LIMs Option Guide

InfraLab Series 9

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Issue B

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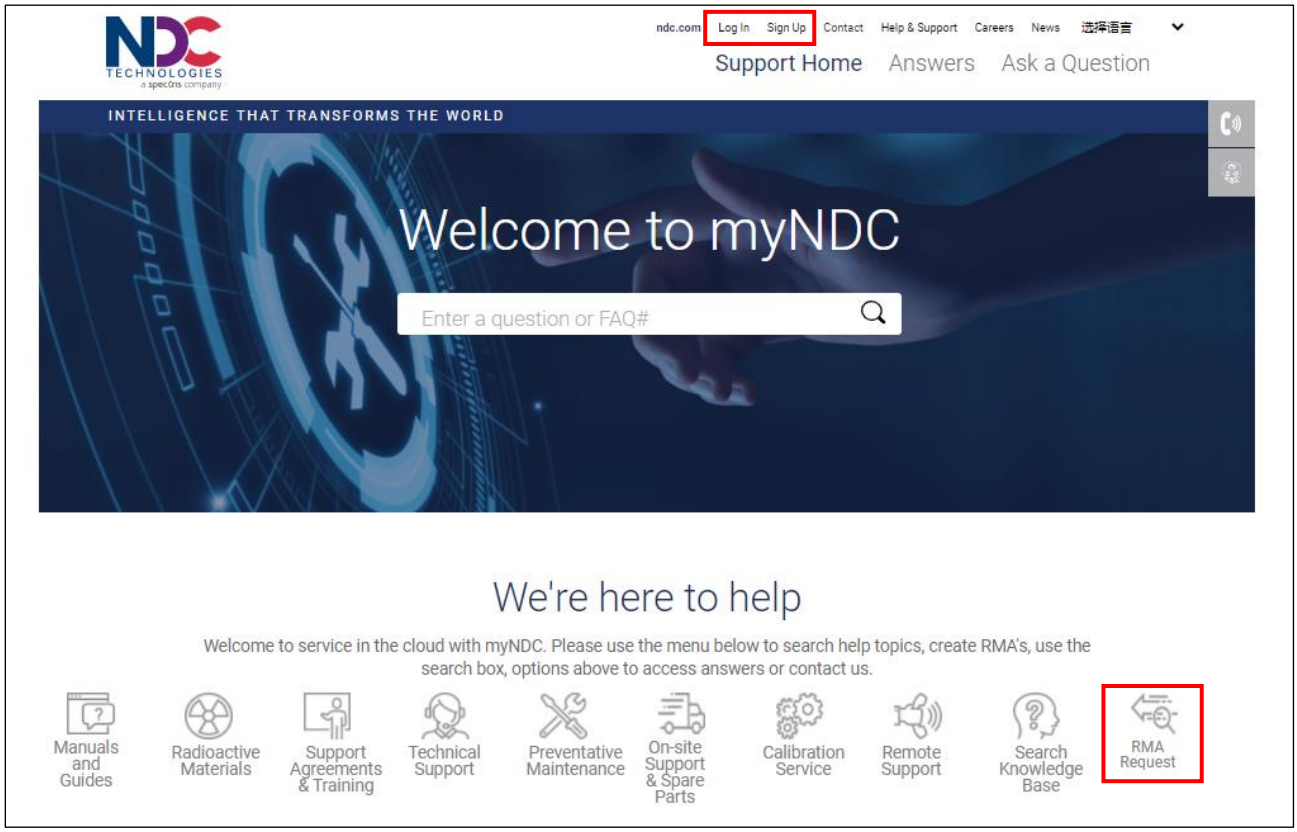

NDC Contact Numbers

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Americas	+1 626 939 3855
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	All other countries (English speaking): +44 1621 852244 Please select option 2 to be connected to the service team

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CHAPTER 1

1 Overview

LIMS (Laboratory Information Management System) is a term used to cover communications protocols allowing data from laboratory instruments to be transferred to management systems.

The LIMS interface on the InfraLab allows a management system to interact with the InfraLab via a simple ASCII-based interface.

The LIMS interface provides event data (e.g., when a sample is taken) and sets of commands to allow the configuration of the device to be read or updated.

The InfraLab may support many LIMS streams in parallel. Event messages will be sent to all connected streams, reply messages will only be sent to the stream from which the command originated.

On connection to a LIMS stream, the following ASCII data will be sent:

```
NDC Series 9 LIMS Interface

======================

Series 9>
```

The Series 9> prompt will be displayed to indicate that the interface is ready to accept a command.

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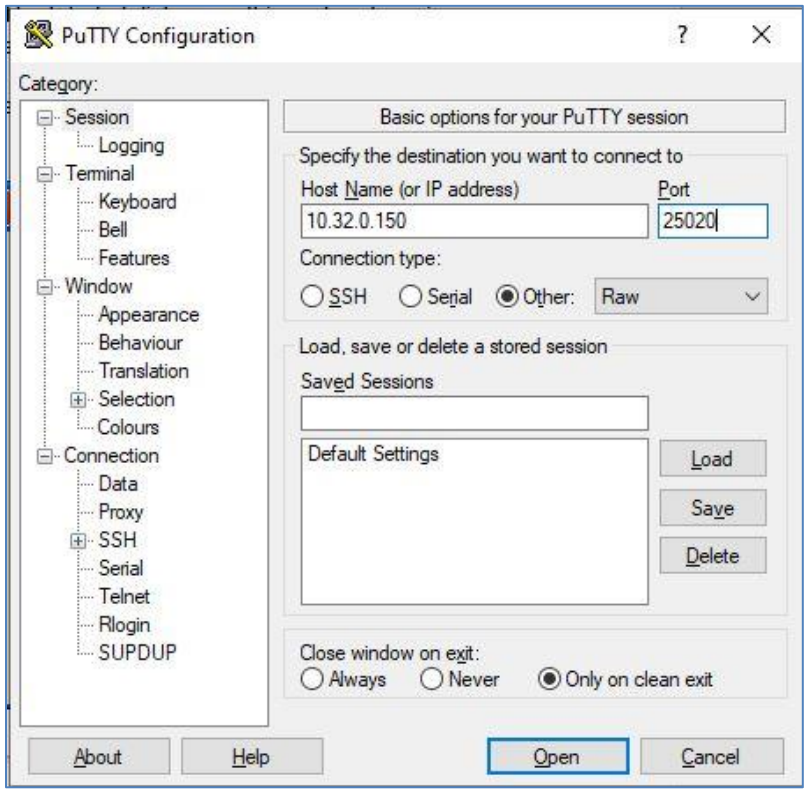
CHAPTER 2

2 Connecting to the LIMS Interface

All communications from the InfraLab is Ethernet based, via the RJ45 connector at the rear of the unit.

The LIMS connection is serviced on TCP/IP port **25020**. The InfraLab listens on this port and services any requests to connect on this port. The InfraLab can service up to 16 LIMS sessions in parallel.

The following screenshot illustrates the communications settings used for PuTTY, for a device at IP address 10.32.0.150.



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CHAPTER 3

3 Message Format

Messages to and from the InfraLab will be ASCII-based.

Examples of commands are as follows:

HELP No command parameters follow

VAL ? Command **Val** followed by a single parameter "**?**"

Replies and event messages from the InfraLab will be fully human-readable.

Each message will be terminated with a carriage return and line feed. Incoming messages will only look for the line feed character (ASCII character 10). Carriage return characters (ASCII character 13) are optional.

3.1 Data Encoding

Data is encoded using UTF8 encoding.

This encoding sends data in blocks of 8 bits, and allows support for both standard ASCII characters as well as complex characters (e.g., Chinese characters, etc.).

ASCII characters (codes 0 to 127) are sent without any changes to the data, and most console applications will display the data correctly.

Complex characters (with character codes greater than 127) are encoded using either 2 or 3 bytes and may not be correctly decoded on all terminal applications.

3.2 Numerical Data

Numerical data will be displayed in ASCII characters, with a dot (.) used for the decimal separator.

3.3 Date and Time Stamps

Date and time stamps will be sent in the form **YYYY/MM/DD HH:MM:SS** and enclosed in quotes, e.g., "2021/8/22 14:22:28".

Times will be in 24-hour clock mode. All fields other than year will be shown using 2 digits, with a leading 0 if the value is less than 10.

CHAPTER 4

4 LIMS Commands

This section details the available messages.

4.1 Help Command

Message ID	**HELP** or **?**

This command can be sent to receive a list of commands and a brief description of each.

4.2 Get Details

Message ID	**INFO**

The information command lists details about the instrument as follows:

```
Series 9>info
Information
-----------
Name                : InfraLab1
Filter Wheel        : 2003
Application Set     : IL2003-01

Total samples       : 103
Free samples        : 9897

MAC Address         : 00:19:B9:19:CB:1A
IP Address          : 10.32.0.86
IP Net Mask         : 255.255.240.0
IP Gateway          : 10.32.1.253
```

Wins Host Name : InfraLab1

Series 9>

4.3 Audit Trail Command

Message ID	**AUDIT**

This command allows the client to request audit trail event information.

The reply to the message is a tabulated list of audit trail events that match the query.

Queries can contain the following comma-separated filters:

TYPE=”xxx”	where **xxx** is the desired event type (case sensitive and enclosed in quotes). **xxx can be “System”, “User” or “Recipe”.**
USER=”xxx”	where **xxx** is the desired user ID (case sensitive and enclosed in quotes)
DATE>datetime	Includes events occurring since a given date and time, where the **datetime** is in the format **[YYYY/]MM/DD [HH:MM[:SS]]**
DATE<datetime	Includes events occurring before the given date and time; where the **datetime** is in the format **[YYYY/]MM/DD [HH:MM[:SS]]**
INCSYS=”x”	where **x** can be "Y", "N", "y" or "n". Determines whether or not System events are included in the output. By default they are not. Note that this option is ignored if TYPE=”System” is entered.

For the **DATE** filter, the operators **>**, **<**, **>=**, and **<=** are all valid. Multiple filters can also be included, e.g.,

AUDIT

AUDIT INCSYS=”Y”

AUDIT Type=”Recipe”, User=”User1”, Date>=2021/8/12, Date<=2021/8/13

Note: Where multiple **DATE** directives are used, the last directives are used, where

>, **>=** override any previous **>** or **>=** directives

<, **<=** override any previous **<** or **<=** directives

= override all previous directives

The command returns a list response with the number of matches followed by a tabulated list of events, one event per row. Event information of the same row are separated by commas. The start and end of the list are shown by a line of “=” characters.

4.4 Sample List Command

Message ID	**LIST**

This command allows the client to request a list of samples to be resent. This is often used to resynchronise a database with the samples stored in the flash of the device.

The reply to the message is the number of samples that match the query.

Queries can contain the following comma-separated filters:

PROD=”xxx”	where **xxx** is the desired product ID (case sensitive and enclosed in quotes)
USER=”xxx”	where **xxx** is the desired user ID (case sensitive and enclosed in quotes)
DATE>datetime	Includes samples taken since a given date and time, where the **datetime** is in the format **[YYYY/]MM/DD [HH:MM[:SS]]**
DATE<datetime	Includes samples taken up to a given date and time; where the **datetime** is in the format **[YYYY/]MM/DD [HH:MM[:SS]]**
SAMPINDEX>x	Includes samples with an index greater than **x**
SAMPINDEX<x	Includes samples with an index less than **x**

For **DATE** and **SAMPINDEX** filters, the operators **>**, **<**, **>=**, and **<=** are all valid. Multiple filters can also be included, e.g.,

```
LIST Prod=”Product1”, User=”User1”, Date>=2021/8/12, Date<=2021/8/13
```

Note: Where multiple **DATE** or **SAMPINDEX** directives are used, the last directives are used, where

>, **>=** override any previous **>** or **>=** directives

<, **<=** override any previous **<** or **<=** directives

= override all previous directives

The command returns a list response with the number of matches followed by sample event messages for each match. The start and end of the list are shown by a line of “=” characters. Each sample is separated by a line of “-“ characters.

The data for each sample is the same as a sample event message (see Section 5.1 - Sample Event Message).

```
Series 9>list date>=8/23
LIST:3
============================================================
DATETIME . . .
------------------------------------------------------------
DATETIME . . .
------------------------------------------------------------
DATETIME . . .
============================================================
Series 9>
```

4.5 Sample Query Command

Message ID	**QUERY**

This command is the same as the sample list command, except that a list of samples is not returned (only the number of samples that match).

E.g.,

```
Series 9>query date>=8/23
QUERY:1
```

4.6 Data Filter Messages

These messages are used to determine which parts of the sample event messages are sent to the user.

There will be 3 versions of the command:

FILTER <IDENTIFIER>=0	Disables the item in the sample messages
FILTER <IDENTIFIER>=1	Enables the item in the sample messages
FILTER <IDENTIFIER>?	Queries the state of the item

The response to all forms of the message will be:

<IDENTIFIER>=X where **X** is the state (0 or 1)

In each, **<IDENTIFIER>** is the item identifier in the sample event message. The name of the identifier will typically be the same as used in the sample event message. Each identifier will have a default state (On or Off). A list of identifiers is provided below.

Identifier	Default	Additional Information
VAL	On	**Controls all the VAL[x] elements**
SD	On	**Controls all the SD[x] elements**
APP	On	**Controls all the APP[x] elements**
SPAN	On	**Controls all the SPAN[x] elements**
TRIM	On	**Controls all the TRIM[x] elements**
REF	Off	**Controls all the REF [x] elements**
DPS	Off	**Controls all the DPS [x] elements**
CONSTIT	Off	**Controls all the CONSTIT [x] elements**
DATETIME	On	
PROD	On	
USER	On	
SAMPID	On	
SAMPINDEX	Off	
REPLICATE	Off	

E.g.,

```
Series 9>filter span?
SPAN=1
Series 9>filter span0
SPAN=0
Series 9>filter span?
SPAN=0
Series 9>
```

The command "**filters?"** can be used to list all current filter value settings.

4.7 Echo and Prompt Commands

These commands control how the console responds to user input.

The **Echo** command turns on and off character echo (default is on). With **Echo** on, all characters typed are sent back by the device (echoed).

Echo?	Returns the current character echo state
Echo=0	Turns character echo off
Echo=1	Turns character echo on (default)

The **Prompt** command turns on and off the Series 9 prompt (default is on).

Valid commands are as follows:

Prompt?	Returns the current prompt state
Prompt=0	Turns the prompt off
Prompt=1	Turns the prompt on (default)

4.8 Events Commands

These commands control whether events are displayed or not (see Section 5 - Event Messages).

Events? Returns the current events state

Events=0 Turns event messages off (default). Note that sample event message is always enabled.

Events=1 Turns event messages on

4.9 User Commands

These commands are used to control and monitor the users.

The command **"Users?"** lists the available user names. The response starts and ends with a line of = characters, with each user name on a separate line, e.g.,

```
Series 9>users?
============================================================
User1
User2
<Administrator>
============================================================
Series 9>
```

The command "**User?**" can query the current user.

The command "**User=<name>**" can set the current user. A blank name will log the current user out. Note that using the "**User=**" command will affect the active session on the InfraLab console.

4.10 Product Commands

These commands are used to control and monitor the products.

The command "**Products?**" lists the available product names. The response starts and ends with a line of = characters, with each product name on a separate line, e.g.,

```
Series 9>products?
============================================================
Product1
Product2
Product3
============================================================
Series 9>
```

The command "**Product?**" can query the current product.

The command "**Product=<name>**" can set the current product. A blank name will unload the current product (if set), while selecting a valid product will load that product. Note that using the "**Product=**" command will affect the active session on the InfraLab console.

4.11 Sampling Commands

4.11.1 SAMPLESTATE? Command

This command queries the current sample state and returns in the form **SAMPLESTATE=n** where **n** is the sample state. For a list of sample states, see Section 5.3 - Sample State Event.

4.11.2 STARTSAMPLE command

This command requests a sample to be started. Note that this command is only valid if the sample state is 2 (ready to sample).

4.11.3 SAMPLEID= command

This command can be used to send a manual sample ID. This may be called at any time, but is most likely to be used in response to a **EVT:SAMPLESTATE=5** (waiting for sample ID event).

The manual sample ID follows the command. E.g., the following command sets the sample ID to "testing 1 2 3":

```
SAMPLEID = testing 1 2 3
```

CHAPTER 5

5 Event Messages

Some messages are output when an event occurs. The sample event is always enabled, and is sent when a sample is completed.

The other events are enabled/disabled using the **events** command (default is off). See Section 4.8 - Events Commands.

5.1 Sample Event Message

Message ID	**SAMP**

This message is sent when a new sample is completed. An example of a sample output is shown below:

```
Sample data
-----------------
DATETIME    : 2021/06/18 12:52:15
PROD        : Test1
USER        : John Smith
SAMPID      : Sample123
VAL[1]      : -0.113
SD[1]       : 0.893
APP[1]      : 8204349
SPAN[1]     : 1.000
TRIM[1]     : 0.000
VAL[2]      : -0.07
SD[2]       : 1.066
APP[2]      : 8204350
SPAN[2]     : 1.000
TRIM[2]     : 0.000
VAL[3]      : -0.04
SD[3]       : 0.533
```

APP[3] : 8204351

SPAN[3] : 1.000

TRIM[3] : 0.000

A sample may contain some or all of the data elements described in the following sections. Each element is identified by an element descriptor (a string), followed by a colon (":"), followed by the data. Each element is sent on a new line.

Notes:

1. The exact content of the messages is configurable, allowing some element types to be turned on or off. For further details, see Section 4.6 - Data Filter Messages.

2. Where data is available for multiple channels, an index will be enclosed in square brackets. E.g., VAL[1] is the value for channel 1.

5.1.1 Sample Data

The following data will be sent, providing data about the sample.

Data	Element ID
Time stamp (string – see Section 3.3 - Date and Time Stamps for format)	**DATETIME**
Product ID (string), e.g., PROD="Product1"	**PROD**
User ID (string), e.g., USER="John Smith"	**USER**
Sample ID (string). The descriptive name given to the sample.	**SAMPID**
The sample index (uint32). Each sample within a set will have a unique sample index. For Infralabs, the sample index will be unique throughout the life of the instrument.	**SAMPINDEX**
For samples made up of multiple replicates, the replicate index will be included, for all but the first replicate.	**REPLICATE**

5.1.2 Measurement Data

The following data will be sent for each active channel. In each case, the element ID will have the measurement index enclosed in square brackets, starting with an index of 1.

Data	Element ID
Sample value (average as floating point)	**VAL[x]**
Sample SD (floating point)	**SD[x]**
Application code (uint32)	**APP[x]**
Span (floating point)	**SPAN[x]**
Trim (floating point)	**TRIM[x]**
Constituent. The name of the constituent e.g., “Moisture”.	**CONSTIT[x]**
Decimal Places to which the measurement is rounded (uint32)	**DPS[x]**
Reference value (floating point). A reference value may be provided for each channel. In most cases, the InfraLab will not have a reference value associated with a sample channel, and in these cases, this element will not be included in the sample message.	**REF[x]**

5.2 User and Product Events

These events are received in response to a User or Product being changed, either in response to a command from the LIMS, or user interaction at the InfraLab itself (via touch screen or from barcode entry).

Each event will be in the form **EVT:<name>=<new value>** where **name** is the name of the event ("**USER**" or "**PRODUCT**") and the new value is the new property value.

E.g.,

EVT:USER=<Administrator>	Indicates <Administrator> user has just logged in
EVT:USER=	Indicates user has logged out
EVT:PRODUCT=Product1	Indicates Product1 just loaded

5.3 Sample State Event

The sample state event is fired when the state of the sample changes. The event is in the form "**EVT:SAMPLESTATE=n**" where **n** indicates the current state. Values for **n** are given below.

State	Description
0	No sample present – Nothing on the turntable
1	No product. A valid product has to be selected before a sample can be taken.
2	Ready to sample. A sample is present and a valid product is loaded. A sample can now be taken.
3	Initialising sample. A sample has been initiated, and the system is waiting before commencing the actual sample, e.g., waiting for tray speed to stabilize.
4	Sampling. A sample is in progress.
5	Waiting for a sample ID. The sample has completed but the InfraLab is now waiting for a manually entered sample ID.

5.4 Barcode Event

This event is received when the InfraLab has been set up with a barcode reader that has been configured to provide LIMS data.

When a barcode is scanned, the event will be fired with the following format:

EVT:BARCODE=<barcode data>, where **<barcode data>** is the string associated with the scanned barcode.

This event can be used to perform automated sampling. E.g., when a user scans a barcode, the LIMS can select an appropriate product, or initiate a sample.

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CHAPTER 6

6 Servicing, Returns and Recycling

6.1 Servicing and Returning your Equipment

Your instrument was carefully inspected electrically and mechanically prior to shipment. It should be free of surface mars and scratches, and it should be in perfect working order upon receipt. If any indication of damage is found, file a claim with the carrier immediately, prior to using the instrument. If no damage is apparent, proceed by using this manual to install and setup this instrument.

Save the shipping carton and packing material for future storing or shipment of the instrument. If, at some future time, the instrument must be returned to the factory for service, include a full description of the instrument failure and the mode of operation the instrument was in at the time of failure. Also include a contact person to discuss the instrument failure.

When returning equipment for service, it is important to first obtain a Return Material Authorization (RMA) number. The RMA number is needed for proper handling of returned equipment.

- To obtain an RMA, go to https://ndc.custhelp.com/.
- To create a myNDC account, click the **Log in or Sign up** button. After creating the account, you will be immediately logged in. To log in on subsequent visits to myNDC, click the **Log in or Sign up** button, enter your username and password, and then click **Log in**.
- To submit an RMA, click on the **RMA Request** link and follow the on-screen instructions.

Ship the instrument in the original carton, or, if the original carton is unavailable, ship in a carton providing sufficient protection. Send the instrument to the Asia, Europe, or USA office, whichever is closest to you or to the office indicated by your sales engineer. Place the RMA number on the outside of the carton and include a purchase order number and any other information specific to your instrument. Field warranty service is available if the customer pays travel expenses by advance purchase order. All service operations should be performed by skilled electronics technicians, who have been trained by NDC Technologies.

6.2 Recycling, Disposal and Sustainability

NDC Technologies provides intelligent measurement and control solutions to help you focus on your unique mission in a more sustainable way. Better for your people. Better for your bottom line. Better for the planet. For this reason, NDC Technologies encourages its customers to recycle and dispose of equipment in a way which is responsible and encourages sustainability.

Please check the following before disposing of your equipment:

- Is the equipment worth repairing? If in doubt, contact NDC Service.
- If you are aware of any hazardous materials in your equipment, ensure qualified personnel take responsibility for its disposal. Some examples of hazardous substances include lead, mercury, cadmium, chromium VI, flame retardants, plasticizers, fluorescent tubes, monitors containing cathode ray tubes and products containing capacitors. NDC is compliant with the European WEEE and the most current RoHS Directive.
- Can you re-use or recycle any constituent parts? For example, if the housing/chassis is made of metal, it can be recycled by your local authority. Ensure qualified personnel take responsibility for dismantling the equipment.

If the equipment does need to be disposed of, please dispose of it in a way that does not harm the environment.

Warranty

1. All sales of NDC Technologies products are subject to the contractual terms and conditions of the Order pursuant to which they were sold to Buyer, including Warranty terms. The following terms are a general summary of the contractual Warranty terms, NOT a revision or alternative to the contractual terms, and are presented as merely a point of reference for your information. The contractual Warranty is the complete and exclusive statement of all NDC Technologies warranties to Buyer. In the event the following terms are in conflict with any of the contractual Warranty terms, the contractual Warranty terms shall be deemed to control.

   The warranty terms contained herein are expressly in lieu of any and all other warranties, expressed or implied, including any warranty of merchantability or fitness for a particular purpose. In no event shall NDC Technologies be liable for any incidental, consequential or special damages, including but not limited to, any loss of business, income or profits, expenses incurred for time when the system is not in operation, and any labor costs relating to or arising out of the performance, functioning or use of the system.

   Purchaser assumes the risk for use of this product and agrees to indemnify and hold NDC Technologies harmless for any and all damage to person or to property resulting therefrom.

   NDC Technologies grants no license under any patent rights except the right, under only such patents as may be owned or acquired by NDC Technologies, to use the product sold hereby for the purpose for which it is sold. NDC Technologies does not warrant that the product or its use does not infringe any patent owned by persons other than NDC Technologies.

2. NDC Technologies guarantees all products to be free from defects in material and workmanship for the following periods[1]:

   - Product and peripherals – 2 years from shipment
   - Source lamp – 5 years from shipment
   - Filter wheel motor – 5 years from shipment
   - Spare parts – 1 year from shipment
   - Replacement lamps and motors supplied under warranty – 1 year or up to the original 5 year warranty from shipment of the sensor, whichever is longer

   [1] Refer to the contractual terms and conditions of the Order for usage of the warranty.

   During this period, NDC Technologies will repair or at its option replace, free of all charges for parts and labor, any NDC Technologies parts determined by it to have been broken or damaged due to causes other than improper application, abuse or negligence. NDC Technologies' obligation to repair or replace shall not extend to expendable parts which are subject to normal operating wear.

   Nothing in this paragraph 2 will require NDC Technologies to make repairs or replacements where:

A. The product has been repaired, other than by an authorized NDC Technologies dealer or an NDC Technologies employee, or altered in any way without the prior written consent of NDC Technologies; or

B. The product has not been properly maintained in accordance with any operating and maintenance manual supplied therewith; or

C. The product has been damaged as a result of fire, flood, war, insurrection, civil commotion, acts of God or any other cause beyond the control of NDC Technologies or Buyer.

3. NDC Technologies' liability shall be limited to the obligations set forth in Paragraph 2. These shall be the Buyer's sole and exclusive remedies, whether in contract, tort or otherwise, provided, however, that in lieu thereof, NDC Technologies at its option may replace the entire product on an exchange basis or refund the purchase price against the return of the defective product.

4. NDC Technologies will not be responsible for failure to provide service or parts due to shortage of materials, labor or transportation strikes or delays, or any causes beyond NDC Technologies' control.

5. Unless otherwise specified by NDC Technologies, all warranty repairs will be made at NDC Technologies' facility. The customer shall be responsible for all expenses of packing, freight and insurance in connection with the shipment of products to NDC Technologies for repair. NDC Technologies will pay the cost of returning the equipment to customer.

   If it is mutually determined by the buyer and NDC Technologies that the examination, replacement or repair takes place at the buyer's facility, then the buyer will be responsible for NDC Technologies' travel and living expenses incurred in traveling to and from the buyer's facility, and during the time of the visit, as well as the cost of field labor and replacement parts unless the parts being repaired or replaced are determined to have been defective, in which event the cost of said repaired or replacement parts shall be borne by NDC Technologies. These travel and living expenses will be billed to the buyer at actual cost to NDC Technologies.

6. No person, including any NDC Technologies distributor, agent or representative, is authorized to assume any liability on behalf or in the name of NDC Technologies, and NDC Technologies shall not be bound to any understandings, representations, or agreements with respect to warranties except as set forth in this policy.

7. NDC Technologies requests immediate notification of any claims arising from damage in transit in order to determine if carrier responsibility exists. If damaged equipment arrives, save the shipping container for inspection by the carrier and telephone NDC Technologies as soon as possible.