SHARKLog XRay

SHARK®Log XRay
Operator's Manual
Software Version 6.25

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Tectronix Systems Inc
9 – 18812 96th Ave.
Langley BC   V4N 3R1

www.metal-shark.com

1   SYSTEM INFORMATION

Customer Name: _____

Location: _____

Date in Service d/m/y: _____

     We would like to take this opportunity to thank you for purchasing your SHARK®Log Xray scanner from Tectronix. The confidence you have placed in our product is sincerely appreciated and we will endeavor to provide the best service and support possible.

     Please take the time to read the User Manual completely as this provides you with the expertise necessary to install and adjust the system according to your requirements. In addition to this, you will learn about the sophisticated options provided by the SHARK®Log Xray electronics.

     If you have any problems in the set up and operation of your system, the Tectronix team are available to assist you**.**

Tectronix Systems inc.
Unit 9 18812 - 96th Ave
Surrey , British Columbia
Canada, V4N 3R1

Telephone: (001) 604 607-6028
**Fax: (001) 604 607-6026**
E-mail: service@metal-shark.com

Equipment Information Label

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2 GENERAL INFORMATION

SHARKLog XRay is a measuring system for determination of dimensions and grading of logs by means of X-ray beams. The measuring can be made on logs with bark and the result is a diameter measurement under bark.
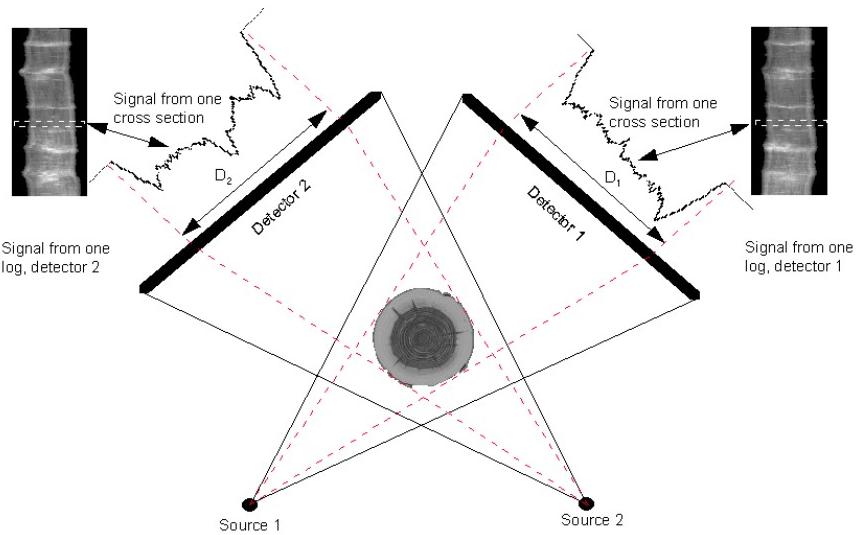
The Log Scanner contains two X-ray sources and two semiconductor X-ray detectors, set up so that two separate scaling directions are obtained.

The X-ray sources consists of X-ray tubes, especially developed for log scaling in an industrial environment, and the detector measures the radiation intensity at a number of points along the log's crosscut.

The logs pass the scanner on a measuring conveyor, with high positioning accuracy. As a result, a multi-dimensional "picture" of the log is obtained. In the system's computer, the picture is analyzed and dimension under bark is determined for the log. In addition to diameter at various points, volume, taper, sweep, ovality and other characteristics based on form are calculated.

Also other defects, such as whorl of branches, will give effect through variations in intensity. The size of these variations is the basis for the quality factor, which is a gauge of the log's timber grade. Through analysis of the inner characteristics the log can then be classified as but log, middle log or top log.

Log data from the Log Scanner are transmitted to a master control system for sorting, log rotation, etc.

3   OPERATING SECURITY

Since the radiation from the X-ray tubes can cause permanent damages to humans, special safety regulations have to be followed.

The sawmill is responsible that the system is operated in compliance with the legal regulations.

X-ray room

The scanner is placed in a room that is carefully shielded to prevent leakage of harmful radiation. The radiation levels in the immediate environment are measured at the time of the commissioning, and should later be checked at regular intervals.

To maintain the shield, any damages to the shield have to be repaired as soon as possible. No damage may be caused to the walls of the X-ray room, such as making holes, etc.

Only personnel trained in local radiation protection (the instructions applicable for the installation of the Log Scanner) are allowed in the X-ray room, which should be locked during operation. The radiation is immediately turned off if the door to the X-ray room is opened.

Warning lamps

A warning lamp above the scanner and one above the door to the X-ray room indicate that the power to the X-ray tubes is turned on.

4   SYSTEM DESCRIPTION

4.1   Included Units
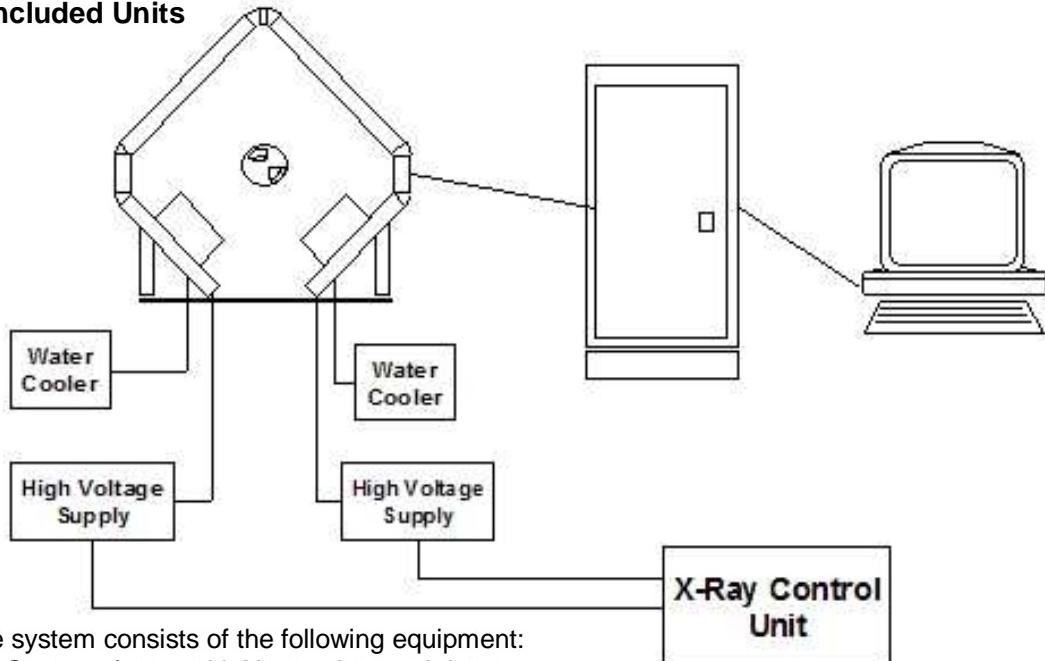
The system consists of the following equipment:
- Scanner frame with X-ray tubes and detectors.
- High voltage generators with coolers and control unit.
- Electronics cabinet containing Measuring computer, Operator's Computer and power supply.
- Operator's monitor, keyboard and mouse.

The Measuring Computer's monitor and keyboard is only used during commissioning and mainte-nance. All other communication with the system is done through the operator's PC.

Data communication with the host system, for example SHARK15 or SHARK21, takes place either through the network cable or by serial link.

Scanner

Both of the scanner's X-ray sources radiates the logs that pass through the measuring area. The ra-diation is caught up by detectors, that are scanned a large number of times per second. The measur-ing results are analyzed to produce a picture of the log under bark.

Operator computer

The Operator Computer (with VDU, keyboard and mouse) is used to
- start and stop the system
- set table values, parameters, etc that affect the system's functions
- indicate status in the measuring system
- verify measurement data or trouble-shoot
- calibrate

The operator computer is an Industrial PC with Microsoft Windows.

Measuring Computer
The Measuring Computer collects and analyses the data from the scanner. It also makes a final calculation of log data and handles all communication with the host system.

4.2 Sensors

The signals from the photocell and pulse encoder are used for log positioning and length measurements.

Photocell
The photocell determines where the log starts and ends, which results in a length value. To better handle logs with damaged ends, the photocell consists of one transmitter and two receivers:
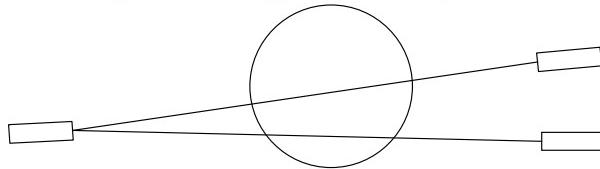
There is also a separate signal indicating if there is soil on the unit's window. It is important that the photocells are checked with regular intervals so that they are clean and in correct position

Pulse Encoder
The conveyor's position is determined by the pulse encoder, connected to the rotating wheel. The position value is a number between 0 and 65535 and can be checked in Tools – Test Functions – Sweep Data. Correct length measurement is dependent on the scale factor of the circumference of the rotating wheel; see Setup – Installation Parameters – Conveyor.

Temperature
The temperature is measured in the following locations:
Tube 1:   X-ray tube in direction 1.
Tube 2:   X-ray tube in direction 2.
Scanner: Inside the scanner at top.
Computer: Inside the computer rack, inside the cabinet.

The temperature readings are updated every 100 seconds and can be checked in Data for each log. In System Parameters there are settings for allowed temperatures, deviations from the limits will cause an alarm.

5 LOG DATA

The following Log Data are calculated by the system:

Length	Length measured by pulse encoder and photocell. Unit cm.
Sweep	Number of sections (lines) in the x-ray image.
Log-ID	Sequence number for each log 0,1,..65535,0,1,…
Diameters:	All diameters are calculated through linear regression of top data from the log. See Setup – System Parameters . Unit mm.
Top Dia 1	Diameter in direction 1
Top Dia 2	Diameter in direction 2
Top Dia	Minimum of TopDia1 and TopDia2
Avg Dia	Average of TopDia1 and TopDia2
Top Volume	Volume of a cylinder based on AvgDia and Length. Unit dm³.
Total Volume	Total volume calculated by adding the volume of all sections. Unit dm³.
Logtype	1 = Butt Log, 2 = Mid Log, 3 = Top Log, 0 = Unknown.
WhorlDist	Average distance between whorls. Unit cm.
Density	Average density of the whole log
HeartDia	Diameter of the heart. Unit mm.
Species	0 = Unknown, 1 = Pine, 2 = Spruce. Determined in one of the following ways:

Species (continued):

0 = Unknown, 1 = Pine, 2 = Spruce. Determined in one of the following ways:

Method 1: Determined only from SHARKLog XRay's SpeciesIndex, the limit value is the average of the two limit values given in System Parameters. If the SpeciesIndex is lower than this limit, the species is pine, otherwise it is spruce.

Method 2: Determined by using both SpeciesIndex and the decision from the operator.
- If the SpeciesIndex is in the "safe" area, below Upper Limit Pine or above Lower Limit Spruce, then the operator's input is excluded. The result will be Pine if the SpeciesIndex is below Upper Limit Pine, otherwise spruce.
- Else: If the operator's species and SHARKLog XRay's species are the same, this will be the result.
- Else: If the operator has a changed his decision from the last log, then the operator's species will be the result.
- Else: The species is determined as in method 1.

SpeciesIndex   Is normally a value between 0 and 300, where pine gives values up to a certain limit (e.g. 140) and spruce gives values from a limit (e.g. 160) and upwards. In between there is an "unsafe" interval. The limit values are set in Setup – System Parameters and is given as a fraction number (e.g. 140 is entered as 1.400)

Q-Gen   General quality index based on density variations in the log. A high number denotes a log with many internal density alterations, a "bad" log.

Q-Pine   Same as above but optimized for pine logs.

Q-Spruce   Same as above but optimized for spruce logs.

U/S Pine   Probability for U/S Pine. Integer 0..200. A high number denotes a "good" log.

U/S Spruce   Probability for U/S Spruce. Integer 0..200.

B Pine   Probability for Green knots Pine. Integer 0..200.

ARWPine   Annual Ring Width, calibrated for pine. Unit 1/10 mm, e.g. a value of 25 means a ring width of 2.5 mm.

ARWSpruce   Annual Ring Width, calibrated for spruce. Unit 1/10 mm

Spare1
Spare2   Up to 5 optional customer defined log qualities can be used.
Spare3
Spare4
Spare5

6   OPERATION

Any abnormal condition is presented in an Event List and the corresponding message is sent to the host system for presentation.

6.1   Event List

All events that occur in the system are stored in the event list. This list can be studied and handled through the menu selection Operation – Event list
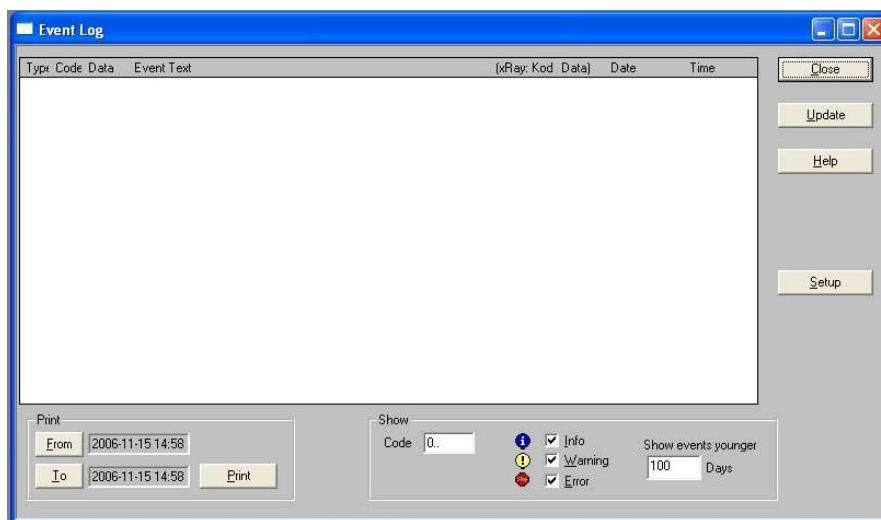
In the box **Show** it is possible to select what is to be shown in the list. Indicate in the boxes **Info, Warning** and **Fault** which type of events should be shown. With **Code** it is possible to show certain specific events.

If the whole or parts of the list is to be printed, this is done through the box at the lower left. Click on the first line wanted in the list and press **From**. Then click on the last line wanted in the list and press **To.** Press **Print** to start printout of all these events.

The following events exist:

| Code	Name	Action
19	Time to calibrate.	Time or temperature limit has been exceeded. Make a new calibration.
20	The door is open	When the door to the x-ray room is opened, the safety switch turns the x-ray off. When this happen, the system must be restarted manually, close the door first.
24	Soil on photocell	Clean or readjust the photocells.
27	Temperature limit exceeded	Check the temperature. 1=Tube 1, 2=Tube 2, 3=Scanner, 4=Computer
28	XRay shut down	X-ray images indicate no x-rays (black image). 1=Detector 1, 2=Detector 2, 11=Both detectors.

7 SETUP

All settings made on the operator computer are gathered under a common menu:
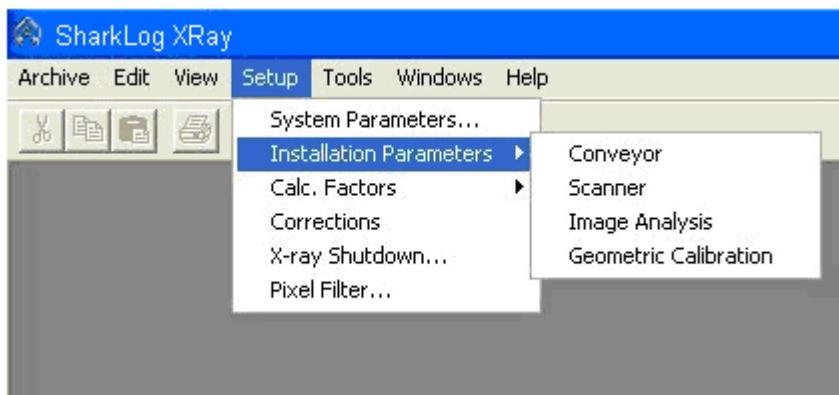
7.1 System parameters

Parameters that indicate conditions for calculation of log data. Can be found under the menu "Settings – System parameters".
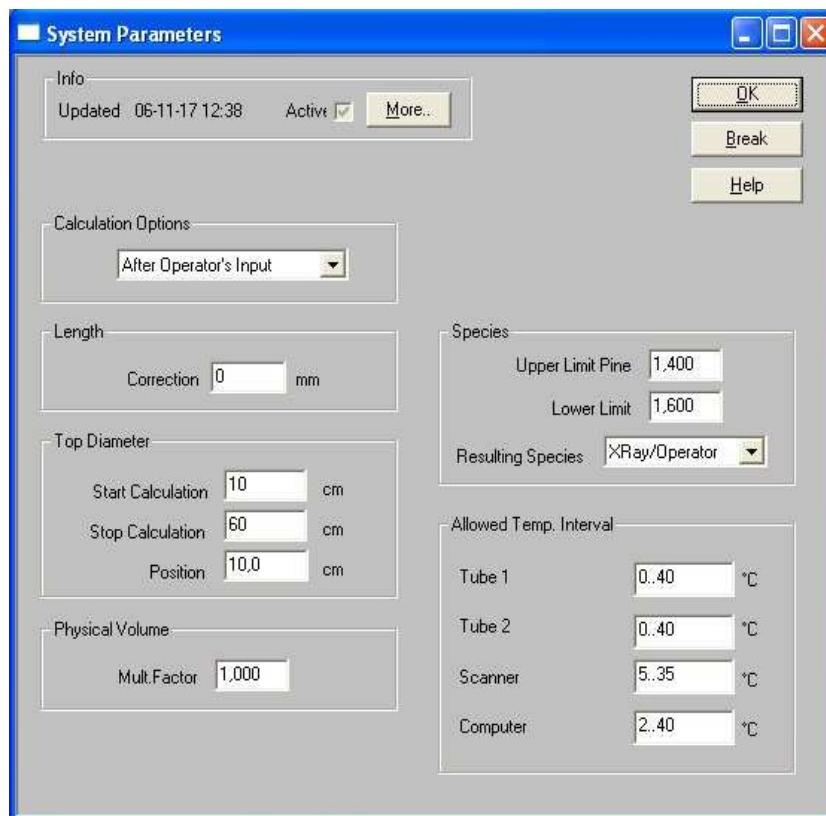
Calculation Options

No Calculation	For test purposes it is possible to exclude all calculations.
Direct after Scanner	Calculation starts as soon as the log has passed the scanner; the species from SHARKLog XRay is used.
After Operator's Input	Calculation starts after receiving the operator's species from the host system.

Length
    Correction   Number of millimeters that is added to the calculated log length.
Can be indicated as negative, i.e. shortened

Top Diameter   The diameter is calculated using a straight line fit by the method of least squares.
    Start Calculation   Start of calculation line, cm from top end.
    Stop Calculation   End of calculation line, cm from top end.
    Position   Position for calculated diameter, cm from top end. Can be outside the line limits above.

Physical volume
    Mult. factor   Factor that is multiplied by the calculated total volume.

Species   Limits for safe determination of the species (pine = 1, spruce = 2).
    Upper Limit Pine   Species will be pine if species index is lower than this value.
    Upper Limit Spruce   Species will be spruce if species index is larger than this value. Must be greater than Upper Limit Pine.
    Resulting Species   Alternating ways to determine the Species. See "Species" in chapter 5.
    Operator   Operator alone decides.
    XRay   Only SHARKLog XRay's species index is used.
    XRay/Operator   Species index is compared with the Operator's choice.

    Allowed temperature interval   Allowed temperatures at following measuring points:

Tube 1   X-ray tube for measuring direction 1
Tube 2   X-ray tube for measuring direction 2
Scanner   Top of the scanner
Computer   Electronics cabinet in computer room

If the temperature becomes too low or too high more than temporarily, an alarm is given.

Indicated as intervals in ºC, for example 5..50 means at least 5ºC and at most 50ºC. The value 0..0 is interpreted such that the temperature check at the respective measuring point is disconnected.

7.2   Installation Parameters

The parameters that are found here should normally be adjusted during commissioning and exchange of measuring units.

7.2.1   Conveyor
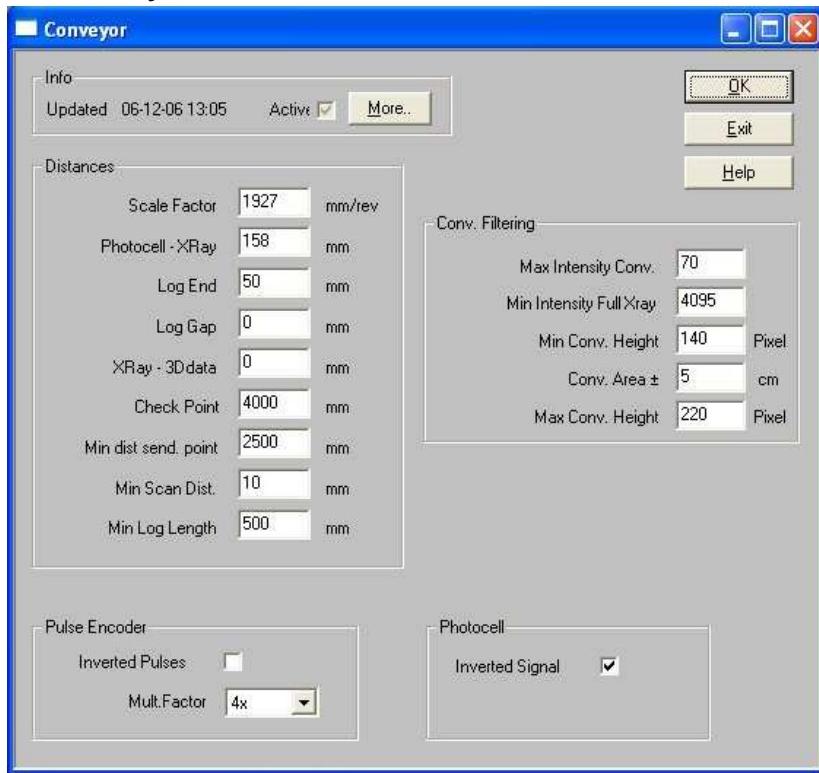
Distances

Length scale factor	Number of millimeter conveyor movement that corresponds to one revolution on the turning wheel where the pulse encoder is connected.
Photocell - XRay	Distance from the photocell to the x-ray sweep plane.
Log End	The distance that the photocell has to be free in order to terminate the measuring for the current log.
Log Gap	Minimum distance from accepted Log End (previous parameter) to the start of next log. May be set to 0.
XRay - 3Ddata	Distance from SHARKLog XRay to a point where data from 3D-scanner are safely received. SHARKLog XRay must have finished with its own calculation at this point. If no 3D-scanner is used, set this parameter to 0.
Check Point	Distance from previous point (XRay - 3Ddata) to a point where data safely has been received by the host system. This is the point where all data are available, image data files can be saved, data for each log is presented etc.

Min dist send point	Number of millimeters from the scanner to the point where log data transmission to the host system shall start.
Min Scan Dist.	The smallest distance between collected crosscuts, mm. This parameter limits the number of measurement values for a log when the conveyor moves extremely slow, and should adapt according to the conveyor's speed when it is moving at maximum
Min Log Length	Shorter logs are ignored. Temporary objects like short branches etc will not cause a log calculation.

Pulse encoder

Inverted pulses	Makes it possible to shift the channels if the pulse encoder is mounted so that the channels end up in the wrong sequence. At a forward moving conveyor channel 1 should come ¼ period before channel 2.
Multiplication factor	The pulse frequency can be 1x, 2x or 4x the number of pulses. Indicate the alternative in question.

Reconstruction at carrier

	Parameters for reconstruction of how a crosscut should have turned out if it had not been affected by carriers.
Max. Intensity Conv.	Highest edge value 0 – 4095 that could have been affected by the carrier foot in direction 1.
Min. Intensity Full Xray	Lowest intensity at full Xray radiation. With standard calibration this value should be 4095.
Min Conv. Height	Minimum pixel height of the carrier image. 0 - 576.
Conv. Area ±	Area along the log that is reconstructed instead of the carrier. Position ± cm (both sides of centre of carrier)
Max Conv. Height	Maximum pixel height of the carrier image. 0 - 576.

Photocell

	Applies to the photocell mounted in the scanner.
Inverted signal	Logical setting so that the photocell signal is active when the light curtain is shadowed, i.e. a log is in the scanner.

7.2.2 Scanner
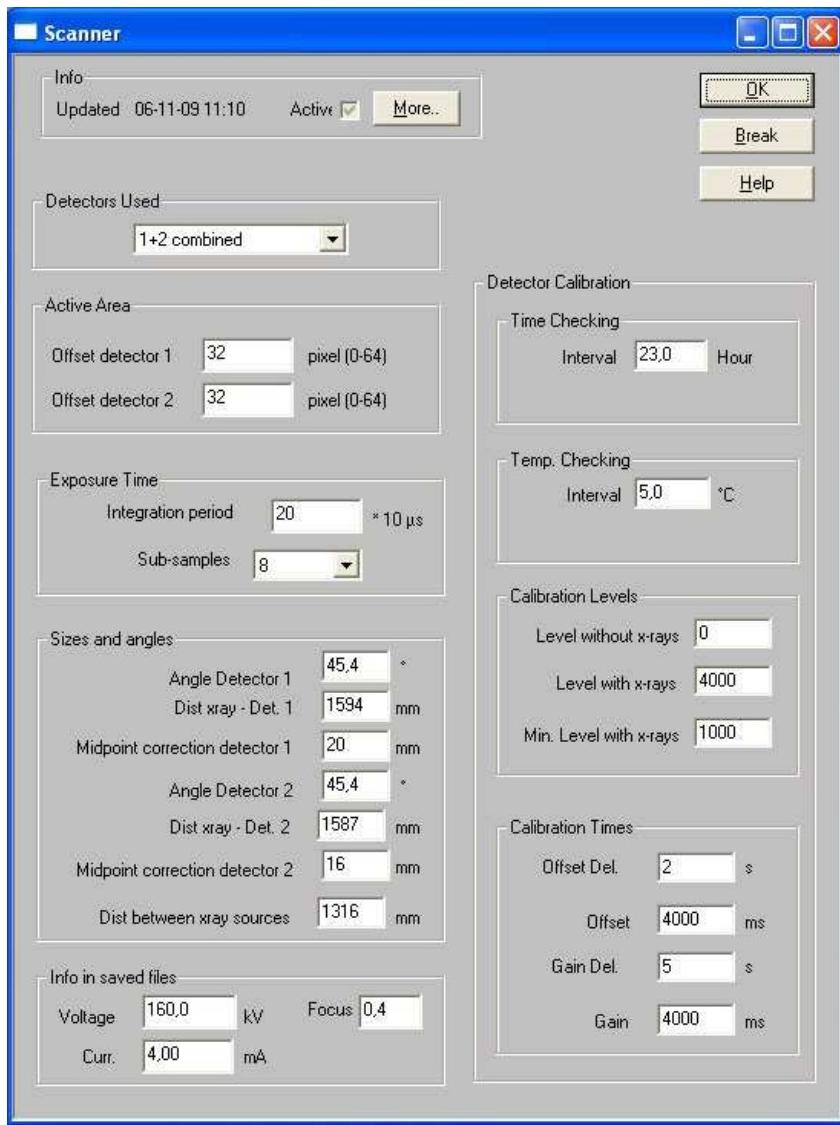
Detectors used	If one of the scanning directions is not working, it is possible to – with limited accuracy – temporarily only use the other one. Normally both directions should be used, i.e. the alternative "1+2 combined".
Active Area	The detectors have 640 pixels of which 576 is used.
Offset detector 1	The first active detector pixel from the bottom of direction 1.
Offset detector 2	The first active detector pixel from the bottom of direction 2.
Exposure time	The total exposure time (µs) for the detectors is: **10 x Integration period x Sub-samples**
Integration period	1 - 1000
Sub-samples	1,2,4,…256

|	
Sizes and angles	Geometric data for the scanner. Do not alter these numbers, they are automatically calculated when running the Geometric Calibration.
Angle detector 1	The detector unit's inclination towards the horizontal plane, direction 1. Indicated in degrees.
Dist. Xray − Det. 1	Distance from the radiation source to the detector unit, direction 1. Indicated in mm.
Midpoint correction detector 1	Distance between the midpoint of the detector and the centre of the radiation line from the Xray source, mm.
Angle detector 2	The detector unit's inclination towards the horizontal plane, direction 2. Indicated in degrees.
Dist. Xray − Det. 2	Distance from the radiation source to the detector unit, direction 2. Indicated in mm.
Midpoint correction detector 2	Distance between the midpoint of the detector and the centre of the radiation line from the xray source, mm.
Dist between xray sources	Distance between the Xray sources, mm.
Detector Calibration	Adjustment of the detector unit's zero point (offset) and amplifying (gain) for the current measuring task.
Time checking	Checking that calibrations are done at regular time intervals. A message is sent to the host system when it is time for a new calibration. A value of 0 means no time check.
Temp. Checking	Checking that calibrations are done when temperature is changing. A message is sent to the host system when it is time for a new calibration. A value of 0 means no temperature check.
Calibration Levels	Levels used for checking that it is possible to perform a calibration.
Calibration Times	Timing for the signals that control the calibration sequence. Must be at least 4000 (4 s). Delay means waiting before the action starts.
Info in saved files	It is recommended to fill in the same values as are set in the Xray Control Unit, this will help when evaluating the raw data image files.

7.2.3   Image Analysis

Parameters that control the evaluation of the X-ray picture. can be found under the menu **Setup – Installation Parameters – Image Analysis**
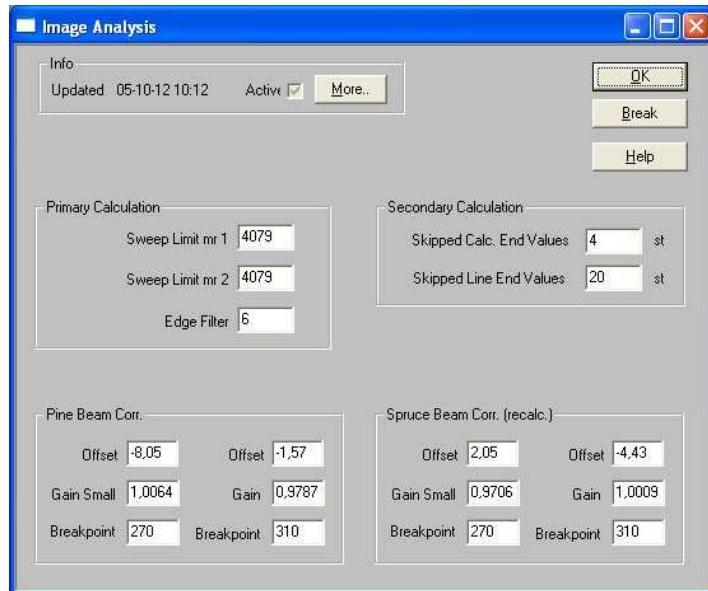
Primary Calculation

Sweep Limit mr1	The limit between bark and wood in direction 1, 0 - 4095.
Sweep Limit mr2	The limit between bark and wood in direction 2, 0 - 4095.

Secondary Calculation

Skipped Calc. End Values	Number of lines that are skipped at the ends of the log. A value of 0 means that only empty lines will automatically be removed.
Skipped Line End Values	Number of lines that are skipped at the ends of the log before calculation.

Pine Beam Corr.	Correction of diameter value due to lower damping of the radiation in the log's surface layer, Pine.
Offset Small	Constant term, diameters lower than breakpoint 1
Gain Small	Proportional term, diameters lower than breakpoint 1
Breakpoint 1	Limit between small and medium diameters, mm
Offset Large	Constant term, diameters higher than breakpoint 2
Gain Large	Proportional term, diameters higher than breakpoint 2
Breakpoint 2	Limit between medium and large diameters, mm

Spruce Beam Corr. (recalc.)	Correction of diameter value due to lower damping of the radiation on the log's surface layer, Spruce. **Note**: A correction for pine must be done first.
Offset Small	Constant term, diameters lower than breakpoint 1
Gain Small	Proportional term, diameters lower than breakpoint 1
Breakpoint 1	Limit between small and medium diameters, mm
Offset Large	Constant term, diameters higher than breakpoint 2
Gain Large	Proportional term, diameters higher than breakpoint 2
Breakpoint 2	Limit between medium and large diameters, mm

7.2.4 Geometric Calibration
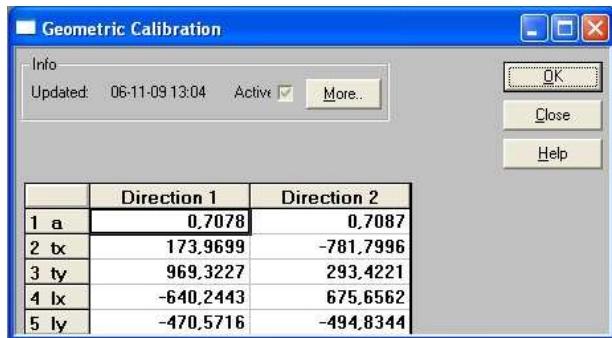
Do not alter these numbers, they are automatically calculated when running the Geometric Calibration.

7.3 Corrections

All data may be corrected after the calculations by multiplying with a Mult.Factor and then adding a Constant.

7.4 Calculation Factors

Do not alter these numbers, they are the result of quality algorithm calibrations.
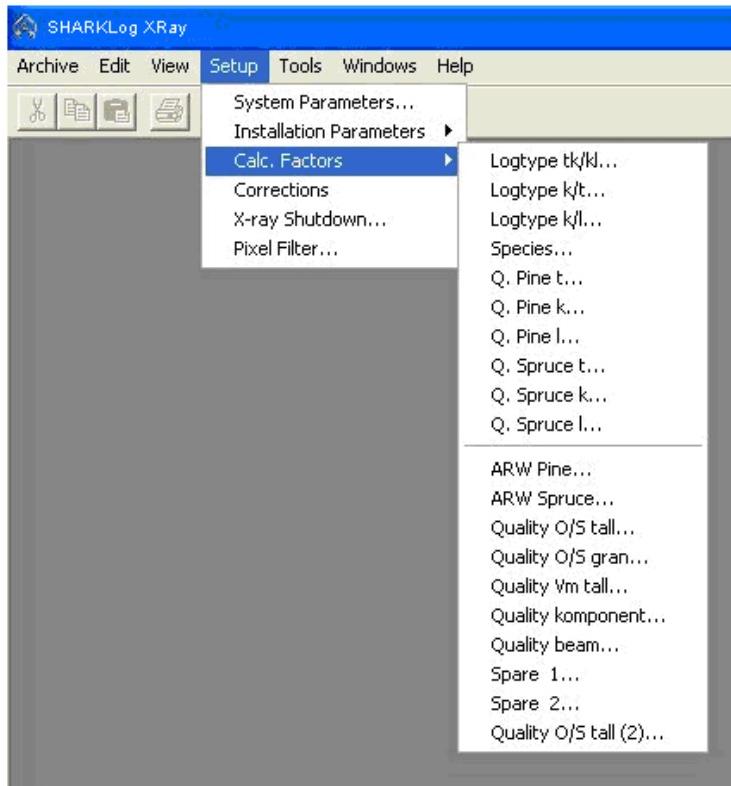

7.5 X-ray Shutdown-times
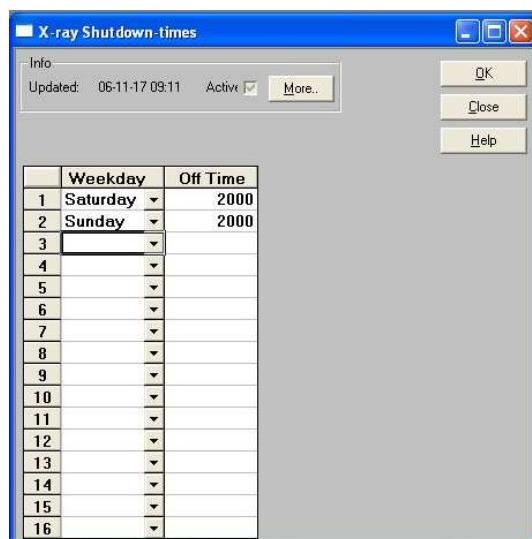
Used if the system shall turn off the x-ray system automatically. Requires that the X-Ray system be manually restarted with the X-ray Control Unit.

7.6   Pixel Filter

	Pixel mr1, 1-640	Pixel mr2, 1-640
1	279	0
2	0	0
3	0	0
4	0	0
5	0	0
6	0	0
7	0	0
8	0	0
9	0	0
10	0	0
11	0	0
12	0	0
13	0	0
14	0	0
15	0	0

(Pixel Filtering dialog — Info: Updated: 06-11-17 09:12, Active ☑, More.. / OK, Close, Help)
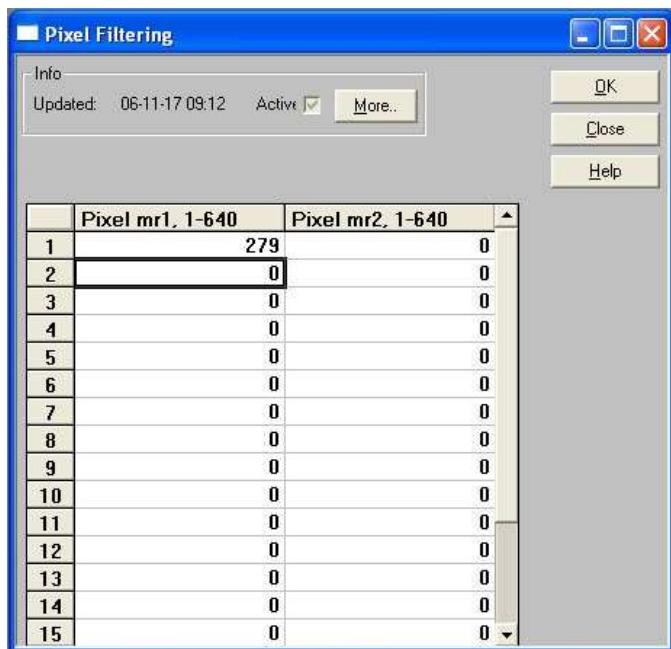
If individual pixels in the detector are defect, using data from the pixel neighbors can filter them. See chapter 8.5.4, page 8-34, how to identify defect pixels. The filter becomes active after next detector calibration.

8   MAINTENANCE

The following commands are available.
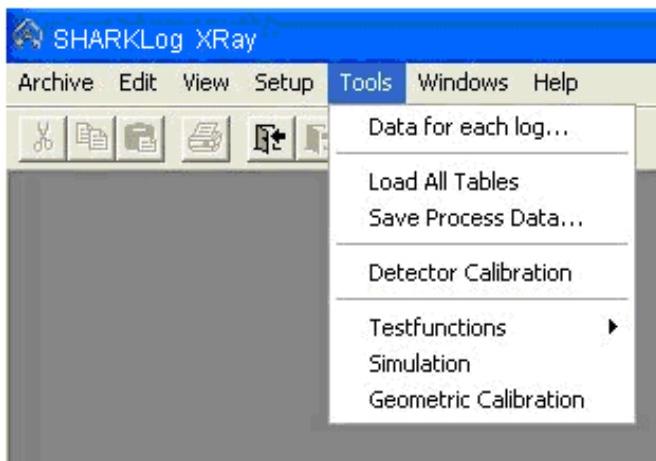
8.1   Data for each log

Through the menu selection **Tools - Data for each log** a function can be started that writes out information log by log..
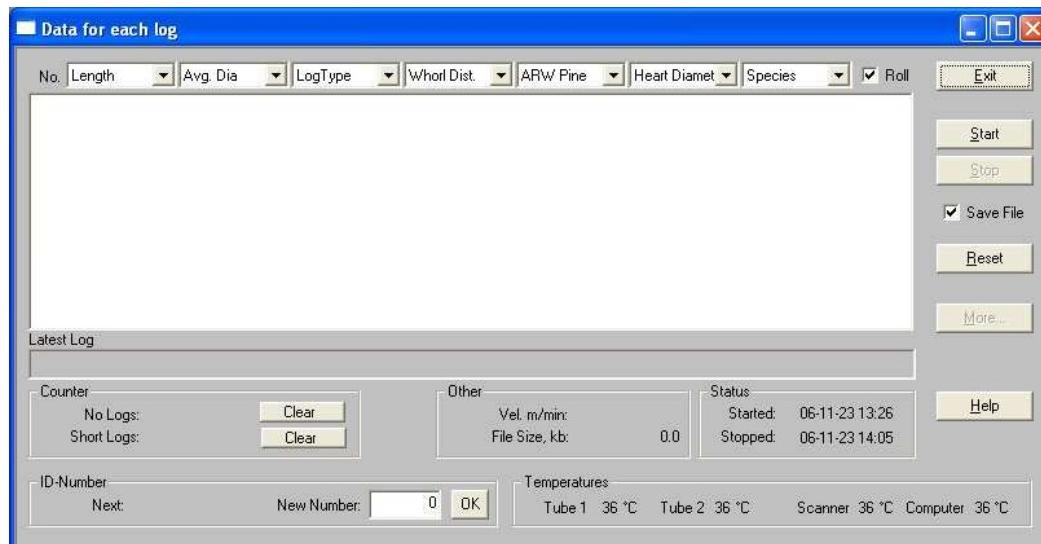
By means of the selection fields at the upper edge the data to be shown in the list are set. By pointing on a line and pressing the button **More** all the data on the log appear.

The larger window is consecutively supplemented with data for the logs that have passed the evaluation zone. It is possible to move up and down in this window, even while new logs are being added to the list. If **Roll** is marked, the list will move upward as new logs are being added. The latest log can then be found furthest down. If **Roll** is not marked, the list is at a standstill and new logs are added at the end of the list, as long as there is room. When the screen surface is filled, a scroll list comes up which makes it possible to move manually in the list.

The window **Latest log** continually show the data for the latest log.

Through the pushbuttons **Start** and **Stop** the collection of data is controlled. The fields **Started** and **Stopped** show the times for these occasions. The pushbutton **Start** activates storage of all log data in a file on the hard disk (if **Save File** is marked). This file is called C:\DATA\SNAP.TXT. The file is added to until the pushbutton Stop is clicked on. The file can at the most be 20 MB, thereafter the data storage ceases. The pushbutton Reset changes the name SNAP.TXT to SNAP.BAK, any older SNAP.BAK is deleted. The file format is a normal text format suitable for export to other software products such as Excel.

Clicking on the Clear button zeros the counter. "No Logs" is incremented for each log that is at least as long as set in Installation Parameters – Conveyor – Min Log Length. If the length is shorter, Short Logs is incremented instead.

The temperature is monitored at 4 different locations which are updated every 100th second.

8.2 Load All Tables

Loads the database to the Calculation Computer.

8.3 Save Process Data

Saves the process database in a file on the hard disk. Must be used after any change of the parameters otherwise the system will not work properly after a power failure.

8.4   Detector Calibration

To obtain the best results, the measuring system has to, at certain intervals, be calibrated. This means that the detector's "gain" and "offset" are adjusted. This is especially important after large temperature fluctuations.

Calibration is done through the use of the menu **Tools – Detector Calibration**.
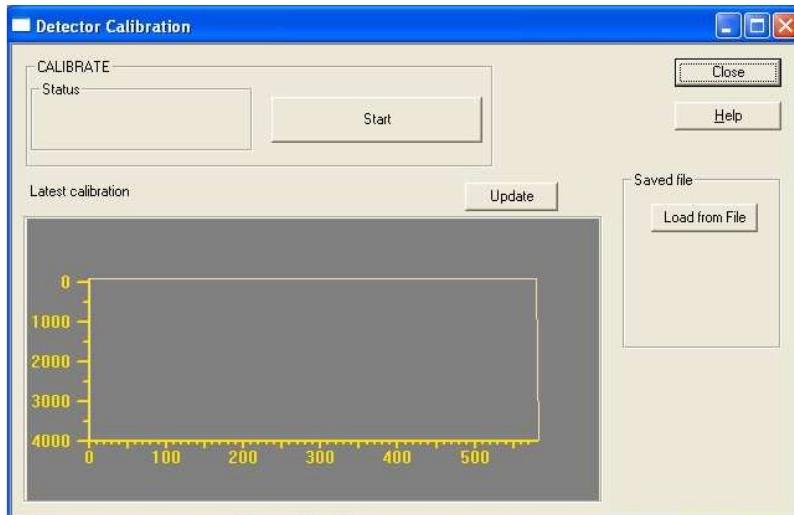
Calibration step by step

1   Make sure that the conveyor is at a standstill and the scanner frame is free from carriers, etc.

2   The button **Update** updates the data view so that it is possible to see if there are any objects in the scanner.

3   Click the button **Start**. The calibration sequence takes about 10 seconds.

4   Ready when the text **Calibration Ready** is displayed.

Every calibration is saved in a file on the hard disk. It is possible to load a previous calibration if desired.

8.5   Test Functions

8.5.1   Data Acquisition

This function is used to collect log data for a number of logs. These logs can then be used in the simulation program or for graphic presentation under the menu Tools –Test Functions – Log Image.

These logs are stored on the harddisk in the folder C:\ Data. The file names are created based on consecutive numbers: RLXxxxx.DAT where xxxx is the file number 0000..9999. If the same number is indicated several times, the old file will be overwritten.

Do not let the number of files in the folder c:\data become too large. It is better to store the files to be kept in a different folder and then delete the remainder.
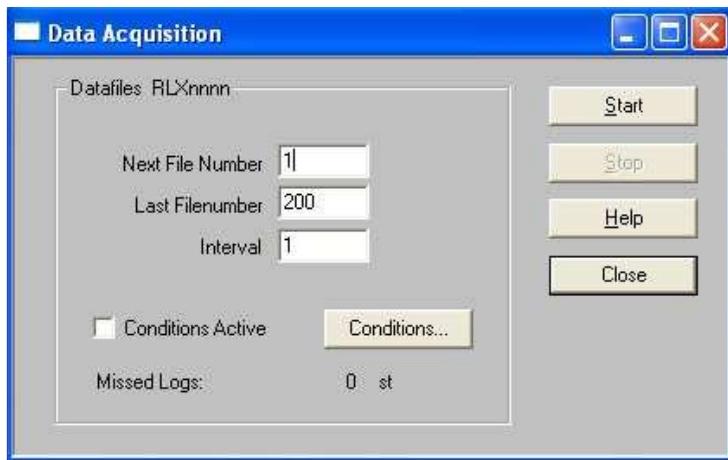
Next file number	Next collected log gets this file number. Updates automatically while the data acquisition is active.
Last file number	End number of the log files. When this number is reached, the data acquisition stops.
Interval	Indicates at what interval the logs shall be stored. 10 means that every 10th log is stored.
Conditions connected	Conditions on/off. When Conditions Active is marked, only those logs that meets the given conditions are saved. Note that the Interval also is in use.
Conditions	Click to set the conditions.
Start	Starts the data collection
Stop	Terminates the collection (before the end number is reached)

Please note that if the interval is too small, the scanner will not have time to do the normal collection and calculation work. For example, at interval 1 (each log) a log gap of at least 10 m (at 2 m/s) is required.

When the button "Conditions" is pressed, the following form is opened**:**

Indicate here any special requirements concerning which logs are to be stored. A log parameter is selected in the column **Log Data,** and the values that the logs shall have in order to store them are set in the column **Interval.**

Up to three different conditions can be used to define a log to save (same row). All rows that are marked Active are checked and if the conditions in one of those rows are true, then the log is saved.

8.5.2   Log Image

Shows a graphic picture of an X-rayed log. The log to be shown can be selected by indicating in the form: Three Latest logs, current log or the next can be selected. Logs stored as a file on the hard disk can also be viewed.
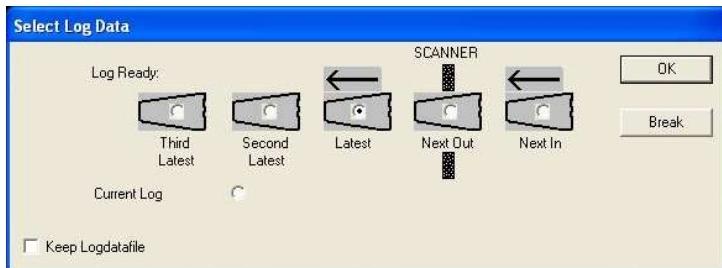
Break	Press if you for example want to see saved logs instead..
Select log	Click the radio button for the selected log: Confirm by pressing OK .
Current Log	Select this if the current measurement shall be aborted and the log that has passed the scanner so far will be viewed. Confirm by pressing OK
Keep Logdatafile	Mark this if the log image shall be saved on hard disk.

Example of a log image:
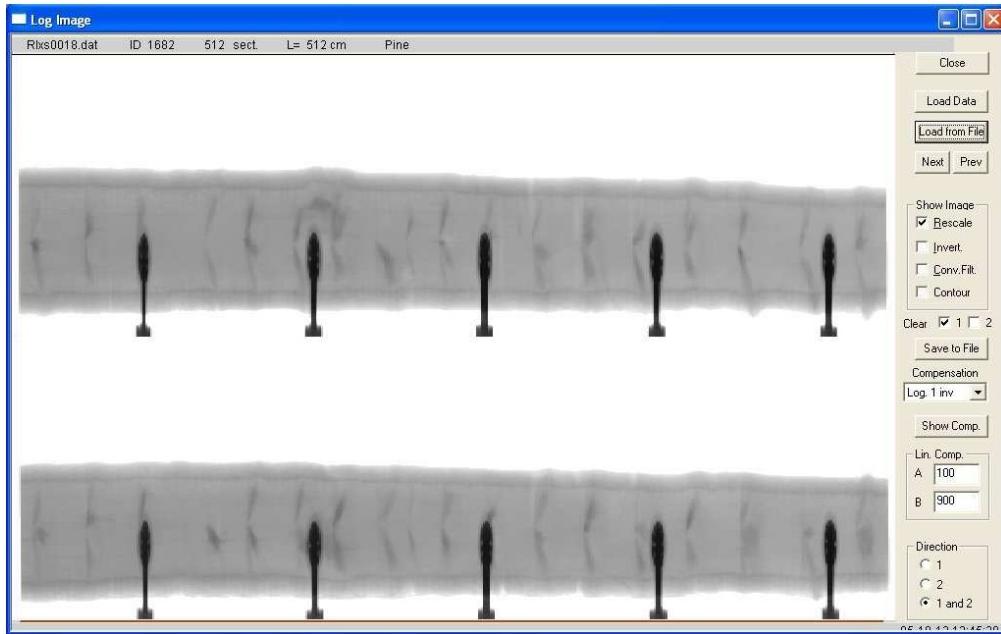
The upper status line displays:
- Filename (Rlx0018.dat),
- ID-number (1682),
- Number of sections (lines) (512),
- Length (512).

The lower status line displays:
- Info text entered when the log was saved,
- Date and time.

In the log picture above the log has been obtained from a stored file. Both of the measuring directions are shown. The vertical black piles are the conveyor's carriers. The brown line under the image shows the distance where the photocell was active.

Load data	Loads data from one of the latest logs that have been run through the scanner. A form with choice of selecting the latest, next latest or the preceding log appears.
Load from File	Loads a stored file with log image data. A form for selection of stored logs appears.
Next	Loads the file with the next sequence number. E.g.: Viewing file Rlx6007.dat and pressing Next will show file Rlx6008.dat.
Prev	Loads the file with the previous sequence number.

Image view options:

Rescale   If the log contains less than 900 scans, the entire picture sur-face on the screen will not be used. If the check box is marked, such a log will be re-scaled so that the entire picture surface is used.

Invert.   The log picture's grey values are shown inverted.

Conv.Filt.   Carriers and other parts of the conveyor are removed.

Contour   Calculates the outer limits of the log used for diameters.

Clear   Options for conveyor filtering. Normally "1" should be marked but not "2".

Save to File   Saves the current log as a file. It is also possible to enter a text description that is saved in the file.

Compensation   Choices of compensation method for scan data. In order to get a good view of different logs, you can use different compensations of the data:

- **None**   No compensation.
- **Ext File**   Function defined in an external file.
- **Log. 1**   Logarithmic function.
- **Log. 1 inv.**   Logarithmic function, inverted.
- **Parable**   Parable function.
- **Linear**   Linear function between two levels A and B (0-4095). Set below. Everything under A becomes 0, everything over B becomes 4095.

Show Comp.   Shows the compensation curve for the selected compensation.

Lin Comp.   Setting of offset values for linear compensation.

Direction   Choice of measuring direction to show the log picture. If **1 and 2** is selected, then direction 1 is shown in the upper half and di-rection 2 is shown in the lower half.

Sweep Data

The sweep data is a diagram that shows data from a selected measuring scan. Selecting scan is done by right-hand clicking somewhere in the log **picture and** the sweep data will show up directly with a diagram for the scan where the mouse was placed.

For each scan (crosscut) the conveyor position is recorded as well as the radiation intensity in 576 measuring points. The intensity ranges from 0 to 4096 units, where 0 is the lowest radiation. Measuring direction one, two or both directions can be selected.

The following symbols are used:

 Sweep data within measuring range of the log.

 Sweep data in the start or end section of the log.

Level	Radiation level 0 - 4095. The scale is inverted so that the highest level (no damping) is at the bottom.
Pixel	Detector element 0 - 575.
Conv. Pos	Current conveyor position in pulses 0 - 65535.
Sect.	Number of the sweep section 1,2,…. Note that there are sections also before and after the log.
Direction	Choice of measuring direction to show the log picture. Direction 1 is red, direction 2 is white.
Edge Values	Only possible when Contour was selected in the log image.
Sect.	Select the section (sweep) by clicking one of the arrows [◄] [►] or by using the scroll bar: ▣.

Note! You must close the Sweep Data window before clicking elsewhere on the screen, otherwise the current window will be hidden**.**

If Contour is enabled in the Log Image, then diameter values are shown in the Sweep Data image:
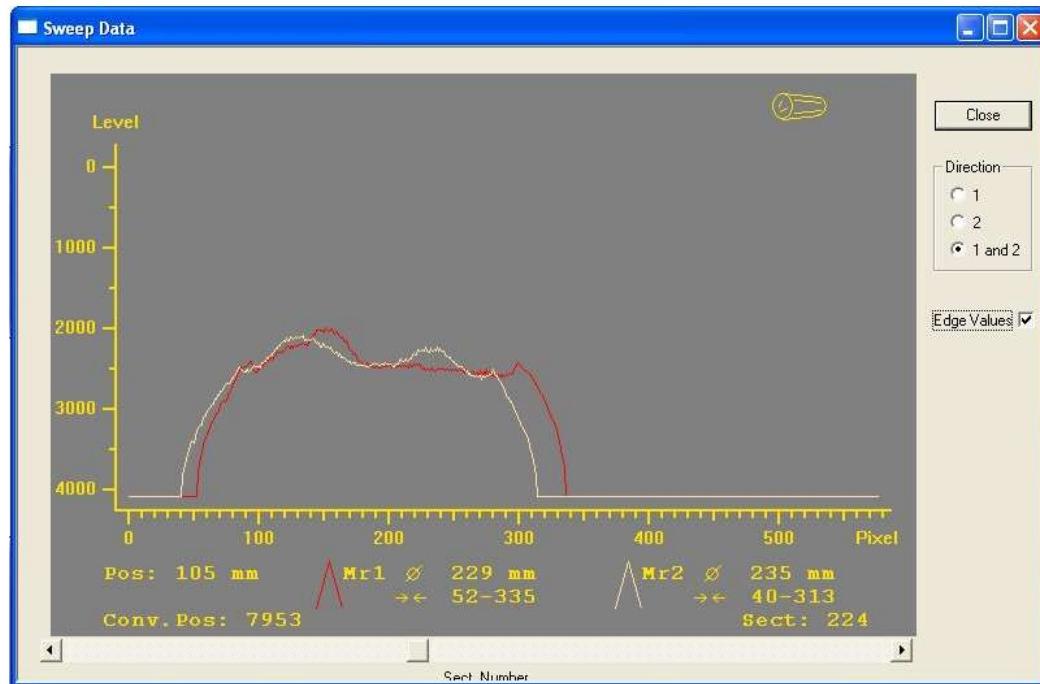

Note: The diameters are calculated using the species that was applied to the log when it passed the scanner, se Species in chapter 5.

Pos		The section position in mm from the first end of the log.
Mr1 ∅		Diameter ini direction 1, mm.
→←		Edge limits in pixels.
Mr2 ∅		Diameter in direction 2, mm.

Edge Values   The edge limits are shown only if this box is marked.

8.5.3 Sweep Data

This real-time display is found under Tools – Testfunctions – Sweep Data. The update rate is only maximum 2 frames per second, but it is a fast way to see that the hardware is operating OK.
The conveyor position and the radiation's intensity at 576 measuring points are recorded for each scan (crosscut). The intensity ranges from 0 to 4096 units, where 0 is the lowest radiation. Measuring direction one, two or both measuring directions can be selected. The values from both measuring directions are used to calculate scan diameter, scan density and scan center.

.
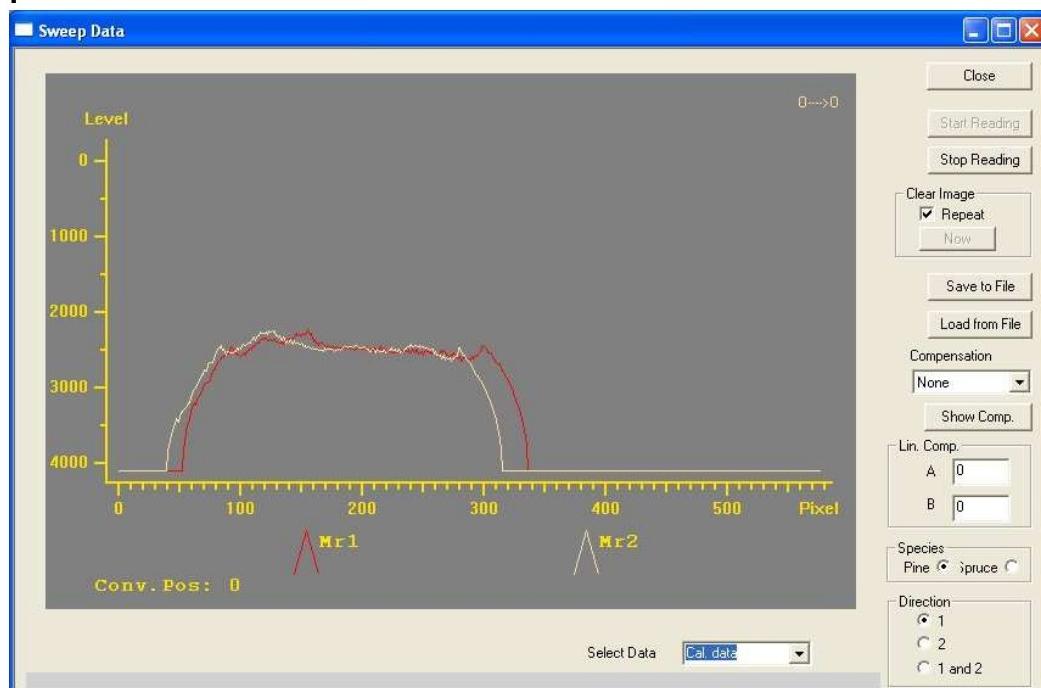
"Sweep" is a line of signals from the 576 detector elements (pixels).

The following symbols are used:

Log measurement is active.

Log measurement is in the end phase.

0---->0   The photocell is not activated (light).

0-//->0   The photocell is activated (dark).

Note that the photocell symbol directly shows the status of the photocell without the distance delay normally used. It is then easy to check the photocell using this display.

Level	Radiation level 0 - 4095. The scale is inverted so that the highest level (no damping) is at the bottom.
Pixel	Detector element 0 - 575.
Conv. Pos	Current conveyor position in pulses 0 - 65535.
Start Reading	Continually reads data from the detectors. The reading is done in intervals of one second.
Stop Reading	Closes continuous reading.
Clear Image	Clears the picture area
Repeat	Every sweep is erased before showing the next one.
Now	Erases the picture.
Save to File	Stores the current log as a file. A form "Save as" appears and it is possible to enter a file name. The default name is ddhhmmnn.dat where dd = day, hh = hour, mm = minute and nn = a number 00-99. It is also possible to enter a text description that is saved in the file.
Load from File	Loads a stored file with log data. A form to select a previously stored log appears.
Compensation	Choices of compensation method for scan data. In order to get a good view of different logs, you can use different compensations of the data:

- **None** No compensation.
- **Ext File** Function defined in an external file.
- **Log. 1** Logarithmic function.
- **Log. 1 inv.** Logarithmic function, inverted.
- **Parable** Parable function.
- **Linear** Linear function between two levels A and B (0-4095). Set below.
Everything under A becomes 0, everything over B becomes 4095.

|	
Show Comp.	Shows the compensation curve for selected compensation.
Lin. Comp.	Setting of offset values for linear compensation.
Species	Species used when calculating diameter and edge values.
Direction	Choice of measuring direction to show log picture. If **1 and 2** is selected, then direction 1 is shown in the upper half and direction 2 is shown in the lower half.

Diameters and Edge Values

When the automatic update is interrupted (Stop Reading) and there is an object in the scanner, then the corresponding diameter and edge values are shown:
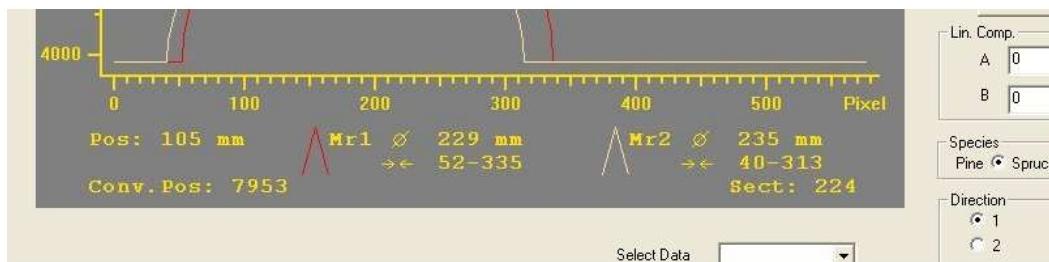
Edge Values: →← , Diameter: ∅ .

Note that the values differ slightly if Pine or Spruce is selected.

Select Data
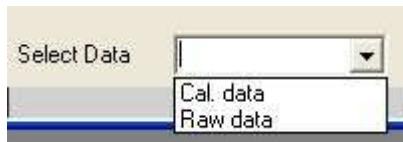
Selection of displayed data:
    Calibrated data
    Raw data (data directly from the detectors)

Note that Selecting Raw Data during normal production will cause the log calculation to fail. Use this option only when there is no logs on the conveyor or when the conveyor is not moving.

8.5.4 Pixel errors

If there is an error in one of the detector elements, the Sweep Data can look like this:
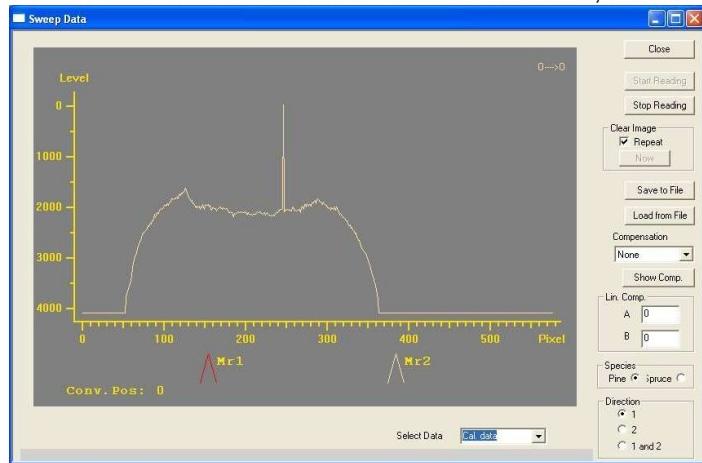
It is then possible to remove the error by using the neighboring pixels. If you right-click near the faulty pixel, the following table will show the intensity value for each element. Here you can see that element no 279 is faulty.

The element number of the faulty pixel must be entered in the table for Pixel Filtering, see chapter 7.6 page 7-21.

8.6 Simulation
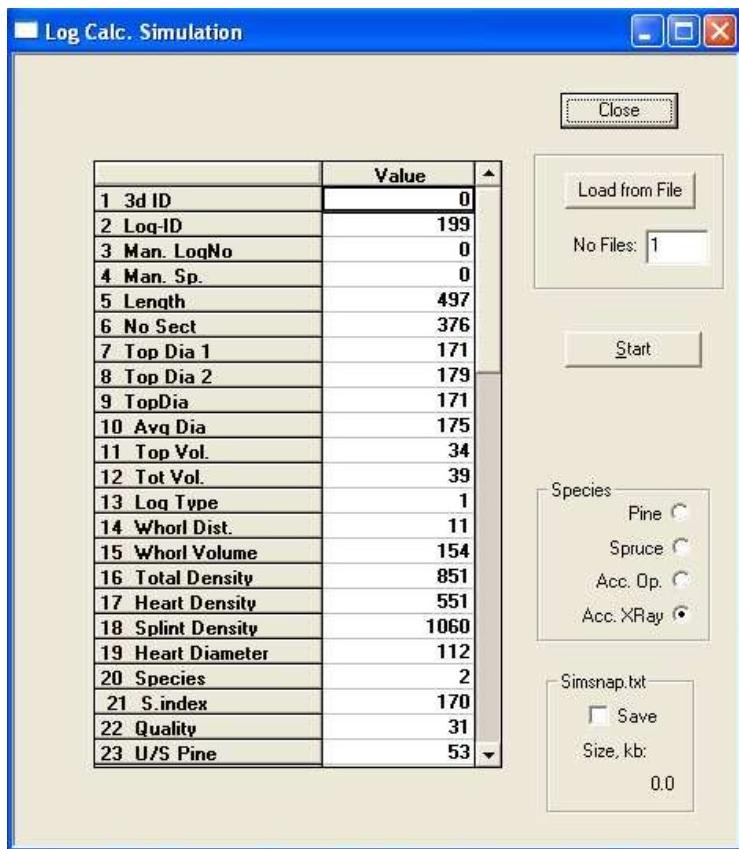
Load from File	Browse to the first file that is to be used in the simulation.
No. Files	Number of files to be used.
Start	Press to start the calculation.
Species	Specify what species shall be used in the calculations. Species from the operator is saved in the data files.
Save	Specify if the result shall be saved in simsnap.txt

8.7 Geometric Calibration
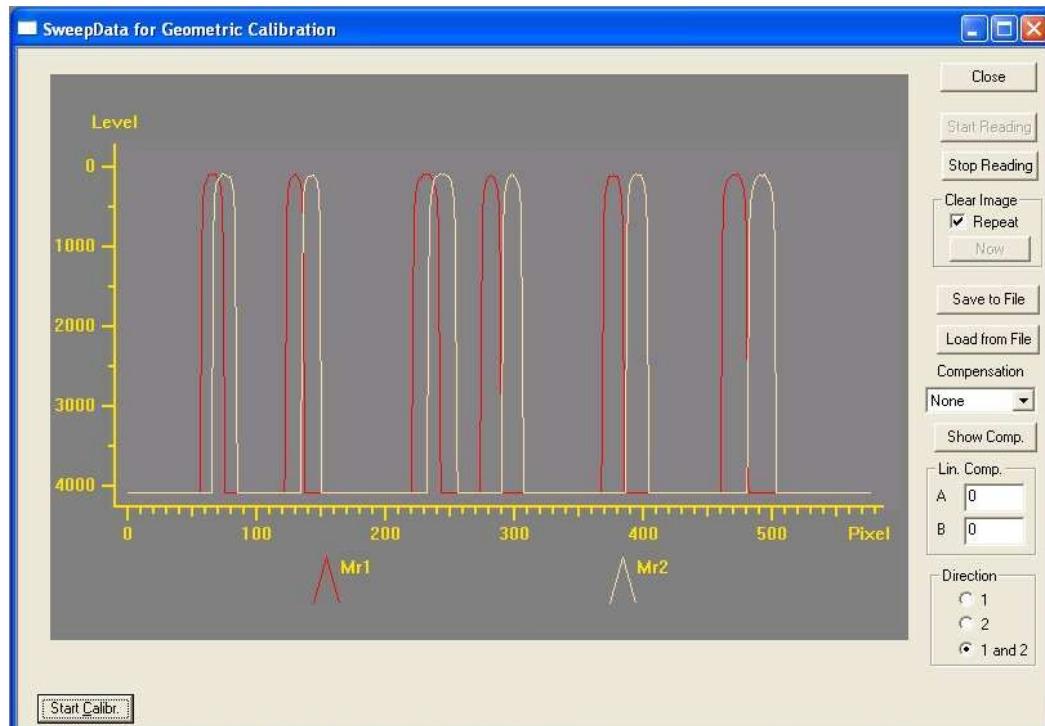
Geometric calibration requires special equipment to be placed on the conveyor inside the scanner. Then it is possible to calculate the absolute position of the x-ray tubes and the detectors. This needs to be done only once after commissioning.

9   FILES AND DATA STORAGE

The following data files are produced by SHARKLog XRay and are available to the user.

c:\hod\snap.txt	Result from Data for each log. Every log produces one line of data separated by spaces. The file can be read and evaluated in Excel. Maximum size is 20MB.
c:\hod\snap.bak	Copy of snap.txt which is created by the command Reset before snap.txt is deleted.
c:\hod\simsnap.txt	Result from simulation. Same format as snap.txt
c:\data\rlxnnnn.dat	Result from Data acquisition. One file contains all raw data from a log.
c:\data\nnnnnnn.dat	Sweep data file.

The following files are important components of SHARKLog XRay. This list is for information only. More components are installed inside the Windows system.

c:\hod\hod.exe	Operator's interface to SHARKLog XRay.
c:\hod\hod.ini	Installation parameters for hod.exe.
c:\hod\hod.hlp	Help file.
C:\hod\komp*.bin	Files containing compensation data for image presentation.
c:\hod\rtbackup.exe	Backup program, used for security copy of databases and parameters.
c:\hod\rtrest.exe	Program for restoring backup.
c:\hod\db\hod.mdb	Database file where all settings are stored.
c:\hod\md\program\xRay.	Program for Measurement Computer. Is loaded via network.
c:\hod\md\dbpd\xray.bin	Database file used by Measurement Computer. Contains process data. Created by the command Tools - Save Process Data.
c:\hod\md\dbpd\xRay.ini	Starting parameters for Measurement Computer program XRay.

10   SYSTEM RESTART

Certain situations make it necessary to restart SHARKLog XRay. The system contains two computers connected in a network. If one computer fails, the other one also is affected. The following procedures must be followed when restarting the computers.

NB! Restarting the computers is an abnormal measure that Tectronix Systems urgently wants to find a remedy.

Before restarting a computer, it is very important to save any error messages that can help explaining what went wrong. Reporting such error messages to Tectronix Systems will help development of software updates.

Operator's Computer.
Errors are shown in Windows Messages forms.

Measurement Computer.
Normally there are some text messages shown, but if there are messages containing the words "error" or "fault", please write down these.

Order.
The software in the two computers are dependent of each other so it is important to restart in the right order. If the procedure Restart1 is not working, try using Restart2.

Restart 1

1. Close the HOD-program on the Operator's Computer (File-Exit). Do NOT close Windows.
2. Restart the Measurement Computer(MD) by pressing the reset-button in the cabinet.
3. Select the MD screen (Press Ctrl + Ctrl + Enter). Wait until the program starts. It takes a while because the program file is loaded from the Operator's Computer. It is ready when you can see a blinking dot at the lower left side of the screen.
4. Start the HOD-program on the Operator's Computer by double-clicking the icon.
5. Now SHARKLog XRay should work properly again.

Restart 2

1. Close the HOD-program on the Operator's Computer (File-Exit).
2. Delete the file xray.bin under c:\hod\md\dbpd. Use the Explorer.
3. Restart Windows (Start- Shut down -Restart).
4. Wait until Windows comes up.
5. Restart the Measurement Computer (MD) by pressing the reset-button in the cabinet.
6. Select the MD screen (Press Ctrl + Ctrl + Enter). Wait until the program starts. It takes a while because the program file is loaded from the Operator's Computer. It is ready when you can see a blinking dot at the lower left side of the screen.
7. Start the HOD-program on the Operator's Computer by double-clicking the icon.
8. Select "Load all tables" under the menu Tools.
9. Answer Yes to the question "Should all tables be loaded?"
10. Select "Save Process Data" under the menu Tools.
11. Answer Yes to the question "Save process Data?"

11   SCANNER ROOM LAYOUT
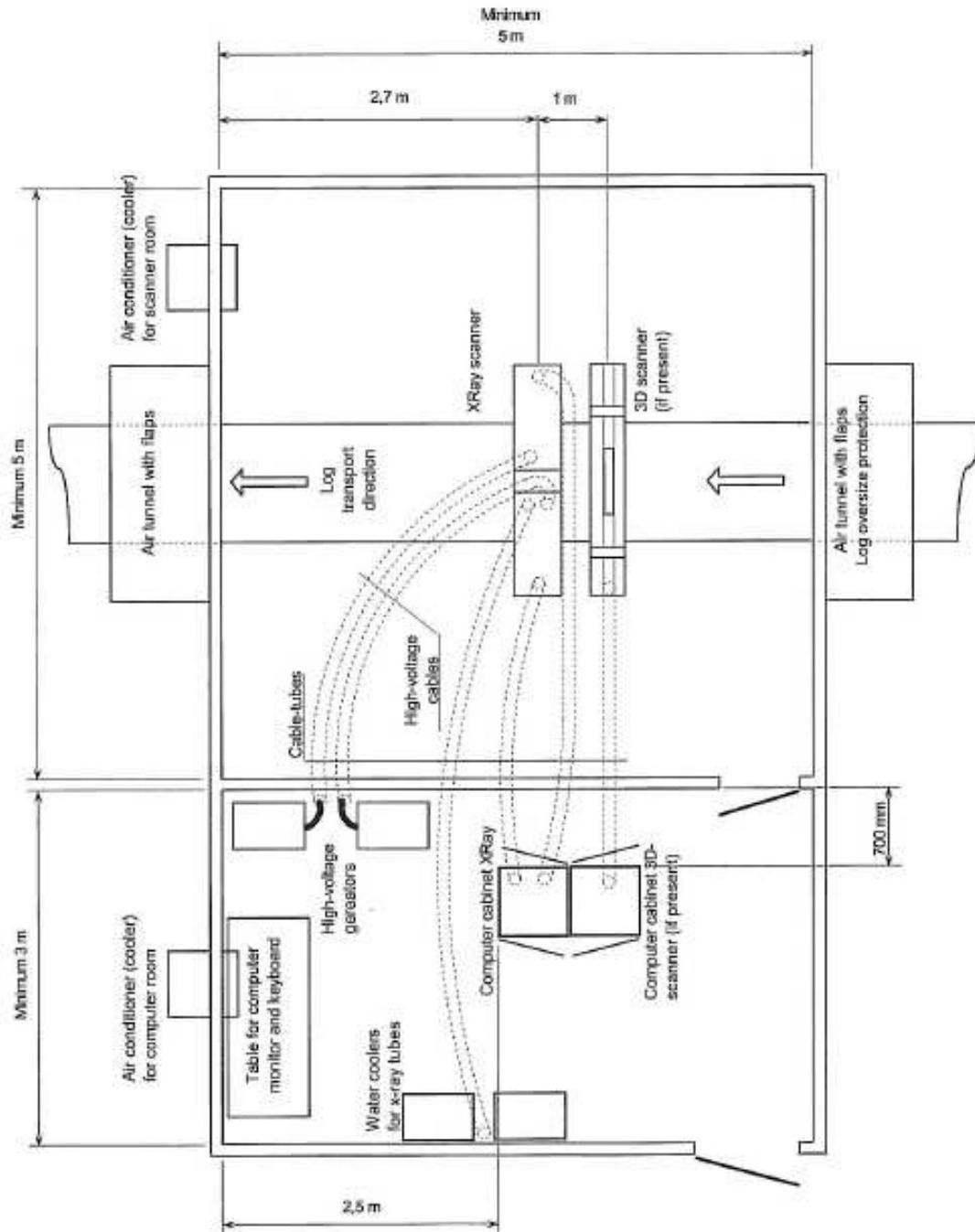
12   WARRANTY

Tectronix Systems Inc extends to the original purchaser a limited warranty from the date of installation. The Equipment is warranted to be free from defects in materials and or workmanship provided the equipment is installed and operated in accordance with the recommendations and instructions written in the operator's manual for this equipment. This warranty is limited to repairing or replacing, at Tectronix's option, any defective component, circuit board, or module contained within the product only when it is returned with an Tectronix Return Material Authorization (RMA) number to Tectronix or to an Tectronix-designated repair facility. In all cases, the customer is responsible for shipping charges to and from Tectronix or the Tectronix-designated repair facility. The SHARK®Log Xray detector may qualify for an onsite repair at no additional charge to the owner when determined by Tectronix

- Your SHARK®Log Xray detector is designed to the most stringent manufacturing specifications to insure a long life in your industrial environment,

- Your SHARK®Log Xray detector us warranted against defects in materials and or workmanship

    a. One-year warranty on detector sensor head

    b. One-year warranty on electronics

Tectronix Systems Inc

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Unit 9 18812- 96th Ave

Surrey BC   V4N 3R1

Tel.: 1 (604) 607-6028

Fax.: 1 (604) 607-6026

Internet: www.metal-shark.com

Email: service@metal-shark.com

Manual and operating instruction SHARK® XRay

Version 2.3

Software-version 6.25

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