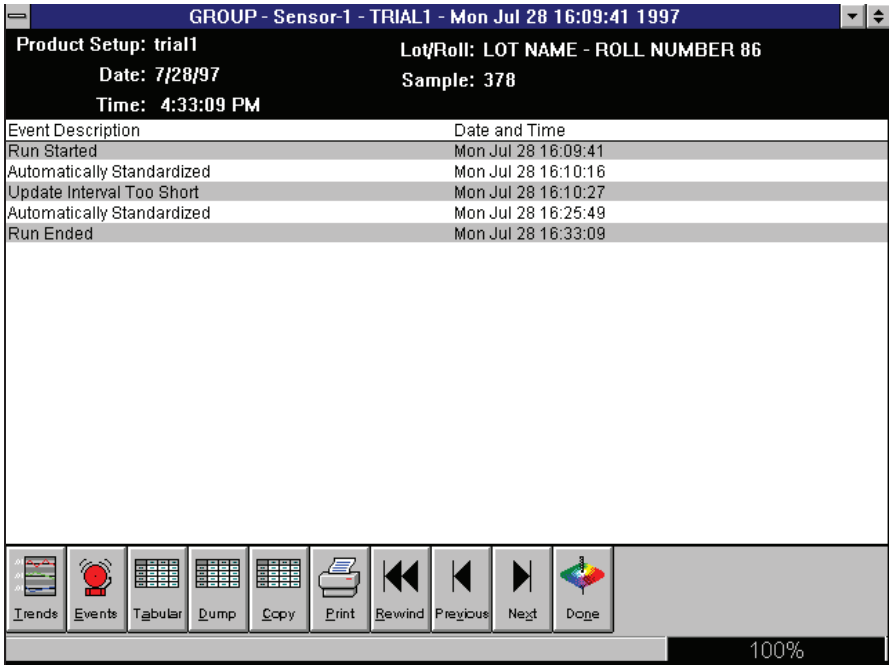
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The horizontal axis of the Trend Graph screen displays roll yardage markers, lot yardage, roll yardage, date and time, or run/scrap markers. This display will provide all pertinent data concerning the current roll/run along this axis in an easy-to-read and understand format.

Events

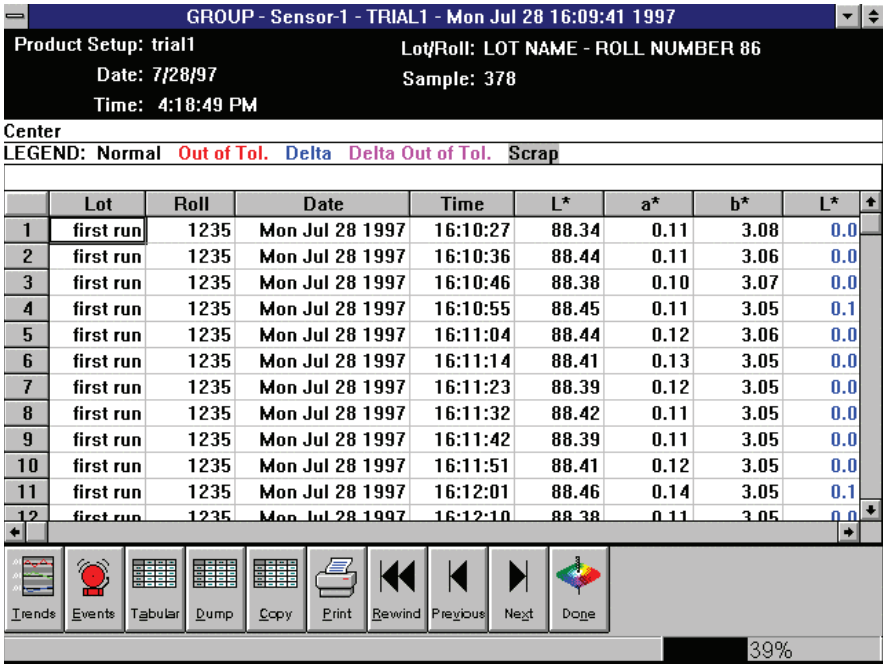
Selection of **Events** displays all events that took place during the selected run. The file date appears at the top of the screen. The Event Log will not record an entry if any color reading exceeds the intermediate tolerance value. An Event Log is shown below.



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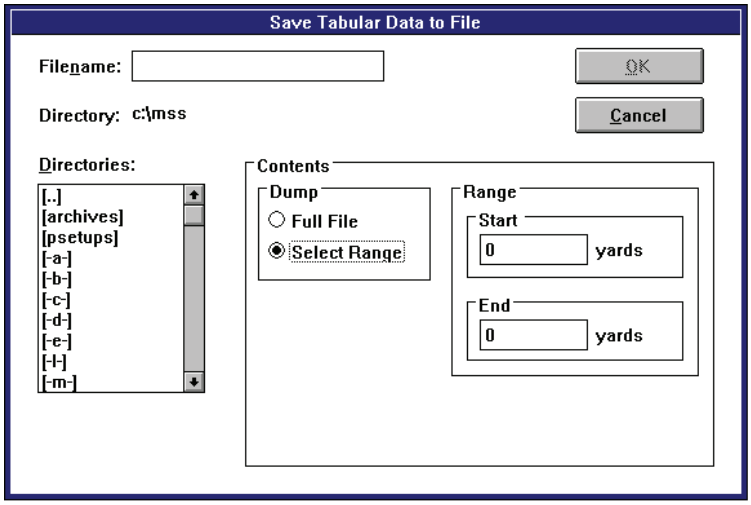
Tabular

Selection of **Tabular** lists each individual data point that is used in the trend as shown in the figure below.



Dump

Selection of **Dump** allows you to save tabular and archive data to a floppy disk. You can select all data or data intervals. First enter the file name to which the data will be archived and the disk and directory for placement. Next, specify whether to archive the full file or a selected range. If a selected range is desired, enter the start date and time and the end date and time of the range to be archived (if the data collection unit is time) or the start and end length (if the data collection unit is length-based). Select **OK** to archive the data.



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The data is exported to a disk file in tabular ASCII format. Selection of **Dump** brings up one of two types of dialog boxes, depending on whether the archive is for a time-based or a distance-based run. Both types let you select a file name under which to save the data and also select a range of the files that you want to save.

If the run was traversing, enter a file name with no extension and the program creates three output files: filename.001 for the Center to Product Standard data, filename.002 for the Left to Center data, and filename.003 for the Right to Left data.

If the run was fixed point, then there is only one output file created and you may enter a filename without an extension.

Copy

Selection of **Copy** allows you to cut and paste selected tabular data to a pop-up plot (if this option has been purchased) or to another Windows application by way of the Windows clipboard. (Once **Copy** is selected, open your spreadsheet program, select an empty cell, and then choose **Paste** in that application.)

You may recall an archived tabular data file and select any number of points to be copied to either the pop-up plot or another Windows application. Use the left mouse button and **Shift** key to highlight the contiguous points to be copied. If additional points are desired the process can be repeated as required. The data will be presented in a spreadsheet format.

You can select all data or data intervals. Next, specify whether to copy the full file or a selected range. If a selected range is desired, enter the start date and time and the end date and time of the range to be copied or the start and end yardage. Select **OK** to copy the data.

Shade

Selection of **Shade** displays the Shade Screen for the run.

Print

Selection of **Print** prints the currently-displayed archive screen.

Rewind

Selection of **Rewind** returns you to the data at the top of the run.

Previous

Selection of **Previous** takes you back to the previous data screen.

Next

Selection of **Next** allows you to view more data.

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Done

Selection of **Done** exits the archive screen.

Note: It is suggested that your archive files (all files in the C:\MSS\ARCHIVES directory) be backed up weekly.

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Chapter Ten

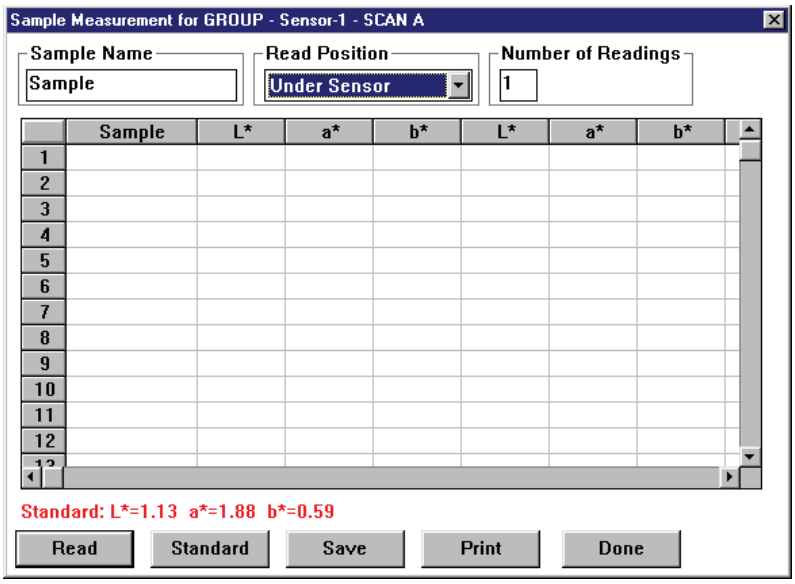
Sample Measurement

The Sample Measurement screen can be used for taking measurements of samples when the sensor is not involved in a run. Absolute values may be obtained or differences from a specified standard may be viewed.

Press **Offline** to display the Offline Functions Menu.

Select **Sample Measurement**.

From the Sample Measurement screen shown in the picture below you can enter a name for the sample, specify the read position, and enter the number of readings to be averaged per measurement. Buttons at the bottom of the screen offer the choices of taking a reading, setting the standard for use, and saving and printing the readings that are shown on the screen.



Use the mouse to place the cursor in the Sample Name box on the left and type in an identifier for the sample measurement(s). Move to the drop down menu beneath Read Position and make your choice. Read positions available are: Under Sensor, Right Tile, Right Limit, Right Edge, Right Center, Left Center, Left Edge, Left Limit, Position 1, Position 2, Position 3, and Position 4. The Position terms refer to placement in the automatic tile holder. Next, move to the number of readings and enter the number of readings to be averaged per measurement.

Read

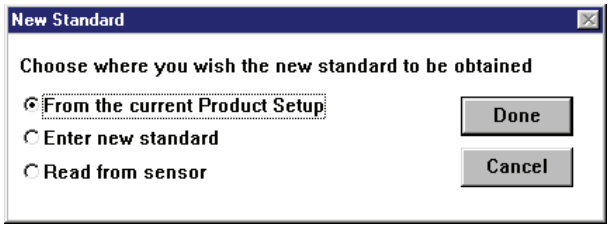
Select **Read** to take a measurement and display it on the screen. Follow the on-screen prompts to place the sample and complete its measurement. The sensor moves to the Read position, takes a reading, and

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then moves to the Calibration Park position. Both positions are defined in the Run Group Configuration. The color scale and other display parameters are as configured for the current setup.

Standard

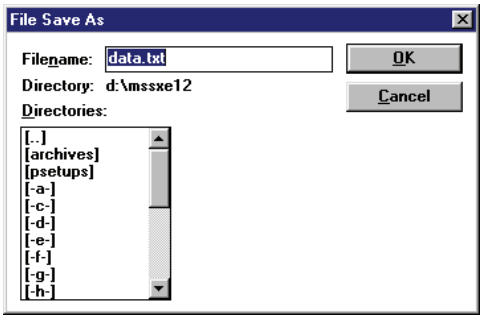
Press the **Standard** button to choose the standard to which measurements will be compared.



The standard can be the same one used in the current product setup, a hand-entered standard, or it can be read from the sensor using the Sample Measurement screen.

Save

Press the **Save** button to save the data currently on the Sample Measurement screen to an ASCII text file. The text file name may contain up to eight alphanumeric characters.



Print

Select **Print** to print all of the readings displayed on the screen.

Done

Select **Done** to return to the current display screen when you have completed all your measurements.

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Chapter Eleven

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 standardization procedures, consistently followed.

It is extremely important that the standards used for standardization be treated carefully. 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 Hardware Maintenance chapter.

Two levels of standardization are provided: primary and secondary calibrations. Primary calibration 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. The green calibration check tile may also be performed at this time. This standardization 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 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 those readings over time.

Immediately after standardization, the white standard tile should read within ±0.03 units of its factory-read values in XYZ. You might want to use the Sample Measurement screen to check this. Generally, when the white tile readings differ from the factory-read values by more than ±0.05 units XYZ, calibration should be performed.

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

> *Note: 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.*

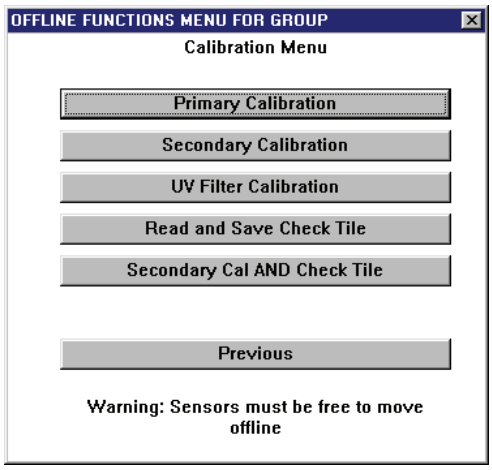
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Primary Calibration

1. Press **Offline** to display the Offline Functions Menu.

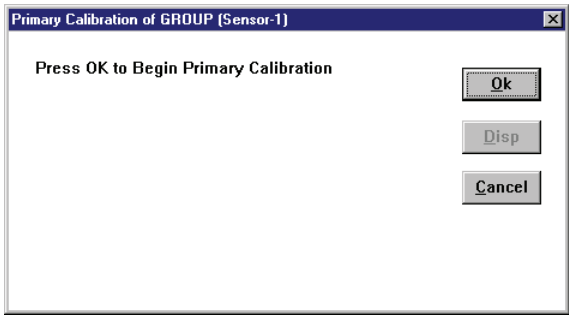
2. Select **Calibration**.

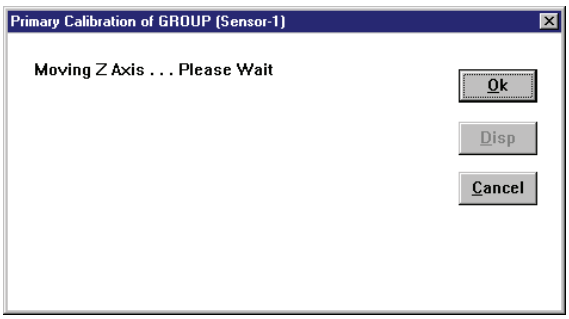
3. Select **Primary Calibration**.



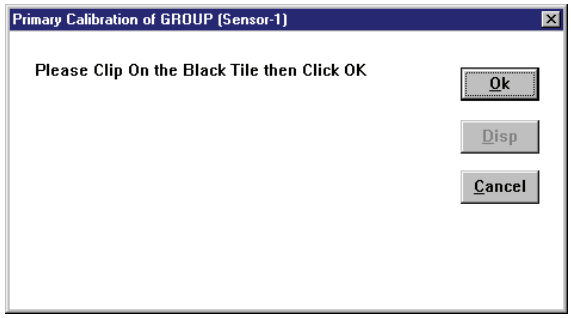
4. Follow the prompts on the screen for placement of the black tile, the primary white tile, and the secondary white tile. (The secondary tile will be read from the automatic tile holder, if present.)

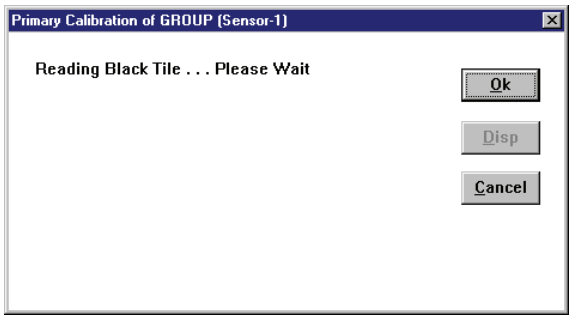
   Note: If Auto Primary Calib. was checked on the Tile Positions Screen in your Run Group Configuration and your primary tiles were placed in the tile holder, then primary calibration can proceed without prompting. See Chapter 12 for more information.

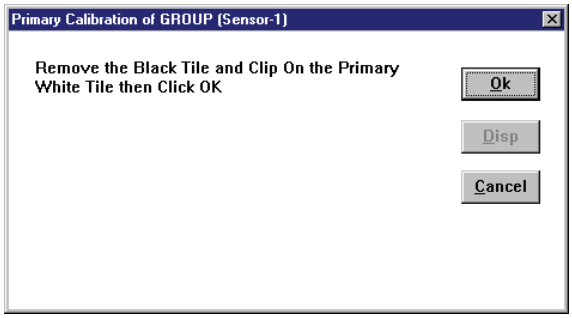


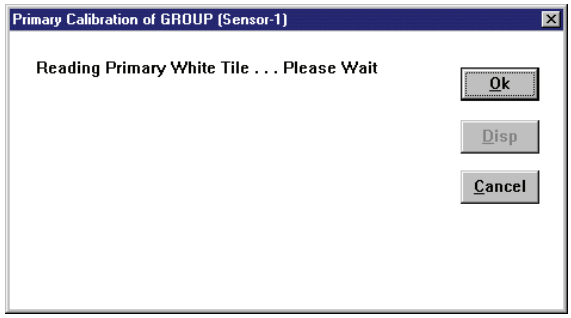


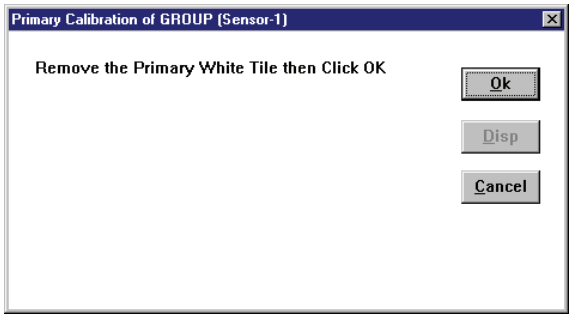
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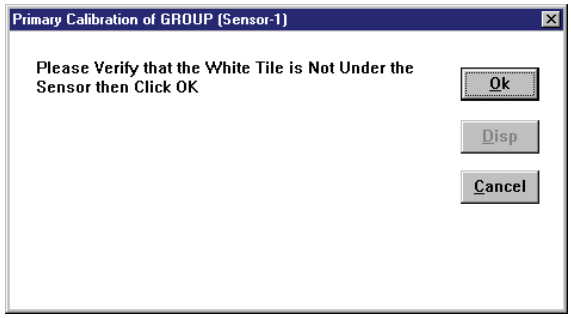


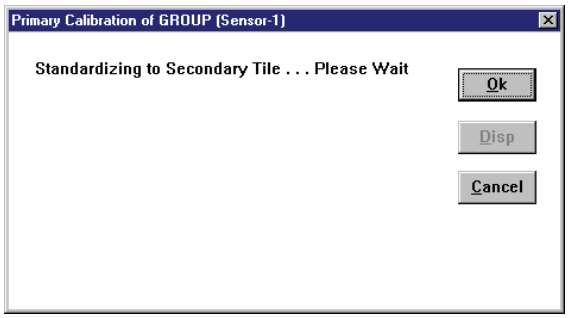






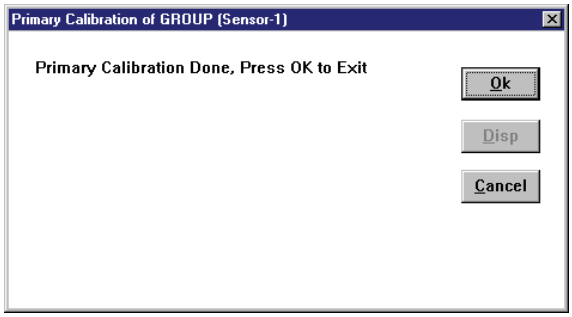
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5. If you enabled the green calibration tile check in the Run Group Configuration, then the green tile is read and its values saved at this point.

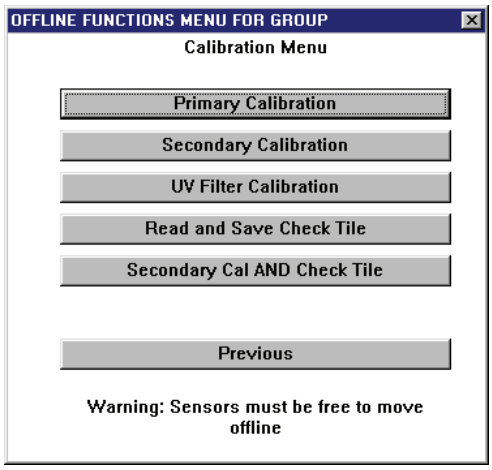
6. When calibration is complete, select **OK** to return to the current display screen.



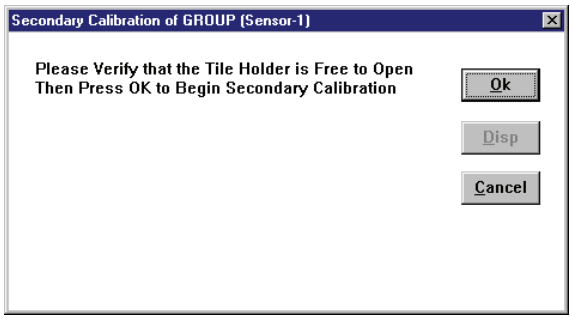
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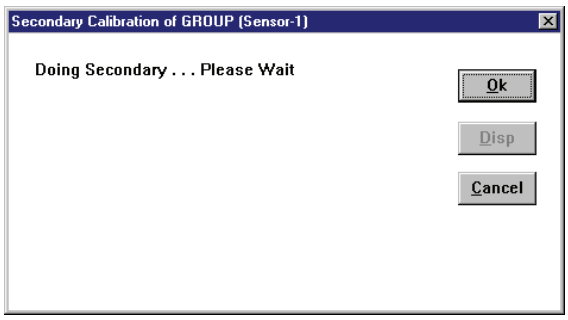
Secondary Calibration

1. Select **Offline** to display the Offline Functions Menu.
2. Select **Calibration**.
3. Select **Secondary Calibration**.



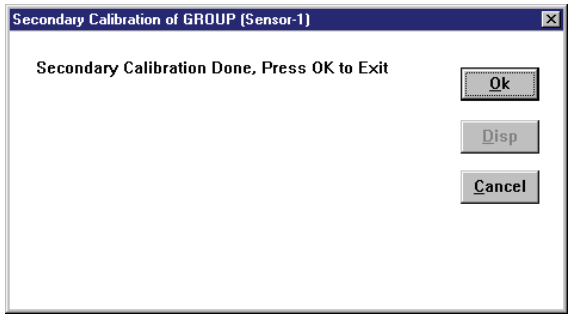
4. Follow the on-screen prompts to complete the calibration. If an automatic tile holder is installed, the proper tiles will automatically be positioned under the sensor.





5. When calibration is complete, select **OK** to return to the current display screen.

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Secondary calibrations will also be automatically performed as part of a run. The secondary calibration interval is set in the product setup.

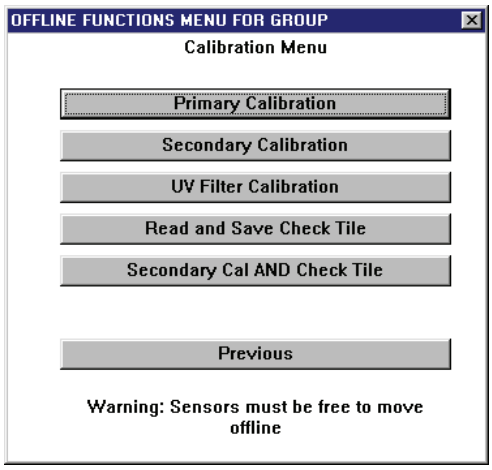
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UV Filter Calibration

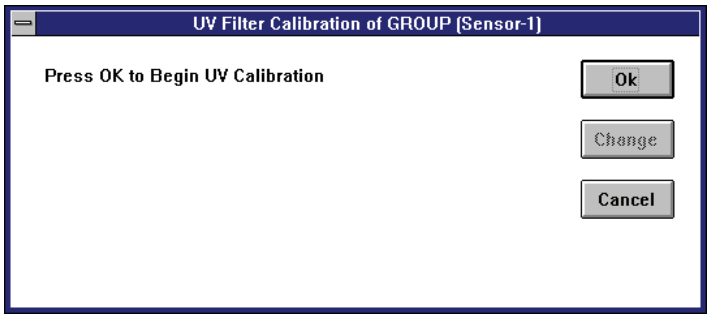
1. Select **Offline** to display the Offline Functions Menu.

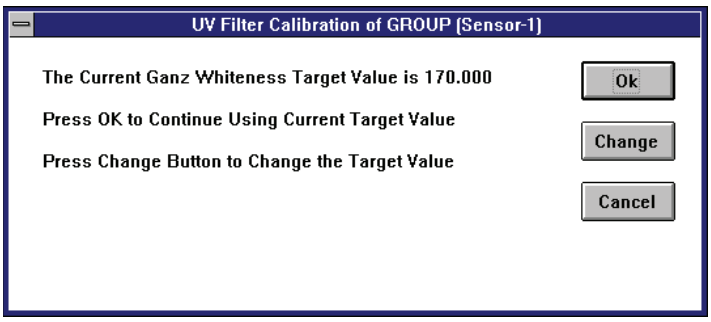
2. Select **Calibration**.

3. Select **UV Filter Calibration**.



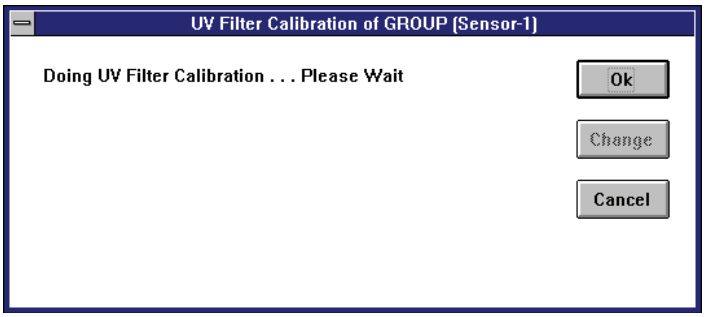
4. Follow the on-screen prompts to complete the UV calibration. If an automatic tile holder is installed, the proper tiles will automatically be positioned under the sensor.



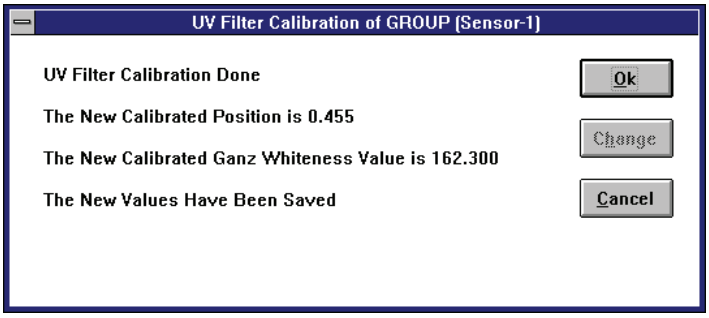


The current Ganz Whiteness target should only be changed if the tile has been replaced or the stored information has been corrupted. Each tile has a unique whiteness value.

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5. When UV calibration is complete, select **OK** to return to the current display screen.



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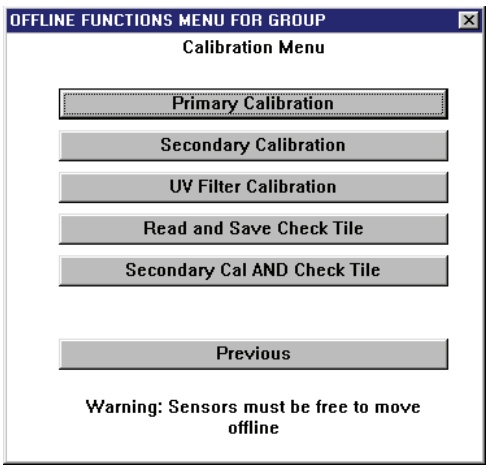
Read and Save Check Tile

This command allows you to read and save calibration check tile values directly from the Calibration menu. This is the same operation that is performed automatically at the end of primary calibration if the check procedure is enabled in the run group configuration. This check is normally performed using the standard green tile provided with the instrument, but a blue denim tile may be used in lieu of the green check tile if this option was purchased.

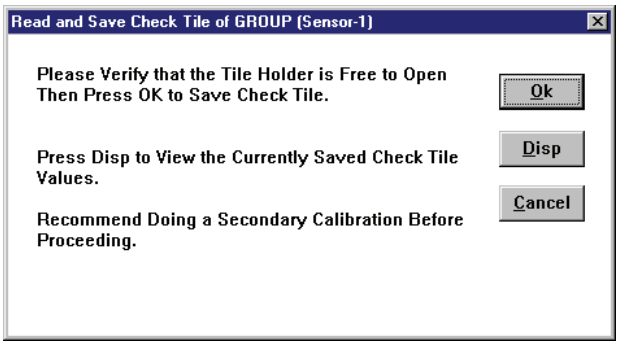
1. Select **Offline** to display the Offline Functions menu.

2. Select **Calibration**.

3. Select **Read and Save Check Tile**.

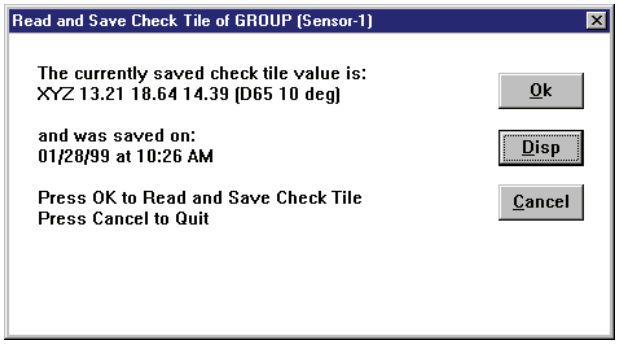


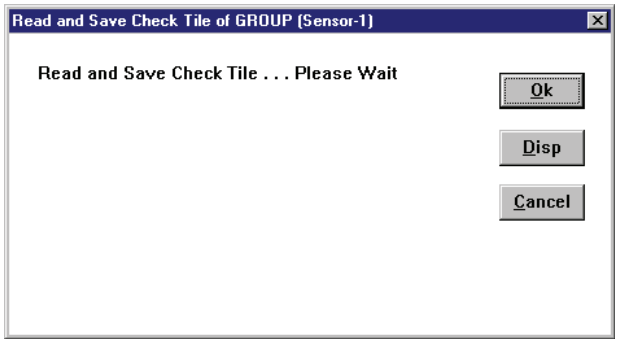
4. Follow the on-screen prompts to read the check tile and save its values.

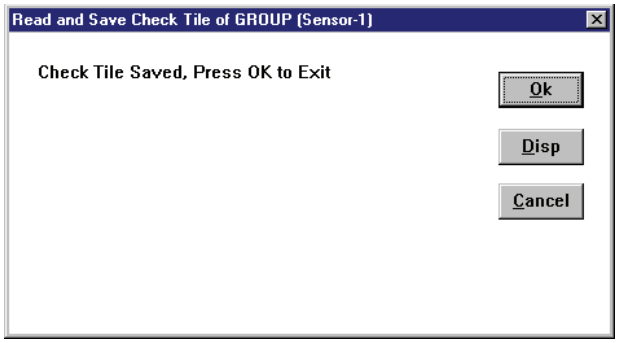


Press **Disp** to display the currently stored check tile values.

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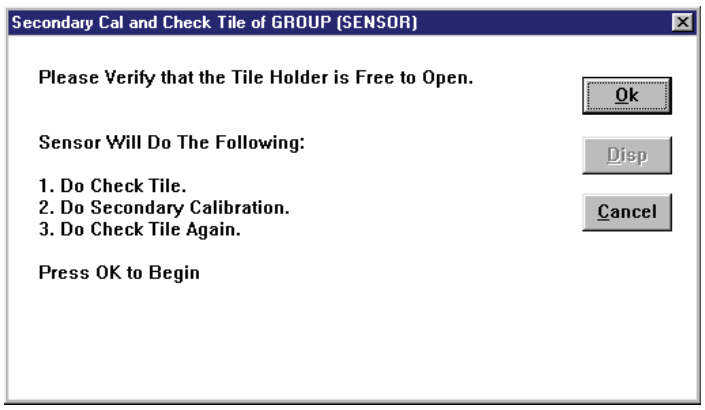


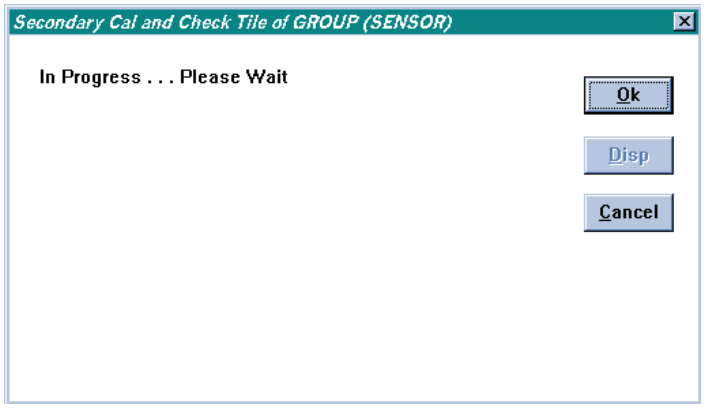
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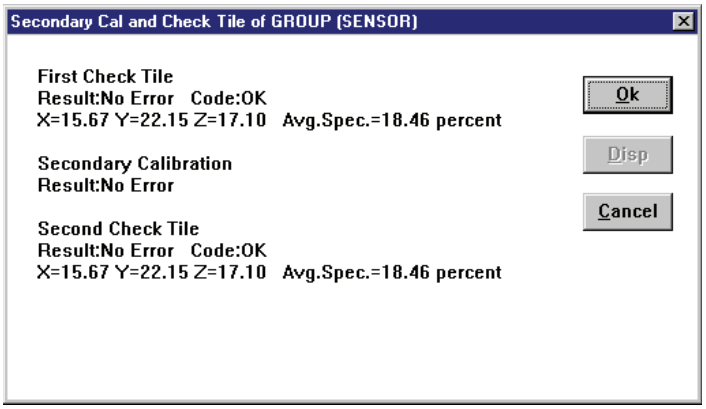
Secondary Cal AND Check Tile

When the **Secondary Cal AND Check Tile** command is chosen, the green (or optional blue denim) tile is checked, a secondary standardization is performed, and then a second tile check is performed, after which the check tile readings (before and after secondary standardization) are reported. The sequence of screens shown is as below.

Note: You must have read and saved check tile values using the command described in the previous section before you can check the tile using the Secondary Cal AND Check Tile command.







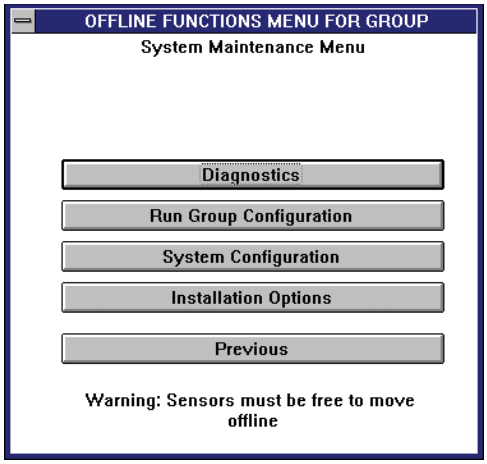
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Chapter Twelve

System Maintenance

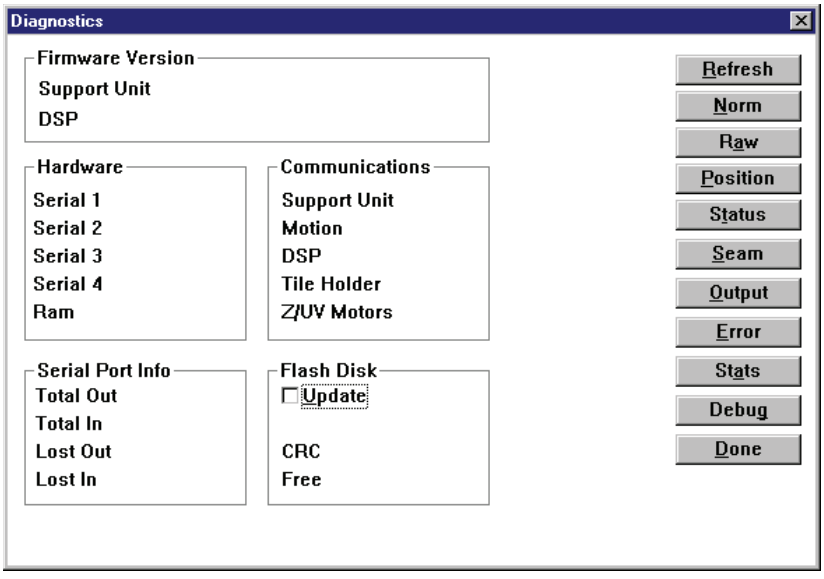
When you select **System Maintenance** from the Offline Functions Menu the following menu appears:



Each menu option is described in detail below.

Diagnostics

Once **Diagnostics** is chosen from the Offline Functions Menu, the screen shown below appears.

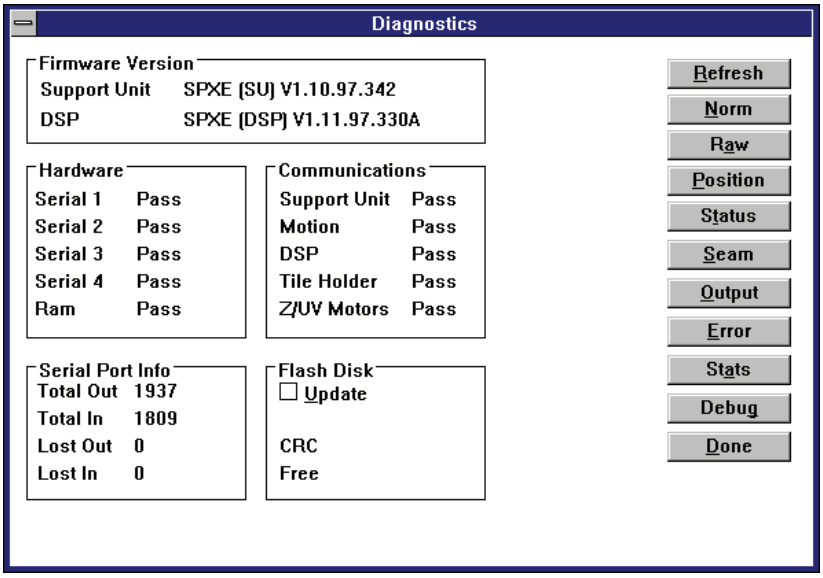


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The diagnostic functions available are accessed using the buttons on the right side of the screen. These functions are discussed in the sub-sections below.

Refresh

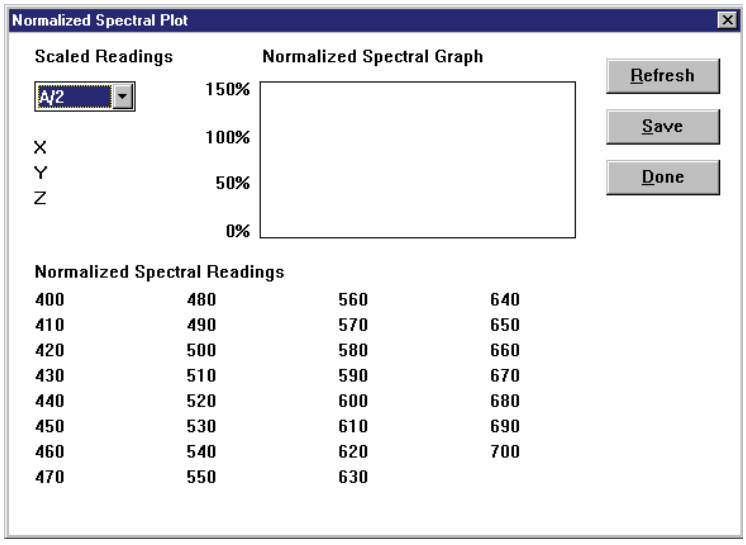
When the **Refresh** button is pressed, the information shown on the initial Diagnostics screen is obtained from the sensor and support unit and the screen is filled in in a manner similar to that shown below.



If "Fail" is obtained for any of the items assessed, maintenance is in order.

Norm

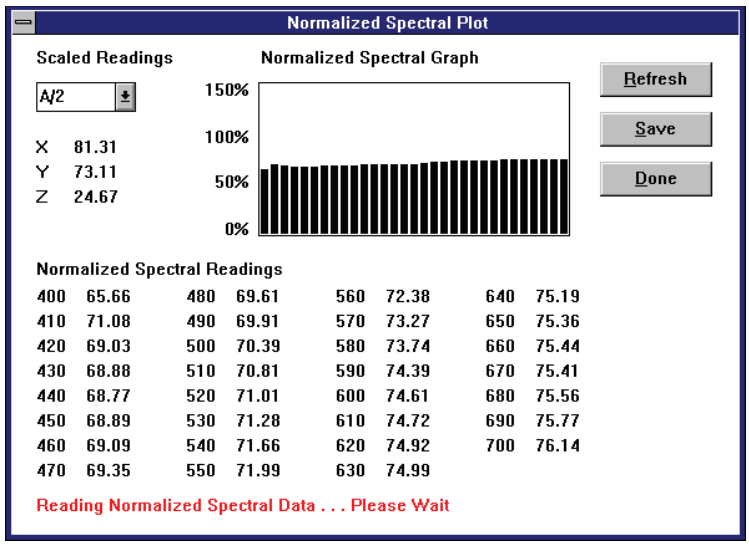
When the **Norm** button is pressed, a blank Normalized Spectral Plot screen is first obtained.



When the **Refresh** button is then pressed, the normalized spectral readings and spectral graph are shown for the sample beneath the sensor. XYZ values based on the illuminant and observer chosen at the upper left of the screen are also shown. You may save the normalized spectral data to an ASCII file by

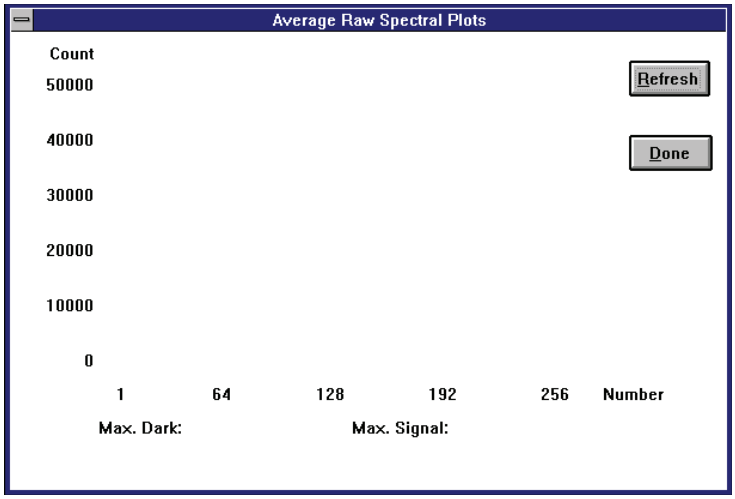
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pressing the **Save** button. The data will be saved to the file NORMSPEC.TXT in the directory where you installed the software. If the file already exists, the new data will be appended. If the file doesn't exist it will be created. The file must be deleted manually using Windows File Manager or Explorer in order to clear the values. When you are finished examining the values, press **Done**.



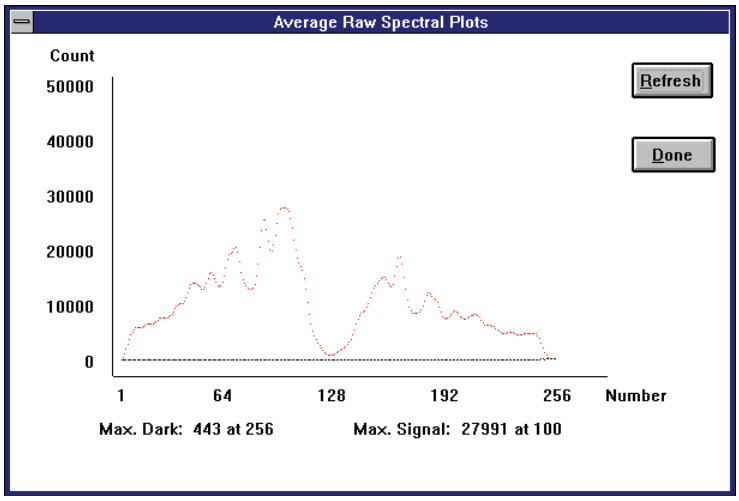
Raw

When the **Raw** button is pressed, a blank Average Raw Spectral Plots screen is first obtained.



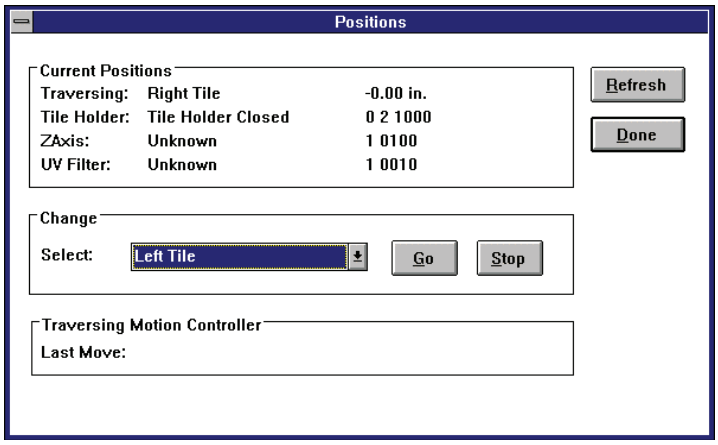
When the **Refresh** button is then pressed, the maximum dark value and maximum signal values, along with the average raw spectral data plot are shown for the sample beneath the sensor. The black curve shows the dark data and the red curve shows the signal data. When you are finished examining the values, press **Done**.

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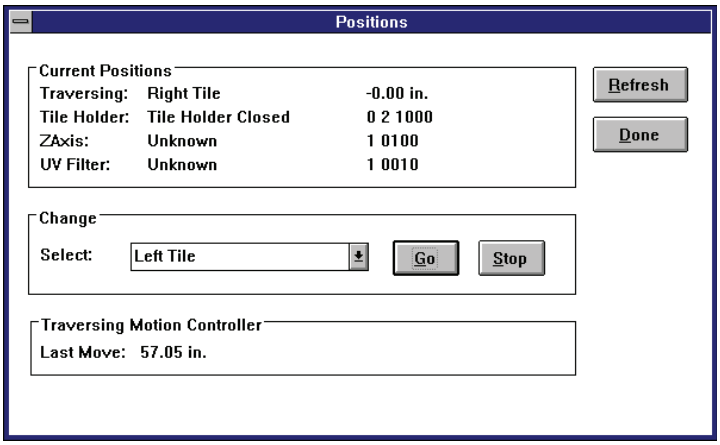
Position

When the **Position** button is pressed, the Positions screen, showing the current positions of the sensor, tile holder, z-axis, and UV filter (if installed) is obtained.



You may select a new sensor position from the drop-down box beside Select and press **Go** to move the sensor to the selected location. When you press **Refresh**, the new position will be reported. When you are finished examining and/or changing the positions, select Tile Holder Closed and then Z-Read from the drop-down box. Click **Done** to exit.

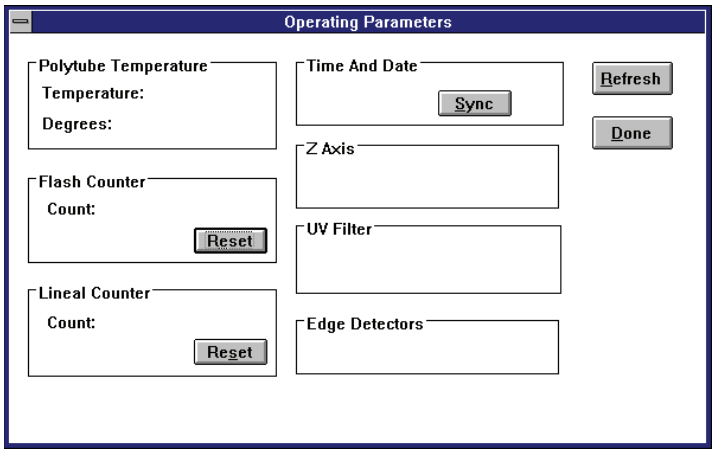
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For the z-axis and UV filter, only the home positions are reported as "known." All others are indicated as "Unknown." The Last Move value under "Traversing Motion Controller" is measured directly from the Step Out output of the motion controller.

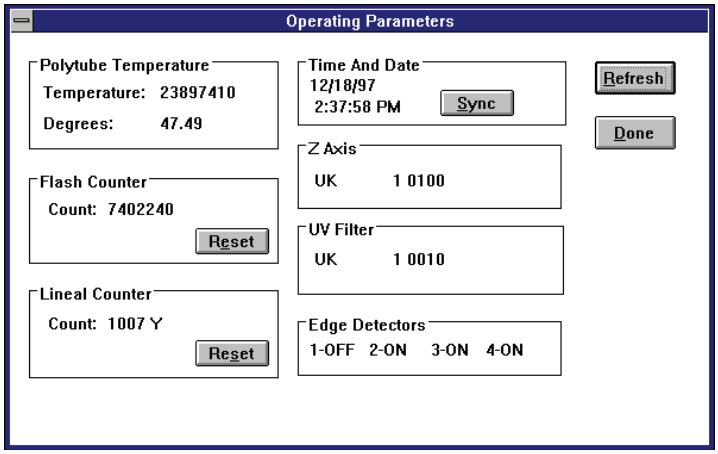
Status

When the **Status** button is pressed, the blank Operating Parameters screen is obtained.



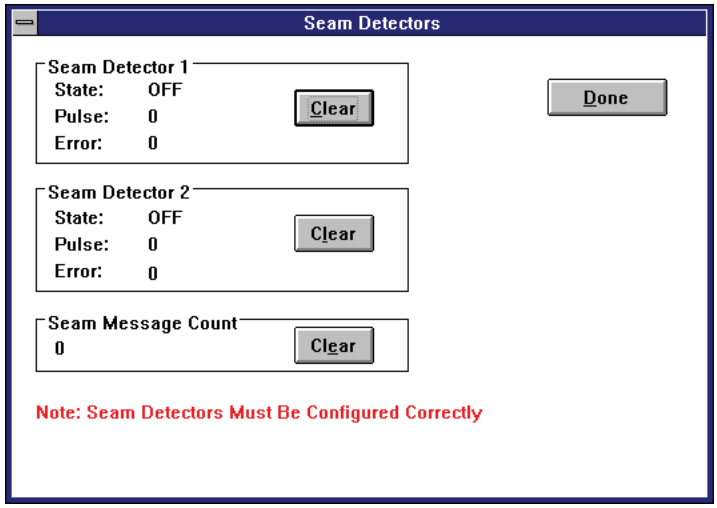
When the **Refresh** button is then pressed, the current polytube temperature, flash count, lineal count, time and date, z-axis, UV filter, and edge detector status are displayed. When **Sync** is pressed, the system time is synchronized with the host computer's time. When you are finished examining the values, press **Done**.

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Seam

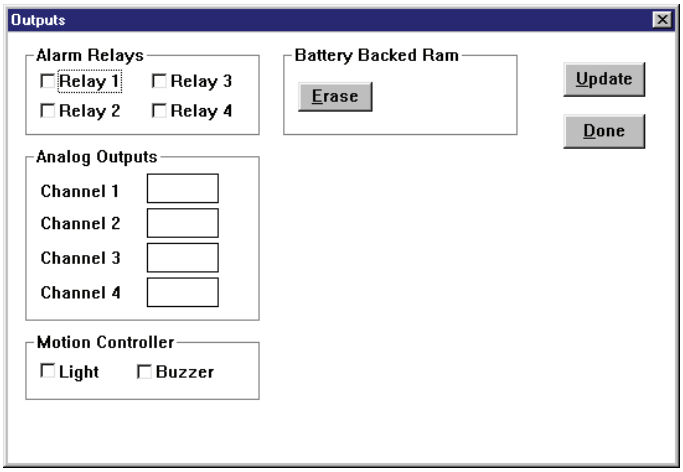
When the **Seam** button is pressed, the Seam Detectors screen is obtained. This screen reports the status of each of the seam detectors. When you are finished viewing the status, click on **Done**.



Output

When the **Output** button is pressed, the blank Outputs screen is displayed.

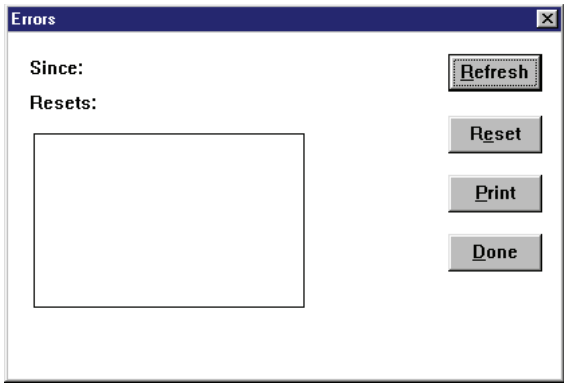
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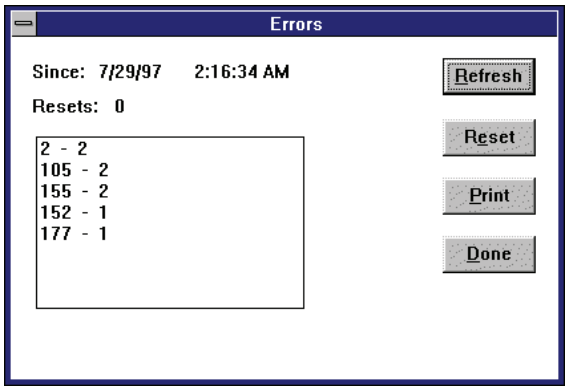
When **Update** is pressed, the current state of the alarm relays, analog outputs, and motion alarms are displayed if installed. If you wish to erase the battery-backed RAM, click the erase button. When you are finished with this screen, click **Done**.

Error

When the **Error** button is pressed, the blank Errors screen is displayed. **This function should be used only by trained HunterLab personnel.**

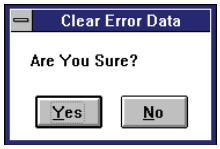


When **Refresh** is pressed, the number and type of errors and the number of resets since the last time this screen was displayed are reported.

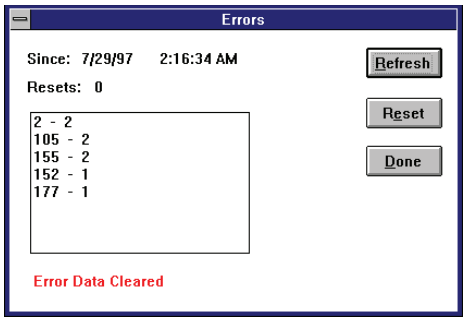


When **Reset** is pressed, you are asked if you wish to clear the error data reported on the screen.

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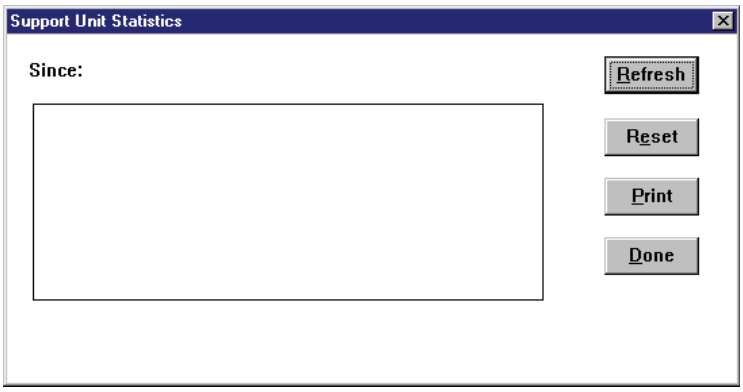
If **Yes** is chosen, the error data is cleared.



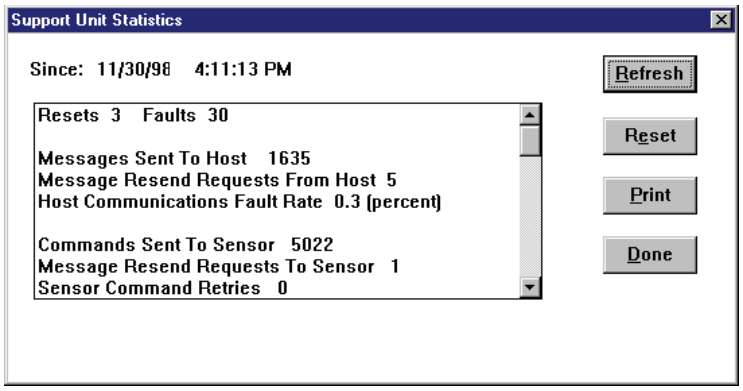
Press **Done** to exit the Errors screen.

Stats

When the **Stats** button is pressed, the following screen is displayed.



Press **Refresh** to display program statistics as received from the support unit. This information can be used to detect problems with the operation of the support unit. This feature is designed for HunterLab's use in diagnosing problems.

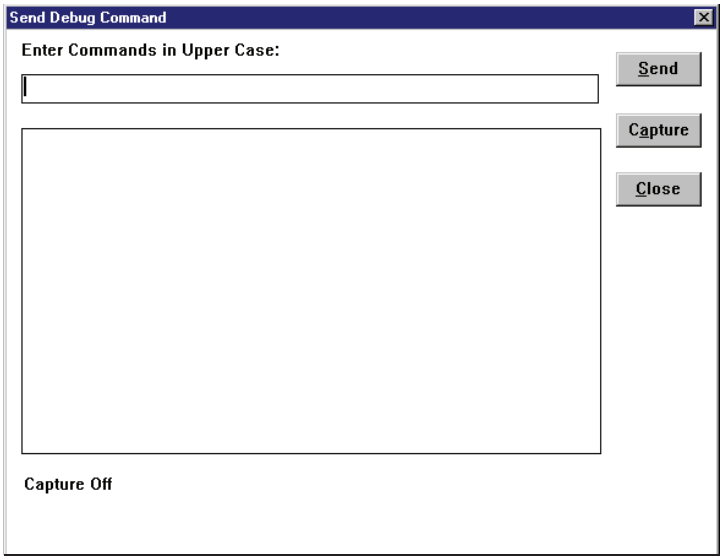


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You may press **Reset** to clear the statistics and/or **Print** to print the statistical data. Press **Done** to exit this screen.

Debug

When the **Debug** button is pressed, the blank Send Debug Command screen is displayed. **This function should be used only by trained HunterLab personnel.**



If desired, type debugging commands in upper case letters and press **Send** to send the commands to the support unit and sensor. The **Capture** button enables saving of the debug data to a file called DEBUG.TXT in the software installation directory. To exit this screen, click **Close**.

Note: The command for entering "transparent mode," which allows downloading of sensor firmware directly through the support unit, is "TRANSPARENT ON." This feature is intended for use by HunterLab Service personnel.

Done

Press **Done** to exit the Diagnostics screen.

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Run Group Configuration

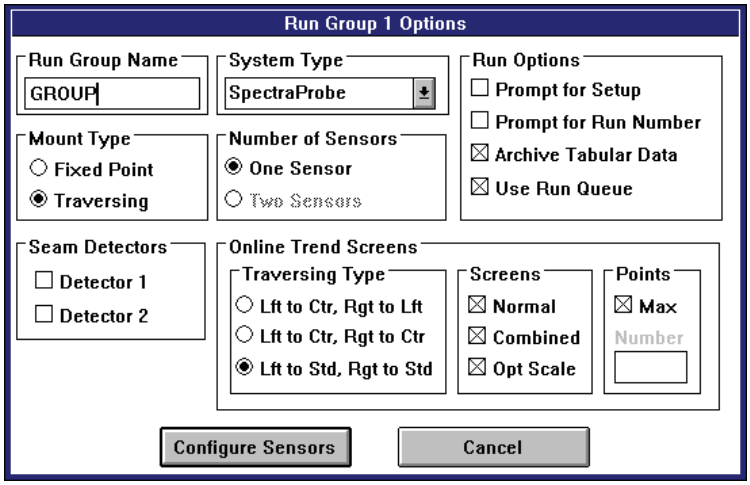
There are several screens that control run group configuration. You can access each successive screen after you complete the previous screen.

The Run Group Configuration is set at the factory and normally does not need to be changed. If changes are made, however, exit the program and restart it.

*Note: Changes will not be made to the sensor configuration if the **Cancel** button is pressed.*

Run Group Options Screen

From this screen, shown below, you can enter a name for the run group, designate the sensor to be used, designate the mount type, and select options to control the run which prompt for the setup, the run number, and archiving of tabular data. Also, you may set up what data the trend screens will display. Once you have made all your desired selections you can move to the second screen.



RUN GROUP NAME

The text entered in this field appears in the caption of message boxes to indicate the run group to which the message applies. You may enter a name for the run group.

SYSTEM TYPE

Select the type of system that has been installed. Choose SpectraProbe for your SpectraProbe XE system.

MOUNT TYPE

Select either Fixed Point or Traversing for the mount type. Dual position rails are considered traversing.

NUMBER OF SENSORS

One Sensor is currently the only option available.

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SEAM DETECTORS

There are two seam detector inputs available on the hardware for retracting to external events. The operations for each detector are configured in the Seam Detector Setup dialog box.

There are five basic actions which the system can perform on a seam break:

1. Roll Change
2. Move Offline
3. End Run
4. Check Run Queue
5. Trigger Start Reading

In addition, if the Roll Change action is chosen, the following roll reports can be printed:

1. Trend
2. Shade.

The Roll Change and Move Offline actions can be both configured to occur on a single seam input. The End Run action should be assigned to its own seam input (with Roll Change and Move Offline not selected).

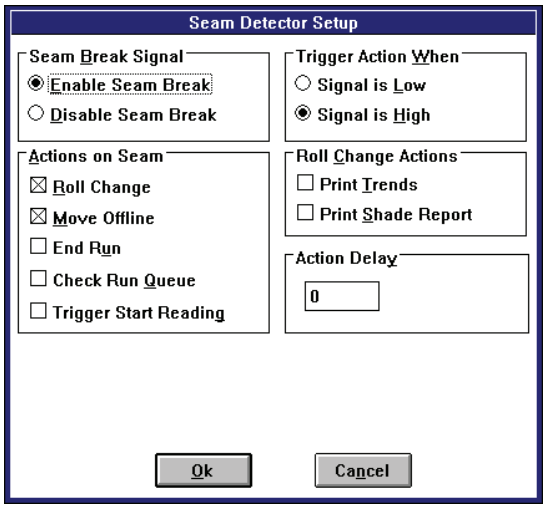
When Move Offline is chosen and the seam input is activated, the sensor will move to the right tile position and remain there until the signal is removed (at which point the run will continue with a Product Break message showing up in the Event Log).

When a Roll Change signal occurs, a vertical white line will appear in the trend screens and a Roll Change message will appear in the Event Log.

Selection of Detector 1 allows Seam Detector 1 to be set. When the text is clicked with the mouse the Seam Detector Setup dialog box appears.

Detector 2 allows the options for Seam Detector 2 to be set. As with Seam Detector 1, when the text is clicked with the mouse the Seam Detector Setup dialog box appears.

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Seam Detector options are as follows:

Seam Break Signal

Choose either to enable or disable the seam break. Enable Seam Break enables the seam signal and enables other controls. Disable Seam Break disables the seam signal and disables the controls.

Trigger Action When

Choose to trigger the seam break signal when the signal is either low (open) or high (closed).

Actions on Seam

When the seam break signal is detected, actions available are to: Roll Change, Move Offline, End Run, Check Run Queue, or Trigger Start Reading.

Roll Change - a roll change will occur when the seam input is activated. Further options can be selected in the Roll Change Operations group.

Move Offline - the sensor will move to the right tile position and wait until the seam signal is removed.

End Run - the current run will end on the seam signal.

Check Run Queue - the run queue will be checked as one of the actions on seam input.

Trigger Start Reading - the sensor will begin to read when the seam input is detected, although a run is already in progress.

Roll Change Actions

This group is enabled when the “Roll Change” option in “Actions on Seam” is checked. When the roll change action is begun, available options are to Print Trends (trend plots for the last roll are printed) or Print Shade Report (shade report for the last roll is printed).

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Action Delay

This parameter indicates how much product passes the sensor after the seam input is sensed before the action chosen in Roll Change Actions takes place. The units will be the same as the data collection units specified in the Product Setup. This parameter is relevant only when distance-based measurements are made.

OK

Select **OK** to accept all changes made to the Seam Detector Setup.

ON-LINE TREND SCREENS

Traversing Trend Type provides three choices of trend data display for a traversing system:

Left to Center, Right to Left - 1) Center to Standard, 2) Left to Center, 3) Right to Left

Left to Center, Right to Center - 1) Center to Standard, 2) Left to Center, 3) Right to Center

Left to Standard, Right to Standard - 1) Center to Standard, 2) Left to Standard, 3) Right to Standard.

You may choose to view normal, combined, and/or optional scale trend screens and a given number or all points.

RUN OPTIONS

Selection of **Prompt for Setup** prompts you to enter the name of the setup when the Start button is pressed.

Selection of **Prompt for Run Number** prompts you to enter the number of the lot/roll when the Start button is pressed. You must select this option if you wish to use the lot name as your file name when sending run data to a file.

Selection of **Archive Tabular Data** archives the run's tabular data. If tabular data is not required, leaving this box unchecked will save disk space.

Selection of **Use Run Queue** enables the run queue and allows automatic changing of runs based on a list of product setups. When the run queue is enabled, the Queue button appears on the tool bar.

CANCEL

Cancel allows you to return to the System Maintenance Menu without saving your changes.

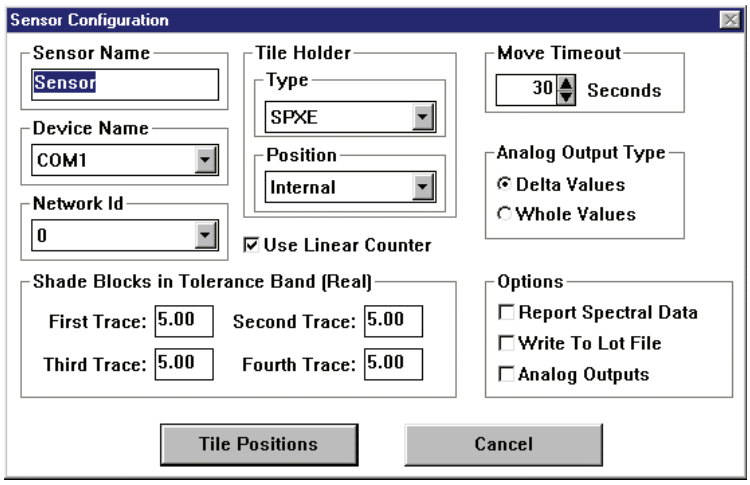
CONFIGURE SENSORS

When you have made all the desired selections use **Configure Sensors** to move to the Sensor Configuration screen.

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Sensor Configuration Screen

There is a second run group screen available for the sensor as shown below. When you have completed the selections for the first screen, Configure Sensors moves you to the second screen for the sensor.



SENSOR NAME

You can enter a name for the sensor. The sensor name is used in the caption of dialog or message boxes. It is not required (can be left blank) if there is only one sensor in the run group.

DEVICE NAME

Make a selection for the serial port where the sensor is attached.

NETWORK ID

Select a value from 0 to 3 for the ID of the SpectraProbe XE support unit that is controlled by this run group. The network ID must also be set in the support unit using shunts as described in the paragraph below.

Each support unit on the RS-485 network must have a unique ID (from 0, 1, 2, or 3). The network ID is set using three jumper pins on connector J1 (LPT1) on the embedded PC board. The three sets of jumper pins are located next to the programming pair (pins 25 and 26) on the board. They are referred to as ID1, ID2, and ID3:

Name	Pins
ID1	23 and 24
ID2	21 and 22
ID3	19 and 20

The jumpers are set as follows:

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ID Value	ID1	ID2	ID3
0	OFF	OFF	OFF
1	ON	OFF	OFF
2	OFF	ON	OFF
3	ON	ON	OFF

Note: The ID value is set as a binary number with ID1 and the least significant bit. If only one support unit is on the network, then these jumper pins should be left off to assign an ID of zero.

TILE HOLDER

Select the type and position of the tile holder. "SPXE" refers to the internal (automatic) tile holder, whereas "Manual" refers to the simple, non-pneumatic tile holder. For position, choose "Internal" for the automatic tile holder mounted on the sensor and "Under Sensor" for fixed point clip-on tile holders. If your automatic tile holder is mounted at either the Right Tile or Left Tile position rather than on the sensor, choose that position from the drop-down box.

USE LINEAR COUNTER

Select Use Linear Counter if this option was purchased. **This parameter is set at the factory and should not be changed.**

MOVE TIMEOUT

30 seconds is appropriate for fixed mount systems, 45 seconds for traversing mount systems. Available choices range from 1 to 150 seconds.

ANALOG OUTPUT TYPE

Enabling this function changes the optional analog outputs from representing difference between measured values and standard values (delta) to representing whole scale measured values.

SHADE BLOCKS IN TOLERANCE BAND (REAL)

Enter the number of shade blocks allowed within the tolerance band for each scale and index parameter. This entry is only relevant if shade sorting is being used.

OPTIONS

Report Spectral Data

Report Spectral Data is used if you are acquiring spectral data from the remote data serial output. Otherwise, it should be unchecked.

Write To Lot File

When Write To Lot File is checked, the color data from a run is written to an ASCII file on the disk using the name of the current lot as the file name. In order for this feature to work, Disk File must also

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be checked in the System Options dialog box and Prompt for Run Number must be checked on the Run Group Options screen.

Note: This file can employ a long file name if you are using Windows 95 or 98. If you are using Windows 3.1, the file name will be truncated to eight characters. If the lot/file name already exists, the existing file will be appended.

Analog Outputs

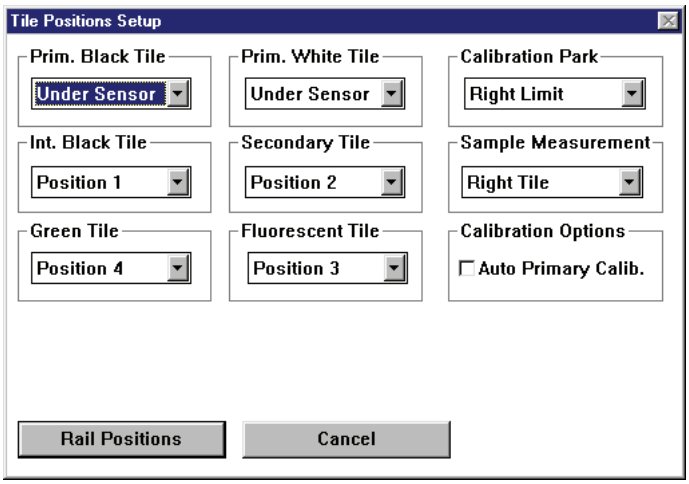
Analog Outputs is checked to activate the analog outputs.

TILE POSITIONS

Select **Tile Positions** to move to the next Run Group screen.

Tile Positions Setup Screen

The third run group screen is shown below. The "positions" refer to positions in the automatic tile holder. "Tile Box" means inside the tile box. "Under Sensor" means that you will be prompted to place the tile under the sensor during calibration. This choice is used when the tile holder is a clip-on type and the sensor is stationary. "Offline" is the off-line position for a dual point mount. "Right Tile" is the right tile position of a traversing mount.



PRIM. BLACK TILE

Select the position at which the black tile is to be read during calibration.

INT. BLACK TILE

Select the position at which the internal black tile (the one in the tile holder) is to be read during calibration.

GREEN TILE

Select the position at which the green tile is to be read during calibration.

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PRIM. WHITE TILE

Select the position at which the primary white tile is to be read during calibration.

SECONDARY TILE

Select the position at which the secondary tile is to be read during calibration.

FLUORESCENT TILE

Select the position at which the fluorescent standard is to be read during calibration.

CALIBRATION PARK

Select where the sensor is driven to be clear of the tile positions during primary calibrations and sensor measurements. Use "Online" for dual point mount systems, "Right Limit" for traversing mount systems, and "Under Sensor" for sensors on a stationary (fixed) mount.

SAMPLE MEASUREMENT

Select where samples are to be placed during sample measurement. This position can be overridden in the Sample Measurement dialog box.

CALIBRATION OPTIONS

Check the box next to Auto Primary Calib. if you wish to perform primary calibration with the primary black and white tiles inside the automatic tile holder. In order to do so, you must also set the Prim. Black Tile to Position 1, the Prim. White Tile to Position 2, and the Secondary Tile also to Position 2. This will cause primary calibration to occur without any prompting to the operator.

RAIL POSITIONS

Select **Rail Positions** to move to the next run group configuration screen, Rail Positions and Motion Controller.

CANCEL

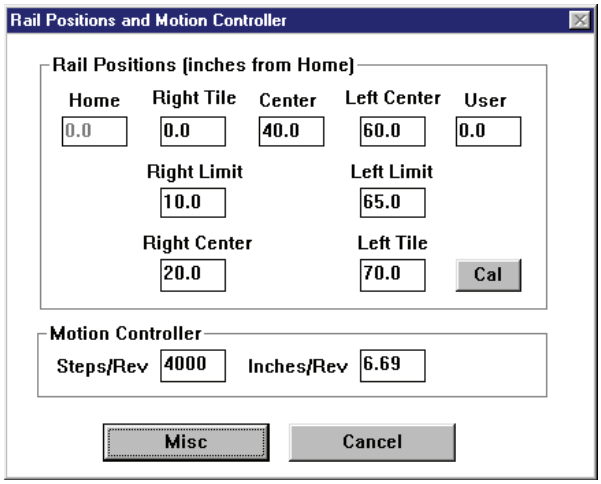
Select **Cancel** to return to the Offline Functions Menu without modifying the current run group configuration.

Rail Positions and Motion Controller Screen

The Rail Positions and Motion Controller screen, shown below, allows you to set the traversing system rail positions relative to the preset Home position. With Home assigned a location of 0.0, type the location of each switch position into its box. The location should be the distance from Home in inches. Also enter motion controller parameters. The default values are 4000 Steps/Revolution and 6.69 Inches/Revolution. After the correct values are entered, click **Misc** to continue to the Miscellaneous Parameters screen.

Note: The motion controller parameters are normally set by HunterLab and should not be changed. If you are unsure what your values should be, please contact HunterLab.

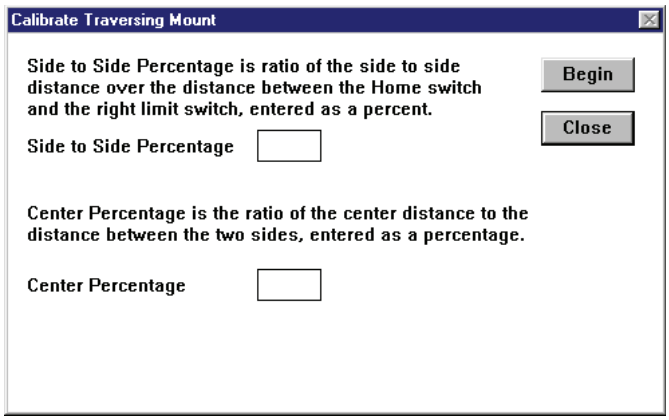
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Note: "Right" is the side of the rail that is closest to the Home position.



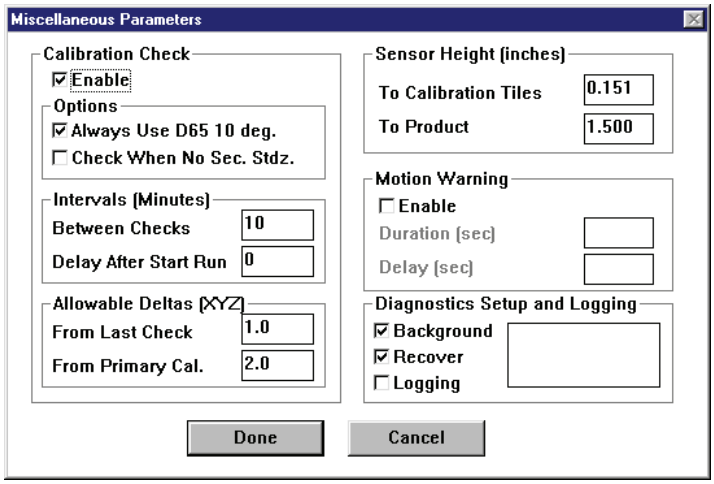
Alternately, you can click the **Cal** button to have the support unit detect the proper traversing mount positions. You then have to enter the desired side-to-side value, as a percent, between the home switch and the left limit switch (the percentage of the Left Limit minus Right Limit positions over the distance between the two switches) and the desired center value as a percent. This is the distance between Left Center and Right Center over the side-to-side distance from Left Limit to Right Limit. Then, press **Begin** and the support unit will return the correct rail positions, rounded to the nearest inch. These values can either be accepted or can be changed in the Rail Positions and Motion Controller dialog box.



Miscellaneous Parameters Screen

The Miscellaneous Parameters screen allows you to set up the green calibration tile check option and to indicate the position of the sensor. In the Calibration Check area of the box, check Enable to enable automatic checking of the green calibration check tile at the end of primary calibration and at specified intervals thereafter.

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OPTIONS

Always Use D65 10 deg.

Check Always use D65 10 deg. if you wish the green tile data to be stored and displayed using the D65 illuminant and 10 degree observer. If this box is not checked, the data will be displayed and saved using whatever illuminant and observer are being used in the current setup when primary calibration is performed.

> *Note: If you change the illuminant and observer for the calibration check, you will then have to either perform a primary calibration or use the Read and Save Check Tile operation in the Calibration menu in order to resave the new calibration check values.*

Check When No Sec. Stdz.

If "Check When No Sec. Stdz." is chosen, the green tile check is performed during a run even when secondary standardization is not enabled. Otherwise, the calibration check will be performed only when secondary standardization is enabled.

INTERVALS

Between Checks

Enter a whole number to indicate the number of minutes between green calibration tile checks during the run.

Delay After Start Run

Enter a whole number for the number of minutes that should elapse after the start of a run before the first green calibration tile check is performed.

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ALLOWABLE DELTAS (XYZ)

From Last Check

If any of the XYZ values read during a green tile check differs by more than this delta from the last check, then the message "Check Tile Drift 1" will be displayed in the Event Log. A value of 0.3 is suggested.

From Primary Cal.

If any of the XYZ values read during a green tile check differs by more than this delta from the value saved at primary calibration, then the message "Check Drift Tile Check 2" will be displayed in the Event Log.

SENSOR HEIGHT (INCHES)

Enter the position in inches of the sensor (relative to the z-axis home switch at the top of the z-axis travel) over the calibration tiles in the tile holder and over the product line. These values control the z-axis positions for calibration and reading. The "To Product" value should be about 2 inches. It should be adjusted until the physical distance from the bottom of the bezel to the surface of the product measures 1.5 inches ± 0.05 inch. Correct entry of these values allows for accurate calculation of color values.

> *Note: Do not modify the factory setting for "To Calibration Tiles." The "To Product" value is determined during initial system installation and whenever the position of the product plane changes. For example, if the product changes thickness such that its surface gets closer to or further from the sensor, then the "To Product" distance must be changed accordingly. See the installation chapter of the SpectraProbe XE Hardware manual for instructions.*

MOTION WARNING

Check Enable to enable to traversing system warning and configure its parameters.

DIAGNOSTICS SETUP AND LOGGING

Check Background to perform background diagnostics on the support unit. This item should normally be checked.

Check Recover to cause the support unit to automatically try to recover from certain diagnostic faults. This item should normally be checked.

Check Logging to log certain messages from the support unit to spxe_log.txt in the directory where you installed MultiSensor Software (normally C:\MSS). Once this box is checked, you may select the type(s) of messages to log from the list that appears in the box to the right of this area. Normally, Logging should remain unchecked unless you are diagnosing hardware problems in the support unit.

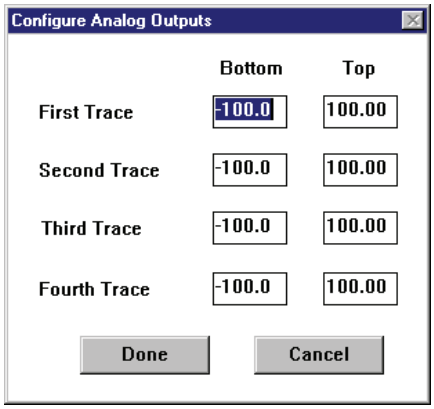
After entering all desired values, click **Done**. If Analog Output was turned on previously and the Analog Output type is Whole Values, the Configure Analog Outputs screen will be shown next. Otherwise, run group configuration is complete.

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Configure Analog Outputs Screen

The Configure Analog Outputs dialog box is shown only if Analog Outputs is checked on the Sensor Configuration screen. This screen allows entry of whole values or delta values for zero and full scale for each trace.

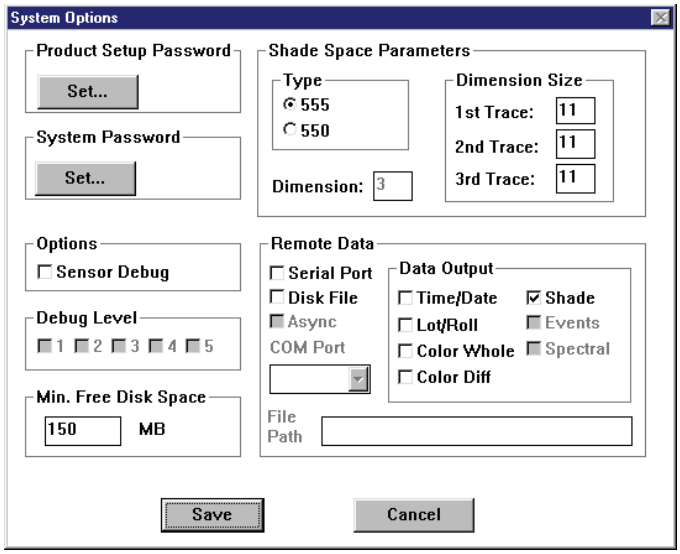
For example, if the second trace is the Hunter "a" value and you wanted a value of -50 to be bottom of scale (0 volts) and +50 to be top of scale (10 volts) then you would enter -50.0 for Second Trace/Bottom and 50.0 for Second Trace/Top.



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System Configuration

From this screen you can enter a system password or a product setup password, specify a remote computer, or enable the remote calibration feature. You can also set your shade sorting parameters if shade sorting is being used. Once you have made all the desired selections you can save them in memory. The System Options screen is shown below.



The System Configuration is set at the factory and normally does not need to be changed. If changes are made, then exit the program, close it, and restart it.

Product Setup Password

A product setup password can be created to regulate editing of product setups.

System Password

A system password can be created to regulate access to the system configuration and run group configuration.

Shade Space Parameters

Select the type of shade sorting system (555 is typical and 550 is a special), and the dimensions for the system. Dimension is the number of digits in the shade number (typically 3). Dimension size is the number of values that each digit (dimension) of the shade number can have. This value is normally 11, which allows "-", 1, 2, 3, 4, 5, 6, 7, 8, 9, and "+" as characters in the shade number.

Options

This selection, along with the Debug Level area, is used by HunterLab Service personnel.

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Min. Free Disk Space

This area allows you to set the minimum free disk space for automatic deleting of archives. Enter an integer greater than or equal to five (megabytes). Archives will then be automatically deleted (oldest archives first) when the free disk space reaches this threshold level.

Remote Data

Check Serial Port to send the data out a serial port to a remote computer or Disk File to export the data to an ASCII text file on this computer's hard drive. You can specify a COM port for the remote computer. "COM1" through "COM4" designate standard COM ports. "COM5" through "COM 8" represent ports on the Longshine RS232x4 serial card. If Disk File was chosen, type the drive and directory for the storage of the file in the File Path box. (Make sure the directory already exists; the software will not create it.) Choose all the data you'd like to send to the remote computer. Check "Async" if you would like the remote data sent asynchronously (without being polled). If Async is not checked, the data will be sent synchronously (polled).

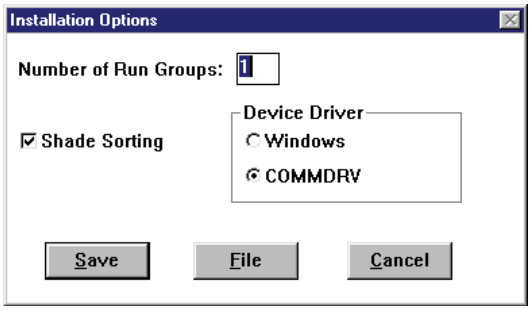
Note: If "Spectral" is checked under "Data Output," you should also check "Report Spectral Data" in the Spectra-Probe Options area of the Sensor Configuration screen shown on page 12-14.

Note: The communications settings for the remote computer serial port are 9600, n, 8, 1.

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Installation Options

This screen can only be accessed by HunterLab Service personnel.



The Installation Options dialog box is accessed from the System Maintenance Menu. A password must be entered. The program should be restarted after making changes to any of these parameters.

Number of Run Groups

This indicates the number of run groups that the program will support (from 1 to 4).

Shade Sorting

When this box is checked shade sorting is enabled.

Device Driver

Device Driver chooses whether the standard Windows communications driver or the Willies Computer Software (COMMDRV) is used.

Serial communication using the Windows driver will function under all operating systems, whereas serial communications using the COMMDRV driver type will only function under Windows 3.x, Windows 95, and Windows 98.

> *Note: If you choose the Windows type of driver, you must use the normal PC serial ports (COM1 through COM4) to communicate with the sensor. The 4-port serial (Longshine) card may not be used with the Windows driver.*

File

This command brings up a dialog box that allows the support unit firmware to be updated. **This function should be used by trained HunterLab personnel only.**

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Previous

Selection of **Previous** returns you to the Offline Functions Menu.

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Chapter Thirteen

Measurement Values

All of the color scales available with MultiSensor XE are described below.

Color Scales

CIE Tristimulus XYZ Scale

MultiSensor XE Software performs integration of reflectance values over the visible spectrum to arrive at tristimulus X, Y, and Z values. These values simulate the color matching response functions of the human observer as defined by the 1931 2° Standard Observer or the 1964 CIE 10° Standard Observer. Tristimulus integrations based on any or all of the illuminants may be selected. For a complete description of how to calculate tristimulus values, refer to the publication CIE 15.2 and to ASTM Method E308.

CIE Chromaticity Coordinates, Yxy

The relationship between CIE XYZ values and the x,y chromaticity coordinates is as follows:

$$Y = \text{CIE Tristimulus Y (as above)} \qquad x = \frac{X}{X + Y + Z} \qquad y = \frac{Y}{X + Y + Z}$$

Opponent-Color Scales (Hunter Lab, CIE 1976 L*a*b*, and CIELCh)

The opponent-color scales give measurements of color in units of approximate visual uniformity throughout the color solid. Thus, in the **Hunter scale**, L measures lightness and varies from 100 for perfect white to zero for black, approximately as the eye would evaluate it. The chromaticity dimensions (a and b) give understandable designations of color as follows:

a measures redness when positive, gray when zero, and greenness when negative.
b measures yellowness when positive, gray when zero, and blueness when negative.

The relationship between the Hunter Lab Scale and the CIE XYZ Scale for the CIE 1931 2° Standard Observer and the CIE 1964 10° Standard Observer is as follows:

$$L = 100\sqrt{\frac{Y}{Y_n}}$$

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$$a = K_a \frac{X/X_n - Y/Y_n}{\sqrt{Y/Y_n}}$$

$$a = K_b \frac{Y/Y_n - Z/Z_n}{\sqrt{Y/Y_n}}$$

where:

X, Y, and Z are CIE tristimulus values.

X_n, Y_n, and Z_n are tristimulus values of the standard illuminant as listed in ASTM E308 with Y_n always equal to 100.00 (normalized).

K_a and K_b are chromaticity coefficients for the illuminant used (see ASTM E308).

Illuminant A represents incandescent lamplight with an approximate color temperature of 2854 K. Illuminant C represents light from an overcast sky with a correlated color temperature of approximately 6770 K. Illuminants D65, D50, and D75 represent daylight with correlated color temperatures of approximately 6500 K, 5000 K, and 7500 K, respectively. Illuminants F02, F07, and F11 are fluorescent illuminants.

The **CIE 1976 L*a*b* Scale** is recommended by the Commission Internationale de l'Eclairage (CIE). It is a simplified cube root version of the Adams-Nickerson space produced by plotting the quantities of L*a*b* in rectangular coordinates.

The relationship between the CIE L*a*b* scale and the CIE XYZ scale for any illuminant referenced in ASTM E308 is as follows:

If all values of X/X_n, Y/Y_n, and $Z/Z_n > 0.008856$, use the following:

$$L^* = 116 \sqrt[3]{\frac{Y}{Y_n}} - 16$$

$$a^* = 500 \left(\sqrt[3]{\frac{X}{X_n}} - \sqrt[3]{\frac{Y}{Y_n}} \right)$$

$$b^* = 200 \left(\sqrt[3]{\frac{Y}{Y_n}} - \sqrt[3]{\frac{Z}{Z_n}} \right)$$

If any value of X/X_n, Y/Y_n, or $Z/Z_n \leq 0.008856$, use the following:

$$L^* = 903.3 \frac{Y}{Y_n}$$

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$$a^* = 500\left[f\left(\frac{X}{X_n}\right) - f\left(\frac{Y}{Y_n}\right)\right]$$

$$b^* = 200\left[f\left(\frac{Y}{Y_n}\right) - f\left(\frac{Z}{Z_n}\right)\right]$$

where:

$$f\left(X/X_n\right) = \sqrt[3]{X/X_n} \qquad X/X_n > 0.008856$$

$$f\left(\frac{X}{X_n}\right) = 7.87\left(\frac{X}{X_n}\right) + \frac{16}{116} \qquad X/X_n \le 0.008856$$

$$f\left(Y/Y_n\right) = \sqrt[3]{Y/Y_n} \qquad Y/Y_n > 0.008856$$

$$f\left(\frac{Y}{Y_n}\right) = 7.87\left(\frac{Y}{Y_n}\right) + \frac{16}{116} \qquad Y/Y_n \le 0.008856$$

$$f\left(Z/Z_n\right) = \sqrt[3]{Z/Z_n} \qquad Z/Z_n > 0.008856$$

$$f\left(\frac{Z}{Z_n}\right) = 7.87\left(\frac{Z}{Z_n}\right) + \frac{16}{116} \qquad Z/Z_n \le 0.008856$$

and X_n, Y_n, and Z_n are tristimulus values for any illuminant.

CIE LCh is a modification to the CIELAB scale which plots in polar coordinates rather than rectangular ones. See "Recommendation on Uniform Color Spaces, Color Difference Equations, Psychometric Color Terms," Supplement No. 2 to *CIE Publication No. 15* (E-1.3.1) CIE, Paris, 1978.

$L^* =$ CIE 1976 psychometric lightness $= 116\sqrt[3]{\frac{Y}{Y_n}} - 16$

$a^* =$ Red(+) - Green(-) axis $= 500\left(\sqrt[3]{\frac{X}{X_n}} - \sqrt[3]{\frac{Y}{Y_n}}\right)$

$b^* =$ Yellow(+) - Blue(-) axis $= 200\left(\sqrt[3]{\frac{Y}{Y_n}} - \sqrt[3]{\frac{Z}{Z_n}}\right)$

$C^* =$ CIE 1976 a,b chroma $= \sqrt{a^{*2} + b^{*2}}$

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h° = CIE 1976 a,b hue-angle = arctan (b*/a*)

The CMC versions of these values are the same.

Reference: Commission International de l'Eclairage (CIE): "Recommendations on Uniform Color Spaces, Color Difference Equations, Psychometric Color Terms," Supplement No. 2 to *CIE Publication No. 15*, Colorimetry, Bureau Central de la CIE, Paris, 1978. For more information, see AATCC Test Method 173: *Calculation of Small Color Differences*.

Dominant Wavelength and Excitation Purity (DWEPY)

The dominant wavelength and excitation purity chromaticity system was one of the first systems for specifying the chromaticity of objects other than by their x,y values. It not only compensates for the influence of the illuminant's chromaticity, but also improves the correlation between the numbers and visual attributes because it permits chromaticity specification in terms of hue and saturation. The system is based on the additive-color-mixing properties of the x,y diagram. A color is specified by describing how it would be matched by additively mixing the illuminant and light of some single wavelengths.

Dominant wavelength is the wavelength needed for mixture with the illuminant. In general, it identifies the hue of the object's color.

Excitation purity is the percentage contribution of the dominant wavelength to the mixture. Thus, 1.00 is the purity of all spectral colors and zero is the purity of the illuminant. Excitation purity corresponds with saturation.

In order to derive dominant wavelength and excitation purity for a sample, plot the position of the illuminant C - object color combination on the CIE x,y chromaticity diagram. The dominant wavelength for sample S under illuminant C is found by drawing a straight line from the illuminant C point through S to the spectrum locus, where it intersects at the dominant wavelength. Excitation purity is the percentage of the distance from illuminant C to S compared to the total distance from illuminant C to the spectrum locus.

Dominant wavelength and excitation purity are calculated for the wavelengths of 397-673 nm. These values are always calculated and displayed relative to the CIE 1931 2° standard observer and illuminant C regardless of the selected illuminant and observer. For complementary wavelengths, the displayed values are zero.

For further information, see "A Digital Computer Technique for Calculation of Dominant Wavelength" by Charles G. Leete and Jack R. Lytle in *Color Engineering*, Volume 4, No. 1 (January-February 1966).

FMC2 (Friele-MacAdam-Chickering) Color Difference

Red-green (RG) differences, yellow-blue (YB) differences, total lightness differences (DL), and total color differences (DE) between standard and sample are computed according to the Friele-MacAdam-Chickering metric (*JOSA*, February 1968, p. 292 and August 1969, p. 986).

The FMC2 unit of color difference is based on just-noticeable, or threshold, color difference data published in 1942. Friele used the data in his suggested color-difference formula, which was modified later by MacAdam, and then by Chickering. The FMC2 scale is a color difference scale only and was

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designed for illuminant C and 2° standard observer conditions only. It has been successfully used for non-saturated colors under illuminants D65 and A, as well as 10° observer conditions.

Hunter Rdab Color Scale

The relationship between the Hunter Rd,a,b values and the CIE XYZ values for any illuminant is as follows:

$$R_d = Y$$

$$a_{Rd} = K_a f(Y)\left(\frac{X}{X_n} - \frac{Y}{Y_n}\right)$$

$$b_{Rd} = K_b f(Y)\left(\frac{Y}{Y_n} - \frac{Z}{Z_n}\right)$$

where

$$f(Y) = 0.51\,\frac{21 + 0.2Y}{1 + 0.2Y}.$$

See ASTM E308 for values of K_a, K_b, X_n, and Z_n. Y_n is always equal to 100.00.

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Color Difference Scales and Indices

TAPPI Brightness, BT

BT is an approximation of TAPPI brightness. TAPPI Brightness is the reflecting power of an infinitely thick stack of material measured in blue light with a centroid wavelength of 457 nm under spectral and geometric conditions of measurement as specified in TAPPI method T-452.

C*

C* refers to the CIE L*C*H* color difference scale and is simply the difference in C* values, where C* is defined as:

$$C^* = \sqrt{a^{*2} + b^{*2}}$$

E*, E, and Ef

E* and E are total color differences between a sample and a product standard calculated using either the CIE L*a*b* or Hunter Lab difference values:

$$DE^* = \sqrt{DL^{*2} + Da^{*2} + Db^{*2}}$$

$$DE = \sqrt{DL^2 + Da^2 + Db^2}$$

Ef is the DE color difference for the FMC2 scale.

Ecmc and Tolerances

If CIE L*a*b* is the color scale and ΔCIE L*C*H* is the color difference scale, then Ecmc may be selected as a single number measurement scale.

Selection of Ecmc provides for automatic tolerancing. When you select Ecmc and read the standard, Ecmc is set equal to 1.0. The tolerances for DL*, DC*, and DH* are then generated automatically based on the CMC calculations for visually acceptable color differences. The CMC calculations are made using a specified lightness to chroma ratio (l:c). Selection of Ecmc may help you determine tolerances for your product standard.

The equation for Ecmc < 1 describes an ellipsoidal volume with axes in the direction of lightness and chroma and hue centered about a standard. When the semi-axis lengths for the Ecmc formula equal the calculated values for the standard, the resulting ellipsoid describes a 1.0 DEcmc unit volume/tolerance. This volume and the size of its component parts become the basis for the establishment of an appropriately sized volume of acceptability for a given commercial situation by the application of a commercial factor (cf).

When l = 2.0 and c = 1.0, the equation fixes the ratio of the three components (SL:SC:SH) to correlate with visible assessment of typical textile samples. Other values of l may be required in cases where the surface characteristics change dramatically. The value of c is always left at 1.0.

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For a more detailed description of CMC, refer to *Calculation of Small Color Differences for Acceptability*, AATCC Test Method 173-1992 published in the AATCC Technical Manual.

Whiteness Index, WI

WI measures the degree of whiteness. Normally, a product is measured for whiteness before and after processing. Whiteness is measured using ASTM method E313.

WI E313 = 3.388Z - 3Y.

Whiteness Index Ganz

Whiteness Index-GANZ = DY + Px + Qy + C for D65/10°

where

$$D = \frac{\delta W}{\delta Y} = 1$$

$$P = \left(\frac{-\delta W}{\delta S}\right) * \left(\frac{\cos(\varphi + \eta)}{\cos(\varphi)}\right) = -1868.322$$

$$Q = \left(\frac{\delta W}{\delta S}\right) * \left(\frac{\sin(\varphi + \pi)}{\cos(\varphi)}\right) = -3695.690$$

$$C = \left[W_0 * \left(1 - \frac{\delta W}{\delta Y}\right)\right] - \left(P_{X_n}\right) - \left(Q_{y_n}\right) = 1809.441$$

Y, x, and y are the CIE Chromaticity Coordinates

φ = the hue preference in reference to the perpendicular to the reference dominant wavelength (RWL) = 15°

η = the angle between the RWL and the x-axis of the chromaticity chart = 48.18154°

$\frac{\delta W}{\delta Y} = 1$ = contribution of lightness to whiteness

$\frac{\delta W}{\delta S} = 4000$ = contribution of saturation to whiteness

$W_0 = 100$ = degree of whiteness of physical ideal white

$$x_n = \frac{X_n}{(X_n + Y_n + Z_n)} = 0.313795$$

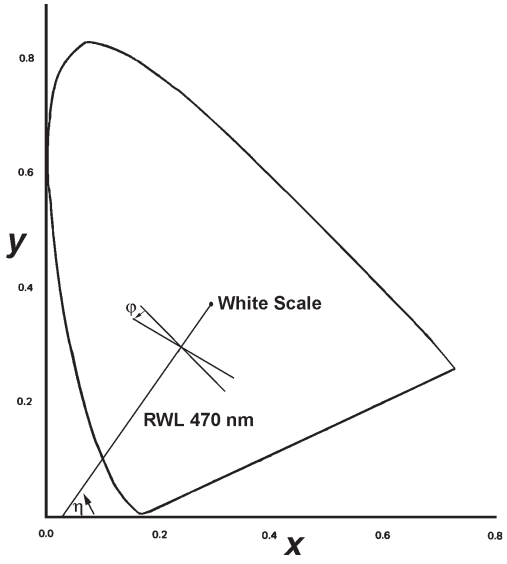
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$$y_n = \frac{Y_n}{(X_n + Y_n + Z_n)} = 0.330972$$

$X_n = 94.81$ (for D65/10°)

$Y_n = 100$ (for D65/10°)

$Z_n = 107.33$ (for D65/10°).



Yellowness Index, YI

YI is used to measure yellowness from degradation by light, chemical exposure, or processing. YI is measured using ASTM method D1925.

$$YI\ D1925 = \frac{100\,(1.28\,X - 1.06\,Z)}{Y}.$$

Paper Brightness (Z%)

Paper brightness, Z%, is used in the evaluation of the degradation of white materials. It can also be a measure of the effectiveness of bleaching.

$$Z\% = \frac{Z}{1.08103}.$$

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